



HYDROCARBONS AND AIR POLLUTION: AN ANNOTATED BIBLIOGRAPHY

Part I. Categories A to E

**U. S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
Public Health Service
Environmental Health Service**

**HYDROCARBONS AND AIR POLLUTION:
AN ANNOTATED BIBLIOGRAPHY
PART I**

Office of Technical Information and Publications
Air Pollution Technical Information Center

U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
Public Health Service
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INTRODUCTION

As the level of air pollution attributed to automotive and stationary sources increases, so does the necessity to extend our knowledge of hydrocarbon pollutants.

Certain hydrocarbon derivatives may have direct carcinogenic effects on lung tissue. One of the major concerns with hydrocarbons as pollutants, however, is in the indirect effects attributed to their role in the formation of smog through photochemical reactions with other substances. Photochemical smog has been associated with plant damage, eye and respiratory tract irritation, and reduced atmospheric visibility.

In urban areas, aerosols and exhaust gases have been found to contain not only parafinic, aromatic, acetylenic, and olefinic hydrocarbons but also ketones, aldehydes, phenols, alcohols, and halogenated hydrocarbons.

This bibliography represents an effort to collect, condense, and organize the literature on the hydrocarbons in relation to air pollution. The approximately 2,300 documents abstracted here are all included in the information storage and retrieval system of the National Air Pollution Control Administration's (NAPCA) Air Pollution Technical Information Center (APTIC). Most of them are from recent literature (1959-1970); however, some were written earlier in this century.

The abstracts are arranged in 13 categories listed in the table of contents. Each category is designated by a letter of the alphabet; each abstract is designated by its APTIC accession number. Since accession numbers are assigned as literature is received in APTIC, recent literature will more likely bear higher accession numbers.

A subject index, a geographical location index, an author index, and a title index follow the abstracts; they refer to the abstracts by category letter and APTIC number. The author index lists the first and second authors separately; when there are two or more, the first author is indicated by an asterisk (*). The geographical location index has two major divisions; United States, and Foreign.

This bibliography is composed of selected references. It is intended as a balanced sample of available literature, and no claim of all-inclusiveness is made.

All documents abstracted herein are on file at the Air Pollution Technical Information Center, 1033 Wade Avenue, Raleigh, North Carolina. Readers outside NAPCA may secure duplicates of the abstracted documents from libraries, publishers, or from the authors.

A. GENERAL

00164

STATISTICS ON PARTICULATE CONTAMINANTS - SAN DIEGO COUNTY AIR POLLUTION CONTROL DISTRICT (FIRST QUARTER 1966). San Diego Dept. of Public Health, Calif. Mar. 1966. 7 pp.

First Quarter 1966 Statistics on Particulate Contaminants San Diego County Air Pollution Control District are presented. Data are included on weight concentrations from high volume filter samples, soiling indexes, and hourly averages of gaseous contaminants.##

00233

W.L. Faith

THE NATURE, SOURCES, AND FATE OF AIR CONTAMINANTS. J. Air Pollution Control Assoc. 13, (10) 483-5, Oct. 1963. (Presented at the 56th Annual Meeting, Air Pollution Control Association, Detroit, Mich., June 9-13, 1963.)

A brief synopsis of air pollution specifying the types of pollutants, their habitat, the importance of aerosols and gases, and effect of meteorology on air pollution is presented. In broad terms, the problem of air pollution as it relates to health impairment is discussed.##

00599

J.J. Schueneman

THE NEW JERSEY AIR SANITATION PROGRAM - A REVIEW AND PROPOSALS FOR THE FUTURE. Preprint. 1964.

In order to carry on a reasonably adequate air resource management program which will insure a desirable air supply for the State and provide for continuing growth of population, industry and commerce, a major expansion of activities of the Air Sanitation Program is needed. Major decisions concerning land and air use, degree of control of air pollutant emissions, economics and public welfare must be made in the next few years. Some of these (for example: auto exhaust control; sulfur compound, nitrogen oxides and odor control; refuse disposal problems) involve potential expenditures in the hundreds of millions of dollars. It would be wise to spend enough money on evaluation

of the situation, effects of pollution, education of the public, and study of control problems to provide a sound basis for these decisions. It is further essential that adequate expenditures be made to implement the measures found to be necessary. While it is impossible to arrive at an entirely adequate estimate on the basis of the work done in this review, it appears that the Air Sanitation Program should be allocated about \$900,000 per year and be staffed with about 75 people. This amounts to about 15 cents per capita per year, based on the 1960 population. The present budget of \$190,000 per year (3 cents per capita) is grossly inadequate. The proposed level should be reached in stages over a period of three years of expansion. (Author's abstract)##

00984

S. Tilson

AIR POLLUTION. Intern. Sci. Technol. No. 42:22-31, 1965.

The problem and the approaches to solving it are reviewed. Pollution sources, research, air quality criteria, the need for controls, social attitudes, standards, photochemical reactions, and future prospects are included.##

01073

V.G. MacKenzie

AIR POLLUTION - WHOSE PROBLEM? Preprint. (Presented at A Panel Discussion on Air Pollution at the Board of Directors Meeting, National Petroleum Refiners Association, Washington, D.C., Sept. 20, 1965.)

The need for conservation of air as a natural resource is discussed, with emphasis on the role of the petroleum industry. Ways and means for improving on past patterns of conservation effort through Federal authority under the Clean Air Act, establishment of automotive emission standards, and application of technology to control of sulfur oxides and automotive emissions are delineated. Attention is called to the need for research on oxides of nitrogen and lead contamination. It is suggested that business leaders, by their leadership in research and education, can play a significant part in alleviating environmental health problems.##

01211

J. A. Maga

AIR RESOURCE MANAGEMENT IN THE SAN FRANCISCO BAY AREA. (California State Dept. of Public Health, Bureau of Air Sanitation). California Univ., Berkeley, Inst. of Governmental Studies. 1965. 42 pp.

Author reviews the problems of air pollution in the San Francisco Bay Area, stressing the need for effective air

quality standards. Topics covered in the report (all germane to the San Francisco Area) are: Air Pollution in the Metropolis; the concept of Air Resource Management; Weather, Topography and the Regional Air Resource; Air Pollution and its Effects; Air Pollution and its Relationship to other Regional Problems; a regional approach to the Control of Air Pollution; Control Programs in the Bay Area; and the outlook for the Bay Area.##

01378

I. Baxter

DETERMINATION AND SIGNIFICANCE OF GASEOUS FUEL OCTANE NUMBERS. J. Eng. Power, Vol. 87:166-168, April 1965. (Presented at the Oil and Gas Power Conference and Exhibit, American Society of Mechanical Engineers, Dallas, Tex., Apr. 12-16, 1964, Paper No. 64-OGP-6.)

Gaseous fueled engines have for many years been built without an undue concern for the octane number of the fuel, as long as it contained a substantial amount of methane. The steady increase in engine power ratings in recent years has made the determination of octane numbers on specific gas mixtures desirable. The introduction of turbocharging for gas engines places further stress on fuel quality. A standardized apparatus and technique for determining octane numbers of gaseous fuels in the ASTM-CFR knock test engine is available. The means for making such rating are described. While ratings on mixtures of saturate hydrocarbon gases can be calculated with acceptable accuracy, the presence of unsaturates or of antiknock additives make an engine test necessary. (Author abstract)##

01640

M. Katz

SOME ASPECTS OF THE PHYSICAL AND CHEMICAL NATURE OF AIR POLLUTION. World Health Organization Monograph Ser. (Air Pollution). No. 46 1961. pp. 97-158.

This chapter of the WHO Monograph reviews works on air pollution accomplished within the last ten to 15 years. The subject of the physical and chemical nature of air pollution is so broad and covers many fields of physics, chemistry and medicine that only the most important works have been highlighted. Discussed among others were the following problems: The development of improved methods and techniques for the measurement, separation and identification of air contaminants, the standardization of methods of sampling and analysis of common air pollutants, the application of meteorological concepts and diffusion theory to the study of the dispersion of pollutants in the atmosphere, the formation of smog and the prediction of pollution levels, the development of improved analytical techniques, instrumentation and studies of motor vehicle exhaust gas composition under various operating conditions and the development of catalytic and other exhaust gas system control devices, the study of the action of sunlight on motor vehicle and traffic gas and of photochemical atmospheric reaction in general,

the determination of the health and other effects of irradiated gaseous and vapour pollutants, the continued study of carcinogenic and other toxic substances presented in the urban environment and the evaluation of their effects on health, and the study of radioactive pollutants and their effects in connection with the development of industrial uses of nuclear energy for power and transportation.##

02237

J.P. Dixon J.P. Lodge

AIR CONSERVATION REPORT REFLECTS NATIONAL CONCERN. Science 148, 1060-6, May 21, 1965.

Pollutants, sources, political and economic factors, and the role of scientists in the formulation of public policy is examined in the light of present knowledge.##

02951

A. C. Stern

AIR POLLUTION AND ITS ABATEMENT IN THE UNITED STATES. De Ingenieur 77, (29) G83-93, July 16, 1965 and 77, (31) G97-104, July 30, 1965. (Presented before the Dept. for Public Health Engineering, Royal Inst. of Engineers, Hague, Netherlands, July 3, 1964.)

In the United States, visible smoke is no longer a major problem. Present concern is principally with gases; their chemical reactions in the atmosphere; the effects of both gases and reaction products on humans, animals, plants, materials and visibility; and their abatement. Considerable emphasis is placed on the relation of meteorological conditions to air pollution levels. Forecasting of weather conditions conducive to build-up of pollution is now done routinely in the United States. Although air pollution research is conducted nationally, abatement is on local basis. The new Federal Clean Air Act seeks to improve the effectiveness of local agencies, and to provide for Federal abatement of interstate air pollution. (Author summary)

03058

A. P. Altshuller.

AIR POLLUTION: PHOTOCHEMICAL ASPECTS. Science 151, (3714) 1105-6, Mar. 4, 1966

This paper gives a brief summary of presentations at the Symposium on the photochemical aspect of air pollution, which was held April 1965 in Cincinnati, Ohio. Topics ranged from the measurement of solar radiation in the ultraviolet region of the biological aspects of irradiation of model systems in the laboratory to the relation between meteorological parameters and chemical effects in polluted atmospheres.##

03085

A.C. Stern

PRESENT STATUS OF ATMOSPHERIC POLLUTION IN THE UNITED STATES. Am. J. Public Health' (Presented at the 86th Annual Meeting, American Public Health Association, St. Louis, Mo., Oct. 29, 1958.) 50, (3) 346-56, Mar. 1960

The status of air pollution in the United States is reviewed in terms of knowledge available and action taken to deal with this problem. Studies by the National Air Sampling Network, state, and local health agencies are reviewed. Facilities for training persons for air pollution work are discussed, and the Federal Air Pollution Engineering Research and Technical Assistance Program is surveyed. (Author abstract)##

03205

D. Epstein.

DETECTION AND PREVENTION OF AIR POLLUTION IN THE USSR. Detection et prevention de la pollution atmospherique en U.R.S.S. Pollut. Atmos. (Paris) 8, (31) 273-83, Sept. 1966.

The problems of the toxic amounts of air pollutants (CO, SO₂, H₂SO₄, NO, and 3, 4-benzopyrene) are described and the criteria for standardization in Russia given. The methods for detecting toxic proportions of these pollutants are given in detail, the techniques used for animal experimentation, and studies of the tests applicable to mankind and the techniques of applying them are described in particular. The paper mentions that since chronaxie was judged insufficiently sensitive, the Soviet authors resorted to electroencephalographic methods which reveal an electrocortical reflex for small amounts of polluting agents. These tests involving instantaneous maximum admissible concentration are supplemented by statistically analyzed experiments on animals. (Author summary)##

03401

F. Bonamassa

DESIGN CONSIDERATIONS OF A PHOTOCHEMICAL-ATMOSPHERE ENVIRONMENTAL TEST FACILITY. Am. Soc. Testing Mater., Spec. Tech. Publ. 352, 32-9 pp., Dec. 1963. (Presented at the Symposium on Air-Pollution Measurement Methods, Los Angeles, Calif., Oct. 5, 1962.)

A photochemical-atmosphere environmental test facility is a system designed to stimulate in the laboratory conditions existing in polluted atmospheres. These test environments are finding increasing applications in studying the effects of contaminated atmospheres on humans, animals, plants, or inanimate objects; evaluating air-pollution control systems; establishing air quality standards and permissible contaminant-

emission levels; identifying atmospheric pollutants and their reaction products; and investigating the mechanisms of reactions of polluted atmospheres. Many interdependent factors influence the design of a photochemical-environment test facility. Careful study of the proposed experimental program and its objectives is needed to determine the required test volume and operating conditions. The design and choice of construction materials reflect certain compromises, usually dictated by the relative importance of the various test conditions. Although probably no simulated photochemical atmosphere can ever completely reproduce all the conditions of the natural atmosphere, enough control over significant variables can be achieved to enable the test environment to assume an increasingly important role in increasing our understanding of the complex reactions and effects of photochemical air pollution and in providing much needed information for its effective control.##

03438

B. C. Blakeney and M. D. High.

CLEANER AIR FOR NORTH CAROLINA (A SURVEY AND APPRAISAL FOR AIR POLLUTION PROBLEMS). North Carolina State Board of Health, Raleigh, Div. of Sanitary Engineering and Public Health Service, Washington, D.C. Div of Air Pollution. Sept. 1959. 62 pp.

The most frequently occurring air pollution problems attributed to industrial and municipal establishments results from emissions of smoke, soot, or fly ash from fuel burning equipment. The lumber, wood and furniture industries are frequently sources of dust. Asphalt paving material plants create more acute air pollution problems than any other industry. Pulp and paper mills are the cause of odor complaints and are considered the cause of some property damage. A variety of waste disposal operations emit excessive smoke and odors. In eight cities, open dumps have caused complaints and in five cities semi-landfills (burning before covering) have resulted in public request for relief. Control of gases, dusts, and other pollutants cannot be legally required by the State except through the Nuisance Code or indirectly through some other statute. The lack of specific State legislation limits the control of air pollution to the jurisdictional area of a few cities, whereas pollution of community air is not confined to man-made boundaries or jurisdiction. Existing and potential air pollution problems requiring further investigation are discussed.##

03547

M. W. Korth, R. C. Steward, R. C. Stahman

DEVELOPMENT OF A CYCLE CONTROLLER FOR CHASSIS DYNAMOMETER. Preprint. (Presented at the 57th Annual Meeting, Air Pollution Control Association, Houston, Tex., June 21-25, 1964, Paper No. 64-82.)

A closed-loop speed feedback control system has been developed for a chassis dynamometer; the system permits precise speed control of an automobile following a cycle that represents average driving conditions. This system, when used in conjunction with a variable-length cruise-mode device, permits the generation of consistent exhaust emissions from an automobile being used to charge large irradiation chambers with dilute exhaust gas during lengthy air pollution experiments. The application of this control system is being extended to include operation with a range of vehicles having widely varying power and response characteristics. (Author abstract)##

03556

M. Katz.

SOME TOXIC EFFECTS OF AIR POLLUTION ON PUBLIC HEALTH. Med. Serv. J. (Can.) 16, 504-25, June 1960.

Nature of atmospheric contamination is reviewed. Brief descriptions are given of air pollution episodes, legislation, epidemiology, sources of air pollution and their effect on health. Air pollution research in Canada is summarized.##

03674

J. P. Lodge, Jr.

AIR POLLUTION (REVIEW OF APPLICATION OF ANALYSIS). Anal. Chem. 33(5):3R-13R, Apr. 1961.

This review covers the years 1959 and 1960, which have seen great activity in the air pollution research field. It supplements the previous review, with the exception that the growth of the literature has been so great that explicit coverage of radioactive pollutants has been omitted from this review. The trend toward increased interest in automotive exhaust and atmospheric carcinogens, noted in the previous review, has continued. In addition, there has been a renewal of interest in atmospheric lead. For the most part, these observations hold only for the United States. The bulk of research in Europe continues to be directed toward improved methods for measurement and control of sulfur dioxide and dust. Meetings and conferences were numerous. The annual symposia organized by the Committee on Air Pollution, American Chemical Society, featured sessions on automotive exhaust and on polynuclear hydrocarbons in 1959, and on photochemistry and fine particles in 1960. The Air Pollution Control Association continued its regular schedule of meetings. A conference on air pollution research was sponsored by the U.S. Public Health Service in New Orleans in early 1960, continuing a series of meetings intended primarily for the Public Health Service contractors and grantees in the field. More specialized meetings included a conference on dust in Vienna, one on adhesion of fine particles at Leatherhead, England, and a symposium at Oxford on atmospheric diffusion and turbulence. Increasing public interest in air pollution resulted in the publication of a large number of papers intended primarily

for public consumption. These are too numerous and in general too lacking in novelty to warrant mention here. On the other hand, a substantial number of books and review articles of a general nature were published having high scientific merit.##

04052

R. Haddad and J. J. Bloomfield

ATMOSPHERIC POLLUTION IN LATIN AMERICA. Bol. Ofic. Sanit. Panam. 58, 241-9, Sept. 1964. Sp. (Tr.) (Presented at the Inter-Regional Symposium on Criteria for Air Quality and Methods of Measurement, Geneva, Switzerland, Aug. 6-12, 1963.)

Latin America is an area which is experiencing a very rapid population and industrial expansion. Although this growth is very irregular, the cities which exceed a million inhabitants and the industrial concentration in them is growing yearly. This phenomenon has resulted in serious problems of air pollution in Sao Paulo, Brazil, Santiago, Chile, Mexico City, Mexico, which are in need of further investigation and control as quickly as possible. There are potential problems in Buenos Aires, Argentina, and in all those large metropolitan centres which are growing and industrializing rapidly. The situation created in Lima, Peru, because of the fishmeal industry, seems to be fairly well controlled. The greatest necessity is to train personnel capable of conducting studies in measuring air quality and controlling the contamination of the air. There is also a necessity to create a consciousness of the seriousness of the problem among government authorities and the public in general. It is hoped that the future development of the Institute of Occupational Health and Air Pollution Research in Santiago, Chile, will contribute effectively to achieve these objectives.##

04212

S. Abe

THE PRESENT STATUS OF AIR POLLUTION. Clean Air Heat Management (Tokyo) 15, (7-8) 7-18, Aug. 1966. Jap.

The present status of air pollution in Japan is given naming the kinds of contaminants and their origin, factors affecting contamination density, and various types of smog. The types of contaminants are: 1) minute particles (less than 1 micron in size) such as found in soot, carbon, ashes, dust; 2) coarse particles (greater than 1 micron in size), as found in dust, ashes, and minerals; 3) reactive substances found in mist, fog, and vapor such as SO₂, SO₃, H₂S, CO₂, CO, NO₂, N₂O₃, O₃, aldehydes, HCl, NH₃, HF, Pb, Hg, Cd, As, Be and 3, 4-benzpyrene. The contaminants originate from factories, chemical plants, power stations, domestic heating, public baths, hotels, laundries, dry cleaning establishments, hospitals, schools, and public buildings. Also discussed are the human factors affecting air pollution such as public awareness and interest, seasonal, weekly, and daily changes in heating and cooking. Meteorological aspects are covered such as wind direction and velocity, turbulence, temperature, rain and snow. The types of smog found in New York, London, Los Angeles, Pittsburgh, and Yokkaichi are

described. Graphs and tables list symptoms and diseases affecting plants and humans and give the density of dust particles and SO₂ in the main cities of Japan. Data on the sulfur content of various oils produced by Japanese refineries and on the number of Japanese automobiles produced is included for information on emission sources of pollutants.##

04487

B. T. Commins

CHEMISTRY OF TOWN AIR. Research (London) 15, 421-6, Oct. 1962.

A review of the chemistry of urban air pollution in London and other cities is presented. Topics briefly discussed and summarized included: sources of air pollutants; fuel combustion principles; pollutant measurements; concentrations; air pollutant properties; chemical reactions affecting air pollution. Chief sources of air pollution are seen to be fuels burnt for domestic, industrial and commercial heating, and for power generation and transportation. The more important pollutants are considered to be smoke (and associated particulate matter including H₂SO₄ and tar) SO₂, CO₂, oxides of nitrogen, hydrocarbons, and ground deposits. The more important meteorological factors affecting pollutant concentration are seen to be temperature (highest in cold weather), turbulence and wind, and temperature inversion. Factors which illustrate the differences in air pollution characteristics to be found in various cities are evident in a comparison between London and Los Angeles, the latter being more affected by vehicular exhaust contaminants and photochemical reactions than London where the atmosphere contains more heating fuel exhausts such as SO₂ and smoke.##

06146

W. Rayher* and J. T. Middleton

THE CASE FOR CLEAN AIR (SPECIAL REPORT). Mill Factory 80, (4) 41-56, Apr. 1967.

The introduction in the form of a series of questions put to Dr. Middleton is of special interest in indicating the forward thrust of the Federal government in air pollution control since he is the Director of the National Center for Air Pollution Control which has the responsibility for the administration of the Federal air pollution control laws and regulations. His answers indicate vigorous activity by the Federal authorities where local authorities fail to act. The major provisions of the proposed Air Quality Act of 1967 are outlined as well as the existing Federal authority under the Clean Air Act of 1963. With this background of increased Federal activity and especially with the issuance of emission standards, this definitive review continues with an outline of the various types of air pollutants, their sources, and the accepted methods of control. In the section

covering what is being done by industry today, examples are given of the control measures in effect at a rubber processing plant, a cement plant, steel plant, and a foundry.##

06722

A. Goetz

PARAMETERS. Symp. Environ. measurements, Cincinnati, Ohio, 1963. (PHS Publ. No. 999-AP-15.) (July 1964). pp. 29-34.

Air and water as gaseous and liquid components of the environment are considered essential ingredients for human, animal, and plant life -- ingredients that are also acted upon by these live forms. Air and water are evaluated in terms of chemical and physical parameters relating to their occurrence in the natural regenerative and degradative cycle and to their physiological assimilation. Particulate pollutants and reactive gases are discussed. Emphasis is given to the physical and chemical characteristics of aerosols and their potential role as pollutants of environmental significance. (Author's summary)##

06723

J. S. Nader

DATA ACQUISITION SYSTEMS IN AIR QUALITY. Symp. Environ. Measurements, Cincinnati, Ohio, 1963, (PHS Publ. No. 999-AP-15.) (July 1964). pp. 107-23.

Two major automated data acquisition systems are now being used in the United States for air quality measurements. These systems, operated by the Los Angeles County Air Pollution Control District and by the U.S. Public Health Service (Continuous Air Monitoring Program), are reviewed in detail; plans for automated data handling by the California State Health Department are discussed briefly. Design and operation of these systems are reviewed in terms of sampling, detection, recording, data validation, and data display. (Author's summary)##

06744

T. Suzuki

AIR POLLUTION IN JAPAN. Kuki Seijo (Clean Air - J. Japan. Air Cleaning Assoc., Tokyo) 2, (2) 1-4, 1964. Jap.

The nature of air pollution in Japan has been changing. Pollution from the chemical industry, petroleum processing, and automobiles has become more prevalent than dust and soot from coal and heavy fuel oil. At present, the degree of air pollution is indicated primarily by the amount of dust and soot fall and concentration of SO₂ and floating dust, and secondarily by the concentration of carbon monoxide, nitrogen oxides, and hydrocarbons. Use of heavy oil and coal of very low grade makes

the situation worse. General considerations of the effects of pollutants on the human body are given. Studies made by the Yamaguchi Medical School on floating dust and SO₂ indicate a correlation between concentration and death rate. Mention is made of the now familiar "Yokohama Asthma". It was found that in Yokkaichi city, air pollution is especially heavy when the wind velocity is greater than 5 m/sec and SO₂ is highly concentrated. The death rate from lung cancer in Hokkaido for 1950 to 1960 was 1.6 times as great as the mean value for the rest of Japan. Maximum allowable concentrations of various pollutants are tabulated for the United States, Soviet Union, and West Germany.##

07181

F. Begemann

TRITIUM IN THE ATMOSPHERE. Tritium in der atmosphere. Umschau (Berlin) No. 22 741-2 (1966). Ger.

The current state of knowledge about tritium in the atmosphere is reviewed. Tritium originates in the stratosphere through bombardment of nitrogen and oxygen by cosmic radiation. Having a half life of 12.3 years, it can be used as a tracer to study various atmospheric problems. Since tritium is also contained in radioactive fallout, the concentration has doubled every 1.5 years during the last 12 years. Tritium is also found in methane in the atmosphere, but this probably stems from a leak in an industrial facility.##

07204

S. Somazzi and G. Zezzo

LIQUID FUELS IN CENTRAL HEATING INSTALLATIONS FOR URBAN HEATING. I Combustibili Liquidi Nelle Centrali Termiche per Il Riscaldamento Urbano. Fumi Polveri (Milan) 7 (4), 79-84 (Apr. 1967). (It.)

Various sources of energy used throughout the world are compared for the years 1900 and 1960. In 1900, 57.8% carbon, 2.2% petroleum, 38.7% wood, 1.0% natural gas, 0.1% hydroelectric energy, and 0.2% other were used, whereas in 1960, 41.6% carbon, 26.6% petroleum, 19.1% wood, 11.6% natural gas, 1.1% hydroelectric energy, and 0.0% others were employed. A similar study in Italy from 1920 to 1960 also shows that the use of petroleum has increased. By 1970 it is estimated that 101.7 million tons of combustible oil will be burned compared to 70 million tons in 1965. The use of solid fuels is expected to decrease in the future and liquid fuels such as petroleum and natural gas, as well as nuclear energy will increase. Liquid fuels are divided into distillate oils such as kerosene and gas oil and residual oil such as naphtha, paraffins, and aromatic hydrocarbons. Air pollution results from combustion of residual oil if the combustion chamber is not large enough, if there is no turbulent mixing, and if the temperature is not high enough to ensure complete combustion. The best source

of fuel would be distilled gas oil with a low sulfur content. The use of central heating systems in a manner which will produce optimum conditions for heat output and eliminate air pollution is mentioned.##

07599

Barnes, J. M., P. Bonnevie, G. M. Fair, P. J. Lawther, M. Hollis, M. Laird, and R. Pavanello

MICROCHEMICAL POLLUTANTS IN THE ENVIRONMENT. Preprint, World Health Organization, Geneva, Switzerland, ((20p.)), 1963. (Paper No. WHO/PA/110.63.)

An attempt is made by the World Health Organization to assess the contamination of air, soil, food and water by the many organic chemicals man synthesizes. The problem, with respect to air pollution, is the contamination of air by the products of combustion, complete and incomplete, of carbonaceous fuels and their contained impurities. Pollution of industrial atmospheres by synthetic organic chemicals and their intermediates is common. The problems involved in this transient type of pollution are likely to be local in extent and, since the chemical concerned is already identified and its properties known, precautions against its inhalation can be applied accordingly. Pollution of the communal air by synthetic organic chemicals is probably insignificant. It is doubtful whether the synthetic pesticides, whether formulated as liquids or powders, can easily be redispersed in inhalable form since their formulations and the methods by which they are dispersed are designed to produce maximum retention by the surfaces to which they are directed. Emissions of synthetic organic chemicals by industry are likely to be very small since they are prime products and not wastes. Within a factory, any waste synthetic organic chemicals can be destroyed in the same way as odoriferous gases. The destruction of scrap organic material such as waste plastics ought always to be complete and such material should never be burnt on open dumps. There is good reason to deduce from investigations on the pollution of air by motor vehicle exhausts that the ultimate fate of organic matter in the air may be complete oxidation. Some chemicals may take part in reactions by which irritant new substances are formed as more or less long-lived intermediates. This type of pollution can hardly be said to be due to synthetic organic chemicals, but exemplifies what might follow the emission into the air of truly synthetic chemicals.##

07845

Parker, A.

WHAT'S IN THE AIR J. Inst. Fuel, 40(315):173-175, April 1967.

We each breathe about 35 lb of air in a day, consume 3 to 4 lb of drinking water and 1 1/2 lb of dry food. This provides energy by oxidation of carbon and hydrogen of which the thermal value is about 12,000 Btu. equivalent to that provided when 1 lb of coal is burnt. Some of this energy is given out as heat, say about 400

Btu/h. Records of smogs in various countries since 1873 exist, but that in London in 1952 had great effect leading to the b8beaver Report and the b8clean Air b8act, 1956. 2.7 million ton of smoke were discharged into the air during 1938 in Britain, of which 63% was from domestic sources, 10% from railways and 27% from industry. This was reduced to 1.1 million tons in 1965, of which 0.9 million, 80%, was from domestic sources. This reduction was also helped by the rationing of coal during the years of World War II and by the desire for cleaner domestic heating methods. 4.1 million tons of sulphur dioxide were discharged into the atmosphere in Britain in 1938 and 6.4 million tons in 1965, but the concentration of SO₂ in the air near the ground has stayed the same. The problem is not yet solved. About 14 million motor vehicles in the U. K. emitted perhaps 5 million tons of carbon monoxide and 1/4 million tons of hydrocarbons in 1965. The interaction of hydrocarbons, oxides of nitrogen and ozone, in sunlight causes the smogs of Los Angeles in which visibility is scarcely reduced and so they are of a different character from London smogs. The International Union of Air Pollution Prevention Associations was recently founded. Its first international clean air congress was held in London in October, 1966. (Author's abstract)##

08071

Gammelgard, P. N.

CURRENT STATUS AND FUTURE PROSPECTS -- REFINERY AIR POLLUTION CONTROL. Preprint, 13p., ((1966)). (Presented at the National Conference on Air Pollution, Washington, D. C., Dec. 13, 1966.)

The oil industry has been engaged in air conservation research and practice for almost two decades, both through the efforts of individual companies and through programs of its trade association, the American Petroleum Institute. The present status and prospective methods for controlling smoke, hydrocarbons, oxides of sulfur, particulates, and carbon monoxide in the petroleum industry are discussed briefly.##

08273

AIR POLLUTION AND THE UBIQUITOUS AUTO. Environ. Sci. Technol., 1(11):878-880, Nov. 1967.

The recent report of the Commerce Department's Panel on Electrically Powered Vehicles is discussed. "The Automobile and Air Pollution: A Program for Progress" details 16 specific recommendations to serve as a basis for immediate action. There is an urgent need for more extensive information regarding the significance of specific and combined air pollutants on public health. Little is known of the social and economic costs of air pollution. The entire area of meteorological effects of air pollutants is speculative at present and only a beginning has been made in the design of meaningful research programs. The panel feels that [the Federal Government should continue to establish

standards for all harmful automotive emissions and realistic timetables for the achievement of such standards.) Lead emissions particularly concerned the panel, because of possible impact on human health, increased levels of hydrocarbon in auto exhaust; modification of atmospheric processes; and deactivation of catalysts or absorbants which may be necessary to reduce emission of other pollutants. The panel feels that the emission standards should specify total mass of specific pollutants. The National Center for Air Pollution Control in its current organization does not appear appropriate for effective action. The panel would like to see an advisory board at the highest departmental level. The use of low pollution performance criteria rather than detailed product specification in the vehicle procurement process would provide strong incentives. To meet future emission standards, more and better technology must be developed. The panel feels that: During the next decade, in the normal course of events, no significant reduction in total air pollution will be achieved through the introduction of unconventional low-polluting vehicles. Gas turbines are reasonable alternatives to internal combustion engines in the large sizes used in trucks, trains, and buses. Hybrid power plants might provide satisfactory performance. Because two separate energy sources are needed, such hybrids might be too expensive for private passenger autos.

09310

Kalika, Peter W.

THE GROWING PROBLEM. Mach. Des., 39(17):19-21,
July 20, 1967.

The facts, figures, and concern about the national problem of air pollution are covered. Past air pollution episodes, sources and types of pollutants released in the atmosphere, and the mechanisms and characteristics of temperature inversions are reviewed.

09780

Environmental Science Services Corp., Stamford, Conn.

AIR POLLUTION CONTROL PRIMER. 35 p., ((1968)).

The main sources of air pollution are combustion processes, especially internal combustion engines. In a general manner the following are discussed: causes and effects of air pollution; legal aspects; automobile emissions; fossil fuels and lead additives; and control equipment and its market potential.

11227

J. E. Yocom

AIR QUALITY. In: Instructional Material for the
Connecticut Air Pollution Simulation Model Program

Travelers Research Center, Inc., Hartford, Conn., 10p., 1968.
2 refs. (Presented at the TRC Seminar, Hartford, Conn.,
Oct. 12, 1968.)

The nature and composition of clean air itself is reviewed. An almost infinite number of individual chemical compounds, singly and in combination, and existing in a variety of physical forms contribute to community air pollution. The most important pollutants and classes of pollutants found in majority of communities may be listed within five categories: carbon monoxide, hydrocarbons, nitrogen oxides, sulfur oxides, particulate matter. A discussion of each is presented to show their sources and importance in air pollution problems. Criteria background information which is required prior to setting air quality criteria for SO₂ and other pollutants is presented.##

12177

John T. Middleton

AIR QUALITY AS A CONTROLLING FACTOR IN LIFE PROCESSES. In: Biometeorology, Proceedings of the Twenty-Eighth Annual Biology Colloquium, 1967, William P. Lowry (ed.) p. 67-79, 1967. (4) refs.

The quality of air is determined by the uses made of it and by the pollutants injected into it by man. The quality of air varies for a number of reasons, but principally because of contaminants arising from economic and social developments throughout the world. Air pollution is one of the undesirable side effects of this growth and development. The extent, severity, and character of man-made air pollution are determined by the kind, number, and location of contaminant sources, the chemical reactivity and interaction of the pollutants, the topography of the land, the weather, the nature of the community, and the characteristics of the airshed.##

14479

Biersteker, Klaas

AIR POLLUTION IN THE NETHERLANDS. Tijdschr. Soc. Geneesk. (Assen), 47(3):66-70, Jan. 31, 1969. 24 refs.

In a survey conducted in 1965, all Dutch municipalities with populations above 50,000 reported experiences with air pollution. Many complaints center on local nuisances, particularly the odors caused by a potato plant in Gronigen, textile industries in the eastern part of the country, spice, timber, and oil operations north of Amsterdam, and oil refineries and phosphate plants in Rotterdam. The odors are frequently a result of water pollution, indicating a connection between the two types of pollution, at least in the Netherlands. Because of the increasing concentration of population and industries in the area comprising Rotterdam, Amsterdam, and The Hague, a further increase in air pollution problems is anticipated. Tables give the standard smoke concentrations in central Rotterdam in the winter months for the

years 1957 to 1968 and the 3,4-benzopyrene content at two sampling stations in Rotterdam from 1961 to 1967. Also tabulated are the distribution of Dutch municipalities according to the number of inhabitants since 1900 and the population densities of The Netherlands and other countries.

16523

Urrutia, D. Jose Llado Fernandez

ASPECTS OF INDUSTRIAL CONTAMINATION. (Aspectos de la contaminación industrial). Text in Spanish. Rev. San. Hig. (Spain), 43(9-10): 663-713, Sept.-Oct. 1969. (Pages 691-710 are pertinent to air pollution.) (Presented at the Conference of the Sociedad de Higiene y Medicina Social, April 16, 1969.)

The industrialization processes, the increase in industrial water and air pollution, the causes of contamination, and Spanish legislation for the control of air and water pollution are discussed. The principal atmospheric contaminants are carbon oxides, sulfur oxides, nitrogen oxides, hydrocarbons, and particulates. The amounts were estimated and it was found that half of the pollutants are concentrated in the major cities. The main sources of pollutants are automobiles, heaters, incinerators, and industrial processes. Industrial emissions are not controlled because of poor equipment, insufficient finances, and inefficient legislation. Another important source is radioactive contamination from laboratories, hospitals, and nuclear centers. The irritant effects of pollutants on the eyes, nose, and throat were briefly discussed. Foreign legislation was also briefly discussed. Generally, foreign regulations prohibit the emission of gases and smoke above certain pre-established limits, provide vehicle emission standards and regulation of some control equipment. Spanish legislation is scarce and inefficient. Old regulations include provision for industries to emit noxious gases with the consent of Sanitation inspectors and weekly atmospheric analyses for chemicals and bacteria. Other old regulations prohibit the establishment of vapor-producing industries within 500 m of a town and a maximum emission limit for sulfur anhydrides at 8 g/cu m. More recent legislation established maximum allowable concentrations for smoke, particulates, sulfur anhydrides, and carbon anhydrides, and an opacity index. The amounts of sulfur allowed in combustible liquids for industrial use were prescribed. Carbon monoxide emissions from vehicles and dust emissions from cement industries were also regulated. It was concluded that public and industrial responsibility and enthusiasm for control should be encouraging and more flexible, realistic legislation should be passed.

B. EMISSION SOURCES

00020

J. R. Goldsmith and L. H. Rogers

HEALTH HAZARDS OF AUTOMOBILE EXHAUST. Public Health Rept., 74(6):551-558, June 1959.

Of the substances which occur in automobile exhaust and their reaction products, hygienic standards have been established for industrial exposure to carbon monoxide, nitrogen dioxide, lead, and ozone. Establishing a full set of levels for community exposures to these substances is very difficult because of the sensitivity of frail or ill individuals, the indeterminate period of exposure, the effect of agents in combination, and the cumulative effect of exposure from other sources, such as cigarette smoking. The hazard of automobile exhaust to the population of a large community will depend, among other things, on the extent and way that vehicles are used, and the meteorology of the area. In the absence of effective control for air pollution from automobile exhaust, the public health hazard should be evaluated. (Author)##

00027

A. H. Rose, Jr., M. Corn, R. R. Horsley, D. R. Allen, and P. W. Kolp

AIR POLLUTION EFFECTS OF INCINERATOR FIRING PRACTICES AND COMBUSTION AIR DISTRIBUTION. J. Air Pollution Control Assoc. 8(4):297-309, Feb. 1959.

The relationships between incinerator design criteria and resulting atmospheric contaminant discharges were investigated. Tests were made by burning a fuel of constant composition in a prototype, multiple-chamber incinerator under controlled conditions. Effects of variables were measured by analyzing the flue gases for solids, hydrocarbons, oxides of nitrogen, and CO. The series of tests reported was made to (1) provide information on the relative importance of such variables as stoking and amount of fuel per charge insofar as they affect the production of atmospheric pollutants, and (2) evaluate the chosen levels of variables such as excess combustion air, underfire and secondary air distribution, and fuel charging rate. Production of particulates was highly dependent on the amount of excess combustion air and the percentage of this air entering under the fuel bed. At the 50% excess air level, particulate discharge increased when underfire air was increased from 15% to 30% of the total combustion air. This did not hold true for the 150% excess air level. Reduction of hydrocarbons and CO appeared to be more dependent on the level of excess combustion air available than

on its distribution between overfire, underfire, and secondary air. These pollutants were produced under combustion with 50% excess air but not with 150% excess. Production of oxides of nitrogen depended on the rate of fuel charging, the amount of excess air, and the gas temperature in the ignition zone. (Author)##

00030

W. S. Smith

ATMOSPHERIC EMISSIONS FROM FUEL OIL COMBUSTION (AN INVENTORY GUIDE). Public Health Service, Cincinnati, Ohio, Div. of Air Pollution, (999-AP-2.) Nov. 1962. 102p.

This review provides a guide for the inventorying and control of emissions arising from the combustion of fuel oil. Information was collected from the published literature and other sources. The report is limited to information on oil used as a source of heat or power (exclusive of process heaters). The data were abstracted, assembled, and converted to common units of expression to facilitate understanding. From these data, emission factors were established that can be applied to fuel oil combustion to determine the magnitude of air-contaminating emissions. Also discussed are the compositions of fuel oils; the preparation and combustion of fuel oil; and the rates of emission, their variables, and their control. (Author)##

00052

MOTOR VEHICLES, AIR POLLUTION AND HEALTH (A REPORT OF THE SURGEON GENERAL TO THE U.S. CONGRESS IN COMPLIANCE WITH PUBLIC LAW 86-493, THE SCHENCK ACT). Public Health Service, Washington, D.C., Div. of Air Pollution. June 1962. 463 pp.

"Motor Vehicles, Air Pollution, and Health" is a report prepared by the Division of Air Pollution of the Public Health Service as directed by the Congress in Public Law 86-493. The Report is presented in three parts as follows: Part I. Summary--A Review of the Problem; Part II. Effects of Motor Vehicle Pollution on Health; Part III. Air Pollution from Motor Vehicles. Part I summarizes current information and theories of the nature of air pollution resulting from emissions from motor vehicles. It also examines approaches to the reduction of such pollution, and some of the problems associated with control measures. Finally, it presents an appraisal of the biological effects, proven or potential, of such pollution. Part II reviews, in detail, information which has been reported concerning the influence of air pollution on health, with particular reference to the effects from pollution arising from the operation of motor vehicles. The results of mortality and morbidity surveys, of laboratory research, and of other pertinent investigations are given. The responses of vegetation and animals, as well as of humans, to individual contaminants as well as to mixtures, such

as are encountered in the atmosphere, are examined. Part III describes, in some detail, how motor vehicle operation elates to emissions of pollutants, the magnitude of the pollution problem, the nature of chemical reactions in the atmosphere, factors affecting concentrations, methods for reducing pollution, and the subject of ambient air and emission standards.##

00054

A STUDY OF AIR POLLUTION IN THE INTERSTATE REGION OF LEWISTON, IDAHO, AND CLARKSTON, WASHINGTON. Public Health Service, Cincinnati, Ohio, Div of Air Pollution. (999-AP-8.) Dec. 1964. 166p.

As a result of an increasing number of complaints from citizens about reduced visibility, damage to house paint, tarnishing of silver, undesirable odors, and suspected effects of air pollution on health, Idaho and Washington and Lewiston and Clarkston officials requested assistance from the U.S. Public Health Service. Subsequently, the Public Health Service, the two states, and the two cities agreed to undertake a cooperative study; the two cities participated in the study. The purpose of the study was to determine the nature and extent of air pollution in the two-city area and to assemble information to be used as a basis for technical and official action needed to conserve air quality in the area. Because of its unique valley location, the two-city area is susceptible to meteorological conditions conducive to pollutant accumulation. Either city can contaminate the other, and this creates a multi-jurisdictional problem that requires joint and cooperative action to control air pollution. As a first step to solve the problem, an Air Resources Management Council consisting of county, city, and state officials is to be organized. This council will be responsible for planning surveys and studies to determine air quality guides and legislation and administration necessary to control air pollution in this multi-jurisdictional area. The Public Health Service in its advisory capacity will provide technical assistance. (Author)##

00081

R.T. Arnest

ATMOSPHERE CONTROL IN CLOSED SPACE ENVIRONMENT (SUBMARINE)
Naval Medical Research Lab., New London, Conn., Bureau
of Medicine and Surgery, (Rept. No. 367.) Dec. 14, 1961. 39
pp.

CFSTI, DDC: AD 270896

The purpose of this work was to make a general summary of the toxicological problems associated with the closed space environment of submarines and to review the current state of development of tools for measuring and removing the problem substances involved. More than twenty-five atmospheric contaminants are listed, their sources, and their maximum allowable concentrations (MAC) are given, as well as the symptoms they cause, the long-term effects; tools for measuring the amounts of contaminants present are described and methods of removal indicated, in so far as known.##

S. S. Griswold

CONTROL OF STATIONARY SOURCES (TECHNICAL PROGRESS REPT. VOLUME 1). Los Angeles County Air Pollution Control District, Calif. Apr. 1960. 191 pp.

As a result of the intensive source control measures administered in Los Angeles County, Virtually all industrial operations have been brought within the scope of the air pollution control program. From the melting of metal to the painting of manufactured goods, specific industrial processes and equipment have been subject to air pollution control measures. This volume provides individual discussion of control techniques applied to the most significant stationary sources of air contamination. Certain source emission problems, such as those traceable to the operation of railroad locomotives and ships, are not discussed in this volume in view of the current unimportance of the source. The material reported in this volume generally contains only those developments occurring subsequent to the publication of the Second Technical and Administrative Report on Air Pollution Control in Los Angeles County, 1950-51. (Author)##

A. P. Altshuller

REACTIVITY OF ORGANIC SUBSTANCES IN ATMOSPHERIC PHOTOOXIDATION. Public Health Service, Cincinnati, Ohio, Division of Air Pollution. (999-AP-14.) July 1965. 29 pp.

The organic vapors emitted to urban atmospheres by motor vehicles and other sources of emissions consist not only of paraffinic, acetylenic, aromatic, and olefinic hydrocarbons, but also of aldehydes, ketones, alcohols, phenols, and chlorinated hydrocarbons. To estimate the contribution of each of these classes of compounds to photochemical smog, one must know both their atmospheric concentrations and their relative reactivities in atmospheric reactions. A review of the available literature on concentration levels of organic vapors in urban atmospheres indicates that much more analytical work is needed. The existing data are adequate, however, for the formulation of useful estimates. Reactivities of organic substances in photooxidation reactions can be considered from many standpoints. Rates of disappearance of the organic substances, rates of disappearance of nitric oxide or of formation and disappearance of nitrogen dioxide, and rates or maximum yields of various products such as oxidant or organic nitrates all can be used as chemical measurements of reactivity. Eye irritation, various types of plant damage, and aerosol formation are indicators of reactivity that can be related only to a limited extent to chemical measurements of reactivity. The problems of developing a single index of reactivity are considered. The application of reactivity measurements to automobile exhaust composition, to control devices, and to improvements in atmospheric purity is discussed. (Author)##

00154

Beckman, E. W., W. S. Pagley, and Jorma O. Sarto

EXHAUST EMISSION CONTROL BY CHRYSLER - THE CLEANER AIR PACKAGE. In: Vehicle Emissions, Part II, SAE Progress in Technology Series, Vol. 12, New York, Society of Automotive Engineers, Inc. 1966, p. 178-191. 16 refs. Also: 90th Congress ("Air Pollution--1967, Part I (Automotive Air Pollution)" Hearings before the Subcommittee on Air and Water Pollution of the Committee on Public Works, U.S. Senate, Feb. 13-14, 20-21, 1967, p. 411-424.)

Air pollution problems in California required control of vehicle exhaust emissions. The early development of catalytic converters and direct flame afterburners led to relatively complex mechanisms with substantial added cost to the vehicle. An evaluation of the primary factors affecting exhaust emissions indicated the feasibility of control by engine modification alone. A series of engine modifications were subsequently developed which reduced the exhaust emissions to below the California standard of 275 ppm hydrocarbons and 1.5% carbon monoxide. b8the primary changes were to employ optimum combinations of fuel-air mixture and spark timing at all operating conditions. These changes are known as the "cleaner Air Package" (CAP). 50,000 mile tests indicated that with normal maintenance the exhaust emissions were stable and remained at a low level. The CAP system was put into production on 1966 model Chrysler Corporation passenger cars and light trucks marketed in California.##

00171

THE CONTROL OF AUTOMOBILE EMISSIONS. (FORD CRANKCASE EMISSIONS CONTROL SYSTEM. FORD THERMACTOR SYSTEM FOR EXHAUST CONTROL.) Ford Motor Co., Dearborn, Mich., Engineering Staff. 1966. 6 pp.

An explanation of both Ford's Engine Crankcase Ventilation and Thermoactor Exhaust Emissions Control Systems, complete with schematic drawings of cross-sections of the automobile engines is presented. The rationale for its development, the chemistry involved, and the future implications of the systems are discussed.##

00186

J. H. Ludwig

SEMINAR ON AIR POLLUTION BY MOTOR VEHICLES. Public Health Service, Cincinnati, Ohio, Division of Air Pollution. 1966. 52 pp.

The contribution of motor vehicle emissions to community-wide air pollution is discussed and related to other factors involved in air pollution such as commercial and industrial sources, the size of the community and source distribution, topographical and meteorological factors, and the degree of control exercised on the sources. In particular, one section of the publication analyzes the different pollutant types emitted from diesel and gasoline engines. Another section discusses the photochemical reactions in the atmosphere known to produce air pollutants.##

00220

J. P. Sheehy, J. J. Henderson, C. I. Harding, and A. L. Danis

AIR POLLUTION IN JACKSONVILLE, FLORIDA (A PILOT STUDY - AUG.-SEPT. 1961). Public Health Service, Cincinnati, Ohio, Div. of Air Pollution (AP-3). Apr. 1963. 65 pp.

GPO: 802-899-6

The objectives of this pilot study were: (1) To develop a preliminary opinion as to whether the city of Jacksonville has a generalized air pollution problem. (2) To determine whether certain pollutants - fluorides and SO₂, were present in the atmosphere in concentrations capable of producing the damage to vegetation that had been experienced in the Jacksonville-Duval County area. To accomplish the first objective, a one-week intensive investigation was carried on in downtown Jacksonville, at (emmmg Park, from August 3 to 10, 1961. To accomplish to second objective, additional studies were conducted during the periods August 4 to 12, and September 5 to 13, 1961, in the area in which damage to vegetation had occurred. The two fertilizer plants, located in the industrial area of Jacksonville, were not in production during the first phase of this study. Pollutants sampled in this study included fluorides, SO₂, H₂S, NO₂, nitrogen dioxide, and particulates. As a result of the investigations it was concluded that: (1) Photochemical smog was being produced in the air over Jacksonville. (2) Concentrations of fluorides occurred in certain parts of Jacksonville during the period of the study that could cause damage to sensitive plants. (3) Pollutants from the city of Jacksonville can be transported across the St. John's River. H₂S concentrations measured during this study were not of the magnitude known to cause discoloration of paints containing lead pigments and/or mercury base fungicides. Subsequent to the study, an incident of darkening of paints occurred in the arlington area. Therefore, it is evident that an H₂S problem exists in this area. SO₂ concentrations observed during this study did not reach levels known to cause damage to vegetation. However, it appears possible for SO₂ concentrations to reach levels during the heating season capable of causing damage to sensitive plants, particularly in localized areas downwind of major sources of SO₂.##

00221

L. E. Reed, H. D. Fawell, and P. J. Lawther

VEHICLE EXHAUSTS AND HEALTH. Smokeless Air, (London) 198-202, 1966. (Presented at the Royal Society of Health Symposium, London, England, Feb. 16, 1966.)

A brief report is given of three papers on Vehicle Exhausts and Health presented at the Royal Society of Health, London, Feb. 1966. Subjects covered include motor vehicle exhausts, petrol and diesel engine emissions, and problems of controlling such pollutants as hydrocarbons and carbon monoxide.##

00225

V.G. MacKenzie K. Flieger

THE CLEAN AIR ACT AMENDMENTS AND SOLID WASTE DISPOSAL ACT OF 1965 (P. L. 89-272). Health, Education, and Welfare Indicators. Nov. 1965. 15 pp.

The Clean Air Act Amendments and Solid Waste Disposal Act provide important new tools to help forge a comprehensive attack on the growing national problem of community air pollution. Under the Clean Air Act of 1963, the Department of Health, Education, and Welfare has undertaken the formation of a national program for the prevention and control of air pollution. The Amendments to the Clean Air Act and the Solid Waste Disposal Act will enable the Department to carry its efforts further in several of the most critical areas of the complex problem of air pollution.##

00268

R. M. Brice and J. F. Roesler

THE EXPOSURE TO CARBON MONOXIDE OF OCCUPANTS OF VEHICLES MOVING IN HEAVY TRAFFIC. J. Air Pollution Control Assoc. 16(11):597-600, Nov. 1966. (Presented at the 58th Annual Meeting, Air Pollution Control Association, San Francisco, Calif., June 20-24, 1966.)

Carbon monoxide and hydrocarbons were sampled at operator's nose height inside vehicles moving in moderate to heavy traffic in six cities. The samples were integrated over 20 to 30 minutes by collection in Mylar bags. Carbon monoxide and hydrocarbons were analyzed by infrared and flame ionization, respectively, with instruments at the Continuous Air Monitoring Program (CAMP) station in each city. Detector tubes for carbon monoxide were also used to determine 5-minute concentrations at suspected high points in the field. Estimates of traffic density were made. Three types of traffic arteries were considered: 1) heavily traveled, wide expressways, 2) main city streets with moderately rapid vehicular traffic, and 3) center city streets with slow-moving traffic. Integrated half-hour CO concentrations

obtained within the vehicles while in traffic were generally considerably higher than the concurrent concentrations measured at the CAMP sites. In-traffic CO values in all cities sampled exceeded 30 ppm in at least 10% of the integrated samples. The range of city averages was 21 to 39 ppm carbon monoxide and the range of individual integrated samples was 7 to 77 ppm of carbon monoxide. (Author abstract)##

00271

W. F. McMichael and J. E. Sigsby, Jr.

AUTOMOTIVE EMISSIONS AFTER HOT AND COLD STARTS IN SUMMER AND WINTER. J. Air Pollution Control Assoc., 16(9):484-488, Sept. 1966. (Presented at the 59th Annual Meeting, Air Pollution Control Association, San Francisco, Calif., June 22, 1966.)

The U. S. Public Health Service, as part of its continuing investigations of automotive emissions, began a study early in 1965 to determine the effects of hot-start and cold-start engine operation on exhaust emissions. This study was conducted in the Cincinnati area in summer and winter ambient temperatures. The effects of hot and cold starts on the mass and composition of exhaust gases were compared. Emissions from the test vehicles were measured in actual traffic with a proportional sampler. The test route was developed in earlier work to represent average urban driving conditions. Data from this study reflect the effects of traffic density, route, and climate on hot-start and cold-start engine operation. (Authors' abstract)##

00288

H. C. Johnson, J. D. Coons, and D. M. Keagy

CAN MUNICIPAL INCINERATORS MEET TOMORROW'S REGULATIONS? Preprint. (Presented at the 59th Annual Meeting, Air Pollution Control Association, San Francisco, Calif., June 20-24, 1966, Paper No. 66-131.)

Over the last two decades, Los Angeles, the San Francisco Bay Area, and other West Coast areas have gone far beyond most other parts of the country in the nature and extent of limitations legally imposed on incinerator design and performance. With the increasing population of these areas, and the problems of other solid waste disposal methods, it seems prudent to consider whether additional or tighter limitations may be imposed as rapidly as the technology permits. It is the purpose of this paper to consider briefly some of the implications of these possibilities. It is, therefore, primarily speculative in nature. Present and future standards for incinerator emission control, incinerator performance and design considerations are discussed. (Authors' abstract)##

SURVEILLANCE OF MOTOR VEHICLE EMISSIONS IN CALIFORNIA
(QUARTERLY PROGRESS REPT. NO. 1, JULY - SEPT., 1965).
California Dept. of Public Health, Los Angeles, Vehicle
Pollution Lab. Spet. 1965. 77 pp.

The 1966 model automobiles which are sold and registered in California must be equipped with exhaust control systems or control devices which will meet California standards for the emissions of hydrocarbons and carbon monoxide. Although all control systems were thoroughly tested prior to certification these tests were performed on a limited number of preproduction model cars and their performance in the hands of the general public may differ substantially from that of the earlier test vehicles. Moreover, since the maintenance requirements recommended by the car manufacturers are not enforceable by law, the effects of quality and frequency of voluntary maintenance on emission levels need further study. Under the Federal Surveillance Grant the above conditions will be investigated on a large sampling of cars at 3 separate surveillance test stations in the Southern California area, each equipped with a chassis dynamometer and an analytical sampling train for the accurate determination of emission levels. The 1966 model vehicles equipped with exhaust control systems were not available for testing during this report period. However, test data were obtained and compiled on 2 groups of fleet vehicles. In general, both groups of vehicles were driven in a manner considered representative of the type of driving expected of private owners. Servicing of the fleet vehicles may have been different from the maintenance procedure of private owners. Results of the survey are expressed in both tabular and graphic form for cold and hot starts showing the changes in emission levels of hydrocarbon and CO with respect to mileage accumulation and/or engine adjustments. The data are presented in categories by manufacturer, State-owned Fleet, General Motors Corp., Ford Motor Co., American Motors, International Harvester, Kaiser-Willys. Data derived from the testing of the fleet vehicles will provide a basic reference pattern for comparing fleet-maintained vehicles with: (1) the 1966 assembly line production models (with control system) sold to private owners in California; (2) the 1965 unequipped vehicles maintained by the general public.**

00324

G. C. Hass, F. Bonamassa, P. Neward, N. Kayne

THE INFLUENCE OF VEHICLE OPERATING VARIABLES ON
EXHAUST EMISSIONS. J. Air Pollution Control Assoc. 17(6)
384-7, June 1967. (Presented at the 59th Annual Meeting, Air
Pollution Control Assoc., San Francisco,
Calif., June 20-24, 1966, Paper No. 66-69.)

This paper is a report of the operating variables and emission characteristics of a 1964 283 cubic inch V-8 Chevrolet

automobile. This vehicle was used as a laboratory tool in a project to develop an improved driving cycle to represent Los Angeles peak hour driving. As a result it became necessary to run many expoloratory tests to determine the relationships between the primary variables of intake manifold vacuum, engine rpm, and vehicle speeds and acceleration rates. Emissions of hydrocarbons, carbon monoxide, and nitrogen oxides were also determined for the entire range of operating conditions. The effect of prior operating modes on closed-throttle unburned hydrocarbon concentrations was also determined. The results of these tests are presented in tables and graphs which make a comprehensive picture of one typical automobile as a generator of air pollutants. (Author's abstract)##

00337

W. R. Crouse and N. E. Flynn

SOURCE INVENTORY IBM SYSTEM FOR PARTICULATE AND GASEOUS POLLUTANTS. Preprint. (Presented at the 59th Annual Meeting, Air Pollution Control Association, San Francisco, Calif., June 20-24, 1966, Paper No. 66-10.)

A source inventory IBM system of air pollutants is described which makes use of an existing IBM card index-registration system in an established air pollution control district and which employs efficient utilization of engineering time, including computer services, to establish and maintain current a detailed source inventory of point sources of emissions. An emission inventory specifies the (1) amounts, and (2) sources of air pollution in a community. The knowledge of air pollution can be relegated to three simple questions: (1) "What" the pollution problem is in terms of primary air pollutants, (2) the "where" of the problem -- i.e., a description of the industrial, commercial, or domestic sources by tabulation of either (a) types and location of basic equipment discharging pollutants, (b) a description in broad source categories of industry, or (c) actual tabulation of locations of plants in the community, and (3) the "how much" or extent of air pollutants. In the case of gases, namely organic compounds, the oxides of nitrogen and sulfur, and CO, future regulation and enforcement of invisible gaseous emissions requires an inventory which predetermines or estimates levels of emissions and directs enforcing officers or inspectors to point locations. This capability is discussed as well as the description of the method of construction of a recent source inventory, calculated on the basis of average emission factors and known plant throughput data and plant locations (registered plant equipment).##

00375

R. A. Prindle

AIR POLLUTION AND COMMUNITY HEALTH (CHAPTER EIGHTEEN).
Medical Climatology 505-18, 1964.

In this chapter author reviews major pollution episodes which have occurred since 1930 in various parts of the world. These episodes have demonstrated the danger and the lethality that may result when certain meteorologic phenomena occur in geographical areas where potentially high concentrations of air pollutants may form. Certain pollutants that might be tolerated in low concentrations in some inhabited areas might become dangerous when mixed with pollutants from other sources that could exert an accentuating or synergistic action. SO₂, particulates, CO, beryllium, lead, fluoride, photochemical, and allergenic pollutants and their effect on man and animals are discussed. The most important animal experiments as well as other research are reviewed.##

00379

G. A. Jansen and D. F. Adams

ABSORPTION AND CHLORINE OXIDATION OF SULFUR COMPOUNDS
ASSOCIATED WITH KRAFT MILL EFFLUENT GASES. Preprint. 1966.

Absorption of methyl mercaptan and H₂S into aqueous solutions of Cl₂, NaOH, and Cl₂ plus NaOH has been studied using a 2 in diameter absorption column packed with 1/4 in. Intalox saddles. Absorption rates were noticeably affected by chemical reactions occurring in aqueous Cl₂ and OH media. Potentiometric methods were used to follow the reactions of mercaptan and sulfide in aqueous chlorine solutions. Mercaptan apparently was converted by aqueous Cl₂ absorption media to dimethyl disulfide and stripped off in the effluent gas. The percentage conversion increased with increasing pH. The absorption of H₂S in aqueous Cl₂ (pH 2 to 13) was highly pH dependent. The absorption rate increased slowly as the pH of the feed solution increased to pH 11. Sulfate was the resulting oxidation product. At pH 11, the rate of absorption dropped slightly, then rose sharply at pH 12. Elemental S became the major product at pH 12 and above and fouling of the packed column occurred. The effect of pH on formation of sulfate and/or elemental S in chlorine-sulfide reactions was explained by Choppin and Faulkenberry (1937). The absorption of sulfide in aqueous NaOH increased until the feed hydroxide to sulfide ratio was 1. At higher ratios, the absorption rate remained constant. Apparently, sodium bisulfide was the absorption product. The results of these studies indicate that aqueous Cl₂ solutions at pH above 12 can be effectively used for removal of H₂S in absorption equipment designed to handle S in suspension. The absorption of methyl mercaptan in aqueous Cl₂ solution appeared to be impractical since dimethyl disulfide was apparently the only product formed and was stripped from the tower by the gas stream. Hydroxide solution was effective for absorption of both methyl mercaptan and H₂S when hydroxide to sulfide or mercaptan feed ratios were greater than 1 or 1.8 respectively. (Author)##

E. C. Tabor

CONTAMINATION OF URBAN AIR THROUGH THE USE OF INSECTICIDES.
Trans. N.Y. Acad. Sci. 28(5) 569-78, Mar. 1966.

Results of this investigation show that the air over many communities is contaminated with substantial amounts of a wide variety of insecticides. The concentrations observed represent minimum values, since the sampling method did not collect pesticide vapors and some of the collected aerosols could have been lost by vaporization during the sampling period. These minimum values, nevertheless, demonstrate that the ambient air can be a route for the nonoccupational exposure of people to insecticides. The actual significance of this route requires considerable further definition, particularly with respect to the total pesticide concentrations. Before total air-borne pesticide concentrations can be determined and potential physiological effect on humans, flora, and fauna evaluated, suitable methods must be developed for the simultaneous collection of both aerosol and vapor forms and for subsequent analysis of the resulting samples. Levels reported herein indicate the need for the development of improved techniques and the further definition of the ambient air concentrations. (Author)##

00464

C.F. Ellis

CHEMICAL ANALYSES OF AUTOMOBILE EXHAUST GASES FOR OXYGENATES.
Bureau of Mines, Washington, D.C. (Rept. of Investigations
No. 5822). 1961. 39 pp.

This report presents procedures for chemical analyses of certain oxygenated compounds, procedures for sampling the exhaust gases for these analyses, and the analytical results of some experimental work in which these procedures were used. A stationary 1956 model, 170 horsepower, V-8, dynamometer-mounted engine, operated to simulate vehicular cruise conditions, was used for the study. Exhaust gases produced from a regular-grade Midcontinent gasoline during 15-, 40-, and 60-mile-per-hour cruise operations were analyzed by chemical methods for formaldehyde, total aldehydes, total carbonyls, total alcohols, carbon associated with the oxygenated compounds, and the oxides of nitrogen. Experimental results indicate: (1) The range of concentrations of the total of the functional groups of oxygenated compounds, expressed as moles per million moles of water-free exhaust gases, is about 90-100; the concentrations increase with engine speed; (2) Aldehydes comprise about 80-90 mole-percent of the total of the oxygenated groups, and formaldehyde accounts for about 50 mole-percent of the total aldehydes; (3) The order of magnitude of the concentration of the carbonyls is the same as that for the aldehydes, indicating that ketones are not a major group. A colorimetric test indicates that methyl ketones constitute about 2 mole-percent of the oxygenated compounds;

(4) The concentration of the alcohols is of the order of 10 mole-percent of the oxygenated compounds; (5) The total carbon associated with the oxygenated compounds is about 175 moles per million moles of water-free exhaust gas for all 3 speeds; and (6) The concentration of N oxides, expressed as moles of NO₂ per million moles of water-free exhaust gas, is about 150, 1,600, and 2,800 at 15, 40, and 60 miles per hour, respectively.##

00504

D.A. Jensen

SEPARATING FACT FROM FICTION IN AUTO SMOG CONTROL. Arch. Environ. Health, 14(1):150-155, Jan. 1967. (Presented at the American Medical Association Air Pollution Medical Research Conference, Los Angeles, Calif., March 2-4, 1966.)

Author gives a status state-of the -art summary of the various sources of emissions from automobiles. Topics covered are: crankcase emission controls; servicing and maintenance; requirement of a "closed" system or one equally effective, exhaust emission controls; evaporative emissions; oxides of nitrogen emission controls; diesel smoke and odor emission controls; cars and fuels of the future. In addition, author discusses the impending vehicle emission control which will be put into effect for 1968 motor vehicles.##

00566

W. L. Faith

ECONOMICS OF MOTOR VEHICLES POLLUTION CONTROL. Chem. Eng. Progr., 62(10):41-43, Oct. 1966. (Presented before the Symposium on Economics of Air Pollution Control, 59th National Meeting, American Inst. of Chemical Engineers, Columbus, Ohio, May 15-18, 1966, Paper No. 24 G.)

The cost of air pollution control devices to the motorist, for the reduction of hydrocarbons, carbon monoxide and nitrogen oxides in general and per smog day, are discussed. Cost of the device, of the installation and cost of maintenance are calculated. Results are summarized in tables.##

00592

T. A. Huls, P. S. Myers, and O. A. Uyehara

SPARK IGNITION ENGINE OPERATION AND DESIGN FOR MINIMUM EXHAUST EMISSION. In: Vehicle Emissions, Part II, SAE Progress in Technology Series, Vol. 12, Society of Automotive Engineers, Inc., New York, 1966, p. 71-91. 28 refs. (Presented at the Society of Automotive Engineers Meeting, June 6-10, 1966.)

The purpose of the tests conducted on a single-cylinder laboratory engine was to determine what can be done in the design and operation of a spark-ignition engine to minimize emission of air pollutants. For the engine used in this study, the exhaust emissions were found to have the following dependence on various engine variables. Hydrocarbon emission was reduced by lean operation, increased manifold pressure, retarded spark, increased exhaust temperature, increased coolant temperature, increased exhaust back pressure and decreased compression ratio. Carbon monoxide emission was affected by air-fuel ratio and premixing the charge. NO and NO₂ emission is primarily a function of the O₂ available and the peak temperature attained during the cycle. Decreased manifold pressure and retarded spark decrease NO_x emission. Hydrocarbons were found to react to some extent in the exhaust port and exhaust system. This reaction appears to follow the Arrhenius rate equation relationship. Calculations of theoretical HC concentrations were made based on quench theory using measured combustion pressures and surface temperatures. It was assumed that the only source of HC's in the exhaust is the quench volume, i.e., the thin layer adjacent to the chamber walls through which the flame does not propagate. The difference between actually measured HC emission levels and the levels that quench theory predicts is resolved by assuming 2/3 of the contents of the quench volume leave the engine and Arrhenius type reaction during the exhaust portion of the combustion cycle. It was also concluded that the HC left unburned after flame passage in the combustion chamber are proportional to the area swept by the flame per unit charge. (Authors' abstract)##

00621

D.J. Von Lehmden, R. P. Hangebrauck, J.E. Meeker

POLYNUCLEAR HYDROCARBON EMISSIONS FROM SELECTED INDUSTRIAL PROCESSES. J. Air Pollution Control Assoc. Vol. 15(7):306-312, July 1965.

A number of selected industrial processes considered as potential sources of benzo(a)pyrene and other polynuclear hydrocarbons was surveyed. Polynuclear hydrocarbon emission levels were measured directly for asphalt hot road mix preparation and asphalt air blowing. Emissions of other pollutants, including particulate matter, carbon monoxide, and total gaseous hydrocarbons were also measured, and are reported together with pertinent data on process design and operation. Results are discussed with reference to the type of process; the type of equipment used, including control devices; and other factors. The significance of some additional processes as contributors of polynuclear hydrocarbons was examined indirectly by collecting atmospheric samples of polynuclear hydrocarbons in residential areas in the vicinity of (1) a carbon black manufacturing area, (2) a steel and coke manufacturing area, (3) an organic chemical industry complex, and (4) a residential and small-industry coal burning area. (Author abstract)##

00650

M.C. Battigelli

EFFECTS OF DIESEL EXHAUST. Arch. Environ. Health Vol. 10(2)165-167, Feb. 1965. (Presented at the Seventh Annual Air Pollution Medical Research Conference, Los Angeles, Calif., Feb. 10-11, 1964.)

Over the past three years the author's work at the School of Public Health in Pittsburgh has been directed to the possible detrimental effects brought about through exposure to diesel motor exhaust. Attention was directed to railroad workers employed in locomotive repair shops. Neither respiratory complaints nor impaired pulmonary function, could be related to this type of occupational exposure. As a second phase in this investigation, volunteers were exposed to diesel exhaust gas for short periods and pulmonary resistance was measured. The levels utilized for these controlled exposures are comparable to realistic values such as those found in railroad shops. No effect could be measured in these volunteers after they had been exposed at these varying levels of pollution from diesel exhaust for short periods up to one hour.##

00673

H.H. Hovey, A. Wisman, J.F. Cunnans

THE DEVELOPMENT OF AIR CONTAMINANT EMISSION TABLES FOR NONPROCESS EMISSIONS J. Air Pollution Control Assoc. Vol. 16(7):362-366, July 1966. (Presented at the 58th Annual Meeting, Air Pollution Control Association, Toronto, Canada, June 20-24, 1965, Paper No. 65-17.)

In New York State, the calculation of air contaminant emissions from a variety of sources is an essential part of comprehensive air pollution studies. The tables used to calculate emissions were obtained from an extensive literature search and modified to apply to New York State conditions. For example, sulfur dioxide emission factors for coal were selected to reflect the average sulfur content of the coal sold in New York State. Since the literature contains a wide array of emission factors,##

00679

W. E. Jackson

AIR POLLUTION FROM AUTOMOBILES IN PHILADELPHIA. Preprint. (Presented at the 58th Annual Meeting, Air Pollution Control Association, Toronto, Canada, June 20-24, 1965, Paper No. 65-137.)

This report has been prepared with the objectives of describing the problem created by automobiles in Philadelphia and recommending the action which must be taken. The action

recommended is as follows: (1) Positive crankcase ventilation systems and exhaust control systems should be required on all new cars registered in Pennsylvania. A well planned program of controlling only the new cars with factory installed devices will minimize the problem over a ten year period. If initiated immediately, this reasonable approach would eliminate the need for a crash program at some future date. All mechanical devices require maintenance to insure proper and efficient operation; and (2) The State-wide inspectional system should require a maintenance check of all appropriate parts of the automobiles to insure satisfactory operation (as related to pollution emissions) and to reject those cars with visibly excessive exhaust emissions. This should apply to both new and used automobiles and all other types of motor vehicles.##

00746

R. Piper

THE HAZARDS OF PAINTING AND VARNISHING 1965 . Brit. J. Ind. Med. (London) 22(4):247-266, Oct. 1965.

A review of paint hazards is made, giving brief descriptions of methods of application in use in 1965, of paint usage according to resin base, and of paint ingredients. The most interesting and complex of these are the resin bases, which have much in common with plastics. Reference is made to some of the many minor ingredients. The problem of keeping abreast of the possible toxic effects, so that paint manufacturers and their customers may be warned and protected is emphasized. (Author's abstract)##

00798

R.I. Larsen

VEHICLE EMISSIONS AND EFFECTS, A SUMMARY OF THE DECEMBER 1961 AIR POLLUTION RESEARCH CONFERENCES. Preprint. (Presented at the New England Section Annual Meeting, Air Pollution Control Association, Worcester, Mass., Apr. 25, 1962).

In December 1961 air pollution research findings to that date were presented at two conferences held in Los Angeles. The conferences were the Fifth Air Pollution Medical Research Conference and the Joint Research Conference on Motor Vehicle Emissions and Their Effects. A few highlights follow. Air pollution damages plants, animals, and property, and is harmful to people. Plant damage in the United States exceeds \$25 million per year. Present community air pollution levels weaken an individual's resistance to respiratory diseases such as colds, pneumonia, and lung cancer. Smoking and air pollution age and deteriorate lungs. In one study, smokers' lungs aged 50% faster than non-smokers' lungs. In another study, 90% of heavy smokers (more than two packs per day) had respiratory disease. The disease rate for several respiratory ills was 3 to 5 times greater in these heavy smokers than in individuals who had

never smoked. The death rate from emphysema (deteriorated lungs) has increased 400% in the last 10 years. A recently identified photochemical pollutant, peroxyacyl nitrate (PAN), at concentrations as low as 5 parts per billion (ppb), damages plants. It is quite possible that this pollutant is responsible for most "oxidant-type" damage in Los Angeles. Five times as much exhaust gas from low-olefin fuel was required to produce similar damage. Russian air quality standards probably have at least one present use in the United States. In a given community, pollution concentrations that do not exceed the Russian standards tentatively could be considered to not be problems. The contribution of the internal combustion engine to smog could be reduced significantly by improved carburetor design, improved production control, and improved carburetor and ignition system maintenance. If the conventional engine without an afterburner is considered beyond redemption, a lean-fuel engine (such as gas turbine, stratified charge, or diesel) could be used to meet present emission standards. If an automobile that does not contribute to smog is to be achieved, a new sense of mission, a lot more money, and additional competent researchers will be required. (Author abstract modified)**

00835

B.P. Gourinoff

CANCEROGENIC SUBSTANCES IN THE AIR OF CITIES AND POSSIBLE PREVENTIVE MEASURES. Acta, Unio Intern. Contra Cancrum, Vol. 19, 737-738, 1963.

Carcinogenic properties as identified in emissions from motor vehicles, fuels, and industrial exhaust, are considered an important factor in human cancer epidemiology. This paper reviews briefly studies at home and abroad. Exhaust from carburetor and diesel engines are compared, and other sources of carcinogenic properties investigated. It is briefly mentioned that use of coal tars for road surfacing is prohibited in the U.S.S.R.**

00895

V.L. Lur'e

(STUDY OF THE HARMFUL INDUSTRIAL EXHAUSTS IN THE ATMOSPHERE IN THE SYNTHETIC RUBBER PLANTS IN VORONEZH AND YEFREMOV.)
Obsledovanie Vrednykh Proizvodstvennykh Vybrosov v Atmosferu na Voronezhskom i Efremovskom Zavodakh SK.
Kauchuk i Rezina No. (3):36-37, 1966. Text in Russian

Waste emissions both in the factory area and in the hygienic control zone around it (300-500 m from the factory) were studied both qualitatively and quantitatively. While pollution did not exceed the established limits in the factory areas, it did in the control zone surrounding the factories. Contaminants were butadiene, isobutylene, styrene, benzene and ethanol vapors. Most of the pollution was caused by styrene-

butadiene rubber processing in the belt casting machine. Large amounts of hydrocarbons were given off by shops producing isoprene and latex. Pollution of the surrounding air also came from exhaust ventilation of the factories and open pits of chemical waste. This resulted in a fall of 1200 metric tons in Voronezh and 700 tons in Efremov per year. Measures for the control of exhaust ventilation from the factories are urged.##

00905

O. Buchta

HYGIENIC CONDITIONS ON MOLDING POLYESTER GLASS REINFORCED PLASTICS. Hygienicke Pomery Pri Lisovani Polyesterovych Skelných. Plasticke moty Kaucuk (Prague), 3(6):177-182, 1966.

Hygienic problems associated with the manufacture of polyester glass reinforced plastics are discussed. Results are given for the polarographic measurement of styrene vapor concentration in the atmosphere of the general pressing room and the hand pressing room.##

00962

R. I. Larsen

AIR POLLUTION FROM MOTOR VEHICLES. Ann. N. Y. Acad. Sci., 136(12):275-301, Aug. 26, 1966. (Presented at a meeting of the New York Academy of Sciences, April 6, 1966.)

Motor vehicles are a major source of urban air pollution. They emit carbon monoxide that reduces man's ability to transport oxygen to his tissues; lead that increases man's body burden of this toxic metal; cancerogenic hydrocarbons; and reactive hydrocarbons and nitrogen oxides that combine with sunlight to produce eye-irritating, plant-damaging, visibility-obscuring photochemical smog in New York as well as in California. Present and predicted air pollutant concentrations are compared with pollutant effects and air quality standards. Emission-reduction features presently used in new cars sold in California will improve air quality, but will not completely solve the problem. Indications are that 95 percent reduction in emissions of carbon monoxide, hydrocarbons, and nitrogen oxides from new cars sold in the United States may be needed by 1975. Such a "clean-air car" by 1975 is suggested as a research goal for automobile manufacturers. At present, improved fuel cells or improved battery power seem to be the most likely means for achieving this goal. (Author abstract)##

00969

P. A. Leighton

MAN AND AIR IN CALIFORNIA. Preprint. (Presented at the Statewide Conference on Man in California, 1980's, Sacramento, Calif., Jan. 27, 1964.)

Author discusses polluted air in respect to automobile emissions and projects the concentrations that can be expected by 1980. Presented are charts and tables which easily delineate the salient points of the article.##

00972

M. Mayer

A COMPILATION OF AIR POLLUTANT EMISSION FACTORS FOR COMBUSTION PROCESSES, GASOLINE EVAPORATION, AND SELECTED INDUSTRIAL PROCESSES. Public Health Service, Cincinnati, Ohio, Div. of Air Pollution, May 1965, 53 p.

The source emission factors presented in this report were compiled primarily for use in conducting an air pollutant emission inventory. The compilation is the result of an extensive literature survey and includes emission factors for the principal combustion and industrial processes. Obviously, the best emission factor to use for any specific source of air pollution is that resulting from source tests of the specific source. Unfortunately, many urban areas are not equipped to conduct the numerous and expensive stack testing studies needed for an emission inventory. The purpose of this compilation of emission factors is to provide the best available substitute to air pollution control agencies unable to conduct extensive source test programs. In certain cases, particularly in the combustion and refuse disposal areas, a single number is presented for the emission factor for a specific pollutant. It should be understood that the number is usually a weighted average of several different values found in the listed references. The compilation of source emission factors presented is, in our judgment, the most accurate currently available. As new technical advances are made, however, and additional emission data become available in the literature, the present compilation should be revised to reflect the newer data and developments.##

00975

M. I. Weisburd, (Compiler and Ed.)

AIR POLLUTION CONTROL FIELD OPERATIONS MANUAL (A GUIDE FOR INSPECTION AND ENFORCEMENT). Public Health Service, Washington, D. C., Div. of Air Pollution, 1962. 291p.

Author discusses sources, control methods, training techniques and related aspects of air pollution. Document is an

excellent source for specific information on equipment being used in air pollution control. Pictures, diagrams, schematics and charts are given.##

00985

R.E. Waller, B.T. Commins, P.J. Lawther

AIR POLLUTION IN A CITY STREET. Brit. J. Ind. Med.
(London), Vol. 22:128-138, 1965.

Measurements of the concentrations of smoke, lead, and five polycyclic hydrocarbons in the air have been made in the City of London in the middle of a busy street and at two control sites. Samples were taken only throughout the daytime hours on weekdays to enable us to assess the maximum contribution made by traffic to the pollution in the street. The results showed that during these periods the air in the middle of the street contained three times as much smoke, four times as much lead, and 1.7 times as much 3:4-benzpyrene as were present in the general atmosphere of the City of London as estimated from samples taken at the control sites. One of these sites was chosen because it was only 150 feet from the street; analyses yielded no evidence that the traffic contributed to the pollution sampled there. Sulphur dioxide concentrations were determined in the early part of the study and the results showed that traffic appeared to add little to the background level. The concentrations of lead found were below those held to be safe by many authorities. Carbon monoxide concentrations, reported in greater detail elsewhere, sometimes reached the accepted industrial maximum allowable concentration of 100 ppm. (Author abstract)##

01008

S. K. Ray and R. Long

POLYCYCLIC AROMATIC HYDROCARBONS FROM DIFFUSION FLAMES
AND DIESEL ENGINE COMBUSTION. Combust. Flame 8, 139-51, June 1964.

A study has been made of the effects of air flow rate and of several additives to the fuel of a laminar diffusion flame on the formation of: (1) soot, (2) carbonaceous residue (i.e. chloroform insoluble material), (3) pentane-soluble material (shown to be essentially polycyclic aromatic hydrocarbons), and (4) 3,4-benzpyrene contained in the latter. Increasing air flow rate leads to a decrease in both soot and carbonaceous residue which reach limiting values. Pentane-soluble material and 3,4-benzpyrene decline continuously with increase in air flow rate but at a diminishing rate. Dichloromethane as additive increases the formation of soot and carbonaceous residue to a considerable extent without having any appreciable effect on the formation of pentane-soluble material and 3,4-benzpyrene. Nitroethane, 1-nitropropane, ethyl nitrate and t-butylhydroperoxide all bring about significant reductions in the formation of chloroform-soluble material, including pentane-soluble material and 3,4-benzpyrene.

Total soot formation is reduced slightly but the formation of carbonaceous residue is virtually unaffected. Similar results are obtained in a study of the particulate matter in diesel exhaust when the additives are blended with a diesel fuel, and conditions of inefficient operation are simulated. t-Butylhydroperoxide is found to be most effective in reducing the formation of 3,4-benzpyrene. Both the diffusion flame and diesel engine results are in conflict with the hypothesis that carbon formation occurs through polycyclic aromatic hydrocarbons as intermediates; these may be the end products of side-reactions, probably free-radical in nature. (Author abstract)##

01038

L. J. Goldwater, A. J. Rosso, and M. Kleinfeld

BLADDER TUMORS IN A COAL TAR DYE PLANT. Arch. Environ. Health Vol. 11:814-817, Dec. 1965.

This study was undertaken in order to assemble additional information on the occurrence and natural history of malignant tumors in workers exposed to coal tar dyes and dye intermediates. Specific points to be investigated were: 1. To determine the incidence of urinary bladder tumors, especially in workers exposed to beta-naphthylamine, benzidine, and alpha-naphthylamine. 2. To establish the "incubation" period from the start of exposure to the onset of first genitourinary complaints suggestive of bladder tumor. 3. To establish survival time after diagnosis of bladder tumor. 4. To determine the incidence of malignant tumors other than those of the bladder. The major conclusions from this study of the records of 366 male employees in a coal tar dye factory are: 1. The incidence of malignant tumors of the bladder was 26.2%. 2. The time elapsed from first exposure to first abnormal signs or symptoms ranged from 1 to 35 years, with a mean of 18.4 years. 3. The time elapsed from first exposure to diagnosis of bladder malignancy ranged from 2 to 42 years, with a mean of 22.9 years. 4. The mean survival time following diagnosis of bladder malignancy was about three years for all types of exposure except beta-naphthylamine alone for which it was about eight years. 5. There was no evidence of any unusual incidence of malignancies other than those of the urinary bladder. 6. The findings were similar to those reported by other observers.##

01059

P.J. Lawther, B.T. Commins, R.E. Waller

A STUDY OF THE CONCENTRATIONS OF POLYCYCLIC AROMATIC HYDROCARBONS IN GAS WORKS RETORT HOUSES. Brit. J. Ind. Med. Vol. 22:13-20, 1965.

Measurements of the concentration of 3:4-benzpyrene and other polycyclic aromatic hydrocarbons have been made in gas works retort houses of several types. The tarry fumes which escaped from retorts contained extremely high concentrations of polycyclic hydrocarbons, but in general men were only

exposed to these very briefly. The mean concentration of 3:4-benzpyrene determined from long-period samples at sites representative of normal working conditions in three works was 3 micro g./cu.m., over 100 times the normal level in the City of London. Above the retorts in an old horizontal retort house the concentration was over 200 micro g./cu.m., about 10,000 times that in the City, and the "top-man" working there could be exposed to this in the normal course of his duty. The authors found no working areas in the vertical retort houses where men could be exposed to such massive concentrations of polycyclic hydrocarbons. Apart from defining these special conditions above horizontal retorts the results did not reveal any gross differences in pollution of the general air in horizontal and continuous vertical retort houses. (Author abstract)##

01076

E. F. Darley, P. R. Burleson, E. H. Mateer, J. T. Middleton, and V. P. Osterli

CONTRIBUTION OF BURNING OF AGRICULTURAL WASTES TO PHOTOCHEMICAL AIR POLLUTION. J. Air Pollution Control Assoc. Vol. 16(12):685-90, Dec. 1966. (Presented at the 59th Annual Meeting, Air Pollution Control Association, San Francisco, Calif., June 20-25, 1966.)

Agricultural wastes from orchards, grain fields, and range lands are burned each year in California as the most practical means of ridding the land of these wastes. In order to determine the relative contribution of the burning of such material to photochemical air pollution, the effluent from 123 fires of known weights of range brush, both dry and green, barley and rice stubble, and prunings from various fruit and nut trees were monitored in a special tower which provided an open burning situation. Analyses were made for total hydrocarbon, expressed as C, by flame ionization detection, and for 24 individual hydrocarbons by gas chromatography, as well as for CO and CO₂ by infrared spectroscopy. A few analyses were made for oxides of nitrogen. These data, coupled with temperature and airflow measurements, allowed calculations to be made on pounds of effluent per ton of material burned and demonstrated that the emissions from agricultural burning are much less than those from the automobile, a principal source of such emissions. (Author abstract)##

01132

G. W. Niepoth and S. H. Mick

THE GENERAL MOTORS AIR INJECTION REACTOR SYSTEM FOR THE CONTROL OF EXHAUST EMISSIONS. Gen. Motors Eng. J., 13(3):20-29, 1966.

The Air Injection Reactor (AIR) system developed by General Motors, and initially applied on most 1966 GM car and light truck models produced for sale in California, provides an effective means for controlling hydrocarbon and carbon monoxide exhaust emissions without a sacrifice in automotive performance.

The AIR system, which meets California standards for emission control, is basically simple in operation. Fresh air is injected into the exhaust ports of an engine to provide complete burning of hydrocarbons and carbon monoxide in the exhaust manifold. The development of the system, however, involved much design effort and testing to prove its effectiveness, reliability, and durability. System components, including a specially-designed air pump, had to be designed to be compatible with all engine-carburetor-transmission combinations used in GM car models. In addition, the AIR system had to be designed to require minimum maintenance. (Author summary)##

01133

W. B. Thompson

THE DESIGN AND DEVELOPMENT OF THE AIR PUMP FOR THE GENERAL MOTORS AIR INJECTION REACTOR SYSTEM. General Motors Engineering J., 13(3):30-35, 1966.

The development of the General Motors Air Injection Reactor system for controlling the concentrations of unburned hydrocarbons and carbon monoxide in vehicle exhaust emissions required engine modifications and the design of new components. The most vital component in the system is the air pump, designed and manufactured by the Saginaw Steering Gear Division. The pump developed by Saginaw engineers is a semi-articulated vane type positive displacement pump. The design displacement is 19.3 cu in. per revolution with high volumetric efficiency and low horsepower consumption. Additional design criteria included durability consistent with the life of the vehicle and satisfactory performance without maintenance. (Author summary)##

01165

H. R. Holland

AIR QUALITY CONTROL BY PETROLEUM REFINERS. Preprint. (Presented at the Third Annual Meeting, Pacific Northwest International Section, Air Pollution Control Association, Vancouver, British Columbia, Nov. 2-4, 1965.)

Air quality can best be maintained by controlling pollution on a regional basis. Close cooperation between the technical staffs of the province, municipalities and industries in the region is required to achieve the best solution to the regional problem. Means are available to control the emissions from petroleum refineries to the degree required by our current understanding of the problems.##

01228

L. Rispler and C. R. Ross

VENTILATION FOR ENGINE EXHAUST GASES. Occupational Health Rev. Ottawa 17, (4) 19-22, 1965.

Engine exhaust gases are capable of affecting health in varying degrees, and confusion as to their relative importance often arises. This is partly because most exhaust analyses are reported only as concentrations within the exhaust system, without specifying the total exhaust volume. For clarification, a comparison is made of the actual amounts in which these components are emitted from various engines. These data exemplify the difference in ventilation requirements for diesel engines and gasoline engines. The toxic effects of carbon monoxide and some basic ventilation considerations are outlined. (Author abstract)#

01362

E.K. Diehl E.A. Zawadzki

CONTAMINANTS IN FLUE GASES - AND METHODS FOR REMOVAL. Coal Age, Vol. 70:70-74, Dec. 1965. (Presented at Technical Sales Conference, National Coal Association and Annual Meeting of Bituminous Coal Research, Inc., Sept. 1965.)

The relative importance of the harmful pollutants in stack gases from coal combustion is described. Polynuclear hydrocarbons, oxides of nitrogen, particulates, and sulfur oxides are considered. Sulfur dioxide removal methods are described.##

01375

E.S. Starkman H.K. Newhall

CHARACTERISTICS OF THE EXPANSION OF REACTIVE GAS MIXTURES AS OCCURRING IN INTERNAL COMBUSTION ENGINE CYCLES. California Univ., Berkeley, Dept. of Mechanical Engineering, 1965, 13 p. (Presented at the Mid-Year Meeting, Society of Automotive Engineers, Chicago, Ill., May 17-21, 1965, Paper No. 650509.)

The influence of nonequilibrium in the expansion gases of spark ignition engines has been studied theoretically to determine how power output and exhaust gas composition might be affected. Comparing a gas which is frozen in composition during expansion with a composition which continuously is in equilibrium shows the difference in expansion work can be as large as 10%. Maximum influence is in the fuel-air ratio range of chemically correct mixture. It was found that carbon monoxide and nitric oxide concentrations in the exhaust more nearly reflect the frozen composition than the equilibrium expansion. This is particularly true for the range of mixture ratios - from lean to chemically correct.##

01381

R.W. Hurn

COMPREHENSIVE ANALYSES OF AUTOMOTIVE EXHAUSTS. Arch. Environ. Health, Vol. 5:592-596, Dec. 1962. (Presented at the session on Constituents of Motor Vehicle Exhaust at the Air Pollution Research Conferences, Los Angeles, Calif., Dec. 5, 1961.)

The nature of the gaseous or volatilized components of automotive exhaust is reviewed. Recent work conducted to define more precisely variations in exhaust-gas stream composition is reported. Information on the simultaneous occurrences of the several classes of components is presented. Analytical methods; inert, reactive, and noxious constituents; and hydrocarbon measurements are considered.##

01382

R.W. Hurn, T.C. Davis

GAS CHROMATOGRAPHIC ANALYSIS SHOWS INFLUENCE OF FUEL ON COMPOSITION OF AUTOMOTIVE ENGINE EXHAUST. Proc. Am. Petrol. Inst. 38(3):353-375, 1958. (Presented at the 23rd Midyear Meeting, American Petroleum Institute's Division of Refining, Los Angeles, Calif., May 12, 1958.)

Chemical differences in the exhaust products from different fuels; and the effect of engine speed and load on these differences are reported. Experimental data were obtained with the use of a late model automotive V-8 engine on a dynamometer block. Fuels which were used included pure isooctane, commercial LPG (butane and propane, separately), and seven gasoline stocks from different refining processes. Analytical data obtained by gas chromatography show that exhaust composition varies with engine speed and load according to consistent trends. These trends are influenced by fuel composition, and the degree of fuel influence depends upon mode of engine operation--some basic fuel characteristics are more heavily reflected in the exhaust than are others. Generally, differences in the composition of exhausts from different fuels are quantitatively small, but they are reproducible. (Author abstract modified)##

01383

R.W. Hurn, T.C. Davis, P.E. Tribble

DO AUTOMOTIVE EMISSIONS INHERIT FUEL CHARACTERISTICS? Am. Petrol. Ins., Proc 40(3):352-357, 1960. (Presented at the 25th Midyear Meeting, American Petroleum Institute's Division of Refining, Detroit, Mich., May 11, 1960.)

In general, the composition of the hydrocarbon component of exhaust produced during engine deceleration is closely related to the fuel. However, during acceleration and cruise the hydrocarbons emitted may be quite dissimilar to the fuel. In this latter instance the amount of olefin emitted bears no direct relation to fuel olefin. Moreover, reduced fuel olefin with increased paraffinicity generally results in increased emissions of olefin. In all engine cycles, the aromatic content of the exhausts follows the aromatic content of the fuel. Thus, hydrocarbons which are emitted inherit the fuel's characteristics during only a portion of the average driving cycle. During the remainder of the cycle many of the original fuel characteristics are erased and the emissions become no more than characteristic mutations. (Author abstract modified)##

R.W. Hurn, C.L. Dozois, J.O. Chase, C.F. Ellis,
P.E. Ferrin

THE POTPOURRI THAT IS EXHAUST GAS. Proc. Am. Petrol. Inst.,
42(3):657-664, 1962. (Presented at the 27th Midyear Meeting,
American Petroleum Institute's Division of Refining, San
Francisco, Calif., May 17, 1962.)

Information concerning the myriad compositions and hydrocarbon distributions that accompany changes in engine mode and that define the variable character of an exhaust gas stream is given. Data were obtained on exhaust gases produced using an engine dynamometer cycled through steady-state and transient modes to simulate demands on the engine in city traffic. Test procedures were designed to optimize reproducibility of the tests. Moreover, analyses were scheduled in a manner to permit determination of all components on the same or on comparable samples. Carbon hydrocarbons by major types, oxygen, oxides of nitrogen, and hydrocarbon-derived oxygenates were determined. Concentrations that were measured fell within a range of values that had been reported in the literature. However, the analyses are unique in that they provide information on the simultaneous, concurrent concentrations of materials that constitute the exhaust gas flow and on how these concentrations vary with steady-state and transient engine operation. The data also show the manner in which both absolute and relative distributions of hydrocarbon in the exhausts vary with change in engine mode. (Author abstract modified)##

01404

R. P. Hangebrauck, R. P. Lauch, and J. E. Meeker

EMISSIONS OF POLYNUCLEAR HYDROCARBONS FROM AUTOMOBILES AND TRUCKS. Am. Ind. Hyg. Assoc. J., Vol. 27:47-56, Feb. 1966.

As part of a screening survey to determine the origin of the benzo(a)pyrene found in urban atmospheres in the United States, emission rates of several polynuclear hydrocarbons, including benzo(a)pyrene, were measured on several automobiles and trucks powered by gasoline engines. The vehicles were road-tested over typical driving routes. The total exhaust was sampled by passing it through a multi-plate condenser followed by large high efficiency filters. Operating and emission data are given. The combined effects of vehicle-model age and mileage on polynuclear emissions are discussed, as are the relationships between polynuclear hydrocarbon emissions and the emissions of other products of incomplete combustion. (Author abstract)##

01413

A. H. Rose, Jr., R. Smith, W. F. McMichael, and R.
E. Kruse

COMPARISON OF AUTO EXHAUST EMISSIONS IN TWO MAJOR CITIES . J. Air Pollution Control Assoc. 15, (8) 362-6, Aug. 1965.

Direct measurement of emissions from vehicles operating under actual traffic conditions in Los Angeles, California, and Cincinnati, Ohio are presented. Exhaust emissions expressed as pounds of contaminant emitted per vehicle mile traveled are a function of average speed of the vehicles over the designated route (average route speed) regardless of the characteristics of the specific route and can be best shown as a logarithmic function of pounds of contaminant emitted per vehicle mile versus average route speed. Exhaust emissions expressed as concentration provide a less valid measurement of atmospheric contamination than emissions expressed as pounds per vehicle mile traveled. The reason is believed to be the variability in consumption of combustion air by vehicles and in characteristics of the test routes. The emission data expressed as a logarithmic function of pounds of contaminant emitted per vehicle mile versus average route speed show no significant differences between Los Angeles and Cincinnati. The effects of peak versus offpeak traffic on emissions expressed by weight are basically a function of the changes in average route speed. (Author summary modified)##

01453

R. Tye, M. J. Burton, E. Bingham, Z. Bell, and A. W. Horton

CARCINOGENS IN A CRACKED PETROLEUM RESIDUUM (THE CONTRIBUTIONS OF VARIOUS POLYCYCLIC AROMATIC HYDROCARBONS TO THE CARCINOGENIC POTENCY OF A CATALYTICALLY CRACKED OIL). Arch. Environ. Health, 13(2):202-207, Aug. 1966.

An extensive examination, which involved the preparation and bioassay of more than 100 fractions, of a petroleum residuum, K8, from commercial fluid catalytic cracking, was performed. The preparation of the fractions involved distillation at reduced pressures, solvent extraction, chemical reactions, and chromatography. The fractions were assayed for carcinogenic potency by repeated application to the skin of C3H mice. It was possible to categorize the carcinogens and to evaluate the contribution of each category to carcinogenic potency of the whole residuum. The major carcinogens in this oil were categorized according to whether they were found in the relatively high boiling portion (438-455C) characterized by the presence of 5-ringed or alkyl 4-ringed PAH, in intermediate fractions (404-438 C) characterized by unsubstituted and methyl substituted 4-ringed PAH, and in lower boiling fractions characterized by assorted smaller compounds including alkyl 3-ringed PAH. In the same order the percentages by weight (of the whole oil) of characteristic carcinogens found in each category were as follows: benzo(a)pyrene, 0.4%; benz(a)anthracene and alkyl homologs 0.4%; and benzo(c)phenanthrenes, 0.01%. Larger quantities of benzo(c)phenanthrenes may have been present in the intermediate fractions, which were not analyzed for these compounds. In spite of the small percentage that was found, the presence of this class of carcinogens may be significant because they were the dominant carcinogens in the most volatile portion of the oil. (Author summary modified)##

S. T. Cuffe and R. W. Gerstle

EMISSIONS FROM COAL-FIRED POWER PLANTS: A COMPREHENSIVE SUMMARY. Public Health Service, Cincinnati, Ohio, National Center for Air Pollution Control. (Presented at the American Industrial Hygiene Association Meeting, Houston, Tex., May 1965.) (PHS Publ. No. 999-AP-35.) 1967. 30 pp.

A series of tests on six coal-burning power plants has been conducted to determine certain stack gas components of interest in atmospheric pollution. The six units tested included three dry-bottom pulverized coal-burning units, two wet-bottom units, and a large spreader-stoker traveling-grate unit. Measurements of sulfur oxides indicate that essentially 90 to 100 percent of the sulfur in the coal appears as sulfur oxides in the stack gas. Of this amount 1 to 2 percent is in the form of sulfur trioxide and the balance is sulfur dioxide. Neither the type of furnace, the conditions of firing, nor the reinjection of fly ash affected sulfur oxide emissions significantly. Concentrations of sulfur oxides are thus essentially determined by the amount of sulfur in the coal entering the furnace. Concentrations of nitrogen oxides varied widely, ranging from 221 ppm for the vertically fired unit to 1204 ppm for the cyclone-type furnace. Concentrations of nitrogen oxides apparently are determined by: (1) initial flame temperatures in the firebox, (2) decomposition in the high-temperature region of the furnace, and (3) quenching of the decomposition reaction as the gases are cooled in the boiler section of the furnace. Control of particulate emissions varied considerably in coal-fired power plants. Combination cyclone and electrostatic-precipitator-type fly-ash collectors gave collection efficiencies of about 96 percent and an outlet grain loading of 0.20 grain/scf at full load. Electrostatic precipitators and mechanical cyclone collectors, when used separately, gave average collection efficiencies ranging from 75 to 85 percent, with loadings at the fly-ash collector outlet varying from 0.19 to 0.68 grain/scf. Additional emissions determined included polynuclear hydrocarbons, carbon monoxide, gaseous hydrocarbons, formaldehyde, and trace metals. None of these components was found in appreciable quantities during normal furnace operating conditions. (Author summary)##

01488

Ludwig, J. H.

SEMINAR ON AIR POLLUTION BY MOTOR VEHICLES. Technology Research and Development Programs, Washington, D.C. ((54))p., 1968. 1 ref.

The contribution of motor vehicle emissions to community-wide air pollution levels; emissions from gasoline and diesel engines; and photochemical reactions in the atmosphere are reviewed.##

01534

H. Wozniczek

AIR POLLUTION BY MOTOR CAR EXHAUST GASES) ZATRUCIE
Powietrza Przez Spalanie Samochodowe. Ochrona Pracy
(Warsaw), 21(5):14-17, May 1966.

Pollution of towns and cities by automotive emissions is described. Chemical analyses of the various constituents of exhaust gases are given. Toxicity of these constituents is discussed.##

01544

J.D. Kalasky

VENTILATION AND METHANE DRAINAGE IN LONGWALL MINING. MINING
Engineering 18(8):79-82, Aug. 1966.

The facilities and procedures necessary for adequate ventilation and methane drainage in longwall mines are described. Schematic diagrams showing air coursing and air inspection stations are presented. Company standards require that methane concentration be kept below 0.50%.##

01546

J.J. Hanks H.D. Kube

INDUSTRY ACTION TO COMBAT POLLUTION. Harvard Bus. Rev.,
44(5):49-62, Oct. 1966.

The responsibilities of individual corporations in air pollution abatement are emphasized. Sources of pollution discussed include the paper, steel, electric power, transportation and petroleum industries. Principal equipment for removal of aerosols and particulates is described. It is concluded that although air pollution equipment increases costs in certain industries, recovery of pollutant, such as fly ash, may help to offset the costs. Government activities in air pollution programs are summarized.##

01558

M. Hayer, M. Mandl, and J. Doubek

DEVICE FOR SAMPLING AND ANALYSIS OF METALLURGICAL FURNACE
ATMOSPHERES. Zarizeni pro odber a analyzu hutnich atmosfer.
HUTNICKS LISTY (PRAGUE), 21(8) 532-538, AUG. 1966.

Two types of devices for sampling furnace atmospheres and an instrument for analyzing waste gases and furnace atmospheres based on gas chromatography are described. Specimens can be sampled and delivered to the analyzer within seconds. Sampling from

several points can be carried out manually or automatically. Chromatographic analysis of O₂, N₂, CO, CO₂ or CH₄ can be performed within five minutes. The system can be adapted for other gases.##

01565

E. S. Starkman

ENGINE GENERATED AIR POLLUTION - A STUDY OF SOURCE AND SEVERITY. Preprint. (Presented at the Federal International Societes Ingeneures Techniques De L'Automobile, Germany, June 15, 1966.)

A brief comprehensive view of the state of knowledge, legislation, research and application of devices to control the influence of reciprocating engine emissions on man and his environment is presented from the viewpoint and experiences of a California observer. The pollutants considered are: unburned hydrocarbons; carbon monoxide; oxides of nitrogen; carcinogens; particulate matter; lead; odor; and oxides of sulfur. Engine operating modes and severity of emissions; engine factors and emissions; and legislative control of emissions are considered.##

01572

OXIDES OF NITROGEN IN THE ATMOSPHERE (CHAPTER V OF THE OXIDES OF NITROGEN IN AIR POLLUTION). California State Dept. of Public Health, Berkeley, Bureau of Air Sanitation, p. 33-51. Jan. 1966.

This article discusses the air monitoring systems in California which detect the concentrations of nitrogen oxides. Concentrations are given for hourly, daily, monthly and seasonal variations. Statistics are also stated for hydrocarbon emissions but not in as much detail as for the oxides of nitrogen.##

01575

PHOTOCHEMICAL EFFECTS OF NITROGEN OXIDES (CHAPER VIII OF THE OXIDES OF NITROGEN IN AIR POLLUTION). California State Dept. of Public Health, Berkeley, Bureau of Air Sanitation. p. 69-89, Jan. 1966.

The chemistry of the photochemical reaction is reviewed, with emphasis on the role of nitrogen oxides. It is concluded that quantitative predictions cannot be made about the changes in the photochemical smog effects that would result from various degrees of control of either hydrocarbons or nitrogen oxides from motor vehicles.##

01582

R.W. Gerstle D.A. Kemnitz

ATMOSPHERIC EMISSIONS FROM OPEN BURNING. J. Air Pollution Control Assoc. 17 (5), 324-7 (May 1967). (Presented at the 60th Annual Meeting, Air Pollution Control Association, Cleveland, Ohio, June 11-16, 1967, Paper No. 67-135.)

Open burning of municipal refuse, of landscape refuse, and of automobile components was simulated. Carbon monoxide emissions were: 85 pounds per ton of material burned when municipal refuse was burned, 65 pounds per ton when landscape refuse was burned, and 125 pounds per ton when auto components were burned. These values are all very high when compared to emissions from municipal incinerators or other combustion processes. Gaseous hydrocarbon emissions paralleled the carbon monoxide concentrations and averaged 30 pounds per ton of material burned for all tests. The organic acid concentrations were also fairly high, averaging about 15 pounds per ton of material originally present in all tests. Formaldehyde concentrations varied from 0.095 pound per ton for municipal refuse to as low as 0.006 pound per ton for the landscape refuse. These formaldehyde concentrations also exceed those normally found in incinerators. Emissions of nitrogen oxides varied widely and depended on the intensity of burning. Highest values occurred during the initial burning period when temperatures were high. After the initial intense burning period of about 10 minutes, the nitrogen oxides concentrations dropped off rapidly. Particulate emissions averaged 16 pounds per ton of material burned when municipal refuse was burned and 17 pounds per ton when landscape refuse was burned. Emissions jumped to 100 pounds per ton when auto components were burned. Emissions of polynuclear hydrocarbons were also quite high, but for municipal or landscape refuse they were comparable to emissions from small commercial incinerators. For auto components, the concentrations were very high, comparable to those found in emissions from small coal-burning furnaces. (Author summary modified)##

01616

AIR POLLUTION CONTROL IN CONNECTION WITH DDT PRODUCTION (INFORMATIVE REPT. NO 6). J. Air Pollution Control Assoc. 14, (3) 94-5, Mar. 1964. (TI-2 Chemical Industry Committee).

DDT (Dichlorodiphenyltrichloroethane) is made from chloral, monochlorobenzene and sulphuric acid. The air pollution aspects of the process and of storage are considered.##

01620

THE PETROLEUM REFINING INDUSTRY - AIR POLLUTION PROBLEMS AND CONTROL METHODS (INFORMATIVE REPT. NO. 1). J. Air Pollution Control Assoc. 14, (1) 30-3, Jan. 1964. (TI-3 Petroleum Committee).

Possible air-borne contaminants from refining operations are covered. Control methods for gaseous and particulate emissions, and the industry's research projects are reviewed.##

01624

D.A. Jensen

SOURCES AND KINDS OF CONTAMINANTS FROM MOTOR VEHICLES (INFORMATIVE REPT. NO. 4). J. Air Pollution Control Assoc. 14, (8) 327-8, Aug. 1964. (TA-10 Vehicular Exhaust Committee).

The sources of the pollutants, the important compounds, and the magnitude of the several contaminant sources from both gasoline and diesel powered motor vehicles are indicated.##

01626

C. H. Pesterfield

LITERATURE AND RESEARCH SURVEY TO DETERMINE NECESSITY AND FEASIBILITY OF AIR POLLUTION RESEARCH PROJECT ON COMBUSTION OF COMMERCIALY AVAILABLE FUEL OILS. J. Air Pollution Control Assoc. 14, (6) 203-7, June 1964. (TA-4 Committee, Oil Burner Equipment.)

The basic purpose of this preliminary survey was to determine: (a) whether the combustion of fuel oil presented a serious air pollution problem by nature of its being a serious pollutant contributor; (b) what work has been done to evaluate its pollution contribution; (c) what work is being done; (d) what needs to be done; (e) if there is need and justification for a fuel oil combustion study.##

01654

A.C. Stern

THE REGULATION OF AIR POLLUTION FROM POWER PLANTS IN THE UNITED STATES. Rev. Soc. Roy. Belge Ingrs. Ind., Brussels (Presented at the International Symposium on Immission Regulations, sponsored by the Haus der Technik E.W. Essen and the Arbeits -und Sozialministerium (Dept. of Labor and Social Welfare) of North-Rhine-Westfalia, Essen, Germany Mar. 9, 1966; and before the Societe Royale Belge des Ingenieurs et des Industriels, Brussels, Belgium, Mar. 16, 1966.)

Author discusses the types, concentrations, and levels of control (state, federal and local) that the United States has initiated for the abatement of air pollution from power generating sources. Statistics are presented for various localities as well as specific pollutants which are emitted. The Clean Air Acts (88-206 and 89-272) as they apply to the abatement of air pollution are explained.##

01673

C.J. Conlee, P.A. Kenline, R.L. Cummins, V.J. Konopinski

MOTOR VEHICLE EXHAUST STUDIES AT THREE SELECTED SITES. Arch. Environ. Health 14, (3) 429-46, Mar. 1967.

Air quality was studied in relation to motor vehicle densities at three selected sites: the Sumner Tunnel between Boston and East Boston, Massachusetts; the International Peace Bridge across the upper Niagara River between Fort Erie, Ontario, and Buffalo, New York; and Laidlaw Avenue near the Air Pollution Research Facility in Cincinnati, Ohio. Pollutant concentrations and meteorological findings are presented for each site. Concentrations of pollutants known to be associated with auto exhaust were greater at sites of higher traffic density. A comparison of particulate pollution levels at the Sumner Tunnel operated as a one-way tube in 1963 with the tunnel carrying two-way traffic in 1961, indicates a definite decrease in pollutant levels. Other pollutants were assumed to be dispersed in air in the same way as carbon monoxide in determining the contribution by motor vehicles to ambient air for the Sumner Tunnel. Auto exhaust appears to be a prime contributor (greater than 50%) for carbon monoxide, aliphatic aldehydes, benzene-soluble particulate, and oxides of nitrogen. Lead, benzo(g,h,i)pyrene, and coronene may also be assumed to be important pollutants from auto exhaust, but they do not meet the requirements for contribution calculations. (Author abstract)##

01687

S.C. Rothman

ENGINEERING CONTROL OF INDUSTRIAL AIR POLLUTION: STATE OF THE ART, 1966. Heating, Piping, Air Conditioning Mar. 1966. 141-8 pp. (Presented before the First World Air Pollution Congress, Buenos Aires, Argentina, Nov. 1965.)

Problems encountered by the engineer are illustrated through analysis of air pollution control in the aluminum production industry. Prebaked pots and Soderburg pots and their fluoride emissions are considered.##

01744

J. A. Adams, and E. G. Masdin

THE SUPPRESSION OF CARBON FORMATION IN PARTIAL-COMBUSTION GASIFIERS. Die Verhütung von Kohlenstoffausscheidungen in Gaserzeugern mit unterstöchiometrischer Verbrennung. Erdöl Kohle (Hamburg) 19, (8) 564-72, Aug. 1966. Text in Ger.

Wide industrial application of partial-combustion, liquid fuel gasifiers is limited by the occurrence of solid carbon in the resultant fuel gases. The theory of solid carbon formation and

its inhibition is discussed. Experiments are described in which carbon formation was suppressed in a partial-combustion distillate fuel gasifier by vaporizing the fuel in the presence of steam, carbon dioxide or nitrogen prior to combustion. In the presence of steam the amount of carbon formed is inversely proportional to the steam/fuel ratio at constant air/fuel ratio. (Author summary)##

01763

ORGANIC HALOGEN COMPOUNDS. (METHODS FOR THE DETECTION OF TOXIC SUBSTANCES IN AIR.) Ministry of Labour, London, England (Booklet No. 12) 1966. 10 pp.

The booklet first describes industries and processes in which organic halogen fumes may be encountered, i.e. artificial silk, bleaching, dyeing and dye-making, dry cleaning, electroplating, engineering, lithography, refrigeration and rubber. It then describes the toxic effects, notably liver damage as a long-term effect and narcosis. The chief method of detection described is a halide detector lamp in which the halogen will react with a copper invert. in the lamp to give a typical green copper color in the flame. It is emphasized that this is not a quantitative test although approximate limits of coloration for various organic halogen compounds are given; chlorobenzene, for example will show color at a minimum concentration of 35 ppm, while 1,2 dibromoethane will show color at 5 ppm. Approximately 50 compounds are thus classified.##

01788

R.P. Hangebrauck, D.J. Von Lehmden, J.E. Meeker

EMISSIONS OF POLYNUCLEAR HYDROCARBONS AND POLLUTANTS FROM HEAT-GENERATION AND INCINERATION PROCESSES. J. Air Pollution Control Assoc. 14, (7) 267-78, July 1964. (Presented at the 56th Annual Meeting, Air Pollution Control Association, Detroit, Mich., June 11, 1963.)

This paper presents emission data from a series of tests, for which the sources tested included typical combustion processes involving the burning of conventional fuels (coal, oil, and gas) and of certain commercial and municipal solid wastes. In addition to obtaining over-all emission data from different sizes and types of combustion units, a primary objective of the study was to establish the relative importance of various combustion processes as contributors of benzo(a)pyrene (3,4 benzpyrene) and other polynuclear hydrocarbons with demonstrated or potential carcinogenic properties. The other pollutants measured included particulate matter, carbon monoxide, total gaseous hydrocarbons, oxides of nitrogen, oxides of sulfur, and formaldehyde. Two categories of combustion sources were tested. Those burning conventional fuels were designated as heat-generation processes, and those burning waste materials were classed as incineration processes. Design and operation data for the units studied are given in tables.##

01803

D. Hoffmann

A STUDY OF AIR POLLUTION CARCINOGENESIS. II. THE ISOLATION AND IDENTIFICATION OF POLYNUCLEAR AROMATIC HYDROCARBONS FROM GASOLINE ENGINE EXHAUST CONDENSATE. Cancer 15, 93-102, Feb. 1962.

1. Polynuclear aromatic hydrocarbons, both carcinogenic and noncarcinogenic in animal tests, have been identified in automobile exhaust "tar". These data do not indicate the nature or the amount of these substances in the air.
2. The results are based upon automobile exhaust obtained from a conventional engine under road load, a typical gasoline, and used under "city driving" conditions. Present evidence suggests that the mileage run by an engine does have an influence on the formation of polynuclear aromatic hydrocarbons.##

01815

A.P. Altshuller P.W. Leach

REACTIVITY OF AROMATIC HYDROCARBONS IN IRRADIATED AUTOMOBILE EXHAUST. Intern. J. Air Water Pollution 8, 37-42, 1964.

Gas chromatographic analyses for up to 14 aromatic hydrocarbons in the 7-10-carbon range and for ethylene and propylene were made in irradiated auto exhaust containing total hydrocarbons at 3-, 6- and 12-carbon ppm. The total and individual hydrocarbon concentrations corresponded to the range of atmospheric levels which have been measured in Los Angeles, and San Francisco. About 40 per cent of the m-xylene and p-xylene and of the 1,3-methyl-ethylbenzene and 1,4-methyl ethyl benzene reacted to form products. Over 70 per cent of the trialkylbenzenes reacted to form products. The average percentage conversion of the 7-1 carbon aromatic hydrocarbons measured was approximately the same as the percentage conversion for the ethylene plus propylene. These results provide confirmation at atmospheric concentration levels, of the reactivity of aromatic hydrocarbons. (Author abstract)##

01837

W. F. McMichael and A. H. Rose, Jr.

A COMPARISON OF AUTOMOTIVE EMISSIONS IN CITIES AT LOW AND HIGH ALTITUDES. Preprint. (Presented at the 58th Annual Meeting, Air Pollution Control Association, Toronto, Canada, June 20-24, 1965, Paper 65-22.)

Automobile exhaust emissions were studied in Denver, Colorado. Denver is unique among large cities in the United States in that it is situated at an altitude of approximately 5,000 feet; the opportunity was thus provided for observing the effects of altitude on auto exhaust emissions. The emissions measured in Denver in

1963 are compared with the emissions obtained in a similar, previously reported study in Los Angeles, California, and Cincinnati, Ohio. The survey techniques and the instrumentation used to collect and analyze the exhaust samples were the same. Emission measurements were made on test vehicles driven under actual traffic conditions while equipped with a proportional sampler. This method produces data that reflect the effects of traffic density, route, climate, and altitude.##

01838

T. D. Nevens and F. A. Rohrman

GASEOUS AND PARTICULATE EMISSIONS FROM SHALE OIL OPERATIONS.
Preprint. (Presented at the American Chemical Society Meeting, Pittsburgh, Pa., 1966.)

World-wide and domestic demands for hydrocarbons tend to seek the most economical and convenient sources for potential exploitation. It has been said that the oil shale deposits of the world constitute many times the total of the world's reserves of liquid petroleum. The vast shale oil industry is nearly upon us as the problems of finding new economical sources of liquid petroleum are becoming more acute. The next 5 or 10 years could see the emergence of shale oil industry producing a million or more barrels a day in this small area of the Rocky Mountains. Any ripples of unfavorable prices on imported crude or finished products could cause abrupt waves of decision as to the time of arrival of this industry. It is hoped that all operations involving a future shale oil industry will take cognizance of the potential air pollution problem. To disregard air pollution at the early stages of development may require later intensive and extensive engineering at a much higher cost.##

01848

A. H. Rose

SUMMARY REPORT OF VEHICULAR EMISSIONS AND THEIR CONTROL.
Preprint. (Presented at the Winter Annual Meeting, American Society of Mechanical Engineers, Chicago, Ill., Nov. 1965.)

The report summarizes average emissions from the four sources of contaminants in the present day automobile: the exhaust, the crankcase, the fuel tank, and the carburetor. Levels of contaminants presented are for emissions under average urban driving conditions, in contrast to earlier work in which values were based on cyclic dynamometer tests. Emission levels are expressed as pounds per day emitted and, where applicable, as concentration. Emissions are considered by general chemical classes to indicate the relative photochemical reactivities of compounds from each of the four sources. Control approaches are briefly discussed. (Author abstract)##

01863

AUTOMOTIVE AIR POLLUTION; (SECOND REPORT OF THE SECRETARY OF HEALTH, EDUCATION, AND WELFARE TO THE U.S. CONGRESS PURSUANT TO PUBLIC LAW 88-206 - THE CLEAN AIR ACT.) 89th Congress (1st Session (Document 42) July 15, 1965. 17 pp.

Progress is reported on the resolution of the following problems; exhaust emissions, crankcase emission, fuel evaporative losses, maintenance, fuel, and diesels. The relevant literature is reviewed.##

01868

AUTOMOTIVE AIR POLLUTION. (THIRD REPORT OF THE SECRETARY OF HEALTH, EDUCATION, AND WELFARE TO THE U.S. CONGRESS PURSUANT TO PUBLIC LAW 88-206 - THE CLEAN AIR ACT.) 89th Congress (2nd Session) (Document 83) Mar. 25, 1966. 17 pp.

Reduced exhaust emissions of hydrocarbons and carbon monoxide have become a reality in California with the introduction of the 1966-model passenger cars and light commercial vehicles. Recognition of the need for still further control measures is evidenced by the adoption of nitrogen oxide standards by the California Board of Health. The Department of Health, Education, and Welfare is implementing the new responsibilities and authorities conferred by the Motor Vehicle Air Pollution Control Act. Standards for the control of emissions from gasoline-fueled vehicles are being developed accordingly, to become effective with the 1968 models. Some additional technical information has become available. Further studies of the effect of ambient temperature on exhaust emissions indicate that low temperatures tend to increase exhaust hydrocarbons and carbon monoxide, particularly following cold engine starts. Preliminary results obtained from a study of the effect of leaded fuels indicate that combustion chamber deposits may not significantly affect the quantities of hydrocarbons and carbon monoxide emitted in exhaust gases. A survey conducted to measure carbon monoxide levels in urban communities suggests that human exposure to carbon monoxide may be greater than routine atmospheric monitoring data had indicated. A number of new projects are being initiated by the Government to study the performance characteristics of production-type exhaust emission controls in varied environments, to develop more definitive data on exhaust emissions from small cars and diesel-powered vehicles, to learn more about human tolerance of lead and carbon monoxide, and to effect control of oxides of nitrogen. An expansion of industry research in automotive air pollution and its control is indicated by the recent activities of technical associations. (Author summary)##

01885

W. T. McKean, Jr., B. F. Hrutfiord, and K. V. Sarkanen

KINETIC ANALYSIS OF ODOR FORMATION IN THE KRAFT PULPING PROCESS I. Paper Trade J. 149, (35) 41-2, Aug. 30, 1965

and Tappi 48, (12) 699-704, Dec. 1965. (Presented at the National Meeting, American Inst. of Chemical Engineers, San Francisco, Calif., May 1965.)

The kinetics of the consecutive formation of methyl mercaptan and dimethyl sulfide at constant liquor composition were determined at several temperatures using a novel gas analysis based on vapor phase sampling. Comparison of kraft pulping of softwood and hardwood species shows that more organic sulfur compounds are produced from the latter group. In softwood pulping, a general enhancement in the reactivity of the lignin methoxyls occurs during the alkaline delignification process which results in accelerated odor formation during the last phase of pulping. The activation energies of these reactions suggest a substantial reduction in total formation of organic sulfur compounds may be accomplished by raising the reaction temperature and shortening the time of the kraft cook. The significance of the results to actual kraft pulping process is discussed. (Author abstract)**

01890

Williams, J. D., G. Ozolins, J. W. Sadler, and J. R. Farmer

INTERSTATE AIR POLLUTION STUDY: PHASE II PROJECT REPORT. VIII. A PROPOSAL FOR AN AIR RESOURCE MANAGEMENT PROGRAM. Public Health Service, Cincinnati, Ohio, National Center for Air Pollution Control, 132p., May 1967. 7 refs

This report is devoted to the development of an air use plan for the St. Louis metropolitan area. An air use plan may be thought of as a link between the potential pollutant emissions of a community and the air quality goals. Its function is to optimize the use of the air with respect to the amount of pollutants emitted, by considering the dilution capacity of the air basin and the configuration of the pollutant sources in the area. The air use plan may then be used as the basic framework for achieving the desired air quality by the various means available such as limiting the emissions from individual sources, limiting the emissions from sources in certain areas, or even disallowing new pollution sources in overburdened areas. In short, it provides the basis for enacting control regulations and provides a guide for future planning activities.**

01894

P. A. Bennett, M. W. Jackson, C. K. Murphy, and R. A. Randall

CRANKCASE GAS CAUSES 40% OF AUTO AIR POLLUTION. SAE (Soc. Automot. Engrs.) J. 68, 31-6, Mar. 1960.

Crankcase gas is a major contributor to air pollution. In fact, tests show that hydrocarbon emission from the crankcase is of the same order of magnitude as that due to exhaust. Composition of exhaust and crankcase vent or blowby gases of five test cars was determined by: Orsat analyses (carbon dioxide, oxygen, and carbon

monoxide) of grab samples obtained before and after a combustion train; and a Beckman I/B Model 15A infrared analyzer, which continuously measured exhaust and crankcase vent or blowby concentrations. It was equipped with an n-hexane detector and quartz optics. By using gas chromatography, measured Beckman concentrations were converted to absolute hydrocarbon concentrations. Blowby gases were shown to be predominantly carbureted mixture. This led to the conclusion that the specific hydrocarbons in the fuel determine the specific hydrocarbons in the crankcase gases. Therefore, in cars whose crankcase emissions are not controlled, the fuel used will determine the crankcase hydrocarbons emitted. Feeding engine crankcase gases back to the intake system eliminates crankcase hydrocarbon emissions without appreciably affecting exhaust emissions. An internal crankcase ventilating system can thus eliminate approximately 40% of the engine hydrocarbon emissions (considering crankcase plus exhaust, under all operating conditions) exclusive of carburetor vent losses.##

01902

M. Mukai, J. F. Thomas, and B. D. Tebbens.

AROMATIC HYDROCARBONS PRODUCED DURING COMBUSTION OF SIMPLE ALIPHATIC FUELS. Anal. Chem. 37, 398-403, Mar. 1965. (Presented before the Division of Water, Air and Waste Chemistry, 148th Meeting, American Chemical Society, Chicago, Ill., Sept. 1965.)

The combustion of simple aliphatic fuels such as methane and propane at atmospheric pressure results in the formation of a wide array of products. Previous work has been concerned with arene-type products. Current work has shown the relative production of benzene, toluene, ethylbenzene, as well as other simple alkyl substituted derivatives of benzene. The practical aspects include an index of relative abundance of the latter type of compounds that might be found in polluted atmospheres as well as indicating a method for predicting the relative contribution of automobile exhaust to atmospheric pollution. (Author abstract)##

01941

M. B. Jacobs

HEALTH ASPECTS OF AIR POLLUTION FROM INCINERATORS. Proc. Natl. Incinerator Conf., New York, 1964. pp. 128-31.

The public health aspects of incinerator exhaust gases are discussed first in the light of the physiological response induced by specific contaminants such as sulfur oxides, nitrogen oxides, and other inorganic gases and aldehydes, organic acids, esters, polynuclear hydrocarbons, and other organic compounds; second, with respect to their relation to illness caused by air pollution in general such as emphysema and other respiratory diseases, allergenic responses, and cancer; and third on the character of the effluent gases, namely domestic, municipal, or industrial. One aspect of domestic incinerator effluents is

particularly stressed, that is, the effect on nearby residents. The contribution that incinerator exhaust gases make to the air pollution of any given community depends on the ratio of the amount of refuse and garbage burned to the total amount of fuel used and consumed in that region.##

01958

P. W. Leach, L. J. Leng, T. A. Bellar, J. E. Sigsby, Jr., and A. P. Altshuller

EFFECTS OF HC/NOX RATIOS ON IRRADIATED AUTO EXHAUST, PART II. J. Air Pollution Control Assoc. 14, (5) 176-83, May 1964. (Presented at the 56th Annual Meeting, Air Pollution Control Association, Detroit, Mich., June 11-13, 1963.)

The relative concentrations of individual hydrocarbons have been shown to be independent of autoexhaust concentration in dynamic irradiation experiments. The absolute concentrations of the individual hydrocarbons are linearly related to total hydrocarbon concentration. The decrease in the concentration of reactive hydrocarbons during irradiation is found to be independent of whether a 120- or a 180-minute average irradiation time is used. A fourfold reduction in initial hydrocarbon concentration at constant hydrocarbon to nitrogen oxide level causes a slight increase in the relative amounts (percent) of hydrocarbon consumed during irradiation. The same fourfold reduction in initial hydrocarbon concentration at constant nitric oxide level results in a decrease in the percent of olefins reacted, but does not affect the percent of aromatics reacted. If the hydrocarbon level is kept constant, while the nitrogen oxide level is varied, an increase in nitrogen oxides causes a marked reduction in the percent of olefinic and aromatic hydrocarbons reacted during irradiation. The aldehyde yields are linearly related to the total hydrocarbon level. No significant effect on aldehyde yields was found when the average irradiation time was varied from 120 to 180 minutes. The aldehyde yields did vary with a decrease in yield both at very high and very low ratios of hydrocarbon to nitrogen oxide. The individual hydrocarbon and aldehyde concentrations are shown to fall well within the range of atmospheric concentrations. Although the aldehydes may be responsible in part for the eye irritation, the presence of other eye-irritating species must be postulated to explain the shape of the eye-irritation response curves when plotted against nitrogen oxide concentration.##

02001

B. Gills E.L. Howe

OIL BURNERS FOR DOMESTIC APPLICATION: PRESENT DESIGN AND FUTURE DEVELOPMENTS. Proc. (Part I) Intern. Clean Air Cong., London, 1966. (Paper III/2.) pp. 37-44.

Published work from various research organizations in Europe and the U.S.A. concerning malfunctioning of domestic pressure jet burners is reviewed. It is shown that when poor combustion

performance of pressure jet burners is experienced the cause can be traced to one, or a combination of the following factors: 1. Poor design of the air/fuel mixing system. 2. Bad maintenance. 3. Bad matching of the burner characteristics to the heating appliance requirements. Bad performance of any combustion system is reflected in the composition of the final exhaust products. Results are presented which show that a combustion system can generally be operated so that it produces no smoke, carbon monoxide or unburnt hydrocarbons. Due to attention which has recently been drawn to "exhaust odor" from oil-fired appliances reference is made to methods of measuring the total hydrocarbon content of flue gases. Recent developments with the objective of improving the combustion performance and reliability of domestic oil burners are described, together with references to research into methods of distillate fuel atomization and combustion using novel principles. (Author abstract modified)##

02017

M.A. Termeulen

AIR POLLUTION CONTROL BY OIL REFINERIES. Proc. (Part I) Intern. Clean Air Cong., London, 1966 (Paper IV/5). pp. 92-5.

Stichting CONCAWE has been established by the Oil Companies' International Study Group for Clean Air and Water Conservation (Western Europe). Its Working Group on Atmospheric Dispersion is active in the field of abatement and control of air pollution originating from both domestic and industrial complexes. Major air-borne contaminations, from oil refining operation but not petrochemical operations, such as hydrocarbons, mercaptans, carbon monoxide, hydrogen sulphide and sulphur oxides other than from refinery flue gas, are discussed. Most common sources of the above contaminants are discussed, together with the general refinery practices for preventing or reducing emission of these contaminants. The effectiveness of modern refinery processes in reducing air pollution is reviewed and examples of local conditions and the way they affect the setting of practical limits of emissions are discussed. In conclusion, the general oil industries views with respect to the air pollution problem are summarized. (Author abstract modified)##

02023

G.J. Cleary

POLYCYCLIC HYDROCARBON RATIOS: THEIR USE IN STUDYING THE SEQUENCE OF COMBUSTION IN A HAND-FIRED INTERMITTENT BRICK KILN. Proc. (Part I) Intern. Clean Air Cong., London, 1966, Paper IV/11). pp. 111-4.

Concentration ratios of polycyclic aromatic hydrocarbons have been used to study combustion in a hand-fired intermittent brick

kiln. Soot samples were obtained at various stages in the heating cycle using a scrolltype high efficiency cyclone located at the base of the stack. There is a gradation in the nature of the tar adsorbed by the soot, that collected early in the drying stage being primary, as the temperature rises there is a transition to secondary tar. The highest concentration of polycyclic aromatic hydrocarbons coincides with the highest soot fall from the kiln. Two possible mechanisms are examined. In both it is assumed that soot with absorbed primary tar is deposited on kiln walls and product surfaces during the steaming period and that towards the end of the preheating period the higher flue gas velocities and greater temperature gradients dislodge the soot: (a) in the early part of the steaming period, as successive layers of soot deposit they prevent colatilization of the tar adsorbed on previous deposits. When the soot is dislodged the adsorbed tar, no longer shielded, is thermally cracked on the surface of the carbon particles; (b) the primary tar is alternatively cracked on the surface of the soot before the latter is dislodged and this assumes that the adsorptive forces are sufficiently strong to prevent the mass transfer of the adsorbed tar into the flue gas stream. (Author abstract)##

02066

W. Breuer, and K. Winkler.

SOURCES AND DISTRIBUTION OF AIR POLLUTIONS ASCERTAINED BY STATIONARY RECORDING OF GASEOUS COMPONENTS. Herkunft Und Ausbreitung Von Luftverunreinigungen, Ermittelt Durch Stationare Registrierung Mehrerer Immissionskomponenten. Proc. (Part I) Intern. Clean Air Cong., London, 1966. (Paper VII/10). pp. 239-42.

Simultaneous, continuous and stationary measurement of the concentration of gas components. (CO, CO₂, SO₂, H₂S, C₁₂, nitrous gases, hydrocarbons) combined with the recording of meteorological factors (wind direction, speed of wind, atmospheric stability etc.) enable the identifying of the source of air pollutions (motor vehicle exhaust, domestic heating, power stations, chemical works). The examination of special air conditions and statistical evaluation gives information on the process of distribution. (Author abstract)##

02152

G. Weston.

EXCESSIVE EMISSIONS OF FIREDAMP IN THE WEST LANCASHIRE AND NORTH WALES COALFIELDS. MINING ENGR. (LONDON) 126, (74) 81-96, Nov. 1966.

Several recent sudden emissions of firedamp in the Lancashire and North Wales coalfields are reported; steps taken to deal with the emissions and recognition of common factors indicating when similar occurrences might be expected are recorded and analyzed. Firedamp

drainage by boring holes into the seams close below the one being worked was one method employed. The system should be capable of dealing with more firedamp than is normally encountered to protect against sudden substantial emissions. Regular monitoring of firedamp emitted from wastes and in the tunnels is necessary. Emissions of firedamp from the seam being worked may be reduced if steps are taken to "harden" the coal.##

02153

C. A. Rogus.

CONTROL OF AIR POLLUTION AND WASTE HEAT RECOVERY FROM
INCINERATION. PUBLIC WORKS 97, (6) 100-3, JUNE 1966.

Europe has had for some time rigid government standards controlling air pollution with many large scale air pollution control installations, particularly of refuse incineration facilities. The nature of air pollutants from refuse incineration is discussed. The chemical analysis of fly ash is given as well as the size distribution of stack dust emissions. Air pollution abatement equipment is described. The approximate characteristics and costs of major collector systems are tabulated.##

02232

R.L. Stenburg, T.P. Hangebrauck, D.J. Von Lhdmden,
A.H. Rose, Jr.

EFFECTS OF HIGH VOLATILE FUEL ON INCINERATOR EFFLUENTS.
J. Air Pollution Control Assoc. 11, 376-83, Aug. 1961
(Presented at the 53rd Annual Meeting, Air Pollution Control
Association, Cincinnati, Ohio, May 22-26, 1960.)

A readily vaporizable solid fuel normally considered as being more difficult to burn than ordinary cellulose was treated in a multiple chamber incinerator having an 8.5 sq. ft. grate area in a 19.5 cu. ft. primary combustion chamber, a downpass mixing chamber and a 16.5 cu ft. final combustion chamber. One part shredded asphalt saturated felt roofing composed of 60% petroleum base asphalt, 37 1/2% felt, and 2 1/2% ash with one part 4" squares of newspaper was the fuel mixture. The effects of combinations of excess air (100 and 200%), fuel feed rate (100 and 150 lb/hr), fuel per charge, underfire air (15 and 60%), and secondary air on the emission of particulates, oxides of nitrogen, hydrocarbons, carbon monoxide, formaldehyde, and smoke were evaluated. Optimum conditions imply a temperature range of 1800 to 2000 F in the secondary chamber, 15 to 20% underfire air, and small batch on continuous charging.##

02234

CHEMICAL INDUSTRY REPORT (REVISED INFORMATIVE REPORT NO. 1).
J. Air Pollution Control Assoc. (TI-2 Chemical
Committee). 13, (10) 496-9, Oct. 1963,

The chemical industry uses raw materials from mine, forest, sea, air, and farm; from oil, brine and gas wells; and from by-product materials of many other industries. It converts these widely diversified raw materials into more than 8,850 compounds, called "end chemicals," in more than 12,000 plants operated by hundreds of chemical manufacturers. Since World War II the chemical industry has become so diversified that it is difficult even to classify it accurately. Today, petroleum producers are now important chemical manufacturers; paper companies, rubber companies, even manufacturers of electrical machinery and farm equipment are chemical producers. This report will discuss in general terms some of the characteristics of emissions from certain kinds of operations and the relation of the plant operators to the Air Pollution Control Officials.##

02236

HYDROCHLORIC ACID MANUFACTURE, REPORT NO. 3. J. Air Pollution Control Assoc. 13, (10) 502-5,7, oct. 1963. (TI-2 Chemical Committee.)

This report, published as Informative Rpt. No. 3 of the Air Pollution Control Association's TI-2 Chemical Committee represents the "best thinking of the Association" on the subject. The manufacture of hydrochloric acid involves the generation of hydrogen chlorid gas and its absorption in water for the aqueous solutions. There are three principal processes used to produce hydrogen chloride: (1) Reaction of salt and H_2SO_4 (Mahnheim Process) resulting in the production of hydrogen chloride gas and sodium sulfate; (2) Burning chlorine in a slight excess of hydrogen; (3) As a by-product from chlorination of organic compounds. Up until the early thirties more acid was made by the salt-acid process; by 1961 the hydrogen-chlorine process was more in use. Air pollution aspects of the processes are reviewed.##

02244

A.H. Rose, Jr., R.C. Stahman, M.V. Korth

DYNAMIC IRRADIATION CHAMBER TESTS OF AUTOMOTIVE EXHAUST, PART I. J. Air Pollution Control Assoc. 12, 468-73, Oct. 1963. (Presented at the 55th Annual Meeting, Air Pollution Control Association, Chicago, Ill., May 20-24, 1962.)

The data from this series of tests run under dynamic irradiation conditions show differences attributable to: (1) the concentration of exhaust gas at which the irradiation was made, and (2) the composition of the fuel used to produce the exhaust gas. Evaluations of the variations in chemical reaction and biological effects show: (1) The rate of NO_2 formation increased proportionately with both exhaust concentration and olefin content of the fuel. (2) The percentage of NO_2 reacting with unreacted fresh exhaust components and with secondary reaction products varied inversely with the increase of the exhaust concentration level. (3) No consistent change in oxidant concentration level (primarily ozone) resulted from an increase in the hydrocarbon concentration level at which the irradiation

was made. (4) Formaldehyde formation increased in direct proportion to the increase in hydrocarbon concentration at irradiation. (5) Plant effects indicate a shift in the type of phytotoxicant developed and a decrease in damage level with increase in the hydrocarbon concentration level at which the irradiation was made. (6) Bacterial effect showed a significant increase in degree of kill with increase in hydrocarbon concentration level at which the irradiation was made. (Author summary)**

02335

H. K. Newhall.

THEORETICAL AND EXPERIMENTAL INVESTIGATION OF CHEMICAL KINETICS DURING RAPID EXPANSIONS OF HIGH TEMPERATURE COMBUSTION PRODUCTS (DOCTOR'S THESIS). (For the degree of Doctor of Philosophy in Engineering, California Univ., Berkeley, Graduate Div.) Sept. 1966. 198 pp.

Theoretical analysis predicts that during expansion of combustion products occurring in internal combustion engines, the rate of atom and free radical recombination is sufficient for equilibration of these species. It is further predicted that as a result of kinetic limitations, nitric oxide persists in hyper-equilibrium concentrations. Theoretical analysis of the kinetics of the expansion process was performed through use of a digital computer. Overall reactions considered were the decomposition of nitric oxide and the recombination of atomic oxygen, atomic hydrogen and the hydroxyl free radical. Rate expressions for the overall reactions were formulated through consideration of all significant elementary reactions. Reaction rate data for the elementary reactions were obtained from a large number of published sources. Nitric oxide is of considerable importance in the problem of automotive air pollution and an experimental study of nitric oxide decomposition occurring during engine cycle expansion was undertaken. A single cylinder research engine was equipped with an infrared transmitting window. The emergent infrared radiation was studied by means of spectroscopic equipment making possible the determination of nitric oxide concentrations throughout expansion. The results indicate that nitric oxide concentration remains fixed throughout the entire expansion process. (Author summary modified)**

02362

J.H. Ludwig

STATUS OF VEHICLE EMISSIONS IN AIR POLLUTION. Preprint. (Presented at the Eighth Annual Environmental Health Inst., Colorado Association of Sanitarians, Denver, Apr. 26, 1963.)

Review of the various classes of motor vehicles in use today and associated power plants indicates that as a group the gasoline-powered passenger car accounts for the major share of auto exhaust emissions associated with production of photochemical smog. Of the various sources of emissions from

all types of vehicles, tailpipe emissions from gasoline-powered vehicles are the most significant, followed by crankcase

02375

J. E. Sigsby, Jr. and M. W. Korth.

COMPOSITION OF BLOWBY EMISSIONS. Preprint. (Presented at the 57th Annual Meeting, Air Pollution Control Association, Houston, Tex., June 21-25, 1964, Paper No. 64-72.)

The composition of blowby emissions was evaluated from ten different cars with displacements ranging from 52 cu in. to 365 chromatographic analyses were made of the blowby hydrocarbon composition covering a group of approximately 75 components. Nondispersive infrared and flame ionization equipment were also used to determine CO, CO₂ and hydrocarbon concentrations. (Author abstract)##

02428

M. P. Sweeney

THE POTENTIAL OF MODIFICATIONS TO THE ENGINE INDUCTION SYSTEM ON PERFORMANCE AND EMISSIONS. Scott Research Labs., San Bernardino, Calif. 31 pp., 1966

This paper describes approaches to combining reduction in exhaust emissions from spark ignition internal combustion engines with equal improved "performance". In view of the new legislation of vehicle emissions, a new criterion of engine design is being added, so that now the basic criteria are: Power capabilities, economy, driveability and emissions. The induction system modifications discussed in this study are believed to play a large and increasing part in exhaust emission reduction. Furthermore author states that these improvements will contribute to improved general operation and performance of spark ignition internal combustion engines in the very near future.##

02527

D. S. Smith and E. S. Starkman

PERFORMANCE OF ANHYDROUS AMMONIA AS A SPARK IGNITION ENGINE FUEL. California Univ., Berkeley, Dept. of Mechanical Engineering. 62 pp., Feb. 1966.
CFSTI, DDC: AD 633632

The operating characteristics of anhydrous NH₃ as a fuel for a spark ignition engine were determined and compared, experimentally and theoretically, to those of iso-octane, the reference hydrocarbon fuel. Experimental data obtained over a wide range of parameters--compression ratio, engine speed, manifold pressure--displayed no grossly divergent fuel characteristics for NH₃ compared to iso-octane. Anhydrous NH₃ was demonstrated to operate successfully as a fuel for spark ignition engines.

Principal requirements are that it be introduced into the engine in the vapor phase and be partly dissociated to H_2 and NH_3 . Dissociation was accomplished in a temperature controlled catalytic dissociator using pelletized activated iron catalyst. The optimal weight concentration of H_2 to insure against power loss is approximately 5%. The maximum theoretically possible indicated output using ammonia vapor when adjusted for 5% hydrogen dissociation is about 75% of that with hydrocarbon. The presently obtained maximum experimental level is 72% at a compression ratio of 10. Specific fuel consumption, both by theory and experiment, is twofold at maximum power and 2-1/2 fold at maximum economy when using ammonia as a replacement for hydrocarbon. Spark timing for maximum performance must be advanced slightly for ammonia but sensitivity to spark timing is very little greater than with hydrocarbons. (Author summary modified)##

02548

F. I. Dubrovskaya, I. A. Pinigina, and V. M. Styazhkin

POLLUTION OF AIR BY SYNTHETIC FATTY ALCOHOLS AROUND A FACTORY PRODUCING FAT SUBSTITUTES. (Zagryaznenie atmosfernogo vozdukhа sinteticheskimi zhirnymi spirtami vokrug proizvodstva zhirozamenitelei.) Hyg. Sanit. 31, (1) 113-5, Jan. 1966.
CFSTI: TT66-51160/1-3

The qualitative and quantitative composition of alcohols contaminating the air around factories producing synthetic fatty alcohols and synthetic fatty acids, is described for the first time. Such air may contain volatile lower alcohols, as well as less volatile higher alcohols. Since aliphatic alcohols differ in their toxic properties, the maximum permissible atmospheric concentration should be established for each alcohol separately.##

02549

L. V. Buzunova, A. N. Bokov, A. M. Gurevich, and Z. P. Nikitinskaya

SLAG HEAPS AS A SOURCE OF ATMOSPHERIC POLLUTION. (Otvaly ugol'nykh shakht kak istochnik zagryazeniya atmosfernogo vozdukhа.) Hyg. Sanit. 318 (1) 118-20, Jan. 1966.
CFSTI: TT66-51160/1-3

The burning slag heaps of the coal mining districts in the Rostov Region, where the principle combustible component is anthracite, do not present any carcinogenic hazard. However, this conclusion cannot be extended to burning rocks in slag heaps containing quantities of other grades of coal, such as bituminous coal, and particularly coal which processes a higher content of tarry substances. The burning slag heaps give rise to considerable pollution of the atmosphere by carbon monoxide and sulfur dioxide.##

N.Y.A. Yanysheva, L.G. Andrienko, N.V. Balenko, I.S. Kireeva

THE CARCINOGENIC PROPERTIES OF COKE OVEN WASTES. (O kantsergennykh svoistvakh vybrosov koksovykh pechei.) Hyg. Sanit. 29, (5) 6-11, May 1964.
CFSTI: TT65-50023/5

The authors present data on the concentration of 3,4-benzpyrene, anthracene, 1,2-benzanthracene, phenatrene, pyrene, phryzene in the discharges of coke oven into the air and the effect exerted by these discharges on animals in a biological test. It was shown that the coke gas resin in the coke oven discharges contains 0.3% of benzpyrene and certain other polycyclic aromatic carbonhydrates and has a strongly marked blastogenic effect on experimental animals. As a means of control of atmospheric air pollution with cancerigenic substances the authors suggest a smokeless method of charging coke ovens. (Author abstract)##

02610

C. V. Kanter, and R. G. Lunche

EMISSIONS AND POLLUTANT LEVELS (TRENDS IN LOS ANGELES). Arch. Environ. Health 8, (1) 5-14, Jan. 1964. (Presented at the Sixth Annual Air Pollution Medical Research Conference, San Francisco, Calif., Jan. 28-29, 1963.)

For accurate assessment of the problems, needs, and progress of an air pollution control program, accurate information must be obtained on emissions of contaminants from sources, and on contaminant levels. This is a very large task, requiring the acquisition of a great mass of data on a continuing basis. In a large community suffering the blight of smog, the acquisition of data is imperative in order to take effective action to stop the advancing menace and to begin a trend back toward clean air. In Los Angeles total air pollution surveys and air monitoring activities have provided the means for understanding the basic causes of the smog problem, and for guiding actions which have slowed the advance of smog and which will turn it back. Inspection of trends of emissions and contaminant levels in Los Angeles County affirms that a vigorous control program on stationary sources can slow and even reverse trends. It is clear though, that permanence of these effects cannot be achieved until the increasing emissions from motor vehicles are controlled. Of the major contaminants discussed, only sulfur dioxide, which is not significantly affected by motor vehicles emissions, has regressed.##

02635

J. H. Boddy and D. Turner

A DEFINITION OF THE PROBLEM AND SIGNIFICANCE OF AIR POLLUTION FROM PETROL-ENGINED VEHICLES (PART I OF ATMOSPHERIC POLLUTION: A

SURVEY OF SOME ASPECTS OF THE EMISSIONS FROM PETROL-ENGINED VEHICLES AND THEIR TREATMENT). British Technical Council of the Motor and Petroleum Industries, England. Sept. 1965. pp. 1-34.

World-wide legislation is reviewed; the existing and probable restriction on vehicle use and design is presented. The motor vehicle pollutants are detailed. The public health significance is examined. Automotive emissions are compared to those from other sources. Existing legislation in the western and non-Communist world, other than the Californian legislation, imposes negligible restrictions on the gasoline engine at present, but shows indications of imminent action. Legislation in many countries is framed in such a way that regulations against emission from gasoline vehicles could be enforced without major revision of legislation. This is most apparent in recent revisions of legislation, e.g. Ireland, France, and Belgium. When and if the present legislation in the U.K. is successful in controlling pollution from industrial and domestic sources, more attention must inevitably focus on the motor vehicle. The gasoline-engined vehicle makes a major contribution to the following pollutants: carbon monoxide, unburnt hydrocarbons, and oxides of nitrogen. Of these pollutants referred to, carbon monoxide is certainly the most undesirable. Oxides of nitrogen may be more damaging in respect to chronic exposure but evidence is limited. Unburnt hydrocarbons in vapour form appear significant only in relation to photochemical smogs. Heavy hydrocarbons in association with non-particulate matter, like oxides of nitrogen, have possible significance in relation to effects of chronic exposure. The use of lead in gasolines appears to have minor significance as a health hazard in respect to its pollution of the atmosphere. Major attention should be immediately devoted to the reduction of carbon monoxide emission from automotive vehicles. In the interests of clarifying the situation and, as a safeguard against possible legislation of an unnecessarily restrictive nature, the motor and petroleum industries should support research into the significance of such emissions as oxides of nitrogen and heavy hydrocarbons and methods of reducing these.**

02636

J. A. Walker

INFLUENCE OF GASOLINE COMPOSITION ON THE CONSTITUTION OF ENGINE EXHAUST (PART II OF ATMOSPHERIC POLLUTION: A SURVEY OF SOME ASPECTS OF THE EMISSIONS FROM PETROL-ENGINED VEHICLES AND THEIR TREATMENT). British Technical Council of the Motor and Petroleum Industries, England. Sept. 1965. 35-64 pp.

The major component, adverse to health, in gasoline engine exhausts is carbon monoxide. Fuel composition has no influence on the production of this toxic compound and it is recommended therefore that work is carried out to develop other practicable methods of minimizing CO in engines of European design. Traces of unburned hydrocarbons are also present in exhaust gases and in California they contribute to smog formation by participating in photochemical reactions promoted by sunlight. This reaction rarely occurs in Europe, and thus hydrocarbons are of importance only because they may make a small contribution to

the presence of carcinogenic compounds in the air. The AMA has stated that in some 1966 model cars, an engine afterburner system will be fitted as original equipment which will convert CO and hydrocarbons to the harmless compounds CO₂ and water. Any method adopted in Europe for removing CO from exhaust gases is likely to be of a similar type and inevitably the major part of the hydrocarbons present in the exhaust will also be converted into innocuous materials. It is recommended that work is carried out to assess the importance of the presence of oxides of nitrogen in the air, and if necessary to develop means of preventing their emission from gasoline engine exhausts. Particulate matter is emitted from engine exhausts consisting of sulphur compounds, carbon, compounds of lead and other materials. At the present it is not considered that these represent any appreciable health hazards, but it is recommended that close touch is maintained with workers in the U.S.A. and in the U.K. who are measuring the concentration and nature of particulate matter in the air, particularly under high traffic density conditions. Evaporation of gasoline vapours from the car fuel tanks and carburetors will probably be controlled in the U.S.A. The contribution to atmospheric pollution from these sources must be extremely small, but it is recommended that some work is carried out in European engines to investigate the factors involved. (Author summary)##

02806

F. J. Schuette

AUTOMOTIVE EXHAUST STUDY CONDUCTED AT U.S. BUREAU OF MINES PETROLEUM RESEARCH CENTER, BARTLESVILLE, OKLAHOMA (FINAL REPT. JULY 17-NOV. 10, 1959). California State Dept. of Public Health, Berkeley, Air and Industrial Hygiene Lab. (Rept. No. AIHL-1) June 9, 1960. 28 pp.

Based on the data included in this report it may be said that exhaust hydrocarbon analyses by n-hexane-sensitized non-dispersive infrared analyzers are reproducible from one instrument to another when instrument variables are kept constant. For this reason, they make valuable survey instruments. It must be borne in mind that n-hexane sensitized analyzers "see" only a fraction of the total exhaust hydrocarbons, the fraction depending on the instrument characteristics and the composition of the exhaust gas. Analyzers sensitized to acetylene, benzene and ethylene used in this study were not reliable. Efforts to obtain two analyzers with comparable responses did not produce satisfactory results. Preliminary investigations into flame ionization detection for exhaust hydrocarbon analyses indicate this instrument to be promising as a true carbon counter. Gas-liquid partition chromatography, although very time consuming, still appears to be the best method for analysis of exhaust hydrocarbons. Of course, there is still need for further refinement of techniques in this method. (Author conclusion)##

02911

R. L. Chass, R. G. Holmes, A. P. Fudurich, and R. M. Burlin

EMISSIONS FROM UNDERGROUND GASOLINE STORAGE TANKS. J. Air Pollution Control Assoc. 13, (11) 524-30, Nov. 1963. (Presented at the 56th Annual Meeting, Air Pollution Control Association, Detroit, Mich., June 9-13, 1963, Paper No. 63-46.)

A test program was designed and carried out in two phases: a study of current service station filling losses, and determination of variations in these losses using a prototype vapor return system. Emissions from the filling of underground tanks amount to 11.5 lb of vapor for each 1000 gal of gasoline delivered; in Los Angeles County, this totals 38 tons per day, assuming splashloading techniques are used at all locations. Equipment auxiliary to the delivery and loading of this gasoline is responsible for an additional controllable total of five tons per day of vapor emissions. Use of various combinations of equipment and techniques could provide vapor control of the following magnitudes: A 37% reduction merely by converting from splash filling to submerged filling techniques. A 93% reduction by returning the vapors to the tank truck, but retaining the normal vent line from the underground tank to the atmosphere. Essentially complete reduction by using submerged filling, returning the vapors to the tank truck, and eliminating the atmospheric vent line. (Author summary modified)##

02956

G. B. Warren

FUEL-ECONOMY GAINS FROM HEATED LEAN AIR-FUEL MIXTURES IN MOTORCAR OPERATION. Preprint. (Presented at the Winter Annual Meeting, American Society of Mechanical Engineers, Chicago, Ill., Nov. 7-11, 1965, Paper No. 65-WA/APC-2.)

Following suggestions resulting from previously published results a 1963 225 cu in., 8.2 to 1 compression ratio six cylinder sedan with automatic transmission was modified to permit cruising-speed operation with 10 to 25% leaned mixtures, the leaning air being separately heated by an exhaust heat exchanger. The heated leaning air was introduced into the intake manifold through fixed-area orifices below the throttle valve. With this arrangement, of course, opening of the main throttle valve by depressing the accelerator would drop the vacuum in the intake manifold and reduce or eliminate entirely the induction of leaning air and return the motor to full throttle, cold inlet, and normal throttle mixture immediately, and so result in no diminution of full-throttle performance. Slightly less than 10% gain in normal fuel consumption was demonstrated on a new and already very economical motorcar; analysis indicates that up to 15% may be obtainable. With the heated leaning air inlet no surging difficulties were encountered except at very low idling speeds, which it is believed could be obviated by refinements in controls or adjustments. Also, the smog-making properties of the exhaust should be reduced by this system. This is not to be confused with the more normal preheating of the air to the carburetor, which will also result in simultaneously enriching the fuel-air ratio, and will also reduce full-power performance. (Author abstract)##

R.W. Gerstle, S.T. Cuffe, A.A. Orning, C.H. Schwartz

AIR POLLUTANT EMISSIONS FROM COAL-FIRED POWER PLANTS, REPORT
NO. 2. J. Air Pollution Control Assoc. 15, (2) 59-64,
Feb. 19659

The Public Health Service and the Bureau of Mines are conducting a joint study to evaluate a number of flue-gas-stream components from coal-burning power plants. Emissions of fly ash, sulfur oxides, nitrogen oxides, polynuclear hydrocarbons, total gaseous hydrocarbons, formaldehydes, certain metals, and carbon dioxide are determined. A previous paper covered air pollutant emissions from vertical-fired and front-wall-fired power plant boilers. This paper includes a comparative evaluation of emissions from a tangential-fired and a turbo-fired power plant boiler. (Author abstract)##

M. Brunner, P. Lemaigre

METHODS OF REDUCING POLLUTION CAUSED BY INTERNAL COMBUSTION
ENGINES. (Motor Vehicles). European Conf. on Air
Pollution Strasburg, 1964. p. 191-258.

As a result of the growth of industry and the subsequent development of motor vehicles, European countries are faced with an air pollution problem the nature and size of which depend not only on the degree of industrialisation and the number of motor vehicles in use but also on the density of population and industry, traffic conditions and geographical and climatic conditions. The problem of pollution from motor vehicles in Ireland or Norway is different from that in Germany. The problem in France as a whole is not the same as the problem in Paris. The problem in Paris is, in turn, different from the smog problem in London, while the latter problem is different again from the smog problem in Los Angeles. In Belgium, Ireland, Norway, the Netherlands, Sweden, Switzerland and even Italy, the interest of the public, the police and legislature is concentrated mainly on the visible smoke from diesel vehicles, while petrol-driven vehicles are not yet regarded as a very serious source of pollution. In Switzerland, the inspection authorities have been primarily concerned from the outset (apart from gas emissions by factories) with the quantities of CO and lead compounds to be found in the air along traffic routes. This work began in the years immediately following the appearance of ethyl motor spirit on the market (1947). In the United Kingdom, attention also seems to be directed mainly towards other sources of pollution. In the Federal Republic of Germany and France mortality and morbidity statistics, reports on pollution trends in particular areas, the effects of pollution on people, plants and masonry have made doctors and learned societies alive to the changes, led to Press campaigns and impressed public opinion and government departments. The issue is not only the nuisance

caused by smoke, but, above all, the poisonous nature of the exhaust gases of petrol engines. Considered are: (1) - the organisation of anti-pollution action in each state; (2) - studies and research; organisation, co-ordination and results; (3) - methods and equipment which can be used to reduce pollution; and (4) - anti-pollution legislation in Europe.**

03128

C. Padovani

METHODS OF REDUCING POLLUTION CAUSED BY SPECIFIC INDUSTRIES (CHAPTER V. OIL INDUSTRY). European Conf. on Air Pollution, Strasbourg. 1964. pp 323-36.

One general observation that can be made concerning the national reports received is that the information they contain is not full enough or specific enough particularly as regards pollution statistics, the cost of anti-pollution equipment and the results obtained. Furthermore, as regards sources of pollution and methods of control, the reports mention nothing which cannot be found in technical literature. Recent years have seen enormous refinery development in Europe owing to a steady increase in consumption and the transfer of processing plants from the areas where the crude oil is obtained to those where petroleum products are consumed. There are also signs of a tendency to concentrate production in increasingly large refineries and of a continuous increase in secondary or vertical refining processes as compared with primary or horizontal refining processes. The pollution problem has naturally been aggravated by the tendency to bring refineries closer to consumption areas. By their very appearance, the enormous size of the storage tanks, the tall distillation towers, the flares for burning the surplus gases, petrol refineries make a strong impression on the public at large and give rise to suggestions out of all proportion to the actual threat presented to public health. It should further be pointed out that the European oil industry was almost completely reconstructed after the second world war and that, even in the field of pollution control, it is in the van of progress. However, the oil industry still needs to improve on the measures it has adopted.**

03129

Avy., A. P.

METHODS OF REDUCING POLLUTION CAUSED BY SPECIFIC INDUSTRIES. (CHAPTER VI. CHEMICAL INDUSTRY). European Conf. of Air Pollution, Strasbourg, 1964. p. 337-356.

The pollutants discharged by the chemical industry may be subdivided into several classes. The first and most important class is that of harmful products emitted in large quantities by the "heavy" chemical industry and, in particular, organic chemical works: Sulphur dioxide, sulphuric acid, chlorine, whether manufactured or in the form of impurities in the basic material: fluorine in the case of fertilizers and fluorine again in aluminum electro-chemistry. The chemical industry has a wide

range of special problems which is in a constant state of flux owing to the wide and ever-increasing variety of new synthetic products (intermediate and finished) in the organic chemical industry. From the technical point of view, the prevention of pollution by such products depends on their presentation and manner of application. A problem directly connected with chemical manufacture is that of smell: mercaptans, hydrogen phosphide, methylamines, etc., although, of course, it does not arise in the chemical industry alone. Technical methods used to reduce pollution are highly developed for dusts and smoke and there is a wide choice of apparatus. The chemical industry, like all others, is subject to laws and regulations governing industrial air pollution. A fairly sharp distinction, however, should be drawn between laws, which lay down in general terms the objects to be attained and the obligations to be fulfilled, and the regulations which embody details of the limits imposed and the degree of reduction demanded. In this last report, caution is necessary and impossible or unnecessary standards should not be set. It is clear that international liaison or even international collaboration is not only desirable, but necessary.##

03158

N. C. Kailos

UTILIZATION OF AMMONIA AS AN ALTERNATE FUEL IN ARMY AIRCRAFT ENGINES. Army Aviation Material Labs., Fort Eustis, Va. (Technical Report No. 66-52.) June 1966. 68 pp.
CFSTI, DDC AD 638360

The successful application of the Nuclear Powered Energy Depot Concept is partly dependent upon the practicability of ammonia-fueled gas turbine engines. The purpose of this investigation was to assess the feasibility of ammonia-fueled gas turbine engines in Army aircraft. In accordance with this objective, engine performance in the UH-1D helicopter and in the CV-7A fixed-wing aircraft was compared utilizing both hydrocarbon and anhydrous ammonia fuels. Aircraft fuel system requirements were investigated, and an elementary cost comparison was made for engine conversion kits and production engines. Engine maintenance was considered briefly. From this study, it is concluded that the use of ammonia as a gas turbine fuel results in considerably lower aircraft productivity than the productivity obtained from the use of hydrocarbon fuels. (Author abstract)##

03164

M. E. LePera

INVESTIGATION OF THE AUTOXIDATION OF PETROLEUM FUELS (INTERIM REPT.). Army Coating and Chemical Lab., Aberdeen Proving Ground, Md. (CCL Rept. 204) (Project 1C024401A106). JUNE 1966. 24 PP.
CFSTI, DDC AD 641270

The deterioration of petroleum fuels was studied by investigation of their autoxidation susceptibilities. Federal and Military

Specification fuels and commercial gasolines were subjected to a six-week accelerated aging test with analyses for generated hydroperoxides determined at weekly intervals. The resulting peroxide-time curves revealed autoxidation tendencies to vary considerably. Under the conditions of this aging technique, there is evidence that the bulk storage supply of combat gasoline (MIL-G-3056B) at Aberdeen Proving Ground is experiencing a gradual depletion of antioxidant quality. (Author abstract)##

03202

V. Del Vecchio.

THE PROBLEMS OF BASIC URBAN AIR POLLUTION. Il problema dell'inquinamento di fondo urbano dell'aria atmosferica. Fumi Polveri (Milan) 6, (6) 177-8, June 1966.

Basic urban air pollution refers to the discharge into the air of exhaust gases from motor vehicles and from heating units, which are prevalently inefficient. Both sources discharge respirable dusts and gases, the latter including some aliphatic and aromatic hydrocarbons which have proven carcinogenic in experimental animals. The problem arising from the incomplete combustion of motor fuels is aggravated by the presence, in Italian cities, of narrow streets and relatively high buildings which become repositories of emitted fumes and dust from slow-moving vehicles. As much as 12 to 13% CO may be present in gasoline-driven motor car exhaust. While gross measurement of pollutants present in the urban air is of high indicative value, public health aspects of the problem demand that granulometric studies of the dust particles also be conducted, since size is a factor in respirability. In addition, photochemical studies involving the interaction between the pollutants in the air and the sun's rays indicate that solar radiation transforms the originally present contaminants into biologically more receptive compounds, quite different from their precursors. Thus peroxacetylnitrate(PAN) is produced from NOx, and the new substance is a powerful irritant of the mucus membranes. The dramatic episodes of mass illness resulting from smog in various places in recent years were caused by the phenomenon of thermal inversion which prevented the dispersion of the irritants present in the air.##

03255

R. L. Cummins and V. J. Konopinski

MOTOR VEHICLE EXHAUST CONCENTRATIONS IN A ROAD TUNNEL. Preprint. (Presented at the Conference of the American Industrial Hygiene Association, Philadelphia, Pa., Apr. 29, 1964.)

The contribution of motor vehicle exhaust to ambient air pollution was studied by using a vehicular-road tunnel as a sampling site. An intensive aerometric study was conducted April 20 through 28, 1963, at the Sumner Tunnel in Boston, Massachusetts. The tunnel is now operated as a one-way tube. Air quality was determined on the fresh air supplied to the tunnel (inlet air), on

the air exhaust from the tunnel (exhaust air), and at three sites within the tunnel. Particulate pollutants were analyzed for total suspended particulates, benzene-soluble organics, sulfates, nitrates, metals, and polycyclic hydrocarbons. Concentration of SO₂, oxides N, NO₂, aliphatic aldehydes, and CO were also determined. The average concentration of total suspended particulates in the inlet air was 86 micrograms/cu m while that of the exhaust air was 424 micrograms/cu m. The concentrations of total particulates, benzene-soluble organics, sulfates, and nitrates for the inlet and exhaust air were less than reported in a previous study. The ranges of concentrations of oxides N, NO₂, and aliphatic aldehydes in the tunnel were, respectively, 11.3 to 43.0, 3.5 to 8.8, and 3.1 to 12.6 parts per hundred million (hereafter referred to as ppm). SO₂ concentrations ranged from 0.1 to 0.5 ppm, and were less than ambient concentrations. The mean daily concentration of CO was 2.3 ppm in the inlet air and 50.8 ppm in the exhaust air. Mean concentrations in the tunnel ranged from 20.5 to 54.2 ppm and increased with increasing distance into the tunnel. Other pollutants exhibited a similar gradient. The particulate pollutant concentrations measured during April 1963 study are less than those measured in 1961. This decrease may be attributable to operation of the tunnel with one-way traffic and the concomitant piston effect, and to a 36 percent decrease in the average number of motor vehicles using the tunnel. Values for polycyclic hydrocarbons reported for the 1961 study were in error; corrected values are given in this report. (Author abstract)##

03264

J. N. Pattison and E. R. Stephens

COMPOSITION OF AUTOMOTIVE BLOWBY GASES. Proc. Tech. Meeting West Coast Sect., Air Pollution Control Assoc., 3rd, Monterey, Calif., 1963. 37-50 pp.

Blowby emissions from internal combustion engines have been analyzed, and it has been experimentally shown that they have the same carbon content as exhaust and carbureted mixture. It has also been found that blowby is composed of approximately two-thirds carbureted mixture and one-third exhaust. Gas chromatographic analyses have been made of the blowby from ten cars using the same fuel, and it was found that the ratio of one component to the next (in the C₁ to C₅ range) was very similar for all cars and that the total emission level only varied by a factor of 2 or 3. Cracked products accounted for about one per cent of the organic carbon in blowby. The actual concentration of these compounds was found to be the same in blowby and exhaust, which indicates that some reaction occurs during the compression stroke before any appreciable amount of blowby occurs. Gas chromatographic analysis of the aromatic portion of the blowby showed variations similar in amount to that found in the light hydrocarbons. The composition of the blowby aromatics resembles the composition of the fuel. (Author summary)##

A. F. Bush, R. A. Glater, G. Richards, and J. Dyer

EFFECT OF ENGINE EXHAUST ON THE ATMOSPHERE WHEN AUTOMOBILES ARE EQUIPPED WITH AFTERBURNERS. Proc. Tech. Meeting West Coast Section, Air Pollution Control Assoc., 3rd, Monterey, Calif., 1963.)

"Typical" smog damage of the conventional type if induced in *Nicotiana glutinosa* when the ratio of pure air to automobile exhaust is in the range of 1000 to 1 in the test facility. A specific cycle of engine operation involving acceleration, cruise, deceleration and idle produced typical damage. The absence of cruise in the cycle caused no damage to occur. With an after burner on the exhaust of internal combustion engines, it becomes apparent that a new type of injury was being induced in *Nicotiana glutinosa* plants. Fumigations with afterburner exhausts consistently produced atypical plant damage, whereas automobile exhaust fumigations, without afterburner devices, usually produced typical oxidant damage. It is considered that since the concentration of hydrocarbons is reduced using the afterburner, one of the principal air polluting agents has been eliminated; typical air pollution therefore, does not occur. This does not mean that plant damage is eliminated, only that the usual type of plant damage appears to have replaced it (atypical). Some of the exceptions to the trends described in #1 above can be explained on the basis of lack of sweep of the tunnel so that residual smog-forming materials may have remained behind. The tunnel must therefore be carefully swept with air passed through beds of activated charcoal for at least 15 hours before the fumigation can have validity. Plant damage does not correlate well with measured concentrations of nitric oxide. Atypical damage is produced however in almost every instance of afterburner exhaust fumigation. Since the fumigation period includes the period when the oxides of nitrogen are high (ppm or so) it may be speculated that the new damage is due to oxides of nitrogen in the absence of high hydrocarbon. There is fair correlation between hydrocarbon concentrations and the appearance of typical damage when no afterburner is used. Afterburner exhaust in the chamber showed no appreciable human eye irritation resulting from the new atmosphere while automobile exhaust without afterburner produced eye irritation of the type described by Buchberg. (Author conclusions)##

03352

J. P. Morris and A. B. Calongne

CONTAMINATION GENERATION OF INTERNAL COMBUSTION ENGINES. Preprint. (Presented at the Fourth Annual Technical Meeting and Exhibit, American Association for Contamination Control, Miami Beach, Fla., May 25-28, 1965.)

The contamination generated by various types of mobile equipment used to support implant operations was studied at the NASA Michoud Operations in New Orleans. The contamination sensitivity of various systems on the Saturn C-IC made it mandatory that all contamination generating operations be studied in order to effect the best possible control. Vehicles used

inplant had to be selected on the basis of minimum contamination generation. The exhaust gases of six vehicles were tested to determine the generated waste products. One of these vehicles was a crane that had two separate engines which increased the number of tests to seven. Two 4,000 pound fork lifts; a 6,000 pound fork lift; a crane mobile power motor; and a crane boom motor, all powered with liquid petroleum gas; and a gasoline powered 6,000 pound fork lift and a Diesel fuel air compressor were the vehicles used for these tests. The exhaust gases from each engine were analyzed on a Fisher Orsat apparatus for the following constituents: carbon dioxide, oxygen, carbon monoxide, hydrocarbons, hydrogen, water (calculated), and nitrogen (calculated). In addition, the sampling tubes from each vehicle were saved and photographed to show, candidly, the particulate and oily contamination which was generated. The results of this test show that all of the internal combustion engines are contamination generators. The amount of contamination generated is dependent upon two factors: (1) Condition of the engine, and (2) Efficiency of engine operation. In some cases, the carbon monoxide content was high enough to present a health hazard if the vehicles were operated in a confined space. Cleaning by trichlorethylene and by hot alkaline is not adequate if carbonaceous particles from internal combustion engines contaminate parts. Engines must be kept in perfect condition. Exhaust gases should be analyzed frequently to determine engine conditions. Water-cooled manifolds or water mufflers should be used to precipitate contaminants. Exhaust gases should be filtered.##

03420

A. H. Rose, Jr., H. H. Black, R.C. Wanta

AIR AND WATER POLLUTION STUDIES RELATED TO PROPOSED PETROLEUM REFINERY FOR SAND ISLAND - OAHU, TERRITORY OF HAWAII (-REPORT TO BOARD OF HEALTH, TERRITORY OF HAWAII). Public Health Service, Cincinnati, Ohio, Div. of Air Pollution. Dec. 1955. 60 pp.

HEW

The objective of the atmospheric pollution phase of this study was an evaluation of the possible effect on the atmosphere of the City of Honolulu which may result from the operation of a 24,000-barrel-per-day modern fluid catalytic cracking refinery. Two factors were investigated, first the extent and causes of the current atmospheric pollution level, and second the potential impact on the pollution level which may result from the refinery operation. Process design for the proposed refinery was tentative in that only process flow and major process units were fixed; interflow of components between process units and their elements had not been finalized. Data covering the operation of and atmospheric contaminant discharge from existing industrial operations were relatively meager. Data on the concentrations of specific contaminants in the Honolulu atmosphere were not available. Only published climatological data were available. The quantity of specific atmospheric contaminants from both existing sources and the proposed refinery are presented as determined from the best available data.##

B. J. Steigerwald

CARCINOGEN APPRAISAL STUDY. Preprint. 1960.

The purpose of this study is the development of sampling and analytical techniques which will allow and encourage more widespread source and air sampling and analysis for suspected carcinogenic and cocarcinogenic compounds. A sampling program for the first year has been worked out which allows rapid advancement toward the goals outlined: Development of source sampling techniques for the appraisal of carcinogens in hot stack gases, and exploration of the possibility of correlating short chemical tests for aromatics, or indicator tests for CO with the aliphatic and polynuclear aromatic content of combustion gases or automobile exhausts. Development of routine analytical methods for long-chain aliphatics. Some estimates of the possible importance of many other industrial sources of these compounds. Additional information on the distribution of heavy hydrocarbons in urban areas, and estimates of possible maximum exposure levels of polynuclear aromatic and long-chain aliphatics near some of the suspected sources of such emissions. A broad screening of the emission of polynuclear aromatic hydrocarbons and aliphatic from major combustion sources and the development of emission factors for automobile internal combustion engines.##

A. H. Rose, Jr. and R. C. Stahman.

THE ROLE OF ENGINE BLOWBY IN AIR POLLUTION. J. Air Pollution Control Assoc. 11, (3) 114-7, Mar. 1961. (Presented at the 53rd Annual Meeting, Air Pollution Control Association, Cincinnati, Ohio, May 22-26, 1960.)

The results are presented of a survey of 13 late model cars in which measurements were made of the concentration and quantity of both crankcase and exhaust gas emissions during various modes of vehicle operation. Measurements of CO₂ concentration and flow rate have established that the composition of the blowby gas is approximately 75 to 85% carbureted fuel-air mixture. As such, the specific composition of the crankcase gases will be controlled by the composition of the fuel used in the engine. A high correlation was found between manifold vacuum and both blowby emission rate in cfm and gross emission in pounds per hour. Both factors decrease with increasing manifold vacuum resulting in substantially zero emissions at the low manifold vacuums associated with closed throttle deceleration. A further effect also apparent from the data is a twofold increase in crankcase emission rate and gross emission for the eight cylinder engine as compared to the six. The effect of these variables for all driving conditions was based on the average driving cycle developed by the Traffic Survey Panel of the Automobile Manufacturers Association. It was found that crankcase emissions account for 24% of the over-all automotive emission for the six cylinder engine and 33% for the eights.##

03580

P. A. Bennett, M. W. Jackson, C. K. Murphy, and R. A. Randall

REDUCTION OF AIR POLLUTION BY CONTROL OF EMISSION FROM AUTOMOTIVE CRANKCASES. Vehicle Emissions (Selected SAE Papers) 6, 224-53, 268, 1964. (Presented at the Annual Meeting, Society of Automotive Engineers, Detroit, Mich., Jan. 11-15, 1960.)

Analyses of crankcase vent gases by several methods have shown that crankcase and exhaust hydrocarbon emissions from automobiles are of the same order of magnitude. Internal ventilation of the crankcase to the engine intake system eliminates crankcase emission, thus providing a practical control of this important source of air pollution. (Author abstract)##

03584

G. R. Cann, W. M. Noble, and G. P. Larson

DETECTION OF SMOG FORMING HYDROCARBONS IN AUTOMOBILE EXHAUST GASES USING PLANTS AS INDICATORS. Air Repair 4, (2) 83-6, Aug. 1954.

Following the identification of hydrocarbons in the 4, 5 and 6 carbon atom range in automobile exhaust gases, it became necessary to determine whether these hydrocarbons, mixed with other exhaust gases, could produce typical smog effects. A study was carried out in which the atmospheric reaction of hydrocarbons was duplicated in the Air Pollution Control District's plexiglas house. Certain plants, which had already been proved susceptible to smog damage, were used as indicators. Gasoline vapor was used as the standard against which the plant damaging effects of automobile exhaust gases were compared. Results show that automobile exhaust hydrocarbons are capable of producing effects equivalent to those resulting from smog. (Author abstract)##

03761

P. P. Mader, M. Eye, J. A. Orcutt, and L. A. Chambers

EFFECTS OF FUEL OLEFIN CONTENT ON COMPOSITION AND SMOG FORMING CAPABILITIES OF ENGINE EXHAUST (INTERIM REPT. 2). Los Angeles County Air Pollution Control District, Calif. Apr. 1959. 24 pp.

A proportionate sampling system was used which made it possible to collect continuously representative composite exhaust samples from all all driving cycles in proportion to exhaust volume, under actual driving conditions. Six gasolines, with olefinic contents ranging from 1.0% to 30.9% were used (bromine number 1.6 to 49.4). The exhaust was irradiated for one hour by means of mercury lamps. A panel of laboratory personnel (usually eight in number, but never less than six) was then exposed to the contents of the flask by the use of a specially designed eye mask, which fitted the mouth of the flask as well as the eyes of the individual. The eye piece was built with a shutter to open and close quickly, thereby

enabling an exact measurement of time of exposure. The number of seconds required for each individual to detect the initial eye irritation was recorded, and the arithmetic mean of the observations was calculated as an index of the eye irritation potential of the exhaust sample. The olefin content of the fuels used to drive the automobiles is directly related to the quantities and relative distributions of olefins in the exhaust. The amount of olefins present in the exhaust is directly related to the intensity of eye irritation which is produced when the exhaust gases are irradiated. Since a direct relationship exists between olefins in fuels and olefins in the engine exhaust on the one hand, and between exhaust olefins and eye irritation on the other, it is reasonable to assume that the determination of total exhaust olefin indicates the intensity of eye irritation that can be expected from a given fuel composition.##

03871

L. B. Hitchcock

AIR POLLUTION AND THE OIL INDUSTRY. Proc. Am. Petrol. Inst., Sect. IV. 35, 150-4, 1955. (Presented at the spring meeting, Pacific Coast District, American Petroleum Inst. Division of Production, Los Angeles, Calif., Apr. 28, 1955.)

While most of Los Angeles' air pollution is traceable to petroleum products, by far the largest share arises from the use to which these products are put. Motor-vehicle exhaust accounts for the largest single source of pollution. Fuel oil and gas also contribute. Incineration of refuse and metallurgical and miscellaneous industrial emissions account for most of the balance. The public, through its motor vehicles and rubbish burning, contributes more than half the total pollution. The oil industry, indispensable to the community's growth, has done more than all the rest of the area in developing and adopting corrective measures, and has reduced its emissions very substantially. Petroleum production in Los Angeles County contributes a very minor part to air pollution. Hydrocarbons and nitrogen oxides in combination produce smog effects, although neither alone, at concentrations found, is known to be deleterious. Cleaner air costs money, but less than smog. Intensive application of science and engineering to the overall problem is the only road to success. (Author abstract)##

03883

E. A. Schuck and G. J. Doyle

A STUDY OF IRRADIATED AUTO EXHAUST. Stanford Research Inst., South Pasadena, Calif., Southern California Labs. (Rept. 9 and Technical Rept. 11.) Feb. 1958. 65 pp.

Aerosol was formed by irradiation of exhaust-air mixtures. The aerosol thus formed was in the submicron size region but was of sufficient concentration to reduce visibility appreciably--in some instances from around 40 miles down to 2 or 3 miles. The severity of eye irritation is dependent on the concentrations of

hydrocarbons and nitrogen oxides. More particularly, a relationship has been established between the concentration ratio of hydrocarbons and oxides of nitrogen and the degrees of eye irritation, the degree of irritation being dependent on the concentration ratio. This ratio also influences the rate of formation of the aerosol, oxidant, and indicated nitrogen dioxide. Varying the relative humidity in the exhaust-air mixtures between 40% and 80% and the temperature between 26 C and 40 C had no detectable effect on any of the measured symptoms. Eye irritation increased as the light intensity was increased from zero to 3/4 the intensity of noonday sunlight, but did not appear to increase with a further increase in intensity up to about twice that of noonday sunlight. Eye irritation intensity was found to be a function of residence time under irradiation. The results indicate that the length of time that pollutants reside under irradiation has an effect on the severity of smog symptoms, i.e., leads to an increase and then a decrease in eye irritation with time. The smog potential from an auto exhaust mixture appears to be intimately associated with hydrocarbon concentration, oxides of nitrogen concentration, the concentration ratio of hydrocarbons to oxides of nitrogen, light intensity, and residence time under irradiation. The half life of the eye irritant produced by irradiating dilute auto exhaust was determined to be in the order of 24 hr, indicating the presence of a rather stable irritant. The half life of the aerosol was found to be 12 hr, and that of the oxidant or indicated nitrogen dioxide was less than one hour. Thus, from the measure of half life, the aerosol, oxidant, and indicated nitrogen dioxide do not appear to be intimately associated with eye irritation.##

03887

W. J. Sweeney and C. E. Heath

THE FUEL CELL: ITS PROMISE AND PROBLEMS. Proc. Am. Petrol. Inst., Sect. III 41, 121-6, 1961. (Presented at the 26th Midyear Meeting, American Petroleum Inst. Division of Refining, Houston, Tex., May 9, 1961.)

The inherent high efficiency of the fuel cell and its promise of simple, trouble-free conversion of chemical energy to electricity have prompted a research effort which extends to approximately 100 laboratories throughout the world. This paper discusses the advantages of the fuel cell and the chemical and engineering problems to be solved before its potential is realized. Recent work has encouraged the prospects for development of a general-purpose fuel cell. The question of its ultimate technical and economic feasibility will depend on making the cell work efficiently and dependably on conventional fuels and air. (Author abstract) ##

03935

L. M. Shabad, A. Y. Khezina, Y. S. Fridman

POSSIBLE CONTAMINATION OF CHEMICAL PRODUCTS WITH 3,4-BENZOPYRENE DURING THEIR MANUFACTURE. Hyg. Sanit. 31, (4-6) 304-6, Apr.-June 1966. Russ. (Tr.)
CFSTI, TT 66-51160/4-6

Increasing attention is directed to the possible carcinogenic effects of different industrial products with which man may come into contact in the course of manufacture or consumption. The relationship between the manufacture of ammonium sulfate and coking industry led to the investigation of industrial samples for their contents of 3,4-benzpyrene. The samples were investigated according to the following scheme. A 10-g sample was repeatedly washed, with vigorous shaking, with distilled benzene until the resulting benzene extracts were no longer luminescent. Luminescence was induced with filtered light from a mercury lamp. This was followed by measurement of the volume of the extract and by quantitative analysis to detect 3,4-benzpyrene. Quantitative determination of 3,4-benzpyrene was made by the method of addition from the fluorescence spectrum of the n-octane solution at 77K. The sample contained 1400 micrograms 3,4-benzpyrene per 1 kg ammonium sulfate. The contents of this carcinogenic hydrocarbon exceeded 1000 micrograms per 1 kg in all investigated samples.##

03989

J. H. Freeman, Jr. R. C. Stahman

FUEL INJECTION INCREASES ECONOMY REDUCES EXHAUST EMISSIONS.
S.A.E. (Soc. Automotive Engrs.) J. 74, (10) 70-5, Oct. 1966

The standard carburetors on three test cars were replaced with a fuel injection system. The automobiles were tested on a chassis dynamometer and on four driving routes. Fuel consumption, CO₂ and hydrocarbon emission were reduced.##

04008

J. T. Gray, Jr., E. Dimitroff, N. T. Meckel, and R. D. Quillian, Jr.

AMMONIA FUEL - ENGINE COMPATIBILITY AND COMBUSTION.
S.A.E. (Soc. Automotive Engrs.), Preprint. (Presented at the Automotive Engineering Congress, Detroit, Mich., Jan. 10-14, 1966.)

Full-scale engine studies were conducted to determine the feasibility and compatibility of ammonia combustion in various systems. Briefly outlined is the spark-ignition investigation undertaken by the Army Laboratory to learn the potential and effect of ammonia as a fuel and to study the influence of engine variables on combustion. A study of compression-ignition performance was made to ascertain the ability of ammonia to be pumped in existing injection systems and various means of achieving ammonia combustion were explored. Compatibility of ammonia and its combustion products with engineering materials and lubricants presents no substantial problem. Satisfactory delivery of ammonia may be accomplished by cooling the inlet to the injection pump. Ammonia-only combustion requires high compression ratios and temperatures (35:1 compression ratio, 300 F air and coolant). Ammonia may be ignited by pilot fuels at compression ratios as low

R. E. Kruse and D. M. Hill

EXHAUST EMISSIONS FROM COMPACT CARS. Preprint. (Presented at the Society of Automotive Engineers Meeting, Dayton, Ohio, Mar. 14, 1967.)

The purpose of this study was to develop basic emission data that will provide background information for the setting of Federal emission standards that weigh as equitably as possible the relative contributions to air pollution of different passenger cars varying both in gross vehicle weight and in engine displacement. This was accomplished by determining for a variety of imported and domestic compact vehicles the concentrations and mass levels of emissions of hydrocarbons, carbon monoxide, and oxides of nitrogen during operation on the road and on a chassis dynamometer (7-mode cycle, hot start). The compact vehicle was defined as any car weighing less than 3,000 pounds with an engine displacement of less than 200 cu. in.##

04098

V. A. Gofmekler, M. D. Manita, Zh. V. Manusadzhants,
and L. L. Stepanov

CORRELATION BETWEEN 3,4-BENZPYRENE AND CARBON MONOXIDE CONCENTRATIONS IN AUTOMOBILE EXHAUST GASES. Gigiena i Sanit. 28, (8) 3-8, Aug. 1963. Russ. (Tr.) (Translated by B. S. Levine in U.S.S.R. Literature on Air Pollution and Related Occupational Diseases, Vol. 12.)

One of the most widely occurring cancerogenic substances in ambient air, 3,4-benzpyrene, is also a component of automobile exhaust gases. Seemingly, there exists a correlation between the formation and discharge of 3,4-benzpyrene and carbon monoxide, as both may result from incomplete liquid fuel combustion. A better understanding of this 3,4-benzpyrene and carbon monoxide correlation in dealing with the problem of sanitary protection of atmospheric air was the aim of this investigation. Concentrations of 3,4-benzpyrene in auto exhaust gases were determined by the spectral-fluorescent method. Carbon monoxide concentration in automobile exhaust gases ran in correlation with the concentration of simultaneously occurring 3,4-benzpyrene; accordingly, CO concentration can be used as an indicator of the rate at which 3,4-benzpyrene is discharged into the atmosphere with the automobile exhaust gases. Automobiles with properly adjusted carburetors generated and discharged into the atmospheric air less carbon monoxide and less 3,4-benzpyrene. The highest concentration of 3,4-benzpyrene and of carbon monoxide was discharged with exhaust gases coming from automobiles operated at low rpm, usually at the as 12:1, depending upon the cetane number of the pilot. None of the fuel additives investigated significantly lowered the energy level requirement for ammonia ignition. Gases introduced into the intake manifold resulted in ammonia combustion although amounts required were high: (10% hydrogen, 15-20% acetylene). High temperature glow coils were suitable ignition sources but spark plugs and standard glow plugs failed to initiate combustion.##

time of starting or accelerating atmospheric air pollution with 3,4-benzpyrene and carbon monoxide can be reduced substantially as follows: by controlled carburetor operation at all times, particularly when starting and moving into line with the traffic, and most of all by keeping the carburetor clean and well adjusted; by reducing to a minimum the number of stops and starts at cross sections and light signals. This can be done by proper manual and signal traffic regulations and by instituting overhead and underground auto routes which would allow automobiles to travel without making many stops.##

04108

N. Ya. Yanysheva, I. S. Kireeva, and N. N. Serzhantova

3,4-BENZPYRENE IN CRUDE OIL AND IN BITUMENOUS PRODUCTS.
Gigiena i Sanit. 28, (11) 71-38 Nov. 1963. Russ. (Tr.)
(Translated by B. S. Levine in U.S.S.R. Literature on Air
Pollution and Related Occupational Diseases, Vol. 12.)
CFSTI: TT 66 61429

The present authors investigated the 3,4-benzpyrene concentrations in crude oil tars of different trademarks. The investigation aimed at finding which of the products contained the least amount of 3,4-benzpyrene so their use could be recommended in the place of other products which contained higher cancerogenic hydrocarbon concentrations. The investigation included crude oil, tar and pitch products trademarked BN-IV and VN-V, obtained from cracking residuals BN-V produced by the Kherson plant. This plant processed crude oil coming from the Ukraine and partly from Povolzh'ya. Samples for the investigation came in a variety of forms of processed crude oil, such as crude oil asphalt resulting from direct vertical crude oil distillation, and cracking residuals resulting from processing crude oil break down products. The composition of products resulting from direct vertical crude oil distillation depended largely upon the nature of the crude oil, and the composition of cracking products characterized by high content of aromatic polycyclic hydrocarbons is determined basically by the production technology. Trademarked crude oil bitumens are distinguished by their melting point and viscosity. Results indicated that even the maximal 3,4-benzpyrene concentrations found in the crude oil tar residues were considerably below the maximal concentration of 3,4-benzpyrene found in coal pitch. Therefore, it appears that replacing the coal tar pitch as a binder by crude oil tar residue should reduce considerably the amount of cancerogenic coal products in coal dust brickettes. It should be remembered, however, that crude oil tar residue binders may contain cancerogenic substances other than 3,4-benzpyrene, the concentration of which may be different in different types of the crude oil binders. In view of this, final recommendations for the use of the safest crude oil residue binders of different trademarks should be based on experimental studies with animals.##

04114

N. V. Dmitrieva, A. I. Kukhovkaya, and I. S. Khazanov

METHODS FOR LOWERING SOLVENT CONCENTRATIONS IN THE AIR OF PLANTS ENGAGED IN DRY CLEANING CLOTHES. Gigiena i Sanit. 28, (12) 71-3, Dec. 1963. Russ. (Tr.) (Translated by B. S. Levine in

Indoor air pollution with organic solvent vapors in dry cleaning plants constituted a hazard to the health of the workers. The following air pollution sources were found in dry cleaning plants: open manual method of applying solvents in the spot removing department; non-observance of safety regulations, primitive and manual technological procedures in loading and unloading the rotating cleaning drums, unorganized leakage, etc. The method used in unloading dry cleaned clothes from the solvent containing drums constituted a particularly hygienically unfavorable condition. Comparative evaluation of equipment and machines used showed that highest solvent vapor air pollution was noted in dry cleaning plants equipped with USA machines. Therefore, it is recommended that the use of American machines be discontinued. Prevention of air pollution with solvent vapors in dry cleaning plants can be attained by the following means: (a) strict adherence to most advanced technological defatting processes; (b) elimination of all leakage sources, especially in the pipes and conduits; (c) installation of a properly planned up-to-date overall ventilation system supplemented by the installation of local exhaust devices at points of workers exposure to the inhalation of the solvent vapor polluted air. The present practice of manual spot removing from clothes in the open should be unconditionally prohibited, appropriate local exhaust ventilation devices be installed; the rate of fresh air inflow should be increased. Employees of dry cleaning establishments should be examined periodically by industrial medical personnel, and persons unfit for such occupation should be replaced. (Author conclusions)##

04233L

A. R. Poirier

ENGINEERING INVESTIGATION OF DIRECT LIQUID HYDROCARBON-AIR FUEL CELLS. (FINAL TECHNICAL REPT). ONAN Engine-Generator Div. of Studebaker Corp., Minneapolis, Minn. (Rept. No. 2.) Dec. 31, 1966. 50 pp.
DDC: AD 487798L

The objective was to perform preliminary engineering design studies that will lead to the development of a direct liquid hydrocarbon-air fuel cell power plant operating on logistic military fuels at moderately low temperatures. The basic cell design approach is a matrix-type using phosphoric acid as the electrolyte. Commercially available electrodes were evaluated for their electrical performance in direct liquid hydrocarbon-air fuel cells. American Cyanamid electrodes, type 1-AA, show promise as both hydrocarbon and air electrodes with phosphoric acid electrolyte at temperatures below 200 C. These electrodes have delivered as high as 10 watts/square foot on JP-4, 15 watts/square foot on combat aviation gasoline, and 60 watts/square foot on propane. Air was used as the oxidant in all three cases. There is a strong influence on the initial performance of the present American Cyanamid hydrocarbon electrodes with platinum loadings under 30 grams/square foot. Higher anode platinum loadings lose their sensitivity to initial performance, but become important in the operating life of the electrodes. Humidification of the fuel was found to have a pronounced effect on the

electrochemical performance. As much as 10-fold increase in the power output of the JP-4 fuel cells was observed upon humidification of the fuel feed. A six-cell matrix-type module, employing 1/4 square foot electrodes, was fabricated and tested. Gas leakage problems at operating temperature were encountered. The cause of the gas seal failure was attributed to the "flowing" of the hypalon asbestos gaskets under compressive loading at operating temperature. A new current collector was designed to employ silicone "o" rings along its perimeter. The Hydroform Process which uses only one machined die was found suitable for fabricating a variety of current collector designs at low cost. A design layout of a direct liquid hydrocarbon-air fuel cell system was established. The total weight and volume estimates of a state-of-the-art 1 KW direct JP-4/air fuel cell system are 624 pounds and 12 cubic feet respectively. The high system weight is contributed primarily to the present-day performance of the electrodes on JP-4 fuel.##

04234

J. V. Pustinger, Jr., F. N. Hodgson, and W. D. Ross

IDENTIFICATION OF VOLATILE CONTAMINANTS OF SPACE CABIN MATERIALS. Monsanto Research Corp., Dayton, Ohio. (Rept. No. AMRL-TR-66-53.) June 1966. 210 pp.
CFSTI: AD 642054

Fifty-five candidate materials for space cabin construction were stored for 30, 60 and 90 day periods at 23-25 C, and 20-40% R. H. in environments of air at a pressure of one atmosphere and oxygen at 5 psia. The composition of the gas-off products was determined by mass spectrometry and gas chromatography. Considerable amounts of gas-off products were detected from candidate materials prepared immediately prior to testing, e.g., coatings, paints, and adhesives. Very little, if any, gas-off products were evolved from materials submitted as fabricated sections, e.g., polycarbonates, polyvinyl-fluorides, and nylon based material. In general, the major gas-off products were solvents, plasticizers, and monomers. Some coatings desorbed considerable amounts of carbon monoxide. Others gave off relatively large quantities of trimethyl silanol and low molecular weight methyl siloxane polymers. Although slight differences in relative amounts of alcohols and aldehydes were observed in some gas-off atmospheres, no large changes in atmospheric composition were observed that could be attributed to increased oxidation when materials were exposed at 23-25 C to oxygen at 5 psia. Quantitative analyses of the gas-off products were influenced by: uniformity of sample lots, sample homogeneity, freshness of sample, free surface area, adsorptive characteristics of the encapsulating chamber, method of sampling the gaseous atmosphere, and method of analysis. Additional analyses were performed on desorbates from four carbon canisters from space cabin simulators and the hydrolysis products of MCS 198. (Author abstract)##

04272L

O. J. Adlhart and A. J. Hartner

FUEL CELL CATALYSTS (REPT. NO. 3, THIRD QUARTERLY REPT.-NOV. 1, 1965 TO JAN. 31, 1966). Engelhard Industries, Inc.,

The work consists of an investigation of fuel cell catalysts permitting complete oxidation of hydrocarbon fuels under conditions which all reaction products are rejected from the electrolyte. Anodic catalysts and catalysts for oxygen reduction were evaluated. A study was carried out on fuel cell catalyst carriers used in oxidation of hydrocarbons. The carriers studied were graphite, boron carbide, and because of its specific grain structure industrial diamond. The crystallite sizes of the applied noble metal and its distribution on the carrier were determined by X-ray and electron micrographic techniques. It has been demonstrated that whereas certain carriers may assure the deposition of platinum with the desired small crystallite size, they may not be able to retain it on their surface in a uniformly distributed fashion. At an unfavorable and low surface area of the carrier the noble metal may agglomerate or even separate from the carrier. The anodic oxidation of propane and of carbon monoxide containing hydrogen has been studied on supported catalyst. For both types of fuel, utilization of precious metal is improved by dispersing the metal on a carrier. Of the carriers tested, graphite was found to be the best carrier for the oxidation propane. Alloying supported platinum with ruthenium is particularly beneficial for the oxidation of carbon monoxide containing hydrogen. On the cathode the amount of precious metal needed for a given current output could not be substantially decreased by the use of catalysts on carrier.##

04315

AUTOMOTIVE AIR POLLUTION (A REPORT TO THE U.S. CONGRESS PURSUANT TO PUBLIC LAW 88-206, THE CLEAN AIR ACT). 89th Congress (1st Session.) (Document No. 7.) 1965. 26 pp.

Based on the information presented in this report the following conclusions are made: (1) That all necessary steps should be taken to assure the reduction of pollutant emissions from motor vehicles. For this purpose, there is need for (a) further development of emission criteria, and (b) development of means for insuring the national application of currently available technical knowledge for reduction of such emissions; (2) That the need should be recognized for an expanded automotive vehicle air pollution research program to accelerate further development of emission criteria and improve technical capabilities for controls on automotive vehicles; (3) That means be developed through vehicle inspection programs or otherwise to insure appropriate maintenance of vehicle emission control systems; and (4) That all practicable measures should be taken to expedite the flow of traffic in urban areas, since this will, in itself, accomplish significant reduction in vehicle pollutant emissions.##

04316

FUEL CELLS. FOA Orienterar Om (5) 24-9, Apr. 1966.

The fuel cell has many acceptable properties. It has a high efficiency, 60-80%, which means that with a given amount of fuel a long time of action is obtained. Operating costs moreover remain very low as cheap fuel can be utilized. Since the fuel cell lacks movable parts it operates quietly and in addition has a

greater effect per unit weight and volume than the conventional battery. The fuel cell is utilized in applications where the properties quoted are particularly valued. For current maintenance of space ships for instance a high effect per unit weight and volume is required with maximum utilization of the fuel. Fuel cells answer this need perfectly, and they are used in fact in the space capsules in the American Gemini project and will be utilized in the Apollo project. The fuel cell is ideal for submarines. No interruption for charging is required. Swedish, German, and American developments are reviewed with special mention of cells for hydrocarbon fuels.##

04361T

B. G. Gills, E. L. Howe

OIL BURNERS FOR DOMESTIC USE: PRESENT STATE, RECENT IMPROVEMENTS AND FUTURE DEVELOPMENTS. ((Olbbrenner fur den Hausbrand: Gegenwartiger Stand, erzielte Verbesserungen und Moglichkeiten der Weiterentwicklung.)) Schweiz. Arch. (Zurich), 31(4):119-126, April 1965. 7 refs.

An oil furnace well built and maintained should cause no intolerable air pollution. Soot and a smell of oil will occur only in case of improper adjustment or perhaps in starting up. In the latter case an inadequate means of ignition, too low carburetor temperature, or excessive cooling of the flame may be the cause. Some methods of combating this difficulty are described here (beginning injection of fuel only after an adequate oil pressure is achieved, in the pressure atomizer burner; as nearly continuous operation as possible for evaporator furnaces; use of higher pressure for the air of combustion). In pressure atomizer burners such difficulties can usually be traced to defective nozzles or to poor combustion from other causes. Installations which give rise to complaints must therefore be overhauled and if necessary replaced. Determination of concerns itself among other things with the following problems: improved mixing of air and oil mists; influence of systems for recirculating smoke gases; ultrasonic and airfoam atomizer burners; electrostatic oil atomizing; total evaporation of the fuel in the vaporizer burner; and speed of combustion.##

04419

M. W. First, F. J. Viles, and S. Levin

CONTROL OF TOXIC AND EXPLOSIVE HAZARDS IN BUILDINGS ERECTED ON LANDFILLS. Public Health Rept., (U.S.) 81, (5) 419-28, May 1966.

The principal hazard associated with construction on refuse-filled land arises from anaerobic production of combustible gases by methane-producing bacteria. Gas-tight construction over landfills appears to be difficult, if not impossible, because of gas pressures under the structure resulting from biological gas production. During investigations of gas levels in a housing development constructed on sanitary landfills, unsafe methane concentrations were found in a high proportion of the buildings. A concrete slab laid on top of the fill did not prevent gases produced in the fill from penetrating into the

buildings. Several sealants were tested and found inadequate. The results of periodic gas samplings conducted over several years in the sub-basement spaces of a number of buildings indicated that organic fill located around and under heated buildings becomes completely degraded in approximately 5 years, releasing methane at a proportionately rapid rate. This produces a severe explosion hazard unless suitable methods of aerating and venting are employed. Continuous mechanical ventilation at a rate of one or two air changes per hour adequately reduced methane concentrations. (Author summary)##

04460

J. C. Gagliardi

THE EFFECT OF FUEL ANTI-KNOCK COMPOUNDS AND DEPOSITS ON EXHAUST EMISSIONS. 90th Congress ("Air Pollution--1967, Part I (Automotive Air Pollution)" Hearings before the Subcommittee on Air and Water Pollution of the Committee on Public Works, U.S. Senate, Feb. 13-14, 20-21, 1967, pp. 487-554.) (Presented at the Automotive Engineering Congress, Detroit, Mich., Jan. 9-13, 1967, Paper No. 670128.)

The effect of fuel anti-knock compounds and combustion chamber deposits on exhaust hydrocarbon emissions was investigated. Six Ford Galaxies equipped with production non-Thermactor 289-CID, 2V engines were operated on a light-duty driving schedule for periods of 12- 30,000 miles at Ford's Michigan Proving Grounds. Three fuel blends were used in mileage accumulation-Indolene Clear (a full boiling range nonleaded gasoline), Indolene 30 (Indolene Clear plus 3.0 ml/gallon of motor mix blend), and Indolene 30 plus 0.2 theory of an organic phosphorous compound. Two engine lubricants were evaluated for the first 12,000 miles - a petroleum base SAE - POW - 30 used for Ford factory fill and a synthetic oil, di-2-ethyl hexal sebacate. After 12,000 miles, all test engines were operated on the petroleum based lubricant. Exhaust emissions were monitored at 3,000-mile intervals on the chassis dynamometer using the California Motor Vehicle Pollution Control Board seven-mode procedure. Additional seven-mode cycles were conducted on each engine after combustion chamber deposits were removed at the completion of the mileage accumulation phase. The increase in exhaust hydrocarbon (HC) emissions of the vehicles operating on Indolene 30 and Indolene 30 plus 0.2T phosphorus was substantially higher than the HC increase of vehicles operated on Indolene Clear (an average HC increase of 15 ppm for Indolene Clear versus an average HC increase of 171 ppm for Indolene 30). Operation of nonleaded fuel showed no deleterious effect on intake or exhaust valves or other engine components. (Author abstract)##

04492

C. B. Smith

NUCLEAR POWER AND THE AIR POLLUTION PROBLEM. Preprint. (Presented at the Conference: "Engineering Solutions to Air Resource Problems" Sept. 9, 1966.)

After reviewing the air pollution problem, the role of nuclear power in Southern California and its potential are considered in terms of cost and feasibility. Nuclear power has promise of reducing air pollution in Los Angeles, and has the added advantages of safety and economic savings. In the long run, clean air will require improved control techniques, new sources of power, or perhaps a replacement for gasoline powered vehicles. The scope of these measures - requiring substantial engineering and scientific development - indicates the magnitude of the effort that will be required to "bring back 1940 air to Los Angeles." Nuclear power will undoubtedly help attain that goal.##

04599

R. L. Chass

THE STATUS OF ENGINEERING KNOWLEDGE FOR THE CONTROL OF AIR POLLUTION. Proc. Natl. Conf. Air Pollution, Washington, D. C., 1962. pp. 272-80. 1963.

Control programs are discussed and particular the control program of Los Angeles County, also its demography, urban growth which is paralleled by increase in automobiles. Los Angeles, in spite of stringent air pollution regulations, has continued to increase its industries and to expand existing industries. In spite of the growth pattern, the engineering and enforcement functions of the District have resulted in preventing 4,500 tons of air contaminants from stationary sources, from entering the Los Angeles atmosphere each day. As it is pointed out in this paper, the air pollution problems can be solved, using sound technical and engineering approaches coupled with enlightened administrative and legislative action.##

04621

A. S. Bhullar

REACTION KINETICS IN DIESEL COMBUSTION. J. Inst. Engrs. (India) (Calcutta) 46, (3) 41-4, Nov. 2, 1965.

The combustion process of injected fuel particle is analyzed. The reaction kinetics theory has been utilized to obtain a gas phase molecular mixture by allowing the fuel to evaporate in small doses from the combustion chamber in M-combustion system used in Indian army vehicles. In this system, fuel is sprayed onto the walls of a direct combustion chamber, formed on the piston head, in a pencil shaped spray with no attempt for atomization. Most of the spray reaches the spherical combustion chamber walls. A portion of the spray suspended in the air begins to absorb heat, forms a vapor envelope, and commences to burn. The upper layer of fuel on the combustion chamber vaporizes by absorbing heat from the walls of the chamber. Thus, instead of liquid particles, vapor is supplied into the combustion chamber. It is mixed with air by an induction induced swirl. The mixture becomes more or less like a carburetor mixture, i.e., a gas phase molecular mixture, instead of a suspended liquid particles mixture. Thus, a gas phase molecular mixture can be burnt in very high compression ratio Diesel engine. The M-combustion chamber

not only gives better oxygen utilization, less smoke, less Diesel knock, but comprises a multifuel system which can burn petrol, Diesel or heavy oils.##

04630

Rose, A. H., Jr. and R. Smith

A DIRECT MEASUREMENT TECHNIQUE FOR AUTOMOTIVE EXHAUST EMISSIONS. Arch. Environ. Health 5, (6) 609-15, Dec. 1962. (Presented at the session on constituents of Motor Vehicle Exhaust at the Air Pollution Research Conference, Los Angeles, Calif., Dec. 5, 1961.)

A new sampling approach was developed using direct measurements of the composite exhaust emissions from vehicles moving in actual traffic. Contaminant emissions were expressed at wt. of emission per vehicle mile traveled within the metropolitan areas. The effect of engine power demand on contaminant emissions was also evaluated, since this factor is influenced not only by traffic volume but by average traffic speed, terrain, and operating modes. Emissions were measured under both peak and offpeak traffic conditions for all routes except the neighborhood route. These measurements were made in 8 metropolitan areas chosen to represent different types of geographic areas: Cincinnati, Chicago, Detroit, Los Angeles, New Orleans, Philadelphia, San Francisco, and Washington, D.C. The key to the successful measurement of the exhaust emissions was the proportional sampler. The sampler obtained a composite exhaust sample that is proportional to the exhaust flow under all operating conditions. An electromechanical servo mechanism system controlled the amount of exhaust gas allowed to enter a noncontaminating bag in a fixed proportion to the exhaust flow. The sampling rate was 0.25% of the total exhaust emitted to the atmosphere. Air-fuel ratios also indicate a marked dependence on the effects of the various routes on engine power demand. Mean air-fuel ratio for the downtown routes is 10.8:1; for arterial and residential routes, 12.2:1; for freeways, 13.8:1. This effect on air-fuel ratio is consistent with the effects of engine power demands on hydrocarbon emissions. The effects of olefin production in the exhaust do not show the same degree of correlation as do hydrocarbon emission trends. The conclusions drawn from the limited data thus far are necessarily tentative.##

04663

B. S. Murthy, L. G. Pless

EFFECTIVENESS OF FUEL CETANE NUMBER FOR COMBUSTION CONTROL IN BI-FUEL DIESEL ENGINE. Instn. Engrs. (India), 45(7):155-183, March 1965.

Four fuels covering a broad range of cetane number were carburetted while injecting either a high or low cetane fuel. The carburation rate was about 25% of the total heat input, which was held constant for all tests. Ignition delay, as compared with full load injection only, was reduced with all except the lowest cetane fuel carburetted. Delay decreased with increasing cetane number of the carburetted fuel.

Audible combustion noise was greatly reduced with the carburation of high cetane fuels when the low cetane fuel was injected. With high cetane fuel injection, the entire combustion noise level was lower. Further reductions were not evident when either high or low cetane fuel was carburetted. Concurrent carburation of fuel improved the full load thermal efficiency up to a certain cetane number range. At a carburation rate of 12% of total heat input, methanol did not fire at the compression ratio for standard ignition delay of high cetane injected fuel. The ignition delay with methanol at the higher compression ratio used when injecting the low cetane fuel was longer than with any of the other fuels tested. Audible combustion noise, peak cylinder pressure and rate of pressure rise increased with the increasing rate of propane carburation. When low cetane fuel was injected, exhaust temperature was slightly lower and smoke density slightly higher with methanol carburation. With the injection of higher cetane fuel, the exhaust temperature was lower with carburation of all fuels compared with full load injection only. Exhaust smoke density was reduced with carburation of high cetane fuels, but was increased slightly with methanol carburation. This small effect of dual-fuel operation on exhaust smoke does not agree with large smoke reductions reported by other workers. The difference may be due to the fuels used, percentage of total heat input carburetted, combustion chamber design of the engines used and/or methods of measuring smoke density.##

04731

M. Alperstein and R. L. Bradow

INVESTIGATIONS INTO THE COMPOSITION OF END GASES FROM OTTO CYCLE ENGINES. S.A.E. (Soc. Automotive Engrs.) Preprint. (Presented at the Mid-Year Meeting, Society of Automotive Engineers, Detroit, Mich., June 6-10, 1966.)

Techniques are described for determining the chemical nature of the end gas in a normally fired CFR Otto cycle engine. Apparatus for obtaining and chromatographically analyzing representative end-gas samples is described, and its utility illustrated using isooctane as a fuel. Twenty-seven carbon containing slow combustion products were identified before flame arrival; these consist principally of olefins, ring ethers, carbonyls, CO, and CO₂. Product formation is shown to increase with increasing pressure and temperature stress and to be inhibited by octane number appreciating additives. Distinct product formation trends from the slow combustion of isooctane were observed. (Author abstract)##

04792

R. E. George and R. M. Burlin

AIR POLLUTION FROM COMMERCIAL JET AIRCRAFT IN LOS ANGELES COUNTY. Los Angeles County Air Pollution Control District, Calif. (Apr. 1960). 67 pp.

An investigation of commercial jet aircraft operations at Los Angeles International Airport to determine the daily emission of atmospheric air contaminants was made. Smoke emissions and other air contaminants are byproducts from the combustion of fuel used in the turbojet engines. The jet exhaust was tested for particulate matter, aldehydes, oxides of nitrogen, hydrocarbons, carbon monoxide, carbon dioxide and oxygen. Evaluation of the data suggest that the total contaminant emissions from jet aircraft operations are insufficient to produce any generalized deterioration of air quality. Visible smoke emission from commercial jet aircraft do occur during take off and landing but on take-off the emission of smoke in excess of legally allowable opacity limits is well within the allowable three minute time limit and on landing the smoke emissions do not exceed the opacity limits.##

04808

J. H. Ludwig

THE VEHICLE POLLUTION PROBLEM. Preprint. (Presented at the American Public Power Association Conference, Denver, Colo., May 8-11, 1967.

The problem of emissions from motor vehicles is reviewed from the standpoints of the contribution of vehicles to community air pollution, present progress in control regulations and application of devices, and the immediate and longer-term outlook for additional controls. (Author abstract)##

04922

W. F. Deeter and R. G. Jewell

FACTORS AFFECTING CARBURETOR VAPOR LOSSES. Am. Petroleum Institute, Preprint. (Presented at a Session on Automobiles, Hydrocarbons, and Clean Air, 25th Midyear Meeting, American Petroleum Inst. Division of Refining, Detroit, Mich., May 11, 1960.)

Gasoline vapor, escaping from carburetors of motor vehicles during operation, has been considered as a source of air pollution. During a study made to establish the magnitude of this loss the various contributing factors were investigated. Carburetor vapor loss is affected by: 1, the temperature of the carburetor bowl; 2, the volatility of the fuel; 3, the manner in which the vehicle is operated (driving pattern); and, 4, the carburetor vent design. Carburetors can be divided into two classifications depending upon their venting: 1, those with restricted internal venting capacity (e.g., a single 1/16-in. diameter vent) from which large vapor losses may occur; and, 2, those with adequate internal venting capacity from which vapor losses will be small or nil. Carburetors in the second category include those which have no external vents, and externally vented models equipped with either multiple internal vents or a single internal vent of approximately 1/4 in. diameter. Bench unit data indicated that vapor loss is a function of carburetor bowl temperature, but tests with three different vehicles using and 8-lb Rvp (Reid vapor pressure) fuel indicated that such a relationship only exists for specific driving patterns, such as low-speed cruising and extended periods

of idle. Under these conditions carburetor bowl temperatures may rise by as much as 40 F to 80 F above the ambient, as a result of pickup of engine heat by the fuel. Limited testing indicated that carburetor vapor loss is also a function of fuel vapor pressure, but analyses of the recovered vapors (70 percent of C5+) suggested that fuel composition and front-end volatility were also important factors. The driving pattern affects carburetor vapor loss by influencing the pressure differential across the external vent. At low cruising speeds and during extended periods of idle, a positive pressure differential may exist and losses occur. At higher cruising speeds, the pressure differential tends to become negative, thereby preventing losses. A survey of the California car population (as of July 1957) indicated that approximately 26 per cent of the vehicles were equipped with carburetors from which substantial vapor loss could occur. (Author abstract)##

04993

J. Q. Payne H. W. Sigworth

THE COMPOSITION AND NATURE OF BLOWBY AND EXHAUST GASES FROM PASSENGER CAR ENGINES. Proc. Natl. Air Pollution Symp., 2nd, Pasadena, Calif., 1952 pp. 62-70

The purpose was to present results of work wherein over-all rates and composition of blowby and exhaust from the engines of three passenger cars were studied as a function of operating conditions. Particular emphasis was placed on the so-called noxious products in exhaust and blowby. The tests were carried out on a chassis dynamometer where actual road conditions could be duplicated in an automobile operating on a stationary test bed. Analyses were made using a mass spectrometer. Blowby and exhaust rates increase with increasing power output. Engine mechanical condition has little effect on exhaust rates, but poor mechanical condition can cause a greater than tenfold increase in the rate of blowby under some conditions. Materials such as CO, CO₂, H₂O, H₂, O₂, and N₂, were found to comprise over 99 percent of the composition of both exhaust and blowby. The remaining less than one percent contains the noxious materials. Except under decelerating conditions exhaust gases contain a lower proportion of noxious products than blowby gases and no materials of mass greater than 58. Common conditions of engine malfunctioning such as misfiring and retarded timing can increase the concentration of noxious products in the exhaust. The concentration of noxious products in blowby was affected by fuel type, carburetor adjustment, and power output. The following classes of compounds were identified as present or probably present in blowby: Paraffins, olefins, aromatics, cyclics, acids, alcohols, aldehydes, and an organic hydroperoxide. No material of mass number higher than 86 was found in greater than trace quantities.##

04994

P. L. Magill, D. H. Hutchison, J. M. Stormes

HYDROCARBON CONSTITUENTS OF AUTOMOBILE EXHAUST GASES. Proc. Natl. Air Pollution Symp., 2nd, Pasadena, Calif., 1952. pp. 71-83.

The aim was to present the results of mass spectrometer analyses of hydrocarbons exhausted by passenger car exhausts. The ultimate objective was to arrive at an estimate of the amount of hydrocarbons released into the Los Angeles atmosphere by gasoline-burning vehicles. The exhaust gases of automobile passenger cars were analyzed for C1 to C7 ; hydrocarbon content passenger cars were analyzed for b8c1 to C7 + hydrocarbon content with the mass spectrometer. The hydrocarbons found include methane, acetylene, paraffins, and olefins from b8c2 to C7+. The exhaust composition was found to be independent of the type of gasoline burned, using gasolines ranging from premium gasoline of current-day producers to saturated straight-run gasoline typical of prewar production. New cars and old cars showed relatively little difference in exhaust composition during acceleration and steady driving. Under conditions of idling and deceleration, the hydrocarbon content exhausted from prewar cars was approximately twice that of postwar cars. Over the range of driving conditions encountered in city traffic, there is a loss of hydrocarbon out of the exhaust ranging from 5 percent of the weight of fuel entering the carburetor under conditions of steady driving to 19 percent during periods of deceleration. The total quantity of C1 to C7+ hydrocarbons released by automobile exhausts to the atmosphere over Los Angeles County during a twenty-four-hour day is estimated to be about 850 tons.##

04995

E. L. Hall

PRODUCTS OF COMBUSTION OF GASEOUS FUELS. Proc. Natl. Air Pollution Symp., 2nd, Pasadena, Calif., 1952. pp. 84-9.

Data on the combustion products of fuel gases is reviewed. Work on the photochemistry of smog is related to work on vapor phase gum produced in manufactured gas by hydrocarbons and NO2 catalytically oxidized from NO in the presence of butadiene.##

05005

R. P. Hangebrauck, D. J. von Lehmde, and J. E. Meeker

SOURCES OF POLYNUCLEAR HYDROCARBONS IN THE ATMOSPHERE. Public Health Service, Cincinnati, Ohio, National Center for Air Pollution Control. (PHS Publ. No. 999-AP-33.) 1967. 48 pp.

Rates of emissions of polynuclear hydrocarbons were measured at several sources considered likely to produce such emissions. The sources included heat generation by combustion of coal, oil, and gas; refuse burning; industrial processes; and motor vehicles. The annual emissions of benzo(a)pyrene in the United States were estimated for each of the sources surveyed, to provide a rough gauge of the importance of each source. Small, inefficient residential coal-fired furnaces appear to be a prime source of polynuclear hydrocarbons; other sources may be of local importance. Production of polynuclear hydrocarbons was generally associated with conditions of incomplete combustion. (Author abstract)##

05007

J. H. Ludwig

SEMINAR ON AIR POLLUTION BY MOTOR VEHICLES. Preprint. 1967.
54 pp.

The various facets of the vehicle pollution problem from the standpoint of both effects on community atmospheres nationwide and the source of variables are summarized. The problems that remain today encompass a number of considerations, which may be enumerated as follows: (1) The importance of the diesel problem as it relates to smoke and odor control, the means for securing reduction of smoke and odors, and the development of test procedures for the setting of standards; (2) The importance of relative reactivity of the various organic species, particularly hydrocarbons, and the effects of reactivity on both standards and control methods; (3) The importance of various emission sources (exhaust, crankcase ventilation, fuel tank evaporation and carburetor evaporation losses) in relation to reactivity and need for control and the development of test procedures for these sources from all types of vehicles (passenger cars, trucks and buses); (4) The need for control of nitrogen oxides from vehicular sources, both gasoline engine and diesel engine power sources and concurrently for stationary sources; (5) The importance of instrumentation in measurement of pollution parameters for research, enforcement (certification) procedures, surveillance and inspection; (6) The problems of maintenance of devices on vehicles to insure their continued operation (surveillance and inspection), and/or the upgrading of such devices such that they will be essentially maintenance free; and (8) The importance of in-traffic carbon monoxide levels, particularly their significance relative to driver fatigue.**

05011

A. A. Orning, C. H. Schwartz, and J. F. Smith

MINOR PRODUCTS OF COMBUSTION IN LARGE COAL-FIRED STEAM GENERATORS
- American Society Mechanical Engineers New York Paper 64-
WA/FU-2.
(Presented at the Winter Annual Meeting, American Society
of Mechanical Engineers, New York City, Nov. 29-Dec. 4, 1964.)

An analysis is given of the minor products of combustion from large coal-fired steam generators in relation to thermodynamic equilibria, unit design and operating conditions. Concentrations of nitrogen oxides and the ratios of sulfur trioxide to total sulfur oxides are near equilibrium values at the furnace outlet. Significant amounts of low molecular weight organic acids and comparatively small amounts of polynuclear aromatic hydrocarbons are found under good combustion conditions. (Author abstract)**

05012

A. A. Orning, C. H. Schwartz, and J. F. Smith

A STUDY OF THE MINOR PRODUCTS OF COAL COMBUSTION. American
Society Mechanical Engineers, New York. Paper 64-PWR-4.

(Presented at the IEEE-ASME National Power Conference, Tulsa, Okla., Sept. 27-Oct. 1, 1964.)

A study of the minor products of combustion from large coal-fired steam generators is described. Concentrations were determined for sulfur oxides, nitrogen oxides, various organic materials including organic acids and polynuclear aromatic compounds, and particulate matter with spectrographic analyses for various metals. Analyses of the data in relation to thermodynamic equilibria, operating conditions, and unit design are in progress. Some of the more obvious conclusions are given. Purpose of the paper is to describe the testing plan and the difficulties involved, and their importance in relation to extension of such studies to include oil and gas-fired units. (Author abstract)##

05067

S. T. Cuffe, R. W. Gerstle, A. A. Orning, and C. H. Schwartz

AIR POLLUTANT EMISSIONS FROM COAL-FIRED POWER PLANTS; REPORT NO. 1. J. Air Pollution Control Assoc. 14, (9) 353-62, Sept. 1964 (Presented at the 56th Annual Meeting, Air Pollution Control Association, Detroit, Mich., June 9-13, 1963.)

Air pollutant emissions from two types of coal burning power plant furnaces were studied. Particulates entering the fly-ash collector from the low-intensity-mixing, vertically fired boiler of Unit A accounted for 60% of the ash contained in the coal charge. In the high-intensity-mixing, horizontally fired Unit B, 85% of the total ash entering the boiler in the coal was carried to the fly-ash collector. The fly-ash collectors effectively removed 85 to 95% of the particulate matter and showed essentially the same efficiency in removal of common trace metal compounds. Concentrations of sulfur trioxide ahead of the dust collector varied widely. For Unit A, the vertically fired boiler, they averaged about 4% of the SO₂ concentration; for Unit B, the horizontally fired boiler, formation of SO₃ was lower, averaging less than one percent of the SO₂ concentration. The fly-ash collectors effected an appreciable reduction in sulfur trioxide emissions on Unit A but not on Unit B. For both units SO₃ emissions were less than one percent of their SO₂ emissions. Nitrogen oxide concentrations during normal full-load operation were increased 30 to 40% by passage through an electrical precipitator. Organic acid concentrations were appreciably higher than those of gaseous hydrocarbons, formaldehyde, and carbon monoxide. The very small concentrations of gaseous hydrocarbons, formaldehyde, and carbon monoxide indicated very complete and efficient combustion during both full-load and partial-load operation. Emissions of polynuclear hydrocarbons from large power plant boilers were found to be very small in comparison with those from smaller coal-fired units having less efficient combustion processes.##

05097

R. E. Neligan

A COMPARISON BETWEEN THE HYDROCARBONS IN AUTOMOBILE EXHAUST AND THOSE FOUND IN THE LOS ANGELES ATMOSPHERE. Preprint.

(Presented at the Joint Research Conference on Motor Vehicle Exhaust Emissions and Their Effects, Los Angeles, Calif., Dec. 5, 1961.)

Ambient air samples obtained from the central Los Angeles business district were analyzed by gas chromatography. Hydrocarbons in the C2-C7 molecular weight range were identified and their concentrations determined. The results obtained from these analyses are compared to those obtained from diluted automobile exhaust and diluted automobile exhaust that had been irradiated for a period of four hours. Gas chromatography was found to be an accurate reproducible procedure for the analysis of C3 to C7 hydrocarbons present in the atmosphere. The procedure is limited by the inability to determine the methane concentration as well as the C8 hydrocarbons. In the sixteen samples analyzed, it was found that the relative concentrations of the individual hydrocarbon groups did not change significantly with total concentration. This would indicate that the hydrocarbon emissions to the atmosphere are relatively constant. A linear relationship was also found to exist between total hydrocarbons recovered and the sum of the nitric oxide - nitrogen dioxide levels. Comparison of atmospheric hydrocarbons to those produced by automobile exhaust indicates that natural gas could be a major source of the low boiling hydrocarbons present in the atmosphere. The relatively low acetylenic level found in the ambient air samples, as compared to diluted automobile exhaust, also indicate significant contributions are made by automobile blowby emissions as well as carburetor and fuel tank evaporation losses.##

05106

G. W. Fiero

PROTECTIVE COATINGS AND RULE 66. Am. Paint J. 52 (29), 70-1. 74, 76, 78, 80, 82 (Jan. 9, 1967).

Rule 66 defines "photochemically reactive" solvents as those containing more than 20 per cent total of the substances listed or more than: (1) 5 percent olefinic or cyclo-olefinic hydrocarbons, alcohols, aldehydes, esters, ethers or ketones. (2) 8 percent C8 or higher aromatics except ethylbenzene. (3) 20 per cent ethylbenzene, toluene, branched ketones or trichloroethylene. Rule 66 requires reduction of 85 per cent of emissions of solvents from various industrial applications if "photochemically reactive" solvents are used. There are some uncertainties with regard to the rule. For example, both state and federal protective coatings specifications in many cases specify the solvents employed and often they are the "photoreactive" variety. To make matters worse, Presidential Orders require Federal facilities to abide by local air pollution regulations. After many consultations with industry, in March and April 1966 LA APCD, in conjunction with California Manufacturers Assn., conducted a series of tests on solvents and Rule 66 was finalized. The reason for this rule was that an estimated 345 tons of solvents were emitted each day in 1965 from the drying of protective coatings. After the final Rule 66 was adopted, the Bay Area APCD followed suit and in its current draft it prohibits the sale or use of quart or larger sizes of building coatings containing more than 8 per cent "reactive organic compounds" plus 12 per cent of monosubstituted aromatics.

Industrial coatings are limited to 20 per cent of "reactive organic compounds." Thus, in the current draft, Bay Area APCD regulations are somewhat less restrictive than LA APCD Rule 66, but the number of pounds exempt per facility is less than LA. The Bay Area APCD estimates 1964 emission of solvents to be 297 T/D of solvents. Industry is compiling data for a more up-to-date figure. It should be borne in mind that this is a draft; final Regulation 3 is expected to issue in January of 1967 to become effective January 1, 1968.##

05109

H. L. Falk, P. Kotin, and A. Miller

AROMATIC POLYCYCLIC HYDROCARBONS IN POLLUTED AIR AS INDICATORS OF CARCINOGENIC HAZARDS. Intern. J. Air Pollution 2, 201-9 (1960). (Presented at the Air Pollution Symposium, 136th National Meeting, American Chemical Society, Atlantic City, N.J., Sept. 17, 1959.)

The concentration of 3,4-benzpyrene in air samples has been used as an indicator of carcinogenic risks in breathing polluted air, and rapid and reliable methods for the determination of benzpyrene have been worked out. This approach has two shortcomings. First, polluted air frequently contains carcinogens other than polycyclic aromatic hydrocarbons. Second, there is no accounting for other effects of polluted air. These effects may enhance the carcinogenic process by inhibiting the normal physiologic process by which foreign materials are eliminated from the lung. The conditions under which quantitation of 3,4-benzpyrene in air samples is carried out in the laboratory may be far different from those existing in the lung. The liberation of benzpyrene from rubber tire dust by an aqueous protein solution, as is encountered in the lung, occurs rapidly. In the case of soots, particle size plays an important role in determining whether elution of polycyclic aromatic hydrocarbons will take place. The smaller particles that retain their hydrocarbons may also adsorb additional hydrocarbons that have been eluted from larger size particles in the immediate neighborhood. Competitive effects have been observed between aromatic polycyclic hydrocarbons as found on soot and dust with regard to the production of tumors. As there is marked structural similarity between cancer-producing and inactive compounds, the intracellular site of action may be common for both groups and the latter may thus inhibit the action of the former in producing cancer. A chemical method for the evaluation of the carcinogenic potency of polluted air requires determination of all polycyclic aromatic hydrocarbons elutable by protein solutions. There are still a number of unidentified hydrocarbons present. The stability of these compounds adsorbed on soot when exposed to the atmosphere differs from one compound to the next.##

05113

N. A. Renzetti

ANALYSIS OF AIR NEAR HEAVY TRAFFIC ARTERIES. Air Pollution Found. Los Angeles Rept. 16. Dec. 1956. 30 pp.

The primary objective of this work was to obtain the range of concentration of the principal constituents of automobile

exhaust in the vicinity of heavy traffic. Samples were taken at essentially ground level (five feet) within 60 to 75 feet of the traffic artery and analyzed for carbon monoxide, hydrocarbons, and carbon dioxide by infrared spectrometry. The carbon monoxide values ranged from 4 to 93 ppm (by vol.); the hydrocarbons, from 0.25 to 2.3 ppm (by vol. as hexane); and carbon dioxide, from 0.05 to 0.14 per cent (by vol.). Samples were taken from 6 a.m. to 9 a.m., local time, on week days of the period from September 4 to October 2, 1956. This period was characterized by low inversions, low winds, and high solar radiation, and on a large number of the days high oxidant values and eye irritation were experienced. Meteorological data and atmospheric oxidant and eye irritation values for these days are tabulated at the end of the report. (Author summary)##

05133

Wasser, J., R. P. Hangebrauck, and A. J. Schwartz

EFFECTS OF AIR-FUEL STOICHIOMETRY ON AIR POLLUTANT EMISSIONS FROM AN OIL-FIRED TEST FURNACE. J. Air Pollution Control Assoc., 18(5):332-337, May 1968. 19 refs. (Presented at the 60th Annual Meeting, Air Pollution Control Association, June 11-16, 1967, Paper No. 67-124.)

An experimental, domestic-sized, oil fired test furnace to be used for evaluation of fuel additives and combustion process modifications in reducing air pollutant emissions is described. Operating data and emissions of particulate matter, smoke, carbon monoxide, gaseous hydrocarbons, oxides of nitrogen, and oxides of sulfur are reported over the range of operable air-fuel ratio. Emission levels are interpreted in terms of key operating parameters and potential areas for reduction of emission. (Authors' abstract modified)##

05171

f. g. rounds, P. A. Bennett, and G. J. Nebel

SOME EFFECTS OF ENGINE-FUEL VARIABLES ON EXHAUST GAS HYDROCARBON CONTENT. J. Air Pollution Control Assoc. 5 (2), 109-119 (Aug. 1955) and Trans. SM (1955) and Trans. ASME (Am. Soc. Mech. Engrs.) 63, 591-601 (1955). (Presented at the Annual Meeting, Society of Automotive Engineers, Detroit, Mich., Jan. 10-14, 1954.)

The aim was to obtain a better understanding of the factors influencing the concentration of hydrocarbons in engine exhaust. Initially, tests were made to determine the fraction of the total fuel supplied to the engine which appeared as hydrocarbons in the exhaust at different driving conditions. Later, more exhaustive tests were made to determine the effect of common engine-fuel variables at each driving condition. The data are based on mass spectrometer and/or Orsat analyses of exhaust gas samples obtained from 163 passenger cars and 8 public transit buses. Reductions in exhaust gas hydrocarbon content can be achieved through proper maintenance and design. Mass spectrometer analyses have indicated that the hydrocarbon content of engine exhaust gas varies appreciably with driving condition. The most important engine-

fuel variable affecting the hydrocarbon content at idle was mixture ratio with the highest hydrocarbon contents being observed at rich mixtures. A substantial reduction in the average hydrocarbon content could be obtained by adjustment of the idle mixture ratio of all cars to the range resulting in best idle operation. The current trend toward the overhead valve V-8 engine should also help to reduce idle hydrocarbon losses since these engines will idle acceptably with leaner mixtures than either 6 cylinder or line 8 engines. Fuel type was found to have essentially no effect on the exhaust gas hydrocarbon content. None of the engine-fuel variables investigated at part throttle were observed to affect significantly the hydrocarbon content. These included mixture ratio, compression ratio, fuel type, coolant temperature, engine type, engine speed, and engine load. The most important engine-fuel variable affecting the hydrocarbon content during simulated deceleration was manifold vacuum. The hydrocarbon content was found to increase sharply to high values at manifold vacuums above 21 inches of mercury. Since manifold vacuum during a closed throttle deceleration depends upon engine speed, the trend toward automatic transmissions and lower rear axle ratios made possible by higher output engines tends to reduce hydrocarbon losses by reducing engine speed at a given car speed. Limited studies using gasoline, LPD, and Diesel powered public transit buses have suggested that there is no significant difference in the total amount of hydrocarbon released to the atmosphere by the three different engines provided that the overall fuel consumption is comparable.##

05184

V. N. Trefilov, and M. D. Skanavi

HYGIENIC CHARACTERIZATION OF LABOR CONDITIONS IN THE CHLOROPHOS INDUSTRY. Gigiyena Truda I Professional' Nyte Zabolevaniya. Translated from Russian. 41-3, 1963. Russ. (Tr.)

Analysis established the atmosphere of the chlorophos production department ot be contaminated mostly by chloral, dimethylphosphate and chlorophos vapours. Judging by the available clinical data the detected concentrations of organophosphorus compound (chlorophos and dimethylphosphite) vapours reached dangerous levels, which, as it was noted, gave rise to the development of intoxications. In reconstruction and erecting new analogous plants it is recommended that particular attention be attached to proper sealing of equipment and to elimination of manual operations. It is also suggested to make provisions for automatic pouring of chlorophos, its measuring, weighing and washing of barrels to be effected in special shielded chambers. (Author summary)##

05292

J. M. Chandler

EFFECTS OF ENGINE-OPERATING VARIABLES ON THE COMPOSITION OF AUTOMOTIVE EXHAUST GASES. Proc., Am. Petrol. Inst., Sect. III 38, 324-35 (1958). (Presented before a session on air pollution, 23rd Midyear Meeting, American Petroleum Inst. Division of Refining, Los Angeles, Calif., May 15, 1958.)

The factors affecting hydrocarbon concentration in exhaust gas to the greatest extent are manifold vacuum, engine detuning (maladjustment and/or poor mechanical condition), and cold as compared to hot engine starting. Manifold vacuum of more than approximately 21.5-in. Hg (mercury) accounts for high concentrations of hydrocarbons during deceleration. This effect is accentuated by high speeds at the start of deceleration and by manual transmissions as compared to automatic transmissions. Accelerating and cruising conditions at various engine speeds produce similar hydrocarbon concentrations, generally in the range of 1 per cent to 5 per cent of the supplied fuel, with hydrocarbon concentrations tending to decrease with increasing engine speed. Enriched carburetor idle setting increase hydrocarbon emission during cruise up to approximately 30 mph. One misfiring plug may more than double the average hydrocarbon concentration. A deposit-fouled spark-plug set can increase the rate of hydrocarbon emission more than 2 1/2 times during a wide-open-throttle acceleration. Among variables which affect oxides of nitrogen, air-fuel ratio is of primary importance. Lean mixtures promote the formations of oxides of nitrogen and increase the relative effects of other engine variables. Under full throttle, rich mixture conditions, concentrations of oxides of nitrogen are relatively low. Under part-throttle conditions, however, mixtures are sufficiently lean to permit varying degrees of importance to be attached to ignition timing advance, manifold pressure increase, and compression ratio increase, all of which promote oxides of nitrogen formation. Under road-load cruise conditions and during full-throttle accelerations, higher speeds produce higher concentrations. During part-throttle accelerations, there is no general effect of speed, and high concentrations may be exhausted even at low speeds. During idling and deceleration, oxides of nitrogen concentrations are so low as to be considered insignificant.##

05312

Chironis, N. P.

SMOG: THE DEADLY POISONS PERIL LIFE IN ALL CITY AREAS. Prod. Eng. 37, 33-41 (Dec. 19, 1966).

The air pollution problem is national in scope. Pollution-control officers continue to make a point of cracking down on offending factories, power stations, and incinerators. But, behind the scenes, the case against automotive contaminants is building up, and nothing less than a revolution in automotive engineering will satisfy tomorrow's standards. This design revolution is chartered for three stages: Modification of existing engines--improved carburetors, timing systems, cylinder-head design--and the addition of devices to burn off hydrocarbons and noxious gases. A search for new types of internal combustion engine--fuel injection engines, improved gas turbines, rotary engines. Entirely new propulsion systems that don't use fossil fuels--electric cars with batteries or fuel cells, linear motors for mass transportation systems, perhaps nuclear power either indirectly to charge batteries or directly to drive vehicles. It was indicated that pollutants from all sources amount to 135 million tons a year. So motor vehicles account for about 60 percent of the nation's atmospheric wastes, by weight. Moreover, government figures indicate that vehicles are responsible for about 97 percent of the olefin hydrocarbons and 40 percent to 60 percent of the nitrogen

oxides. Controls are aimed at three specific targets: emissions from the tailpipe, from crankcase ventilations, and from carburetor and gas tank evaporation. The tailpipe is by far the greatest source of emissions, accounting for up to 65 percent of the hydrocarbons and almost all the carbon monoxide and nitrogen oxides. But the crankcase emission is the easiest to control, and California chose it as the first target six years ago. These allow 275 ppm of hydrocarbons and 1.5 percent carbon monoxide by volume. Effective Jan. 1, 1970, however, California will cut these allowables to 180 ppm hydrocarbons and 1 percent CO. The state is also considering a proposal to adopt a standard of 350 ppm of nitrogen dioxide.

05323

Jackson, Marvin W.

EFFECTS OF SOME ENGINE VARIABLES AND CONTROL SYSTEMS ON COMPOSITION AND REACTIVITY OF EXHAUST HYDROCARBONS. In: Vehicle Emissions, Part II, SAE Progress in Technology Series, Vol. 12, Society of Automotive Engineers, Inc., N. Y., 1966, p. N. Y., 1966, p. 241-267. ((41)) refs. (Presented at the Mid-Year Meeting, Society of Automotive Engineers, Detroit, Mich., June 3-10, 1966.)

The effects of air-fuel ratio, spark timing, an engine modification system, and the Air Injection Reactor System on the composition and reactivity of the exhaust hydrocarbons are reported. The reactivity index and composition changes are compared to those indicated by the nondispersive infrared analyzer. Either retarding the spark timing or leaning the air-fuel ratio reduced the hydrocarbon concentration measured by the infrared analyzer. In contrast, the reactivity index increased as the spark timing was retarded and the decrease in the reactivity index due to leaning the air-fuel ratio was only 1/2 the decrease in the concentration measured by the infrared analyzer. For equal reductions in the concentration measured by the infrared analyzer, the reactivity index with the engine modification system was 37% higher than that with the Air Injection Reactor System. Conversely, in order to produce an exhaust with the same level of reactivity, the engine modification system has to reduce the concentration measured by the infrared analyzer about 70 ppm n-hexane more than the Air Injection Reactor System. The use of the reactivity index points out significant differences in smog-forming potential resulting from both changes in engine design variables and exhaust control systems; these differences are not revealed by measurements made using the infrared analyzer. (Author's abstract)##

05337

G. G. Esposito

IDENTIFICATION OF AEROSOL PROPELLANTS IN PAINT PRODUCTS BY GAS-LIQUID CHROMATOGRAPHY (FINAL REPT.) Army Coating and Chemical Lab., Aberdeen Proving Ground, Md. (Rept. No. 226.) Mar. 1967. 15 pp.

Aerosol packaged paint products have gained widespread acceptance in recent years. Because of safety and toxicity factors, the type of propellant employed is of vital importance. This report describes a rapid, specific procedure for the identification of propellants using gas-liquid chromatography. A chilled can of paint is sprayed into a test tube and the atmosphere above the liquid is sampled. The analysis is conducted on silicone grease and porous polymer columns. (Author abstract)**

05411

E. S. Starkman

VARIOUS COMPONENT GASES OF ENGINE GENERATED POLLUTION POSE DIFFERING HEALTH HAZARDS. S.A.E. (Soc. Automot. Engrs.) J. 75, (3) 85-7, Mar. 1967

Unburned hydrocarbons, oxides of nitrogen, carbon monoxide, and carcinogens are among the emissions generated by engines. Each produces hazards of varying importance and each presents a different control problem. For example, the ultimate method of reducing the hydrocarbon emissions is to supply a completely stratified charge. As with the hydrocarbons, many engine variables influence the concentration of nitric oxide. Carbon monoxide concentration follows directly the fuel-air ratio, and a rich mixture operation must be avoided at all times. Reduction in carcinogen content should occur as the concentration of unburned hydrocarbons is reduced.**

05477

K. Gasiorowski

(ENERGY GENERATION FROM LIQUID FUELS.) Energieerzeugung aus flüssigen Brennstoffen. Gesundh. Ingr. (Munich) 86 (4), 116-22 (Apr. 1965.) Ger.

Air pollution due to oil-fired installations is caused by sulfur dioxide, carbon dioxide, nitrogen oxides, and products of incomplete combustion (carbon monoxide, hydrocarbons, ashes, and soot). Percentual share of these agents in flue gases produced from different fuel oils under various combustion conditions is given. Efficiency of high smoke stacks in dispersing SO₂ is discussed and presented graphically. Statistical data are presented on share of automobile engines, domestic furnaces, and industrial furnaces in cities' air pollution due to SO₂. **

05479

A. Goetz

AEROSOL FORMATION IN NATURAL AND POLLUTED AIR.
(Aerosolbildung in natürlichen und verunreinigten Luftmassen.)

The nature, type, and the effects resulting from modifications by aerosols of reactive gaseous constituents contained in the biosphere are reviewed. Aerosols modify the physical as well as the chemical reaction pattern of the molecular-disperse gaseous phase to a considerable degree in spite of the fact that the total mass of this colloid substance is minimal 10 to the minus 7th to 10 to the minus 8th compared to that of the gases which suspend the colloids. The increase in concentration of aerocolloids becomes obvious through a rapidly increasing visibility restriction due to contrast reduction by light scattering should also be considered. The growth of aerosols demonstrates the presence of reactive emission components by increased haze formation. It also has to be realized that the origin of the haze production is not necessarily tied to the locality of the pollution source because such reactions proceed relatively slowly, especially when different reaction partners originate at different localities or when a high particulate level is already present due to climate conditions. The formation of aerocolloids is by far not restricted to industrial and other man-made pollutions but results also from many processes in nature which go on continuously over the earth's surface in large variety. Consequently the final effect of emissions depends to a large extent on the geographical and climatic conditions and the natural aerosol levels, so that knowledge about their origin and formation rate is necessary to judge the final effect of various emission types over specific population areas. The sources, chemical and physical interactions, and methods for determining the size distribution of aerosols are considered.##

05596

C. J. Domke, D. J. Lindley, and C. N. Sechrist

HOW TO STUDY EFFECT OF BLOWBY GAS. Hydrocarbon Process.
45 (9), 303-6 (Sept. 1966).

A new technique for the study of blowby gas uses an engine which contains Teflon parts and thus can operate without lubricating oil. This allows the generation and collection of uncontaminated gas samples for studying vehicle emissions, engine sludge and deposit formation. The character and chemical composition of blowby gases were explored by ducting them from the engine and fractionating them in a series of traps at 32, minus 100, and minus 326F. Each fraction was analyzed by (1) infrared absorption, (2) mass spectrometry, and (3) gas chromatography. Changing air-fuel ratio had little or no effect on the composition of the hydrocarbons being emitted from the crankcase. The hydrocarbon portion of the blowby gas was roughly 50% aromatics, 35% saturates, and 15% olefins. The composition of the hydrocarbon portion was approximately the same whether the fuel was a full range boiling range gasoline or isooctane. The appearance of a broad spectrum of paraffinic hydrocarbons, olefins, and aromatics when using isooctane fuel is evidence of extensive chemical reactions taking place within the combustion chamber of an engine. The

combined concentration of oxygenated organic compounds present in the blowby gas, collected in our studies, was less than five parts per million. This includes all oxy to C12. Only the simplest of these oxygenated compounds, formaldehyde, acetaldehyde, methanol, and ethanol, were identified. The blowby gas from the operating engine was bubbled through oil samples maintained at 275F. As a control, air at the same rate was passed through another sample of the same oil, maintained at the same temperature. Analyses showed that the rate of oxy compound generation in the oil contacted by blowby gas was 10 times greater than that in the oil contacted by air. Details of engine modification, operating conditions and gas evaluation are presented.##

05632

T. W. Legatski

THE ENGINE BEHAVIOR CHARACTERISTICS OF L.P.-GAS FUELS.
Preprint. (1959).

The purpose was to offer a further analysis of the findings of a research program on engine requirements under severe operating conditions and on fuel behavior characteristics as related to fuel composition. Eight two-component and two three-component LP-Gas blends were tested in one or more of four 1958 model LP-Gas truck engines of different makes or models. The permissible knock-limited spark advance was determined throughout the speed range. Neither ASTM Motor or ASTM Research octane numbers, as calculated from a knowledge of fuel composition, nor any combination of them reflects fuel behavior in the more severe types of current LP-Gas engines. Behavior of LP-Gas fuel formulations in severe engines and under severe service conditions can be predicted from fuel composition using a new and different scale of values which has been designated as the ESRU scale. Since the ESRU (service octane scale) numbers are only significant when related to an engine of assigned high severity, the numbers lack utility as an overall quality yardstick. Both propane and propylene are depreciated by about the same amount in current severe types of LP-Gas engines. Behavior of LP-Gas fuels in the more common mild engines, operated under mild conditions, can be predicted from fuel composition and some scale of antiknock values lying in between those of the ASTM-Research and ASTM-Motor methods of test.##

05633

London, A. L.

THE APPLICATION OF RESEARCH TO MOTOR VEHICLE EMISSION CONTROL--CAN WE AVOID AFTERBURNERS? (Presented at a Session of the Air Pollution Research Conference on "The Application of Research to Motor Vehicle Emission Control," Los Angeles, Calif., Dec. 7, 1961.)

B. Emission Sources

Basic improvements in the design, production control, and maintenance of the carburetor and distribution system of the conventional spark-ignition four-stroke cycle automobile engine, and a change of engine type to one having inherently the potential for low hydrocarbon emissions are reviewed. Chemical considerations, especially fuel-air ratio, are discussed. Engine test results are considered. The low pollution potential of the following possible alternate automotive power plants is discussed: diesel engines, gas turbine engines, and stratified charge engines. The cost factor is mentioned.

05648

J. H. Elliott, N. Kayne, and M. F. LeDuc

EXPERIMENTAL PROGRAM FOR THE CONTROL OF ORGANIC EMISSIONS FROM PROTECTIVE COATING OPERATIONS (INTERIM REPT. NO. 7). Los Angeles County Air Pollution Control District, Calif. Jan. 1961. 26 pp.

The progress made on the experimental program for the control of solvent emissions from surface coating operations is reported. The results of 16 runs made with two industrial finishes, an air dry lacquer and a high temperature baking enamel, are discussed with respect to particulate matter removal before the air stream enters the carbon unit. Various filters and combinations of filters were used in this study. Additional runs were made using single and mixed solvents with the four-tray adsorber. The results are analyzed with respect to the effect of using saturated versus superheated steam on the retentivity of the carbon for these solvents. Carbon life, pressure drop, and temperature rise for the four-tray absorber are also discussed. The status of the program, together with the questions that have been answered, and the questions to be answered, are delineated. A modification of the first conical unit adsorber is described. The experimental work on this modified unit, now under construction, will conclude the work on the spray booth phase of this project.##

05649

Smith, I. D.

NITROGEN TETROXIDE DISPOSAL UNIT COMBUSTION PRODUCTS. National Aeronautics and Space Administration, Las Cruces, N. Mex., Manned Spacecraft Center. May 1967. 7pp. (Rept. No. NASA TN D-3965.)

A test program was conducted to determine the identity of the combustion products released to the atmosphere by the vapor disposal units which dispose of nitrogen tetroxide by burning with propane. The burner unit, which is designed to dispose of at least 10 lb of nitrogen tetroxide per minute, consists of an injector system for the propane and the nitrogen tetroxide, a mixing chamber, a burner head constructed to minimize flashback, and a spark-plug igniter system controlled from a blockhouse. Samples of the combustion products were collected and analyzed by infrared

spectroscopy. When the unit was operated in the normal, slightly fuel-rich mode, the detectable combustion products were carbon dioxide, water vapor, and unburned propane or other carbon-hydrogen bond-containing materials. The hydrocarbon emission, which would be undesirable in a smog-prone area, can be controlled to a degree by adjustment of the propane feed. The propane adjustment becomes important when disposing of an oxidized feed that continuously diminishes in nitrogen tetroxide. The combustion products do not contain any materials which present any toxicity problems. After a year of usage, the White Sands Test Facility concludes that the disposal units provide a convenient, rapid, and safe method for the disposal of excess nitrogen tetroxide.

05746

Ourusoff, L.

CLEANER AIR AND THE GAS INDUSTRY (PART I). Am. Gas J. 194 (3), 32-5; 38; 40; 42 (Mar. 1967).

The background of air pollution is briefly reviewed from both a universal and a gas industry viewpoint. The principal causes and sources of air pollution in the United States are discussed. The physiological effects of air pollution are considered. Current methods and means of controlling air pollution are reviewed. Regional aspects of the problem are examined as they affect its severity and bear on the attitudes of the public, the federal and local authorities, commerce, and industry, and more specifically the public utility companies.

05844

THE EFFECT OF ORGANIC MATERIALS IN THE ATMOSPHERE ON VEGETATION. Preprint. California Univ., Riverside. (This is a continuation of the report dated Jan. 21, 1957.)

A study on the effect of irradiated auto exhaust on plant damage is presented. No satisfactory amount of plant damage was produced in any of the combinations of conditions available. These included varying residence time, light intensity, plant exposure time, ratios of the auto operating cycles, and additions of nitrogen dioxide, ozone or raw gasoline. In a few experiments, very slight, but typical oxidant damage was produced along the margins of some leaves, but the amount was too small to be of use in evaluating fuels. Of particular interest is the fact that when ozone was added to the exhaust, no damage occurred. Similarly, when raw gasoline and nitrogen dioxide were irradiated ozone was formed, but no oxidant damage was obtained. No explanation for the failure to obtain plant damage can be offered until the test facilities are made available for intensive trials.***

M. A. Elliott, G. J. Nebel, and F. G. Rounds

THE COMPOSITION OF EXHAUST GASES FROM DIESEL, GASOLINE AND PROPANE POWERED MOTOR COACHES. J. Air Pollution Control Assoc. 5 (2), 103-8 (Aug. 1955). (Presented at the 48th Annual Meeting, Air Pollution Control Association, Detroit, Mich., May 22-26, 1955.)

Exhaust-gas samples were obtained from Diesel, gasoline, and propane-powered motor coaches of similar passenger capacity under idling, accelerating, cruising, and decelerating driving conditions. The samples were analyzed for carbon monoxide, oxides of nitrogen, formaldehyde, and hydrocarbons. In addition, the exhaust-gas flow rates were measured to permit calculation of the emission rate for each constituent at each driving condition. Based on a typical city driving pattern, it was concluded that:

1. The carbon monoxide emission from the Diesel coaches was only a small fraction of that from the gasoline and propane coaches.
2. The differences observed in the emission of oxides of nitrogen, formaldehyde, and hydrocarbons by the 3 coach types were relatively small. No one coach type discharged either the greatest or least amounts of all of these 3 constituents.##

05912

Larsen, R. I.

MOTOR VEHICLE EMISSIONS AND THEIR EFFECTS (CONFERENCE REPORT). Public Health Rept. (U.S.) 77(11), 963-9 (Nov. 1962) (Presented at the Annual Meeting, New England Section, Air Pollution Control Association, Worcester, Mass., April 25, 1962.)

Highlights of the papers presented at the Fifth Air Pollution Medical Research Conference on December 4, 1961, and at the Joint Research Conference on Motor Vehicle Emissions and Their Effects on December 5-7, 1961 are presented. Current research findings on quantities and types of air pollutants from motor vehicles and the effects of these pollutants on the health of man, plants, and laboratory animals are reviewed.

06031

E. E. Lemke, N. R. Shaffer, J. A. Verssen, and R. G. Lunche

AIR POLLUTION FROM AIRCRAFT IN LOS ANGELES COUNTY - A REPORT OF THE ENGINEERING DIVISION, DEC. 1965. 90th Congress. pp. 248-61. ("Air Pollution-1967, Part I (Automotive Air Pollution)" Senate Committee on Public Works, Washington, D. C., Subcommittee on Air and Water Pollution, Feb. 13-14, 20-21, 1967.

The amount of air contaminants emitted into the atmosphere of Los Angeles County as the result of the operation of aircraft was surveyed. The emissions from aircraft with which the District is concerned are those occurring below 3,500 feet altitude and within the geographical boundaries of Los Angeles County. This altitude (3,500 feet) is used as a parameter for the mixing height below which atmospheric dispersion of pollution is inadequate. Observations were made from airport control towers to establish the average time duration of the various operational flight phases for different types of aircraft. These phases are: (1) Taxiing from the terminal to the end of the runway and idling while awaiting clearance from the control tower; (2) Take-off and climb-out through 3,500 feet altitude; (3) Descent from 3,500 feet altitude to touchdown on the runway; and (4) Taxiing from touchdown to the unloading terminal. In observing the departure phase, radio contact was maintained with the pilot in order to learn when the aircraft had climbed-out to 3,500 feet altitude. The distance in miles from the airport when the aircraft was at 3,500 feet altitude was established by radar for both arrival and departure. In the arrival phase, the pilot notified the control tower as the aircraft descended downward through 3,500 feet altitude. It was thus possible to determine the average elapsed time for an aircraft to travel from take-off to 3,500 feet altitude, and from 3,500 feet altitude to touchdown on the runway. Emission factors were then applied.##

06039

K. J. Springer

INVESTIGATION OF DIESEL POWERED VEHICLE ODOR AND SMOKE - PART 2
(MONTHLY PROGRESS REPT. NO. 4, APR. 15, - MAY 15, 1967).
Southwest Research Inst., San Antonio, Tex., Vehicle
Emissions Research Lab. (May 26, 1967) 12p.

Studies of the effect of engine derating on exhaust smoke and odor are in progress. The 6-month fleet test of a smoke suppressant additive, which began on April 1, is continuing. Preparations for the evaluation of the three types of catalytic mufflers for use with two-cycle powered buses are nearing completion. Preliminary studies are under way to establish the feasibility in the laboratory of relating an instrumental odor measurement method with the human odor panel.##

06055

HEALTH PROBLEMS RESULTING FROM PROLONGED EXPOSURE TO AIR
POLLUTION IN DIESEL BUS GARAGES. Ind. Health (Japan) 4(1):
1-10 (1966).

An environmental and a health survey of two diesel bus garages in Alexandria (Egypt) have shown an air pollution problem due to the exhaust of engines containing SO₂, NO₂, aldehydes and hydrocarbons within permissible levels and a relatively higher concentration of smoke. The examination of workers revealed the occurrence of upper respiratory tract disease, chronic bronchitis,

asthma, peptic ulcer, gastritis, and high blood pressure in prevalences higher than expected. Respiratory diseases were probably due to a synergistic effect of smoke and irritants as well as the presence of acrolein and adsorbed hydrocarbons and the smoking habits of workers. Cases of chronic dyspepsia and peptic ulcers were probably related to the nervous tension of night shifts, and other factors as the irregularity of meals and the probable swallowing of dissolved irritants. The blood pressure was relatively "higher" among night shift workers. (Authors' abstract, modified)##

06086

R. L. Stenburg, R. R. Horsley, R. A. Herrick, A. H. Rose, Jr.

EFFECTS OF DESIGN AND FUEL MOISTURE ON INCINERATOR EFFLUENTS. J. Air Pollution Control Assoc. 10 (2), 114-20 (Apr. 1960). (Presented at the 52nd Annual Meeting, Air Pollution Control Association, Los Angeles, Calif., June 21-26, 1959.)

Tests were made to determine the effects of fuel moisture content on pollutant emissions from an experimental incinerator of fixed dimensions while varying (1) the amount and distribution of combustion air, and (2) the burning rate as measured by the amount of fuel charged per hour. Overfire combustion air was introduced into the front of the ignition chamber at the grate level, and swept the surface of the burning fuel bed. Underfire air entered through the ash pit and passed up through the fuel bed. Secondary air was introduced through a duct built into the top of the bridge-wall and was discharged through a series of ports opening into the top of the mixing chamber. Dry components of the fuel include equal parts, by weight, of newspaper and corrugated cardboard, mixed in a ratio of three to one with wood chips. Chopped potatoes were substituted for leafy vegetables as the wet component because of their year-round availability. Five-pound charges were prepared with the wet-to-dry components adjusted to provide a fuel with an average moisture content of either 25 or 50%. Particulate, oxides of nitrogen, hydrocarbons, carbon monoxide, and smoke were measured. Because of the basic physical and chemical laws involved, factors demonstrated by this study as affecting the increase or decrease of air pollutants should be the same as those affecting production of pollutants from larger scale incinerators.##

06104

Swartz, D. J., K. W. Wilson and W. J. King

MERITS OF LIQUEFIED PETROLEUM GAS FUEL FOR AUTOMOTIVE AIR POLLUTION ABATEMENT J. Air Pollution Control Assoc. 13 (4), 154-9 (April 1963). (Presented at the 54th Annual Meeting, Air Pollution Control Association, New York City, June 11-15, 1961.)

The purpose of this investigation is to establish trends and to present some material which could be both interesting and revealing as regards the use of LPG as a motor fuel. Particular emphasis is directed towards its potential for reducing atmospheric air pollution. A major result of this investigation is to provide new data emphasizing the striking differences in the composition of exhaust gas from similar engines operating on Liquefied Petroleum Gas fuel as contrasted with their operation on gasoline. Tests show that in the case of LPG exhaust there are essentially no heavy hydrocarbons (C₄ or greater) present. Since the olefins are the worst offenders as regards smog formation from gasoline exhaust, the absence of heavy olefins in LPG exhaust suggests the possibility of a significant reduction in automotive smog if enough vehicles in a given area use LPG fuel. The scaled fuel system offers an additional advantage by eliminating the evaporation of fuel to the atmosphere, which is currently a source of added expense to the motorist as well as adding to the total amount of air pollution from cars.

06108

Hoffman, D. and E. L. Wynder

STUDIES ON GASOLINE ENGINE EXHAUST. J. Air Pollution Control Assoc. 13(7), 322-7 (July 1963). (Presented at the 55th Annual Meeting, Air Pollution Control Association, Chicago, Ill., May 20-24, 1962.)

Results of the chemical analysis of exhaust gas of a gasoline engine under city driving schedule and road load are presented. Various carcinogenic and noncarcinogenic hydrocarbons, as well as phenols and nitro compounds, were isolated and identified. A benzene extract of the exhaust gas particulate phase and condensate was applied in five different concentrations to mouse skin. An attempt has been made to explain the observed development of papillomas and carcinomas in terms of its chemical constituents. The analyses of various standard runs with different fuels were reported and the possibility of the most pertinent precursors for phenols and aromatic hydrocarbons are discussed. Caution must be used in regard to the interpretation of these findings in respect to their effect on man. (Authors' summary)

06280

Folke Hedlund, Gustav Ekberg, Sten Erik Mortstedt

DIESEL EXHAUST GASES. INVESTIGATION WITH PROPOSALS FOR ACTION. (Communications Dept., Stockholm, Sweden, Guidance Group Concerning Development Work in the Field of Motor

Vehicle Exhaust Gas, Sept. 1967. Translated from Swedish. Joint Publications Research Service R-8943-D, 74p., Dec. 12, 1967. 27 refs.

Diesel exhaust emissions and methods of controlling these emissions in Sweden are reviewed. The diesel engine differs from the gasoline engine in several respects, which have a decisive influence on the pollution it emits. It uses a fuel that is less volatile than gasoline. It normally works with a higher excess of air (leaner mixture) and the devices for feed and ignition of the fuel are quite different. Due to the discharge by individual vehicles of dense smoke and by the discharge of foul-smelling substances they have been pointed out by the public as qualified air polluters. Poor maintenance of the engine or intentionally wrong pump adjustments can result in the giving off of such dense smoke that this can constitute a hazard for overtaking vehicles due to impaired or obscured visibility. Diesel engines can give off various types of smoke. One type is the heavy load smoke, which arises through load on a hot engine. Exhaust gases from diesel vehicles, especially under certain driving conditions, contain substances that are irritating to eyes, nose and throat. These include: oxides of nitrogen, hydrocarbons, polycyclic aromatic hydrocarbons, carbon monoxide and sulfur dioxide. The smoke from a diesel engine can be limited by various measures, undertaken on the engine or the fuel pump, the fuel, and finally on the exhaust gases. Regular maintenance of the engine is necessary to keep the smoke values at the lowest possible level. Current and proposed regulation of diesel exhaust emissions are discussed.##

06299L

Bureau of Mines, Pittsburgh, Pa., Coal Research Center
pp. 51-61 (1966).

FLAME CHARACTERISTICS CAUSING AIR POLLUTION. (SECTION VI OF AIR POLLUTION RESEARCH PROGRESS REPORT FOR QUARTER ENDED DECEMBER 31, 1966.)

A study is in progress of the factors that lead to or limit emission of oxides of nitrogen, carbon monoxide, and light hydrocarbons by gas appliances, such as space heaters and hot water heaters. The separate and combined effect of thermally or chemically perturbing the combustion gases above primary flames of lean, stoichiometric, and rich propane-air mixtures are being determined theoretically and also experimentally by means of factorial experiments. Concentrations of oxides of nitrogen with and without flue gas were determined at sampling stations at the top of the primary flames and concentration of oxides of nitrogen was reduced by the addition of either of two simulated flue gases. Flue gas A (containing no air) was more effective in reducing the concentration of oxides of nitrogen than flue gas B (containing air). The data also indicate that for most of the flames with or without flue gas the major increase in concentration of oxides of nitrogen occurred within about the first inch above the primary flames. The effect of addition of flue gas on concentration of hydrocarbons was measured at the top of the primary combustion zone. Hydrocarbons occurred at the edge of all flames when a flue gas was added. Since the addition of flue gas caused partial flame lift it is

possible that some of the initial hydrocarbon plus other hydrocarbons formed from it may be escaping through the dead space between the burner grid and the base of the flame. (Author's summary, modified)##

06300L

CHARACTERISTICS AND PHOTOCHEMICAL REACTIVITY OF VEHICULAR EMISSIONS. (Section VII of air pollution research progress report for quarter ended December 31, 1966.) Bureau of Mines, Pittsburgh, Pa., Coal Research Center, 1966, pp. BM/63-BM/67.

The effects of halogens, SO₂, and humidity on reactivity of a standard ethylene plus NO plus air mixture were studied. The results showed no effects on the system's chemical reactivity as a result of the presence of halogen and SO₂; the ozone meter's response to oxidant and NO₂, however, was reduced in the presence of SO₂. Humidity was found to interfere with the chemical processes in a way that affected significantly the reactivity-measurement results. Further studies on background reactivity in the irradiation chamber showed that the background oxidant formation result of photochemical reactions involving NO_x and hydrocarbon at extremely low concentrations. (Author summary)##

06350

California State Dept. of Public Health, Berkeley, Bureau of Air Sanitation. (Sept. 1, 1965). 8pp.

CONSIDERATION OF EMISSION STANDARDS FOR EXHAUST HYDROCARBONS IN TERMS OF QUANTITY (PRELIMINARY REPORT.)

The quantity of exhaust contaminants emitted from motor vehicles is proportional to the product of contaminant concentration and exhaust volume (which in turn is proportional to fuel consumption); a concentration standard essentially allows quantity of emissions from individual vehicles proportional to fuel consumption. By requiring the same concentration of contaminants to be emitted by all vehicles, the concentration standards are perhaps more restrictive to small cars. For this reason, it has been suggested that standards based on quantity would be more equitable. Summarized in this report are data on contaminant concentration in exhaust, and exhaust volume flow rates for vehicles classified according to engine displacement. There is no simple relationship between engine size and quantity of hydrocarbon, carbon monoxide and oxides of nitrogen emitted. Quantity emissions of hydrocarbon from all classes of vehicles fall within a narrow range, whereas those of carbon monoxide and oxides of nitrogen vary markedly from class to class. Exhaust hydrocarbon concentration measured on one group of 50 Class A cars (displacement less than 140 cu in) had a range of 2840 ppm; the smallest value was 440 ppm while the largest was 3180 ppm. Similar variations also exist in the data for other classes of vehicles. The exhaust flow rates are lower in smaller displacement engines. The exhaust flow rates, as well as the fuel consumption rates were determined from testing vehicles on a seven-mode dynamometer cycle. Exhaust

flow rates might be expected to be closely proportional to fuel consumption rates. However, the relative exhaust flow rates between classes do not follow closely the relative fuel consumption rates, although similar trends are apparent. The difference may be due to an insufficient number of cars tested for exhaust volume.##

06488

Squires, Arthur M.

CLEAN-FUEL POWER CYCLES. American Society of Mechanical Engineers, New York, 67-WA/PWR-3, 16p., 1967. 58 refs. (Presented at the Winter Annual Meeting, American Society of Mechanical Engineers, Pittsburgh, Pa., Nov. 12-17, 1967.

A number of supercharged-boiler power cycles are surveyed which are regarded as especially suited for use with clean fuels, i.e., fuels which are dust-free and sulfur-free. The cycles are intended for use in "clean power" systems, which offer the prospect that power can be generated not only without discharge of objectionable atmospheric pollutants but also more cheaply. In such systems, dirty fuels would first be converted to a clean fuel gas by processes which recover elemental sulfur for the market, and the clean gas would be committed to an advanced power cycle engineered for clean fuel and affording higher efficiency. The cycles have in common the feature that an unusually large amount of superheat is added to the steam, so that steam exhausts from an expansion in a highly superheated condition. The exhaust is preferably at atmospheric pressure or above. The superheated steam is cooled against boiler feed water, and is then sent to a low-temperature power-recovery step. In some cycles, high-level heat is added indirectly by heat exchange from flue gases at high pressure. In others, high-level heat is added to the steam directly in the form of products of combustion of a clean fuel either with air or with oxygen provided by an improved version of the historic Brin process. Heat rates are given postulating methane as fuel, with steam at 2,400 psia, indirect additions of heat limited to 1200 F, and direct additions of heat limited to 1500 F. Detailed economic evaluations of the several cycles are not yet available, and only qualitative statements can now be made concerning their probable relative worth. (Author's abstract)##

06791

P. Lemaigre

AIR POLLUTION BY MOTOR VEHICLES. LA POLLUTION DE l'Air par les Vehicules Automobiles. Pollut Atmos (Paris) 8, (32) 439-82, Dec. 1966. Fr.

A general review is presented of the air pollution caused by motor vehicles. The known facts and the current research on air pollution is presented on the basis of papers given before the Strasbourg Conference in June of 1964. The various polluting agents are considered and the control measures which involve the fuels and the engines are described. Recent work carried out in both France and the United States is discussed with the differences between the motor traffic conditions taken into account. French legislation is

discussed emphasizing the importance of proper engine maintenance in air pollution control. The results of proper carburetor adjustment during idling are a good example of a simple method of control. It is concluded that the eventual solution will not be easy. The necessity of preserving "green areas" as method of air pollution control is brought out since these plots have a considerable absorbent role.##

06808

G. Scassellati-Sforzolini

TOBACCO SMOKE IN AN ENCLOSED SPACE. Il Fumo di Tabacco Negli Ambienti Confinati. Fumi Polveri (Milan) 7 (2-3), 38-41 (Mar. 1967) It.

The amount of polycyclic aromatic hydrocarbons present in cigarette smoke as well as the amount of tar and nicotine present in filtered and unfiltered cigarette smoke (the part inhaled and the part in the surrounding air) was investigated. For the smoke parameters, the following standards were used: length of stub, 23 mm; period of inhalation, 2 sec; intermittence period, 60 sec; volume inhaled, 35 ml. The method used to determine the amount of polycyclic hydrocarbons present was based on chemical treatment of the liquid through which smoke was bubbled, then separation of alumina and silica gel columns, followed by spectrophotometric analysis of the eluates. The following hydrocarbons were obtained in the smoke inhaled and in the smoke in the ambient air, respectively: Anthracene - 4.85, 5.40 - gamma/100 cigarettes; Pyrene - 4.56, 1.88 - gamma/100 cigarettes; 3/4-Benzopyrene - 2.99, 0.38 - gamma/100 cigarettes. Chloroform extraction was used in the determination of the tar content. The nicotine content was determined by distilling the acetic extract after addition of 30% NaOH. The results indicate that the amount of tar and nicotine is greater in the ambient smoke than in the inhaled smoke. Among the Italian cigarettes studied, those with filters showed higher tar and nicotine content than the non-filtered cigarettes.##

06950

Liebhafsky, H. A.

FUEL CELLS AND FUEL BATTERIES--AN ENGINEERING VIEW. IEEE (Inst. Elec. Electron. Engrs.) Spectrum, 3(12):48-56, Dec. 1966. 9 refs.

Fuel cells electrically connected (in series, parallel or series-parallel) make fuel batteries. Fuel cells should react conventional fuels (by which is meant the fossil fuels and substances readily derived therefrom) electrochemically with oxygen, preferably from air. A fuel cell, therefore, is an electrochemical cell in which energy from such a reaction is converted directly and usually into low-voltage dc energy. Fuel batteries are discussed in terms of the various types of fuels, efficiency, reliability, life, and operating temperatures. All of these properties are tied in with the important consideration of economics.##

Rosen, A.A., R. T. Skeel, and M. B. Ettinger

RELATIONSHIP OF RIVER WATER ODOR TO SPECIFIC ORGANIC CONTAMINANTS. J. Water Pollution Control Federation (Presented at the 35th Annual Meeting, Water Pollution Control Federation, Toronto, Canada, Oct. 7-11, 1962.) 35(6):777-782, June, 1963.

The results of odor tests conducted in conjunction with a study of organic contaminants in the Kanawha River at (itro, West Virginia are reported. A major part of the odor of the river can be ascribed to 11 organic chemical compounds that were identified and measured. Naphthalene, Tetralin, Styrene, Acetophenone, Ethyl benzene, Bis(2-chloro-isopropyl) ether, 2-Ethyl hexanol, Bis(2-chloroethyl)ether, Di-isobutyl carbinol, Phenyl methyl carbinol and 2-Methyl-5-ethyl pyridine. Threshold odor concentrations for each of these compounds were determined from the responses of an odor panel. A mixture of all the identified pollutants, in the same proportions as found in the river, was shown to contribute nearly twice the amount of odor that can be calculated on the basis of the sum of the individual contributions. Thus, it was indicated that odor synergism plays its role as effectively in polluted streams as in the simulated instances tested in the laboratory.##

E. C. Larson and H. E. Sipple

LOS ANGELES RULE 66 AND EXEMPT SOLVENTS. J. Paint Technol. 39(508):258-264 (May 1967). (Presented at the Los Angeles Society for Coatings Technology, Calif., Oct. 12, 1966; at the Golden Gate Society, San Francisco, Calif., Oct. 17, 1966; and at the Portland, Seattle, and Vancouver Sections of the Pacific Northwest Society, Washington, Oct. 19, 20, and 21, 1966.)

The implications of Rule 66 of the Los Angeles County Air Pollution Control District, which controls the emissions of volatile organic solvents, are reviewed for their effect on the paint industry. The various provisions of Rule 66 are discussed to illustrate the desirability of using exempt solvents. Saturated hydrocarbons (iso, normal, and cycloparaffins), alcohols, esters, ether-alcohols, and non-branched ketones are entirely exempt. The exempt limits for photochemical reactive materials are as follows: olefins - 5%, C8 plus aromatics - 8%, and toluene, ethylbenzene, branched ketones, and trichloroethylene - 20%. With mixtures of these photochemical reactives the total allowable amount is 20%. The problem facing the paint industry is the replacement of the aromatic solvents which are good solvents, but are photochemically reactive. (igh solvency naphthenic base stocks will help offset the solvency of the displaced aromatics for the long oil alkyds and many medium oil alkyds. Small quantities of non-exempt solvents can be used provided the escaping vapors are condensed or burned efficiently. The General Services Administration has asked for a revision of all their purchasing specifications to conform to Rule 66.##

07214

Bethge, Per Olof and Lalla Ehrenborg

IDENTIFICATION OF VOLATILE COMPOUNDS IN KRAFT MILL EMISSIONS.
Svensk Papperstid. (Stockholm), 70(10):347-350, May 31, 1967.
3 refs.

Identification of compounds contributing to the odour from kraft mills was accomplished by gas chromatography, and in some cases in combination with mass spectrometry. Attention was centered on the most volatile compounds. Besides seven terpenes, 25 compounds were identified.**

07223

E. Fiala and E. G. Zeschmann

THE EXHAUST GAS PROBLEM OF MOTOR VEHICLES. (Part 1). Zum Abgasproblem der Strassenfahrzeuge. (Teil 1). Automobiltech. Z. (Stuttgart) 67(9), 302-8 (Sept. 1965). (Ger.)

The various pollutants in exhaust gases and their origins are reviewed. The effects of mixing ratios, lubricants, evaporation from tanks and possibilities for reducing the amounts of harmful emissions are discussed. Among other measures, fuel injection and catalytic afterburners are mentioned. The exploration of new forms of energy storage and conversion are discussed. Fuel cells, and primary and secondary batteries are discussed. As a criterion kg/hp, is used.**

07230

K. Horn

(AIR POLLUTING FUELS FROM THE VIEW POINT OF HEALTH PROTECTION OF THE POPULATION IN RESIDENTIAL AREAS.) Luftverschmutzende Energieträger unter dem Aspekt des Gesundheitsschutzes der Bevölkerung in Wohngebieten. Z. Ges. Hyg. Grenzq. (Berlin) 13 (1), 30-4 (Jan. 1967). (Ger.)

A survey of the carriers of thermal energy specific for Germany, particularly considering solid fuels on the brown coal basis, is presented. A study was made of the effect of these household fuels on air pollution throughout Germany. Frequently, the maximum allowable concentrations of pollutants, especially SO₂, are exceeded. The importance of ashes, sulfur compounds, nitric oxides, and benzopyrene as pollutants is emphasized. Epidemiological studies show the existence of correlations between high concentrations of air pollution and occurrence of diseases of the upper respiratory tract. The possibility of changing to a distant heat supply by block heating stations or long-distance heating stations is discussed. The type of fuel is of considerable importance. Values for maximum allowable concentration should be strictly adhered to by technical planners. (Author's summary, modified)**

Gorelova, D. N. and P. P. Dikun

THE DETECTION OF 3,4 BENZPYRENE IN SOME SPECIES OF SMOKED FISH. (FLUORESCENCE-SPECTRAL ANALYSIS). Text in Russian. Vopr. Onkol., 4(4):398-405, 1958. 7 refs. Engl. transl. by B. S. Levine, U.S.S.R. Lit. on Air Pollut. & Relat. Occup. Dis., Vol. 2, p. 126-134, March 1960.
CFSTI TT60-21188

An investigation was made of the presence of 3,4-benzpyrene in smoked fish commonly used in the U.S.S.R. The fish were subjected to saponification. Chromatographic partitioning was made with a 50 g column of aluminum oxide. The unsaponifiable fraction dissolved in 30 - 50 ml of benzene was adsorbed by the aluminum oxide column. Smoke used for processing fish contained 3,4-benzpyrene, which, together with other substances contained in the smoke, was deposited on the walls of smokehouses and on the surface of the processed products. It was shown that 3,4-benzpyrene penetrated into the inner part of the fish; especially fish not covered with heavy fish scales, and split fish, in which the contact between the flesh of the fish and the smoke was direct. In the case of the sprat, smoked by the hot or cold processes, 33 to 38% of the total 3,4-benzpyrene contained in the fish penetrated into the flesh; in the case of the bream or split Rutilus, 26% of 3,4-benzpyrene penetrated into the flesh; and for the split Barbel up to 87% penetrated into the flesh. In cases of smoked whole bream, Rutilus, Pelecus and Chalcalburnus, which are covered with heavy scales, the 3,4-benzpyrene content of the flesh was many times less than its content in the same types of fish processed after splitting. The results of the investigation indicated that the content of 3,4-benzpyrene in smoked fish did not depend solely on the process by which it was smoked, whether cold or hot, or whether the smoke came from openly burned wood or from special smoke generators.**

07300

Dikun, P. P. and I. I. Nikberg

A STUDY OF AIR POLLUTION WITH 3,4-BENZPYRENE IN THE VICINITY OF AN OLD PITCH-COKE PLANT. Vopr. Onkol., 4(6):669-674, 1958. 6 refs. Translated from Russian by B. S. Levine, U.S.S.R. Lit. on Air Pollut. & Relat. Occup. Dis., Vol. 2, p. 135-140, March 1960.
CFSTI: TT60-21188

Analyses were made of three sets of samples collected in the area of the pitch-coke plant at different times, different distances, and in different directions from the plant: set 1 consisted of 6 samples of dust sweepings; set 2 consisted of 4 sedimentation dust samples, and set 3 consisted of 3 aspiration samples. A comparison of pollution before and after the plant was modernized shows that 3,4-benzpyrene content of sweepings collected between the inside and storm windows before the plant was modernized was 100 times greater than after the improvements were installed. (0.03 to 0.05% as against 0.0003%) Dust collected in 1955 from the bricks stored on the plant grounds contained 10 times as much 3,4-benzpyrene as the dust collected between the

windows in 1957 (0.003 to 0.009% against 0.0003%). The fact window pane washings gave negative or trace tests for 3,4-benzpyrene demonstrated the significant reduction in air pollution attained by the plant combustion modernization. This is further confirmed by a comparison of analyses of aspiration samples. After the introduction of the improvements aspiration samples of 15 to 45 cubic meter of air contained only traces of pollutants. Comparison of analytical results collected in 1958 with samples similarly collected in 1955 also shows a substantial reduction in total pollution (95, 370 and 820 mg per cubic meter in 1955 as against 2.5 mg in 1957) and in 3,4-benzpyrene (0.002, 0.005, 0.400 mg per cubic meter in 1955 as against 0.0004 mg in 1957). Thus, results of the 1957 investigation revealed that pollution of the air in the vicinity of the pitch-coke plant decreased sharply after the coke furnaces were modernized.##

07451

Scharf, P. B., B. B. Goshgarian, H. M. Nelson, and G. L. Hody

THE MEASUREMENT OF THE EXHAUST COMPOSITION OF SELECTED HELICOPTER ARMAMENT. Air Force Rocket Propulsion Lab., Edwards AFB, Calif. and Army Aeromed. Res. Unit, Fort Rucker, Ala., Proj. No. 3A0 2560 1A 819, Task No. 051, Rept. No. AFRPL-TR-67-203 and USAARU-67-10, 46p., June 1967. 4 refs.

A study of the exhaust composition of rapid fire machine guns and rockets has been conducted. Methods of analysis were evaluated and exhaust compositions for the 50 cal and 7.62mm machine gun and the 2.75" rocket were determined. A rapid scan infrared spectrophotometer was used for immediate examination of effluent gases in order to detect reactive species. The exhaust gases were analyzed at concentrations as high as 1000 times those present in helicopters to minimize the chance of missing any significant toxic product. A qualitative and quantitative analysis of gas phase and aerosol components is given. It may well be that the proportion of carbon monoxide in the exhaust is so high that permissible exposure times can be selected on the basis of its concentration alone while still limiting exposures to all other toxic materials to safe levels. However, significant amounts of nitrogen dioxide, ammonia, carbonyl sulfide, hydrogen cyanide, lead and copper were found.##

07546

J. G. Terrill, Jr., E. D. Harward, I. P. Leggett, Jr.

ENVIRONMENTAL ASPECTS OF NUCLEAR AND CONVENTIONAL POWER PLANTS. Ind. Med. Surg., 36(6):412-419, June 1967. 24 refs. (Presented at the 5th Inter-American Conference on Toxicology and Occupational Medicine, Miami, Fla., Aug. 1-4, 1966.)

Inherent difficulties in comparing the health risks of conventional and nuclear power plants are pointed out, and currently available data are presented. Efforts of the Public Health Service to establish the relative health risks of the power sources are indicated. There is a lack of accepted

standards for the permissible concentrations of nonradioactive elements in the environment and also a limited amount of data on the exact composition of the atmospheric radioactive releases from operating nuclear plants. In the year 2000, the U.S. power-generating capacity is expected to increase from the present 11×10 to the 15th power BTU/yr to 70×10 to the 15th power BTU/yr with the proportion of this capacity provided by nuclear power increasing from 1% in 1966 to 43% in 2000. The production of oxides of sulfur produced by a 1000 MWi power station when fired by coal, oil, or gas is given showing emission rates in million lb. per year of: 306 for coal; 116 for oil; and 0.027 for gas. The generation of electricity in the U.S. is responsible for 15.6 million tons of atmospheric pollutants per year. There are some radioactive materials such as 1.1 ppm of ^{238}U and 2.0 ppm of ^{232}Th in coal. The only case in which a nuclear plant might be close to requiring as much dilution air as a fossil fuel plant to meet the required conditions would be to prevent the contamination of milk by radioactive iodine. The Public Health Service plans to conduct a study of two oil-fired plants and two nuclear plants at the same site to evaluate the environmental release and effects from both types of plants with identical meteorological, hydrological, population, and topographic features.##

07561

Kaiser, E. R., J. Halitsky, M. B. Jacobs, and L. C. McCabe

PERFORMANCE OF A FLUE-FED INCINERATOR. J. Air Pollution Control Assoc., 9(2):85-91, Aug. 1959. 7 refs. (Presented at the 51st Annual Meeting, Air Pollution Control Assoc., Philadelphia, Pa., May 25-28, 1958.)

A limited survey of representative modes of operation and results of one flue-fed incinerator is reported. The tests were conducted to serve as a basis for comparison with future tests on identical incinerators with modifications to improve combustion and reduce air pollution. The incinerated refuse from a 128-apartment building was approximately 430 lb. a day. The flue-fed incinerator reduced the apartment refuse to about 37% of its original weight and to about 10% of its original volume. The bulk density of the refuse averaged 4.1 lb/cu ft. in the incinerator. The residue had a bulk density of 15.4 lb/cu ft. in the ash cans. The residue averaged 64% metal and glass, 12% ash, 16% combustible, and 8% moisture, excluding quench water. The air normally supplied to the furnace was 10 to 20 times the theoretical air necessary for complete combustion. The high excess air reduced the furnace temperatures and undoubtedly affected adversely the combustion of volatile matter and emission of fly ash. The infiltration air entering the flue through vents on the service doors and cracks averaged 35% more than entered the furnace. Sealing the vents reduced the infiltration air to the flue to 45% of the furnace air during the period of fast burning. The peak furnace temperatures varied from 970 to 1200 deg F. The emissions of particulate matter to the atmosphere via the flue gases ranged from 0.85 to 1.55% of the refuse weight. The weights of particulate matter ranged from 2.5 to 4.7 lb/1000 lb of furnace gas corrected to 12% CO_2 . The emission of eight noxious gases totaled 0.9 to 3.0 lb/100 lb refuse. The presence of additional unburned hydrocarbons in the flue gases was confirmed

by mass-spectrometer tests. The average odor concentrations ranged from 2.5 to 100 ASTM odor units. The incinerator had inherent features of design and operation that caused high emissions of particulate matter and unburned organic compounds. The charging of refuse during burning could contribute to the discharge of particulate matter. Suggested modifications to the conventional incinerator include control of the furnace air supply, better mixing of air and volatile products from the burning refuse in a zone of high temperature, new furnace designs to eliminate the necessity for hooking and raking the refuse and residue, and residue removal with minimum air flow.##

07570

Kireeva, I. S.

ATMOSPHERIC POLLUTION WITH 3,4-BENZOPYRENE IN THE VICINITY OF A COAL BRIQUET FACTORY. (O zagryaznenii atmosfernogo vozdukh 3,4-benzpirenom v raione briketnoi fabriki.) Text in Russian. Gigiena i Sanit., 30(7), July 1965. 9 refs. Engl. transl. by JPRS, Hyg. Sanit., 307):126-128, July 1967.
CFSTI: TT66-51033/3

An investigation was conducted of a large briquet factory which uses 11% coal pitch for the binding of coal fines, so that the 3,4-benzpyrene content in the coal briquets reaches 0.14%. The process of briqueting includes crushing bituminous coal and pitch, mixing them in a certain ratio, and molding the briquets. Determinations were made of the amounts of 3,4-benzpyrene in the gases discharged by the press shop, in the atmosphere, and in the dust falling at distances of 200 to 1000m from the factory. Tarry substances were extracted with pure nonfluorescent benzene and fractionated on a chromatographic column with an activated aluminum mixture. Identification of 3,4-benzpyrene was accomplished by comparing the fluorescence spectra of the individual fractions frozen in liquid nitrogen against the fluorescence spectrum of a standard 3,4-benzpyrene. The quantity of the latter was determined photoelectrically. Thus, 3,4-benzpyrene was found in all samples within the radius of 1 km from the factory, the concentration decreasing regularly with increasing distance from the factory. However, concentrations exceeded the control determinations made on the windward side (0.14--0.30 microgram/100 cu. m.) even at a distance of 1000 m. The results indicate the need to eliminate coal pitch from the technological process and introduce a new briqueting technology using noncarcinogenic grades of petroleum bitumens as the binder .*##

07593

Panel on Electrically Powered Vehicles

THE AUTOMOBILE AND AIR POLLUTION: A PROGRAM FOR PROGRESS.
Los Angeles County Air Pollution Control District, Calif.,
51p., Oct. 1967.
GPO: 0-278-482

Air pollution problems from the viewpoint of automotive transportation were studied in general and all possible alternatives to the current gasoline engine were investigated by

the Panel on Electrically Powered Vehicles. The Panel made sixteen recommendations for the Federal Government with respect to its role concerning air pollution resulting from automotive emissions. Technology and the control of automotive air pollution and the role of industry are also discussed.**

07596L

Styles, H. E., J. Verbos, and J. Lawther

PUBLIC HEALTH ASPECTS OF AIR POLLUTION FROM DIESEL VEHICLES. Preprint, London Transport, England; Transport Administration, Brussels, Belgium and Medical Research Council Air Pollution Research Unit, London, England, (46p.), 1966. 8 refs. (Paper No. WHO/AP/67.28.)

An indication of the nature of air pollutants which may result from the combustion of fuel, an explanation of the differences between petrol and diesel engines which give rise to the emission of exhaust products having different characteristics, and a comparison between the two types of engines in respect of their propensity to cause pollution of the atmosphere is presented. Evidence derived from medical investigations concerning possible health hazards arising from motor vehicle exhausts is reviewed. An indication is then given as to means whereby satisfactory operation of diesel engined vehicles may be achieved without production of objectionably smoky exhausts. There follows a description of the legislative procedure which one country (Belgium) has introduced in the interests of ensuring that vehicles are so operated as to ensure that they emit no unduly offensive exhaust products and, as an appendix, an outline is provided of measures taken by London Transport to prevent air pollution by diesel-engined public service vehicles. The fact that maladjustment or incorrect operation of a diesel engine almost inevitably leads to the production of an objectionably smoky exhaust has given rise to prejudice against the use of such engines in road vehicles and an ill-informed impression that the exhaust which they emit causes more serious atmospheric pollution than does the exhaust from petrol engines.**

07623

Larson, Gordon P., John C. Chipman, and Erwin K. Kauper

DISTRIBUTION AND EFFECTS OF AUTOMOTIVE EXHAUST GASES IN LOS ANGELES. In: Vehicle Emissions, SAE Tech. Progress Series, Vol. 6, Society of Automotive Engineers, New York, 1964. p. 7-16. 12 refs. (Presented at the Annual Meeting, Society of Automotive Engineers, Jan. 1955)

Hydrocarbons or gasoline vapors are known to be an important factor in producing several of the deleterious effects of smog, however, one question to be answered is whether or not the removal of hydrocarbons from all other sources in the community would relieve the burden on the air sufficiently to avoid any control measures on auto exhaust. The measurements of the quantity of hydrocarbons emitted by internal combustion engines another source of hydrocarbons contributing to the buildup were explored. The areas of exhaust gas concentration buildup were determined by a study of

Los Angeles traffic. Studies now clearly show that removal of all other sources of hydrocarbons from refineries and from the distribution of gasoline will not lower the concentration of hydrocarbons in downtown Los Angeles area and the north-central section of the County sufficiently to relieve the eye irritation, crop damage effects, and high ozone content of the air in those areas. The Air Pollution Control District recommends that engineering studies seeking to remove hydrocarbon vapors from exhaust gases should strive for a 90% overall removal under conditions of operation experienced in heavy traffic.

07625

Haas, G. C.

THE CALIFORNIA MOTOR VEHICLE EMISSION STANDARDS. In: Vehicle Emissions, SAE Tech. Progress Series, Vol. 6, Society of Automotive Engineers, New York, 1964, 39-44. 5 refs. (Presented at the National West Coast Meeting, Society of Automotive Engineers, Aug. 1960).

The legal and technical bases of the California standards are reviewed and the air pollution laws of California summarized. The evolution of air quality standards is described. The translation of air quality standards into motor vehicle emission standards is described along with a statement of the underlying assumptions concerning the relationship of the photochemical smog effects to the atmospheric concentrations of primary pollutants emitted to the atmosphere from motor vehicles and other sources. Driving cycles, analytical methods, evaluation of device warmup characteristics, and related problems are also discussed.

07626

Neerman, J. C., and G. H. Millar.

DETERMINATION AND HYDROCARBON EMISSION RATE BY CONTINUOUS AIRFLOW MEASUREMENT AND EXHAUST ANALYSIS. In: Vehicle Emissions, SAE Tech. Progress Series, Vol. 6, Society of Automotive Engineers, New York, 1964, 70-80. 36 refs. (Presented at the National West Coast Meeting, Society of Automotive Engineers, Aug. 1957.)

Two instruments developed as part of a program of portable instrumentation for measuring the emission of incompletely burned hydrocarbons in the exhaust of automotive vehicles on the road are described. The first instrument is an infrared interference filter photometer which measures and records the concentration of hydrocarbons in the exhaust by means of their optical absorption at 3.34 microns. The second instrument is a matrix flow meter developed to measure and record total engine air consumption in a moving vehicle operated in normal service. These two instruments used together will determine the rate of emission of exhaust gas components from vehicles operated in characteristic modes. The instrumentation is relatively portable, compact, simple to use, and adaptable to automobiles. (Authors' abstract, modified)

Way, Gilbert, and W. S. Fagley

FIELD SURVEY OF EXHAUST GAS COMPOSITION. In: Vehicle Emissions SAE Tech. Progress Series, Vol. 6, Society of Automotive Engineers, New York, 1964, 102-120. (Presented at the Annual Meeting, Society of Automotive Engineers, Jan. 1958.)

The operations and results of a comprehensive field survey conducted in Los Angeles are reported. The purpose was to measure exhaust emissions from a representative group of cars during operating conditions encountered in metropolitan driving. Two hundred and ninety-three cars were tested under a schedule of driving conditions which included a variety of accelerations, cruise speeds, decelerations, and idle. During the test cycle, exhaust gases were continuously analyzed by the Model 28 Liston-Becker spectrometer for CO, CO₂, and unburned hydrocarbons and by Model 15 Liston-Becker spectrometer for hydrocarbons. Airflow was measured continuously by the viscous airflow meter. Indications from these instruments were registered by a recording oscillograph. An oscillogram processor was used on location for developing the 10,000 ft of recordings taken during the test. Oxides of nitrogen were determined by analyses of grab samples taken during the acceleration and cruise cycles. A description is given of preparatory operations; survey operations including instrumentation, test procedure, test cycle, and supporting operations; data handling and calculations; and test results. Details and examples of calculations of results and confidence intervals, along with calibration charts for the instruments used are appended.

07632

Wentworth, J. T.

CARBURETOR EVAPORATION LOSSES In: Vehicle Emissions SAE Tech Progress Series, Vol. 6, Society of Automotive Engineers, New York, 1964, 146-156. 8 refs. of Automotive Engineers, Jan. 1958.)

An investigation was made of vapor losses from the carburetors of five 1956-1957 automobiles during both 'suburban' and 'city' driving. The test cars were selected to represent several different carburetor venting arrangements. Generally, carburetor losses were found to increase with increasing carburetor temperCarburetor vent design determined whether the vapor formed was vented to the atmosphere, where it contributed to odor and air pollution problems, or whether the vapor was consumed by the engine where it could cause engine roughness at idle, especially under high temperature conditions. (Author's abstract, modified)

07635

Hagen, D. F. and G. W. Holiday

THE EFFECTS OF ENGINE OPERATING AND DESIGN VARIABLES ON EXHAUST EMISSIONS. In: Vehicle Emissions, SAE Tech. Progress Series Vol. 6, Society of Automotive Engineers, New York, 1964, 206-223. 9 refs. (Presented at the Society of Automotive Engineers, National Automobile Week, March 1962.)

To determine the influence of engine variables on the composition of exhaust gas, engine dynamometer tests were conducted on single and multicylinder reciprocating engines. The following engine variables were investigated; air-fuel ratio, power output, engine speed, spark timing, exhaust back pressure, valve overlap, combustion chamber deposits, and intake manifold pressure. Hydrocarbon concentrations were found to be considerably affected by changes in air-fuel ratio, spark timing, intake manifold pressure. Hydrocarbon concentrations were found to be considerably affected by changes in air-fuel ratio, spark timing, intake manifold pressure, and combustion chamber deposits. Somewhat less change in hydrocarbon concentration was obtained by varying valve overlap and engine speed. Changes in engine power output and exhaust back pressure had little effect on hydrocarbon concentrations. Carbon monoxide concentrations were principally affected by changes in the air-fuel ratio. No other variables affected carbon monoxide concentration except where air-fuel ratio was indirectly influenced. The influence of changes in the variables on hydrocarbon and carbon monoxide emissions in pounds per hour was also determined. Vehicles were tested on the road and chassis dynamometer to investigate the effect of air-fuel ratio, spark timing, and valve overlap on hydrocarbon and carbon monoxide concentrations. Carburetion leaning, spark timing retardation, and reduction of valve overlap produced concentration reductions in line with those predicted from engine dynamometer studies. (Author' abstract)

07637

Nebel, G. J.

AUTOMOBILE EXHAUST GAS TREATMENT - AN INDUSTRY REPORT. In: Vehicle Emissions, SAE Tech. Progress Series, Vol. 6, Society of Automotive Engineers, New York, 1964. 269-273, 298. (Presented at the National West Coast Meeting, Society of Automotive Engineers, Aug. 1957.)

Various methods of treating automobile exhaust to remove hydrocarbons have been explored. Most of the usual gas-phase separation techniques were quickly rejected as impractical for automotive use. Only devices employing the principle of oxidation appear feasible. A number of experimental afterburners and catalytic converters have been tested, and their performance characteristics are briefly summarized. Experience to date has shown that exhaust treating devices will pose some special heat, noise, and design problems for the automotive engineer. (Author's abstract)

07638

Schaldenbrand, H., and J. H. Struck

DEVELOPMENT AND EVALUATION OF AUTOMOBILE EXHAUST CATALYTIC CONVERTER SYSTEMS. In: Vehicle Emissions, SAE Tech. Progress Series, Vol. 6, Society of Automotive Engineers, New York, 1964, 574-298. 14 refs. (Presented at the Society of Automotive Engineers, National Automobile Week, March, 1962.)

A program was conducted to determine the performance and catalyst life of the low temperature catalytic converter system. A program was also aimed at defining and resolving problems associated with the operation of this system on vehicles. Much of this work involved principles common to those encountered with any catalytic converter system. An engine dynamometer screen test was later devised and used to evaluate catalysts capable of oxidizing both hydrocarbons and carbon monoxide. Catalysts were selected from these tests for evaluation on vehicles. Tests of vehicle systems employing catalysts selected from the screening tests showed the systems to be inadequate from the standpoint of the catalysts maintaining oxidation performance for extended mileage. If a satisfactory catalyst can be found to improve the performance of the systems to an acceptable level, much work remains to be done to develop an acceptable catalytic converter system for vehicles. (Authors' abstract, modified)

07690

Cominelli, A.

AN EASILY CONTROLLABLE AIR POLLUTION SOURCE: NAPHTHA ENGINES. ((Una fonte di inquinamento atmosferico che e relativamente facile controllare: i motori a nafta.)) Text in Italian. Ann. Sanita Pubblica (Rome), 28(2):367-375, March-April 1967. 9 refs.

The exhaust from diesel engines (naphtha engines) in contrast to that from gasoline engines is not usually an important source of air pollution. When in good condition and operated properly it emits less toxic gases (CO and hydrocarbons) than a spark ignition engine. Atmospheric pollution from diesel engines depends to a large extent upon the driver as well as on the mechanical condition of the vehicle. Public education is needed and punitive action against offenders. Switzerland has established norms to prevent vehicular air pollution: rapid acceleration and deceleration must be avoided, overloading is forbidden, the vehicle must be frequently checked and kept in excellent working condition. Black exhaust fumes quickly identify an offending vehicle. Maximum permissible opacity for the exhaust fumes can be established by the use of opacimeters. The ideal opacimeter should be ruggedly made to withstand all road conditions and the 700 deg. C temperatures of the gases emitted, it should be easily installed and easily read on either a stationary vehicle or a moving one. The most frequently used types (Hartridge, UTAC, Bosch) and the advantages and disadvantages of each are discussed. Permissible values (Hartridge) are given for different types of vehicles. A schematic drawing is given of the Bosch opacimeter.

07844

Maga, J. A., H. Wong-Woo, and M. G. Mason

A STATUS REPORT ON MOTOR VEHICLE POLLUTION IN CALIFORNIA. J. Air Pollution Control Assoc., 17(7):435-438, July 1967.

The accomplishments to date indicates problems that exist, and the outlook for control are reviewed by analyzing emissions trends in four urban areas in the state. To illustrate the effect of the

current anticipated control efforts in California, six charts are presented showing the emission estimates in four areas from 1940 to 1980. A review of all the factors involved indicates that there is no simple and inexpensive solution to the complex problem of motor vehicle created air pollution. The problem has many aspects. It is legal, political, social, economical, and technological. The final solution must incorporate considerations for all these aspects. The motor vehicle control program in California has reduced emissions of hydrocarbons and carbon monoxide into the atmosphere. In spite of the increasing number of vehicles there has been a reversal in emission trends for the first time. If the goal of prewar air quality is to be achieved, there must be a high degree of emission control. Consequently, the program requires that effective systems be available, and that virtually no cars be exempt. Lack of efficiency control of some emissions, large numbers of cars uncontrolled, and deterioration in efficiency of control systems will lead to air quality poorer than that desired. Under the present program, which is oriented toward the installation of control systems on new cars, the reduction of contaminants emanating from motor vehicles will be gradual. In order to accomplish a rapid improvement, within a few years, exhaust emissions from all cars (new and used) must be controlled.##

07853

Plust, H. G.

FUEL CELLS: PRINCIPLE OF OPERATION, DESIGN AND PRESENT STATE OF THE ART IN FUEL CELL DEVELOPMENT. ((Die Brennstoffzellen: Wirkungsweise, Aufbau und Heutiger Entwicklungsstand der Brennstoffzellen.)) Neue Züricher Zeitung, Technol. Suppl. No. 133, Jan. 12, 1966. 4 refs. Engl. transl. no. J-1352, 13p., Dec. 22, 1966. Translated from German.
CFSTI, DDC: AD 805336

The fuel cell has achieved great progress in recent years. With the aid of this cell it is possible to convert the chemical energy of fuels directly into electrical energy without any limitation due to the so-called Carnot's degree of effectiveness. The present-day state of the art in fuel cell development is marked by the fact that for greater output (above 1 kW) only those fuel cells that operate on hydrogen as fuel and oxygen as oxydizer are sufficiently far developed in order to test them for practical applications. DC voltages of 700 volts could be achieved by placing such cells in series; however, it is customary to use batteries below 100 Volts. Performance weights of 10 to 45 kg/kW and performance volumes of 10 to 40 cu dm/kW are usually stated for these batteries. These data are reduced by the necessary accessories (control system, heat exchange, water removal, converter, etc.) which must first be developed and newly designed in many cases. It is possible to purchase a 1kW fuel cell for about 10,500 dollars.##

07925

Beighton, J.

THE SPECIAL INDUSTRIAL PROCESSES. Roy. Soc. Health J. (London). 87(4):215-218, July-Aug. 1967. 2 refs. (London)

The air pollution problems of a group of industries which produce: sulfuric acid, nitric acid, petroleum and petrochemicals, iron and steel, copper, aluminum, gas, ceramics and electric power are reviewed. The basic technical approach is to avoid the formation of the emission by design of the process, then to require the treatment of any unavoidable emission, and finally to require adequate dispersal of any residual amount which has to be discharged. The legislation is designed to compromise between safeguarding of public health and amenities and providing for a realistic acceptance with adequate control of special processes. Although the loss of gases in the manufacture of sulfuric acid is limited to 2% of the sulfur burned, the loss from a contact acid plant with a 500-ton-per-day capacity may be considerable so that chimney heights as high as 450 ft may be required. Acid mist from contact plants burning sulfur is a special problem as it is difficult to control and its occurrence is unpredictable. There are two nitric acid plants in Britain equipped with catalytic tail-gas reduction units which should solve the problem of brown nitrous fume emission to the air. The use of special flares is required to control H₂S and mercaptans emitted by oil refineries. In the steel industry the development of the Fuel-Oxygen-Scrap process is regarded as an alternative to the electric arc furnace. It is claimed that melting and refining can be carried out without exceeding a fume level of 0.05 grains per cu ft.##

07945

A. Parker

REDUCTION AND PROBLEMS OF AIR POLLUTION IN GREAT BRITAIN 1938 TO 1976. Roy Soc. Health J. (London), 87(4):204-209, July-Aug. 1967.

Air pollution from the use of fuels is discussed. 1938 was chosen as the beginning date because the 1939-1945 war caused a coal shortage. The smog of 1952, which killed 4,000 people in Greater London, stirred public opinion. The Clean Air Act of 1956 which resulted produced a marked reduction in smoke emission and an improvement in the fuel use efficiency. In spite of the decrease in the use of coal by railways, collieries, industrial processes, and domestic heating, there has been an overall increase since 1938. This increase is largely due to increased consumption by electrical powerplants. The total smoke production is down, but SO₂ produced by power-generating plants has increased five-fold since 1938 resulting in an increased SO₂ total in spite of reductions in other areas. There is no section in the Clean Air Act of 1956 for SO₂ control except one for chimney heights. The chief British complaint about transportation is the unnecessary black smoke from diesels. It is estimated that by 1976 the amount of smoke emitted will be reduced; SO₂ will not be any greater; and 'co and hydrocarbons from exhaust gases will be the same for the country as a whole. In the cities, the situation is such that the traffic could hardly be any worse, so that with main roads bypassing the center of towns, and more efficient engines, there may be an improvement on the busiest streets.##

07977

Conkle, J. R., W. E. Mabson, J. D. Adams, H. J. Zelt, and B. E. Welch

DETAILED STUDY OF CONTAMINANT PRODUCTION IN A SPACE CABIN SIMULATOR AT 760 MM. HG. USAF School of Aerospace Medicine, Brooks AFB, Tex., Aerospace Medical Div., Contract NASA R-89, Prog. 7930, Task 793002, SAM-TR-67-16, 142p., Feb. 1967. 18 refs. (Also: Aerospace Med., 38(5):491-499, May 1967.)

A 27-day experiment designed to determine man's contribution to trace contaminants in a sealed environment was conducted. The test cell used in this experiment was an advanced testing device for simulating manned spacecraft atmospheres. A total of 97 compounds were identified and quantified during the 27 days. Twenty-one compounds were noted only during the manned portion of the study. Direct analysis of the sealed environment was not adequate for this type of comprehensive survey. The use of cryogenic fractionation and concentration, however, did provide samples with sufficient concentration of contaminants for analysis by means of gas chromatography, infrared spectroscopy, and mass spectroscopy. Carbon monoxide was the only compound which was produced by man at such a rate that clearly would require removal in long-term scaled atmospheric system habitation. (Authors' abstract, modified)##

07979

L. G. Austin

FUEL CELLS: A REVIEW OF GOVERNMENT-SPONSORED RESEARCH, 1950-1964. North Carolina State Univ., Raleigh, Dept. of Chemical Engineering, NASA-SP-120, 439 p. 1967.

Fuel-cell investigations funded by Government agencies of the United States of America are reviewed. Primary Navy interest is in more buoyant submarines; Army interest concerns silent frontline power and more efficient use of fuel for motive power. Both services need silent, portable electric generators. The Air Force and NASA share the desire for minimum-weight spacepower systems. The Advanced Research Projects Agency of the Department of Defense considered direct energy conversion important enough to carry multimillion-dollar Project Lorraine for several years, which included sizable funds for fuel-cell work. In addition, the Atomic Energy Commission is looking into thermally regenerative fuel cells as possible adjuncts to nuclear power plants. The high fuel efficiency of fuel cells is a major advantage in vehicle propulsion. The fuel efficiency of military vehicles is probably no greater than 15 to 25 percent and a fuel cell unit with an efficiency of 50 percent would have a great impact on the logistics of fuel supply. Only cheap fuels with a high specific energy (Btu/lb or Btu/gal) can be considered. The powerplant must be efficient and capable of (-54 degrees C), and have reasonable weight and size. Electric motors have excellent overload capability and can be run at several times its continuous rated capacity for periods of minutes. Therefore, electric motors probably need only about one-fourth of the nominal rating of gasoline engine; e.g., 28

kilowatts to replace 150 bhp. Power densities of 2kw/cu ft and 22 W/lb for fuel cells have been cited as requirements for vehicle propulsion (assuming 60 percent efficiency), but could be too low by a factor of 3. (o present direct or indirect hydrocarbon fuel cells satisfy these requirements.##

08025

Conkle, James P.

CONTAMINANT STUDIES IN CLOSED ECOLOGICAL SYSTEMS AT THE SCHOOL OF AEROSPACE MEDICINE. In: Proc. 2nd Ann. Conference Atmospheric Contamination in Confined Spaces, 4 and 5 May 1966, Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio, Aerospace Medical Div., AMRL-TR-66-120, p. 31-50, Dec. 1966. 14 refs.
CFSTI, DDC: AD 646512

A 27-day experiment at 760 mm Hg (oxygen, 20%; nitrogen, 80%) was conducted to define the contaminants associated with human occupancy of a sealed environmental simulator. A second experiment of 56 days duration was performed to evaluate the suitability of a helium (30%) - oxygen (70%) atmosphere at 258 mm Hg. The atmospheres to which the four human subjects were exposed were analyzed for trace contaminants. A total of 105 compounds were detected. The concentration of these compounds remained below a level thought to cause a physiologic effect. Carbon monoxide and carbon dioxide were the only compounds which were produced by man at such a rate that clearly would require removal in long-term sealed atmospheric habitation.##

08033

J. V. Pustinger Jr., and F. N. Hodgson

IDENTIFICATION OF VOLATILE CONTAMINANTS OF SPACE CABIN MATERIALS. Monsanto Research Corp., Dayton, Ohio, Contract AF 33(615) - 3377, Proj. 6302, Task 630202, AMRL-TR-67-58, 164p., June 1967.
CFSTI, DDC: AD 658203

Ninety eight candidate materials for space cabin construction were tested to establish possible volatile gas-off and oxidation products. These materials could be potential cabin contaminants. Test conditions were designed to simulate the normal space cabin environment. After pretreatment at 0.1 torr and at 25 degrees C, candidate materials were stored in bench-scale simulators for 14 days at 68 degrees C, and for 30, 60, and 90 days at 25 degrees C, in a 5 psia oxygen atmosphere with 20-40% relative humidity. Individual components of the volatile contaminants were identified and the quantities evolved were estimated by gas chromatographic and mass spectrometric analyses. Paints and coatings, prepared immediately before testing, gave off considerable amounts of entrapped solvents. Lesser, but significant, amounts of contaminants result from oxidation and from hydrolysis. In some cases, larger increases in carbon monoxide levels were observed when the storage temperature was increased from 25 degrees C to 68 degrees C. In addition to the gas-off experiments, a cryogenic system for serial trapping of atmospheric contaminants was

constructed. Gas chromatographic and mass spectrometric analyses were performed on four samples of atmospheres from bio-environmental systems. (Authors' abstract, modified)##

08165

Nedogibchenko, M. K.

PRESENT DAY CONDITIONS OF ATMOSPHERIC AIR POLLUTION BY AUTOMOBILE EXHAUST GASES IN CITIES AND PROBLEMS OF ITS CONTROL. In: Survey of U.S.S.R. Literature on Air Pollution and Related Occupational Diseases. Translated from Russian by B. S. Levine. National Bureau of Standards, Washington, D. C., Inst. for Applied Tech., Vol. 3, p. 195-199, May 1960.

CFSTI: TT 60-21475

Air quality measurements in Russian cities indicated that carbon monoxide was the most important automotive exhaust pollutant. In Moscow, maximum concentrations of carbon monoxide reached 100 - 200 mg/cu m; in Leningrad 145 to 164 mg/cu m; in Saratov 20 to 60 mg/cu m; in Perm 40 to 60 mg/cu m, and in Ivanova 18 to 88 mg/cu m. In Sverdlovsk the lead content in the exhaust gases ranged between 0.069 to 3.70 mg/cu m, depending upon the make of the motor vehicle. Investigations in Moscow in connection with the utilization of ethylated gasoline by the passenger auto transport revealed only from 0.001 to 0.003 mg/cu m of lead in the street air. Investigations disclosed in auto transport exhaust gases the presence of a polycyclic hydrocarbon, 3, 4-benzpyrene, generated at the rate of 0.75 mg/min. According to most recent reports auto transport exhaust gases were polluting atmospheric air also with nitrogen oxides; the more incomplete was the gas combustion the greater was the quantity of formed carbon monoxide and less of nitrogen oxides were emitted into the air; vice versa, the more complete the gas combustion the less CO was formed and the more nitrogen oxides were discharged into the air. Next in importance to air pollution with carbon monoxide is air pollution with soot discharged in large quantities with automobile exhaust gases. The cause of this type of atmospheric air pollution lies in the unsatisfactory technical construction and mechanical and functional adjustment of the engines. The reduction of city air pollution caused by auto-transport exhaust gases should be carried out along the following basic lines: Improvement in the design of automobile motors and carburetors with a view to increasing degree of combustion and of gasoline utilization. Development of methods to render harmless exhaust gases emitted by auto-transport engines, preferably by oxidizing them to smaller non-harmful or less harmful molecules.##

08200

Gurinov, B. P.

THE EFFECT OF COMBUSTION METHOD AND OF FUEL TYPE ON THE CONTENT OF 3,4-BENZPYRENE IN SMOKE GLASS. Gigiena i Sanit., 23(12):6-9, 1958. 5 refs. Translated from Russian by B. S. Levine, U. S. S. R. Literature on Air Pollution and Related Occupational Diseases, Vol. 4, p. 260-264, Aug. 1960.

CFSTI: TT 60-21913

A study was made to determine the effect of different methods of fuel burning on the content of 3,4-benzpyrene in smoke gases. Methods of burning hard fuel differ in different plants; the pulverized and layer bed methods are examples of fuel burning methods most commonly in practice. Both methods of fuel burning were investigated. Dust samples were collected from boiler room smoke flues by an appropriate aspiration method. Two of the boilers burned coal from the vicinity of Moscow, one burned anthracite, and one burned peat. Analogous investigations in boiler rooms using oil as fuel showed that the process of oil burning liberated the greatest amount of carcinogenic substances. the method of layer or bed burning in non-mechanized furnaces produced considerably greater quantities of 3,4-benzpyrene than in mechanized furnaces; chamber burning of powdered fuel did not produce any carcinogenic substances in smoke discharges. It is recommended that boiler rooms using the bed or layer coal burning method should be equipped with mechanized furnaces; boiler rooms with non-mechanized furnaces should be replaced by central regional boiler rooms and heating centers.

08359

Feuerstein, D. L., J. F. Thomas, and D. L. Brink

MALODOROUS PRODUCTS FROM THE COMBUSTION OF KRAFT BLACK LIQUOR. I. PYROLYSIS AND COMBUSTION ASPECTS. TAPPI, 50(6):258-262, June 1967. 7 refs. (Presented at the 51st Annual Meeting of the Technical Association of the Pulp and Paper Industry, New York, N. Y., Feb. 21-24, 1966.)

The production of malodors is an undesirable side effect that has always been associated with the kraft pulping process. Such malodors may originate at six major points in the overall digestion and combined recovery (inorganic chemical and heat) and organic waste elimination processes. Based on information in the literature, these points may be listed in order of decreasing contribution to atmospheric pollution: the recovery furnace is the major source, followed by evaporators, digester, lime kiln, oxidation tower, and dissolving tank. In the present study it was assumed that the recovery furnace operation covers a wide spectrum, such as distillation and sublimation, pyrolysis, auto-oxidation, stoichiometric combustion, and quenching. It was found possible to carry single charges of spent reaction liquors sequentially through the various steps in the laboratory under controlled conditions as well as to quantitatively collect and analyze all products. The contributions from individual, simultaneously occurring processes within a furnace are thus being considered for the first time from the standpoint of air pollution. Several unique control possibilities have been indicated as a result of this work. Results of the work relating to combustion techniques and sample collection are contained in this paper. Analytical methods and a discussion of the results obtained are presented in the second paper of this series. (Authors' abstract)##

08373

'baum, Fritz and Wolfgang Steinbach

WASTE INCINERATION IN SMALL UNITS. Staub (English translation), 27(7):23-25, July 1967. 10 refs.

CFSTI: TT 67-51408/7

The incinerator investigated has a triple jacket combustion chamber, and is heated up and charged with dry paper waste. The CO and CO2 concentration was recorded by infrared gas analyzers. During charging, CO concentration rose rapidly to 0.4-0.6 vol.% then dropped gradually. CO2 concentration rose rapidly to 1.0 - 1.5 vol. percent, then dropped slowly. The CO and CO2 concentrations were as a rule much lower than with medium units. Measurements to determine the emission of solids were performed with a Strohlein instrument at the chimney end. The results yielded a solid concentration between 300 and 425 mg/ cu m. Large quantities of hydrocarbons were deposited on the measuring filters apart from solids, which gave an impression of a deceptively high dust emission. The strong hydrocarbon development was confirmed by observations and measurements. For a long time white-gray clouds were emitted from the chimney, causing noxious odors in the vicinity.

08376

Fiero, George W.

SOLVENTS, SMOG AND RULE 66. J. Am. Soc. Lubrication Engr., 23(11):448-458, Nov. 1967. 29 refs. (Presented at the 22nd ASLE Annual Meeting, Toronto, Canada, May 1-4, 1967.)

Solvents and cleaners evaporate into the air and some of them may become pollutants. Their quantity, however, is relatively small and their photochemical reactivity is relatively low. Since, however, certain solvents when tested in smog chambers at relatively high concentration (4ppm) do produce eye irritating products, their use is restricted in Los Angeles by Rule 66 and in the San Francisco Bay area by Regulation 3. These are discussed in detail. The topographical and meteorological characteristics of these locations are unique. Therefore, such restrictions should not be imposed in other localities until a thorough study is made to determine the extent, if any, which solvents may contribute to smog.

08390

H. E. Benson, C. L. Tsaros

CONVERSION OF FOSSIL FUELS TO UTILITY GAS. Am. Chem. Soc., Pittsburg, Pa., Div. Fuel Chem., Preprints, 9(2):104-113, 1965. 9 refs. (Presented at the 149th National Meeting, American Chemical Society, Division of Fuel Chemistry, Symposium on Fuel and Energy Economics, Detroit, Mich., April 4-9, 1965.)

Natural gas has nearly completely replaced the use of coal as a source of utility gas in the United States. The

production of gas from coal, shale, and distillate and residual oils is discussed in terms of conversion costs. The following processes for converting coal to gas are described in detail; (1) Lurgi gasification, (2) Hydrogasification, (3) Hydrogasification and the steam-iron process. The raw material costs and the plant investments for gas made by these processes are tabulated. Estimates of gas costs averaged for a 20-year period, indicate that with an improvement in coal gasification technology, it would be possible to decrease the cost of utility gas made from coal by \$0.43 per thousand cubic feet for a 90 x 106 BTU/Day plant. Next is described the process for the conversion of shale oil to gas. This can be accomplished by two means: (1) to hydrogenate the shale directly, (2) to retort the material first and then hydrogenate the shale oil. Process schemes are shown for these routes. The hydrogenation of the oil and the difficulties involved are described. A summary is given of: raw material requirements, plant investments and gas price. This shows that utility gas can be manufactured by the hydrogasification of oil shale at a reasonable cost. The most important process variable influencing the cost of utility gas is the hydrogen/shale ratio.##

08391

M. D. Schlesinger, G. U. Dinneen, S. Katell

CONVERSION OF FOSSIL FUELS TO LIQUID FUELS. Am. Chem. Soc., Pittsburgh, Pa., Div. Fuel Chem., Preprints, 9(2):120-126, 1965. 12 refs. (Presented at the 149th National Meeting, American Chemical Society, Division of Fuel Chemistry, Symposium on Fuel and Energy Economics, Detroit, Mich., April 4-9, 1965.)

Supplies of crude petroleum and natural gas, although abundant, are not inexhaustible, and provision is being made for the time when our vast coal and oil shale reserves will be called upon to supply a significant quantity of liquid fuels. The approach on coal research has been to continue theoretical and practical studies to reduce costs by improving stages in the process or by developing new processes. Studies were made in the following areas: coal hydrogenation, gas synthesis, oil shale retorting systems, and bituminous sands and other hydrocarbons. A flexible, integrated plant might emphasize production of different fuels or byproducts under different economic conditions and even at different times of the year. To reduce hydrogen requirements, an alternative is the partial conversion of coal whereby most of the hydrogen is utilized as a hydrocarbon product. The char product is used for generating power or making additional hydrogen by gasification. In recent years, oil shale research by the Bureau of Mines has been limited to small scale laboratory studies on refining analysis. The cost of producing gasoline from oil shale is almost competitive with gasoline from petroleum on the West Coast. One of the main problems is the isolated location of major deposits. The recent process developments discussed have added more to refined technology rather than to significant savings in cost. It has been amply demonstrated both in the United States and elsewhere in the world, that liquid fuels can be made from coal. Except in isolated cases, costs are too high for coal

to be a real contender with petroleum at current prices. Only by continued research will the remaining problems be solved.##

08393

John M. Ryan

UTILIZATION OF PETROLEUM AND PETROLEUM PRODUCTS. Am. Chem. Soc., Pittsburg, Pa., Div. Fuel Chem., Preprints, 9(2):223-230, 1965. 6 refs. (Presented at the 149th National Meeting, American Chemical Society, Division of Fuel Chemistry, Symposium on Fuel and Energy Economics, Detroit, Mich., April 4-9, 1965.)

In discussing utilization of petroleum, the existing or potential technology of oil consumption must be considered, also the effects of potential changes in supply and of new competitive forces. The demand for petroleum products in the U. S. will probably grow at a rate of 2 or 3 per cent a year. Abroad the annual growth rate will be perhaps twice as great as the rate in the U. S. 50% of all the oil consumed in the U. S. is used in the transportation sector. The growth rate will be limited by the growth of the market. General industry and power plant use constitute a second market, accounting for 7% of steam and electric power plant fuel, and 13% of the manufacturers' heat and power market. Another major market is residential and commercial consumption in which oil supplies about one third of the total energy consumed. Resources will not be a limiting factor either in the U. S. or the free world and there should be no significant shift in relative fuel prices in the foreseeable future. It is unlikely that oil demand will be increased appreciably in the U. S. through research in utilization. Research on improved exploratory and productive techniques will probably have a greater influence on domestic oil demand than will research on oil utilization. The changes in oil utilization which appear most probable will not alter the growth rate of oil demand in the U.S. so much as its composition. Finally, some research is being conducted today on the supposition that crude oil is in limited supply and hence that refined product prices are likely to rise in the near future relative to prices of competing fuels.##

08394

Daniel Parson

GAS UTILIZATION TODAY AND IN THE FUTURE. Am. Chem. Soc., Pittsburg, Pa., Div. Fuel Chem., Preprints, 9(2):231-241, 1965. (Presented at the 149th National Meeting, American Chemical Society, Division of Fuel Chemistry, Symposium on Fuel and Energy Economics, Detroit, Mich., April 4-9, 1965.)

A comprehensive picture is given of the current and future status of gas utilization in the United States. Economic problems which affect all phases of industry, from the wellhead to the consumer, are discussed. The research and technological challenges within the industry are examined.##

Loquercio, Peter

AIR POLLUTION CONTROL FOR SCREW MACHINE OPERATIONS. Factory, 125(9):163-164, Sept. 1967.

Generally there are three major sources of air pollution in screw machine operations: machining, finishing, and heat treating and quenching. The most common sources of pollution are the fumes created when cutting oils, lubricants and coolants break down during machining processes. Metal dust is the most significant pollutant in the finishing--grinding, polishing and buffing--phase. Two types of air pollutants can arise from heat treating; oil vapors from the quenching tanks, and toxic gases emitted from heat-treating furnaces under special atmospheres. Heat treating furnaces are suspected of emitting such toxic pollutants as cyanides, carbon monoxide, nitrogen, methane, and metallic oxides. Control equipment falls into several categories. For "particulates" or solids (metal dust) removal, dry and wet collectors are used. For general gaseous pollutants (oil vapors, toxic emissions), afterburners and absorbers may do the job.##

08486

Marchenko, E. N.

FUNDAMENTAL PROBLEMS OF INDUSTRIAL HYGIENE IN PROCESSING OF POLYFLUORETHYLENE RESINS. ((Osnovnye voprosy gigieny truda pri pererabotke ftoroplastov.)) Text in Russian. Gigiena Truda i Prof. Zabolevaniya (Moscow), 10(11):12-18, Nov. 1966. 9 refs.

A literature survey is presented on processes involved in the degradation of polyfluoroethylene resins. Studies of operating conditions during heat treatment of polyfluoroethylene showed that the atmosphere may be polluted with perfluoroisobutylene, tetrafluoroethylene, oxyfluorides, hydrogen fluoride, carbon monoxide, and polymer aerosols. A system of prophylactic measures has been developed which drastically reduces toxic air pollution. Heat processing of polyfluoroethylene resins requires the special attention of hygienists and engineers.##

08493

Shoji, Hikaru Takeo Yamamoto, Konosuke Nishida, Yoshimori Ishikawa, Sasuma Takada, and Kaori Inoue

STUDIES ON AIR POLLUTION OWING TO THE AUTOMOBILE EXHAUST GASES. THE CONCENTRATIONS OF C1-C6 HYDROCARBONS AND SOME INORGANIC GASES IN THE EXHAUST GASES. Text in Japanese. Japan. J. Hyg. (Tokyo), 22(2):341-353, June 1967. 34 refs.

The exhaust of an idling 1959 Datsun was analyzed, using gas chromatography. Fuel consumption rate, air-fuel ratio, exhaust gas temperature, intake air volume, emission gas volume and concentration of the exhausted components were measured under constant conditions (at 600 to 5,000 r.p.m.). Results, which are

abulated, were as follows: 1) Fuel consumption at 600 r.p.m. was 227 gm./ps. hr. and decreased with increasing revolutions. The volumetric efficiency of intake air-fuel mixtures was very low (31-51%) during idling. The air-fuel ratio was 10.4 at 600 r.p.m., while a lean fuel state was observed when rotation was over 2,500 r.p.m. 2) Temperature of the emitted gases (at the tail pipe) was 60-80 deg C from 600 to 1,500 r.p.m. Temperatures above 300 deg C were recorded at rotations above 4,000. 3) At 600 r.p.m., CO₂ content was found to be 2.1%. Maximum CO₂ level was observed at 3,000 to 4,000 r.p.m. The maximum concentration of CO (9.9%) was found at 600 r.p.m.; concentration decreased with increasing revolutions (4.4% at 5,000 r.p.m.). These results suggest that exhaust gases containing 10% CO would be discharged into the atmosphere when this car was stopped at an intersection. 4) In the exhaust gases, 25 kinds of short-chain hydrocarbons were identified: 3,645 p.p.m. total were determined at 600 r.p.m. and 689.9 p.p.m. at 4,000 r.p.m. relatively large proportions (5.5 to 23.7%) were found as methane ethane, n-butane, iso-butane, ethylene, and propylene. 5) The composition of exhaust gases averaged: paraffin, 62%; Olefin, 33%; diolefin, 0.4%; and acetylene, 5%. 6) The ratio of the emitted hydrocarbons to fuel was about .10 w/w at 600 r.p.m. and .03 at 4,000 r.p.m. Emission of the hydrocarbons during the idling was 1.79 gm./min. at 600 r.p.m. and 0.94 gm./min. at 3,500 r.p.m.##

08497

Hoffman, Heinz

EXHAUST GAS PROBLEMS WITH GASOLINE AND DIESEL ENGINES. II. DIESEL ENGINES. ((Abgasprobleme bei Otto- und Dieselmotoren. II. Dieselmotoren.)) Text in German. Erdoel Kohle (Hamburg), 20(9):644-648, Sept. 1967.

The various pollutants present in the smoke produced by diesel engines were measured and discussed. The results, illustrated in tables and graphs, show that CO emission is only 1/10 that allowed for gasoline engines and is therefore of minor importance. Aldehydes with their characteristic irritating odor are also produced in small quantities and are considered annoying, but medically unimportant. The nitrogen oxides, NO and NO₂, are produced in sufficiently large quantities to cause lack of oxygen in the blood, and inflammation of the respiratory tract. The antechamber motor produces fewer nitrogen oxides than the direct injection motor. Amount of SO₂ produced is negligible. 3,4-Benzopyrene is emitted in significant quantities when an engine emits a large quantity of smoke and then only if the motor is run under high pressure. As a control measure a reduction in smoke quantity is recommended. The smoke characteristics can also be greatly influenced by the design of the combustion chamber and proper maintenance of the engines.##

08524

Kapkaer, E. A., L. V. Trofimova, N. A. Evikeeva, and A. K. Monkevich

HYGIENIC EVALUATION OF SOME PETROCHEMICAL INDUSTRIES. ((Gigienicheskaya otsenka nekotorykh neftekhimiches-

kykh proizvodstv.) Text in Russian. Gigiena Truda i Prof. Zabolevaniya (Moscow), 10(11):22-28, Nov. 1966. 10 refs.

Deficiencies in planning and actual operation of petrochemical plants are responsible for the discharge of acetylene, polyethylene, phenol, acetone, methylstyrene, isoprene, divinyl and other toxic complexes which are products of decomposition, oxidation, and hydrolysis. Desorption of toxic substances from construction materials (concrete brick) plays an important part. The authors recommend methods for improving working conditions in petrochemical production facilities. (Authors' summary, modified)

08553

Coffman, Q. H.

SOUTHERN CALIFORNIA AEROSPACE INDUSTRY'S PROGRAM TO CONTROL SMOG PRODUCED BY CHEMICAL MILLING MASKANTS AND SHOP PROTECTIVE COATINGS. S.A.E. (Soc. Automotive Engrs.), Preprint 670816, 10p., 1967. (Presented at the Aeronautic & Space Engineering & Manufacturing Meeting, Los Angeles, Calif., Oct. 2-6, 1967.)

The materials, test criteria results, and conclusions for chemical milling maskants and hand-peelable shop protective coatings which comply with Rule 66 of the Los Angeles County Air Pollution Control District (APCD), and are used by the aerospace industry in Southern California are discussed. The maskants were evaluated to determine the material best suited under Rule 66 to perform chemical milling, and the shop protective coatings were evaluated to determine the material best suited for protecting metal surfaces during fabrication, adhesive bonding, and assembly operations. (Authors' abstract, modified)

08557

George, J. C. and G. R. Morris

AVAILABILITY AND EVALUATION OF NONPHOTOCHEMICALLY REACTIVE PRIMERS AND TOPCOATS FOR AEROSPACE APPLICATIONS. S.A.E. (Soc. Automotive Engrs.), Preprint 670814, 7p., 1967. (Presented at the Aeronautic & Space Engineering and Manufacturing Meeting, Los Angeles, Calif., Oct. 2-6, 1967.)

New coatings with low smog producing potential have been and are continuing to be evaluated for use in the aerospace industry. These new coatings have been proved in laboratory and shop testing to be equal in quality to the conventional coatings they are replacing. Environmental exposure tests to date are satisfactory and are continuing. However, difficulty has been encountered in obtaining consistent quality in large production batches. Some of the new coatings contain solvents that are slightly more toxic. Also, some of the modified coatings have lower flash points. These new materials, which include both proprietary and military coatings, appear to be readily available. Coating costs of the new materials generally are higher, but vary from a reduction of approximately 7 percent to an increase of 35 percent. (Authors' abstract)

08633

Cleary, Graham J.

AIR POLLUTION AND THE AUTOMOBILE. Clean Air (J. Clean Air Soc. Australia New Zealand) 1(1):7-9, 11, June 1967. 18 refs.

The magnitude and nature of the emissions from automobile engines are examined. Most of the pollution is discharged through the tail pipe (about 60 percent on a total hydrocarbon basis), but crankcase emissions (30 percent) are also appreciable. The remaining ten percent is made up of evaporation losses from the fuel tank and from the carburettor after the engine has stopped. Eye irritation, plant damage and cracking of tyre rubber have been found in communities heavily polluted by automobile exhaust products. Control measures to minimize pollution are considered. These involve burning the exhaust gases from the tail pipe by means of either thermal or catalytic afterburners, and recycling the vent gases from the crankcase to either the air manifold or the carburettor. Statistics about the current car population in Sydney and the anticipated future growth rate are presented, and an estimate is made of the future date (1998) when the volume of exhaust products in Sydney will be the same as that in Los Angeles in 1942, when conditions of smog were first experienced. (Author's abstract)

08802

Hoffmann, H.

THE COMPOSITION OF EXHAUST GASES FROM DIESEL MOTORS. ((Die Zusammensetzung der Auspuffgase bei Dieselmotoren.)) Text in German. Z. Praeventivmed. Vol. 11, p. 104-121, March-April 1966.

The smoke emission of different types of diesel motors was determined and the results presented in a series of graphs. Under full load little difference in smoke emission was observed between chambered engines and direct injection engines, while the latter were superior under partial load. The various factors in engine development which influence smoke emissions are discussed. The carbon monoxide, aldehyde, and nitrogen oxide content of the exhaust gas was determined and it was found that the CO content is of no concern in diesel motors, since the concentration is not over 0.1-0.15 Vol.% and in many cases below 0.05 Vol.%. The same is true for aldehydes whose odorous annoyance has a psychological but not medical effect at the emitted concentrations. The nitrogen oxide content was found to be higher with direct fuel injection engines. The amount of 3,4-benzopyrene emission is influenced by the fuel composition and the combustion system and is only of concern if the motor is operated under high mean pressure, when as much as 0.5 gamma benzopyrene in 500 liters of exhaust gas was found at 1200-1500 U/min. under 3/4 load. It is concluded that by proper construction and development and particularly by proper care of the engine, the smoke from modern diesel engines can be reduced to an unobjectionable amount.##

Conkle, J. P., W. E. Mabson, J. D. Adams, H. J. Zeff, and B. E. Welch

A DETAILED STUDY OF CONTAMINANTS PRODUCED BY MAN IN A SPACE CABIN SIMULATOR AT 760. MM. HG. School of Aerospace Medicine, Brooks AFB, Tex., Aerospace Medical Div., Contract NASA-R-89, Proj. 7930, Task 793002, 141p., March 1967. 18 refs.

CFSTI, DDC: AD 653932

The atmosphere within the space cabin simulator contained 20% oxygen and 80% nitrogen. The study was divided into three parts: a preliminary stabilization period of 2 days; an unmanned background period of 11 days; and a manned period of 14 days. The unmanned portion provided information as to the contaminant materials associated with the test cell, previous occupancy by man, and support items required during the subsequent manned portion. The four volunteer subjects were sustained on a liquid diet and were permitted limited hygienic activity during their occupancy of the test cell. Direct sampling and concentrating technics with subsequent analysis were utilized for contaminant detection. Dual flame-ionization gas chromatography and microwave spectrometry were used for the analysis of unconcentrated samples which were obtained directly from the chamber. Methane and carbon monoxide were analyzed by flame-ionization gas chromatography and infrared spectroscopy, respectively. To concentrate the sample, multistage cryogenic trapping systems were operated daily during the 27-day study. Four sample sets were analyzed daily. Rapid initial increases in methane and carbon monoxide were observed soon after man entered the test cell. The methane concentration increased from 20.9 mg./cu m the day after man entered the chamber to a high of 84.6 mg./cu m. The concentration of carbon monoxide ranged from a low of 4.8 mg./cu m to a high of 23.7 mg./cu m. No significant data relating to organic compounds were obtained from the analyses of unconcentrated samples during either portion of the study. Carbon monoxide and carbon dioxide were identified as compounds which were produced by man at a rate that would require removal in a closed system operation.##

08873

Frysinger, Galen R.

FUEL CELL-ENERGY STORAGE HYBRID SYSTEMS FOR VEHICLES. Preprint, Army Electronics Command, Fort Monmouth, N. J., Electronic Components Lab., 25 p., 1967.

CFSTI, DDC: AD 662236

So called vehicle battery problems can be overcome through the use of a fuel cell-battery hybrid power source. This power source allows an electric vehicle full range capability, excellent acceleration characteristics, and very fast energy refuel. To achieve such performance for military vehicles, a 150 Whr/lb molten electrolyte battery and a 20-30 lbs./KW hydrocarbon fuel cell must be developed. Research progress indicates that these goals should be achieved in operational hardware within the next five to ten years.

09023

Epstein, George and Edward F. Westlake, Jr.

MATERIALS FOR SPACE CABINS: THE FIRE HAZARD AND ATMOSPHERE CONTAMINANT CONTROL PROBLEMS. Aerospace Corp., El Segundo, Calif., Materials Science Lab., Contract F04695-67-C-0158, TR-0158(3250-20)-8, SAMSO-TR-67-76, 27 p., Oct. 1967. 3 refs.
CFSTI: AD 663418

The flammability and atmospheric contaminant hazards associated with the use of plastics and other nonmetallic materials in manned spacecraft cabins are discussed. Outgassing characteristics and mechanisms of typical materials are described. Flammability and combustion rates are discussed as highly important materials selection factors. An approach is presented for minimizing the hazards through judicious selection and batch control of cabin materials. (Authors' abstract, modified)##

09094

AIR POLLUTION -- A SPECIAL REPORT. Power, 48p., ((1967?)).

The results of research on each phase of air pollution are reviewed. The nature of this planet's atmosphere, its natural pollutants and the mechanics of their transport are outlined. The contribution to air pollution made by man as he lives and works is described. The effects of air pollution on man's social and economic existence are examined. Constructive approaches are given to help communities meet the challenge of air pollution control effectively and economically. It is shown how intelligent plant design and location can eliminate pollution problems from the start and then how problems of existing plants can be mitigated.##

09106

Asher, William J., Robert H. Shabaker, and Carl R. Heath

FUEL CELL FUEL STUDIES. (INTERIM TECHNICAL REPORT, 10 JANUARY 1967 - 9 JULY 1967). Esso Research and Engineering Co., Linden, N.J., Government Research Lab., Contract DA-44-009 AMC -1484(T), ITR-3, 65p., 1967. 12 refs.
DDC: AD 823 283

Research and development aimed at processes for field treatment of military fuels to make them suitable for fuel cells have continued. This program is divided into two tasks. Task A is directed to the development of a process for removing components in jet fuel which are harmful to fuel cell performance. Task B is concerned with the feasibility of liquid phase reforming to generate hydrogen fuel. In Task A, removal of naphthenes by dehydrogenation has proved difficult. Molecular sieve absorption processing can remove aromatics and sulfur or sulfur alone at an increase yield. Desorption of the impurities adsorbed on the sieve is the key to this process. A simple carbon dioxide desorption process was ineffective. A new carbon dioxide-air hybrid desorption process has shown promise in simulated operation.

The feasibility study on liquid phase reforming has been continued. High reaction rates equivalent to reforming catalyst requirements of 4 lb/kw with a H₂-air fuel cell have been obtained at 600 F using pure n-C₁₂ and n-C₁₅ hydrocarbon feeds. The reaction rates, declined with time on stream due to catalyst oxidation in the intermittent once-through experiments. The thermal efficiency of the system depends on the conversion level per pass required for good hydrogen selectivity. Adequate hydrogen selectivity has been obtained at conversion levels 100-fold higher than in the exploratory studies. Carbon monoxide and hydrocarbon fragments remain undetectable.##

09148

Heath, C. C., E. H. Okrent, M. Beltzer, and G. Ciprios

DIRECT HYDROCARBON AND METHANOL-AIR FUEL CELLS. In: Power Systems for Electric Vehicles. Public Health Service, Cincinnati, Ohio, National Center for Air Pollution Control, PHS-Pub-999-AP-37, p. 307-312, 1967. 3 refs. (Presented at the Symposium on Power Systems for Electric Vehicles, New York, N. Y., April 6-8, 1967.)

Research on direct liquid hydrocarbon and methanol-air fuel cells has identified some of the problems that must be solved before fuel cells can meet the specific requirements for an automotive power plant. The question of whether the fuel cell can reduce air pollution cannot be conclusively answered yet. Direct hydrocarbon cells, operating at temperatures below 500 degrees F, appear to offer no serious source of contamination. Studies have shown that hydrocarbons are completely consumed to carbon dioxide and water in sulfuric acid electrolytes at 90 degrees C. Fuel cell fuels will probably be sulfur and lead-free. Furthermore, the low temperatures should minimize nitrogen oxide formation. Hydrocarbon losses from manifolds and tanks may cause a problem, but using low vapor pressure fuels and proper engineering should minimize this contribution. No major obstacles to a low-emission vehicle are known, but clearly much more experience will be required to define pollution levels in operative systems. The present state of hydrocarbon fuel cell technology cannot meet the requirements of a high-output, low-cost system suitable for extensive vehicular application. Much progress has been made during the past five years. If this progress continues and suitable catalysts are developed, a fuel-cell-powered vehicle could become practical. However, much more research and development will be needed before this stage is reached.##

09224

McDonald, James E.

VISIBILITY REDUCTION DUE TO JET-EXHAUST CARBON PARTICLES. J. Appl. Meteorol., 1(3):391-390, Sept. 1962. 15 refs.

Pyrolysis of hydrocarbon fuels leads to emission of free carbon in the exhaust of aircraft turbojet engines, visible as a faint dark trail. Carbon formation rises markedly when water injection is employed to augment thrust by 20-30 per cent in takeoffs under

heavy loads or at high temperatures, the enhanced pyrolysis resulting from the lower combustion efficiency on such wet takeoffs. During the takeoff run, while the aircraft is still moving at low speeds but with maximum thrust, dense dark smoke fills the exhaust wake, reducing visual ranges to as little as a few hundred feet. To cross-check recent measurements indicating carbon particulate emissions of the order of 15 lb per ton of fuel consumed in wet takeoff, Mie extinction coefficients have been computed for carbon particles of the size known to form as a sequel to pyrolytic freeing of carbon. These are used to make theoretical estimates of the maximum visual range to be expected if the carbon loading measurements were correct. A discrepancy exists in the sense that the predicted visual ranges are found to be some five times larger than the observed. It is concluded that a large fraction of total carbon emission leaves the tailpipe still unaggregated into large soot particles, whence the reported carbon loadings may be too low by a factor of as much as five. Consequently the aircraft operational hazards as well as the air pollution problems implicit in rising volume of jet traffic at certain terminals may become rather more serious than has been predicted. (Author's abstract)

09331

Miles L. Brubacher. Eric P. Grant

DO EXHAUST CONTROLS REALLY WORK? - SECOND REPORT. Preprint, Society of Automotive Engineers, 10p., 1968. 12 refs (Presented at the West Coast Meeting of the Society of Automotive Engineers, Portland, Oregon, Aug. 14-17, 1967, Paper 670689.)

Emission tests on 739 cars (1966 and 1967 models) equipped with exhaust controls in public use confirm that the vehicle manufacturers have done a good job of designing cars with low emissions. However, field data on emissions higher than proving ground results, and deterioration of emissions with mileage, indicate that much more effort is needed with regard to proper engine adjustments and quality control on the production line as well as better servicing of the engines in the field. Continued effective emission control after initial sale of the new car is the responsibility of the states. (Authors' abstract) ##

09341

Oberdorfer, P. E.

THE DETERMINATION OF ALDEHYDES IN AUTOMOBILE EXHAUST GAS. Preprint, Society of Automotive Engineers, 10p., 1967. 14 refs. (Presented at the Automotive Engineering Congress, Detroit, Mich., Jan. 9-13, 1967, Paper 670123.)

A method for the sampling and determination of exhaust aldehydes and ketones is described. The procedure consists of absorbing and converting these compounds to the solid 2,4 di-nitrophenylhydrazone derivatives. Results are reported as total aldehydes and/or the derivatives separated into individual, identifiable components by chromatographic techniques. Exhaust emission data employing this procedure are presented for a limited

number of vehicles with and without exhaust control systems. Total aldehyde levels (as formaldehyde) were found to range from about 20 to over several hundred parts per million depending on the mode of operation and the adjustment of such variables as air-fuel ratio, spark timing, and exhaust emission control devices. Effects of these variables on aldehyde emissions are discussed. The relationship of the chemical structure of inducted fuel to aldehyde emissions is also touched upon. The amount of individual aldehydes was found to be related to the parent fuel to a considerable extent for pure individual hydrocarbon fuels. This relationship is greatly diminished, however, within the design limitations of current full boiling practical gasolines. (Author's abstract)##

09347

D. T. Wade

FACTORS INFLUENCING VEHICLE EVAPORATIVE EMISSIONS. Preprint, Society of Automotive Engineers, 13p., 1967. (Presented at the Automotive Engineering Congress, Detroit, Mich., Jan. 9-13, 1967, Paper 670126.)

The basic factors influencing carburetor and fuel tank evaporative emissions are explored. These factors are combined in a mathematical model to predict the magnitude and composition of evaporative losses. A laboratory technique for simulating carburetor losses is also described. The behavior of fuel in the carburetor bowl during a short soak is adequately simulated by a one plate equilibrium distillation. Factors influencing carburetor hot soak losses are: maximum bowl temperature; bowl volume (including after-supply); and fuel temperature distillation curve from one plate equilibrium distillation. Both quantity and composition of carburetor losses can be calculated from the following: original fuel composition, maximum bowl temperature, effective bowl volume. Fuel tank losses occur because of tank temperature increases which cause an increase in fuel vapor pressure and thermal expansion of the tank vapor. Factors influencing fuel tank losses are: tank temperature; vapor volume; tank pressure; rate of equilibration of liquid and vapor; fuel vapor pressure; molecular weight; and density. If equilibrium between liquid and vapor exists, tank losses can be calculated from a knowledge of the following: tank temperatures, vapor volume, tank pressure, fuel vapor pressure, fuel density, and molecular weight of fuel vapor.

09355

Pahnke, Alden J. and Edward C. Squire

LEAD IN GASOLINE: NO EFFECT ON EXHAUST EMISSIONS FOUND IN 18-MONTH CONSUMER-CAR TEST. Oil Gas J., 64(50):106-110, Dec. 12, 1966.

Use of tetraethyl lead in gasoline does not significantly affect exhaust emission characteristics of vehicles driven by the motoring public. This is the conclusion reached after a test of leaded and unleaded gasoline in 122 privately owned and operated cars spanning a period of 18 months and covering a total of 2,500,000 miles. Carbon monoxide and hydrocarbon-emission

levels of the cars operated on leaded gasoline were essentially equivalent to those of the cars driven on unleaded gasoline. Photochemical reactivity and nitrogen oxide levels for the two car groups were also equivalent, further demonstrating the absence of any effects of tetraethyl lead on vehicle emissions either positive or negative.##

09385

Viroli, G. and E. Preite

AIR POLLUTION FROM ROOMS HEATED BY STOVES USING "LIQUID GAS". (Sulla corruzione dell'aria dagli ambienti riscaldati da stufe a gas liquido.) Text in Italian. Riv. Ital. 'Igiene (Pisa), 26(1-2):113-126, Jan.-April 1966. 26 refs.

The use of liquid-gas fuel in stoves causes the accumulation of CO, CO₂ and aliphatic hydrocarbons indoors. Measurements were made in two rooms, 92 sq. m. and 166 sq. m. on 6 different types of gas stoves, two of them open flame. Gas chromatography and the Fractovap D apparatus were utilized. Data for the levels of CO₂, CO, and hydrocarbons liberated by combustion are tabulated. CO levels ranged from traces to 130 p.p.m. After 2-4 hours of burning, the amount of CO₂ in the room from open flame ovens was 5 percent or more, and , after 8 hours, up to 15.24 percent. The effect of this type of indoor heating on pollution of the ambient (outside) air is well below the limit considered toxic by present standards, but increased use of such equipment would eventually lead to considerable air pollution.

09389

Valori, P. A. Grella, C. Melchiorri, and N. Vescia

SPECTROPHOTOMETRIC DETERMINATION OF AROMATIC POLYCYCLIC HYDROCARBONS. FURTHER DATA ON THE ATMOSPHERE OF ROME. (La determinazione spettrofotometrica degli idrocarburi policiclici aromatici. Ulteriori rilievi nell'atmosfera di Roma.) Text in Italian. Nuovi Ann. 'Igiene Microbiol. (Rome), 17(5):383-414, Sept.-Oct. 1966. 23 refs.

From Jan. 1965 to March 1966, samples of polluted air, taken three times a day, were analyzed spectrophotometrically after column chromatography. The minimum and maximum values micrograms/100 cu. m. of air) were: phenanthrene, 0.43-1.12; anthracene, 0.12-0.22; pyrene, 2.40-4.62; fluoranthene, 2.10-4.92; chrysene, 2.50-4.03; 1,2-benzanthracene, 1.10-3.09; perylene, 0.25-0.60; 3,4-benzpyrene, 2.00-5.20; 1,12-benzperylene, 1.40-3.75; anthanthrene, 0.44-0.80; and corenene, 0.60-1.00. The highest levels were observed during the winter months in morning rush hours and are due to domestic heating and automotive traffic.

09393

Hettche, O.

AIR POLLUTION IN LOCALITIES WITH HEAVY TRAFFIC IN METROPOLITAN CITIES. ((Die Verunreinigung der Atmosphäre an

verkehrsreichen Punkten in Grossstädten.)) Text in German. Z. Praeventivmed. 11(2):122-133, March-April 1966. 27 refs.

Data on the variations in time of CO, SO₂, NO, NO₂, hydrocarbons, polycyclic hydrocarbons, lead compounds and dust in various European cities such as Stuttgart, Frankfurt, Hamburg, Essen and London are discussed and compared with data from Los Angeles. In heavy traffic, concentrations of up to 20 mg. CO, 0.2 mg. NO, 0.1 mg. NO₂, 0.05-0.4 mg SO₂, 2-10 mg. hydrocarbons and 4 microgram of lead per cubic meter were found. Polycyclic hydrocarbons such as benzpyrene and coronene can be determined accurately only in tunnels by analysis of the intake air and the air in the tunnel. In Germany, more diesel engines are in operation than the 0.3 percent in Los Angeles. Diesels generate only about 1 percent CO but maintenance must be frequent and soot emission must be controlled. Two-cycle engines give a very low CO emission. Methods used in Germany for the determination of pollutants are outlined. Standardization of analytical methods is emphasized.

09405

Candeli, A., G. Barboni, and G. Berioi Galoforo

CARCINOGENICITY OF POLLUTED AIR. I. ANALYSIS OF EXHAUST GAS FROM A COMBUSTION ENGINE. ((Il problema della cancerogenicit  dell'aria inquinata. I. Analisi dei gas di scarico dei motori a scoppio.)) Text in Italian. Riv. Ital. Igiene (Pisa), 26(5-6):438-453, Sept.-Dec. 1966. 25 refs.

Study was made of the amounts of polycyclic aromatic hydrocarbons exhausted from an Italian automobile which ran in neutral for two hours on one liter of the most common commercial gasoline. A filter was attached to the exhaust system and 0.3771 gm. of particulate matter extracted from 112 cm of exhaust. The extract was found to contain anthracene, fluoranthene, pyrene (703 microgram), coronene (612 microgram), 1,2-benzanthracene (381 microgram), 1,2-benzpyrene, 3,4-benzpyrene (52 microgram), and a new unidentified substance called "Compound 409". The extracts, obtained with acetone, were chromatographed on an alumina column and the eluates examined spectrophotometrically. Emphasis is put upon the high level of 3,4-benzpyrene, a notorious carcinogenic agent.##

09421

Keller, J. L. and Joseph Byrne

WHAT VALUE FRONT-END VOLATILITY? Proc. Am. Petrol. Inst., Vol. 46, p. 407-426, 1966. 18 refs. (Presented at the 31st Midyear Meeting of the American Petroleum Institute's Division of Refining, Houston, Texas, May 11, 1966.)

Detailed estimates of the vapor lost from California cars for several potential control methods, along with corresponding estimates of fuel-associated costs, are presented. Factors considered include tank and carburetor vapor loss, vehicle performance and fuel economy, diversion of volatile hydrocarbons to alternate uses, crude oil consumption, and investment and operating costs of alternate refining processes. It is estimated that the

average car in California loses 1.7 percent of its fuel by evaporation and that nearly half the loss could be eliminated by a general reduction of 3 lb in Reid vapor pressure. However, fuel consumption at equal warm-up performance would increase three times as much as vapor loss decreased, adding more air pollutants to the exhaust of pre-1966 cars than would be saved. Total fuel cost would increase 85 dollars over the life of a car. A capital investment of approximately 2 billion dollars would be required of the U.S. petroleum industry to reduce volatility to this extent. Alternately, a lossproof fuel system, for which one possible arrangement is suggested, offers the possibility of eliminating substantially all vapor emissions with no penalty in fuel consumption, and a net reduction of 41 dollars in fuel costs per car, or 127 dollars lower cost than with reduced volatility. If such a fuel system permitted a general increase in volatility equivalent to 3 lb Rvp, achieved gradually over enough years to retire present cars, not only would vapor loss be eliminated but fuel consumption would decrease 6.5 percent and total fuel costs would increase by an estimated \$228 per car.

09655

Major, William D.

VARIATIONS IN PULPING PRACTICES WHICH MAY EFFECT EMISSIONS. In: Proceedings of the International Conference on Atmospheric Emissions from Sulfate Pulping, Sanibel Island, Fla., April 28, 1966. E. R. Hendrickson (ed.), Sponsored by: Public Health Service, National Council for Stream Improvement, and University of Florida. Deland, Fla., E. O. Painter Printing Co., ((1966)), p. 265-281. 8 refs.

Emissions from a kraft mill can be divided into two categories, gaseous and particulate. Malodorous emissions are subject to far less control and precision of analysis than particulate emissions. The magnitude of loss is more sensitive to operating variables, the chemistry is more complicated and the sources are more numerous. This discussion is concerned with the effect of operating variables on gaseous sulfur losses. Evidence is given which indicates that the wood species has a definite effect on the odor produced during kraft pulping. Cooking variables include: sulfidity of the white liquor, cooking time and cooking temperature. More recent cooking variables are: continuous vs. batch digestion, and the use of black liquor dilution in the digester as a means of controlling the liquor-to-wood ratio. Multiple-effect evaporators are the second largest source of gaseous sulfur losses in the process. The high vacuums set up by condensers result in the release of low vapor pressure sulfur compounds. Operating variables in direct contact evaporation are: black liquor pH, sodium sulfide concentration, and per cent CO₂ in the flue gas. Dust losses from the recovery furnace are controlled with either a venturi scrubber or an electrostatic precipitator. Operating variables which influence the efficiencies of these two units are overloading, and the temperature of the flue gas. The key to the effect of operating variables on emissions from a kraft pulp mill is to recognize the degree to which the various steps in the kraft process are interrelated, especially in the case of gaseous sulfur losses.

Ozolins, G. and C. Behmann

AIR POLLUTANT EMISSION INVENTORY OF NORTHWEST INDIANA. (A PRELIMINARY SURVEY, 1966.) Public Health Service, Durham, N. C., National Center for Air Pollution Control, APTD-68-4, 36p., April 1968.

Sources of air pollutant emissions were surveyed to quantify the total pollution load emitted to the air over the Northwest Indiana communities of East Chicago, Gary, Hammond, and Whiting. The emissions are reported on an annual basis and subdivided into the five major pollutants: particulates, sulfur oxides, nitrogen oxides, hydrocarbons, and carbon monoxide. The four major source categories that were utilized in reporting emissions from area and point sources are: fuel combustion in stationary sources, fuel combustion in mobile sources, combustion of refuse, and industrial process losses. The results of this survey are reported by city and illustrated on the grid system established by the Northwest Indiana Air Resource Management Program. (Authors' abstract)

09751

Schmertzling, Hannibal and Julian H. Chaudet

UTILIZATION OF INFRARED SPECTROPHOTOMETRY IN MICROCONTAMINANT STUDIES IN SEALED ENVIRONMENTS. Melpar, Inc., Falls Church, Va., Contract AF 41(609)-1962, Task 793002, SAM-TR-67-2, 20 p., Jan. 1967.

CFSTI, DDC: AD 650000

Microcontaminants in a sealed environmental system were separated and identified. The separation and identification of the collected samples were accomplished with gas-liquid chromatography and infrared spectrophotometry. Fifty-four sets of samples of the atmosphere from a space cabin simulator, comprising 162 individual samples, were analyzed. The method used was gas-liquid chromatography using a flame ionization detector. The retention time on the column was used for identification, while the peak area was used for quantitative estimation of the compounds. A collection of the vapor infrared spectra of 146 compounds, which are possible contaminants for space cabin simulators, has been compiled during 2 years. A computer program for sorting infrared spectra with the aid of the ASTM deck of infrared cards has been established. Analyses have been made of gases evolved from paint panels, from the decomposition of a Teflon insulator, and from human waste products.

09752

Beaver, Hugh

COMMITTEE ON AIR POLLUTION: REPORT. London, Her Majesty's Stationery Office, 1960, 80p. (Presented to Parliament by the Minister of Housing and Local Government, the Secretary of State for Scotland and the Minister of Fuel and Power by Command of Her Majesty, Nov. 1954.)

A committee on air pollution was established to examine the nature, causes, and effects of air pollution and the efficacy of present preventive measures; to consider what further preventive measures were practicable; and to make recommendations. The report of the committee examined current emission sources of pollutants, the effects of air pollution on health, and the legislation and administration of air pollution. Some recommendations made by the committee were: prohibition of emission of dark smoke from chimneys; arresting plant for grit and dust obligatory in new industrial installations; control of smoke from railways; establishment of smokeless zones and smoke control areas; provisions of financial assistance by Local Authorities; requirement of Local Authorities to submit annual reports on progress of smoke abatement; preparation of documents on codes of practice and standards; clean air should be national policy; establishment of a "Clean Air Council" to coordinate and encourage research work.

09759

Sharpe, L. M.

ENERGY SOURCES AND POLICIES, THEIR IMPACT ON AIR POLLUTION, CURRENT AND PROJECTED. Public Health Service, Washington, D. C., Bureau of Disease Prevention and Environmental Control, Contract PH-86-67-69, ((227))p., April 15, 1967. ((76)) refs.

There have been a number of energy studies over the last 15 - 20 years that have attempted to project the national energy needs to various dates in the future. This study compiles energy projections and the "mix" of energy sources to the year 2000, made as recently as 1967, and, on the basis of these data: estimates the atmospheric pollution burden to be expected by the years 1980 and 2000 provided present fuel policies remain essentially unchanged; summarizes some of the major technological developments that could have an impact on energy source selection and total energy requirements; identifies and discusses some of the major government policies that affect both fuel source and energy demand; outlines some approaches to an evaluation on a benefit/cost basis of alternative policies that would reduce atmospheric pollution and completes the analysis for the solvent refined coal process.

09781

Environmental Science Services Corp., Stamford, Conn.

SOLVENT EMISSION CONTROL LAWS AND THE COATINGS AND SOLVENTS INDUSTRY. (A TECHNO/ECONOMIC STUDY.) 56 p., ((1967)). 6 refs.

The widespread adoption of the strict California solvent emission laws will seriously effect practices and products in the surface coating industry. The California codes contain three main elements: the emission of photochemically reactive solvents is restricted; the sale of coatings containing these materials is banned; and the emission of these materials during the manufacture of coating materials is restricted. Widespread adoption of these codes would cause changes in the formulation of the coatings, and would adversely affect the markets for mineral spirits, naphthas, substituted aromatics, branched ketones, olefins, and trichloroethylene. However, alcohols, esters, odorless mineral

spirits, and glycolesters would gain markets at the expense of the photochemically active solvents. Emission control methods, analytical techniques, and measurement methods are outlined. The effectiveness of various organic solvents in photochemical smog formation is discussed. An evaluation of existing regulations, with emphasis on California Rule 66, is presented along with lists of exempt sources.

09784

Danielson, John A. (comp. and ed.)

AIR POLLUTION ENGINEERING MANUAL. (AIR POLLUTION CONTROL DISTRICT, COUNTY OF LOS ANGELES.) Public Health Service, Cincinnati, National Center for Air Pollution Control, PHS-Pub-999-AP-40, 999-AP-40, 892p., 1967. ((314)) refs.
GPO: 806-614-30

The control of air pollution at individual sources peculiar to the Los Angeles area is considered. The practical engineering problems of design and operation for many sources of air pollution are emphasized. There are 11 chapters, each by different authors, and 4 appendixes. The chapter titles are: (1) Introduction; (2) Contaminants; (3) Design of Local Exhaust Systems; (4) Air Pollution Control Equipment for Particulate Matter; (5) Control Equipment for Gases and Vapors; (6) Metallurgical Equipment; (7) Control Equipment; (8) Incineration; (9) Combustion Equipment; (10) Petroleum Equipment; and (11) Chemical Processing Equipment. The introduction discusses the Los Angeles Basin, rules and regulations in Los Angeles County, and the use of the manual. The appendixes' titles are: (A) Rules and Regulations; (B) Odor-Testing Techniques; (C) Hypothetical Available Heats from Natural Gas; and (D) Miscellaneous Data.

09785

Dickinson, Janet, Robert L. Chass, and W. J. Hamming

AIR CONTAMINANTS. In: Air Pollution Engineering Manual. (Air Pollution Control District, County of Los Angeles.) John A. Danielson (comp. and ed.), Public Health Service, Cincinnati, Ohio, National Center for Air Pollution Control, PHS-Pub-999-AP-40, p. 11-21, 1967.
GPO: 806-614-30

The parameters of an air pollution problem, particularly the problem in Los Angeles County; the measures taken to eliminate the problem; and control measures still needed are described. The air contaminants include: organic gases (hydrocarbons, hydrocarbon derivatives); inorganic gases (NO_x, SO_x, CO); miscellaneous inorganic gases (NH₃, H₂S, Cl₂, F₂); particulates (carbon or soot particles, metallic oxides and salts, oily or tarry droplets, acid droplets, metallic fumes). Each is discussed indicating the sources and significance in the air pollution problem.

Thomas, G.

CORE OVENS. In: Air Pollution Engineering Manual. (Air Pollution Control District, County of Los Angeles.) John A. Danielson (comp. and ed.), Public Health Service, Cincinnati, Ohio, National Center for Air Pollution Control, PHS-Pub-999AP-40, p. 309-315, 1967.
GPO: 806-614-30

Various types of core ovens are described. These include the shelf, drawer, portable-rack, car, and conveyor ovens. Heating core ovens, core binders, air contaminants from core ovens, and control methods are discussed. In foundries, core ovens are used to bake the core used in sand molds. Most cores contain binders that require baking to develop the strength needed to resist erosion and deformation by metal during the filling of the mold. Core ovens supply the heat and, where necessary, the oxygen necessary for the baking. Generally, emissions from core ovens are a minor source of air pollution when compared with other metallurgical processes. The air contaminants discharged from core ovens consist of organic acids, aldehydes, hydrocarbon vapors, and smoke. Most core ovens are vented directly to the atmosphere through a stack. Occasionally more than one vent is used, but if emissions are such that air pollution control is needed, then ducting the vents to a control device is all that is necessary. The use of hoods or of excess air is not necessary to capture the emissions. When operated below 400 Degrees F and when fired with natural gas, most core ovens do not require air pollution control equipment. Excessive emissions from core ovens have been reduced to tolerable amounts by modifying the composition of the core binders and lowering the baking temperature. When it is not feasible or possible to reduce excessive emissions by modifying the core mix or the baking temperature, afterburners are the only control devices that have proved effective.##

09818

Weiss, Sanford M.

SURFACE-COATING OPERATIONS. In: Air Pollution Engineering Manual. (Air Pollution Control District, County of Los Angeles.) John A. Danielson (comp. and ed.), Public Health Service, Cincinnati, Ohio, National Center for Air Pollution Control, PHS-Pub-999-AP-40, p. 387-390, 1967.
GPO: 806-614-30

Basic coating operations include dipping, spraying, flowcoating, and roller coating. Each operation is described. Air pollution problems, hooding and ventilation requirements, and control equipment are discussed. The discharge from a paint spray booth consists of particulate matter and organic-solvent vapors. Air contaminants from paint dipping, flowcoating, and roller coating exist only in the form of organic-solvent vapors since no particulate matter is formed. The usual spray booth ventilation rate is 100 to 150 fpm per square foot of booth opening. Insurance standards require that the enclosure for spraying operations be designed and maintained so that the average velocity over the face

of the booth, during spraying operations, is not less than 100 fpm. Dip tanks, flowcoaters, and roller coaters are frequently operated without hoods. When local ventilation at the unit is desirable, a canopy hood may be installed. Particulate matter in paint spray booths is controlled by baffle plates, filter pads, or water spray curtains. Known solvent recovery processes make use of condensation, compression, absorption, distillation, or adsorption principles. In view of the small solvent vapor concentration in the airstream from the spray booth or applicator hood, the only economically feasible solvent control method is adsorption. Recent work indicates that adsorption by activated carbon can be a feasible method for the control of paint solvents. This work indicates that control efficiencies of 90 percent or greater are possible, provided particulates are removed from the contaminated airstream by filtration before the airstream enters the carbon bed.

09820

Bailor, William C.

DRY CLEANING EQUIPMENT. In: Air Pollution Engineering Manual. (Air Pollution Control District, County of Los Angeles.) John A. Danielson (comp. and ed.), Public Health Service, Cincinnati, Ohio, National Center for Air Pollution Control, PHS-Pub-999-AP-40, p. 393-397, 1967.

GPO: 806-614-30

Dry cleaning equipment follows two basic designs. One design is tailored for petroleum solvents, and the other, for chlorinated hydrocarbon, or synthetic, solvents. In a petroleum solvent dry cleaning plant, the equipment generally includes a washer, centrifuge, tumbler, filter, and, in many instances, a batch still. With perchloroethylene, the washer and extractor are combined in a single unit. The tumbler is equipped with a condenser for recovery of solvent vapor. The tumbler is a closed system while in operation and is vented to the atmosphere only during a short deodorizing period. A muck cooker is often used to reclaim solvent from filter sludge. The dry cleaning industry contributes to air pollution by the release of organic-solvent vapors to the atmosphere. The lint generated when fabrics are tumbled dry is controlled by devices not normally considered to be air pollution control equipment. The synthetic-solvent tumblers are provided with a cloth bag to filter the lint from the exhaust air. Because of safety requirements, hooding and ducting are an integral part of all dry cleaning equipment. In synthetic-solvent plants, vents are provided near the doors of the washer-extractor and the tumbler. An exhaust system is automatically activated whenever these doors are opened, and the system exhausts the vapors resulting from transfer of the wet textiles. When a carbon adsorption unit is used to collect the perchloroethylene vapors, floor vents are also provided to capture vapors from other areas. Activated-carbon adsorption can also be adapted to control the solvent emissions from the petroleum solvent dry cleaning plant, but the lower value of the recovered solvent requires a much longer period of time to pay the cost of the equipment. Other methods of reducing emissions from dry cleaning plants include operational procedures and equipment maintenance.

Netzley, Arthur B. and John E. Williamson

MULTIPLE-CHAMBER INCINERATORS FOR BURNING WOOD WASTE. In: Air Pollution Enin Pollution Engineering Manual. (Air Pollution Control District, County of Los Angeles.) John A. Danielson (comp. and ed.), Public Health Service, Cincinnati, Ohio, National Center for Air Pollution Control, PHS-Pub-999-AP-40, p. 436-447, 1967.

GPO: 806-614-30

Air pollution from the burning of wood waste can be reduced to a minimum through the use of multiple-chamber incinerators. By promoting complete combustion, multiple-chamber incinerators produce considerably less air pollution than is emitted from single-chamber incinerators or by open burning. The design of multiple-chamber incinerators to burn all forms of wood waste--from large pieces of lumber to sawdust particles that may comprise from 10 to 100 percent of the total weight of the charge is discussed. The designs of mechanical feed systems are also included since the feed system must be properly integrated with the design of the incinerator to promote maximum combustion. An illustrative problem shows calculations involved in designing a multiple-chamber incinerator with a mechanical feed system. The calculations in this problem fall into three general categories: (1) Combustion calculations based upon refuse composition, projected air requirements, and heat transfer; (2) gaseous flow calculations based upon the products of combustion at elevated temperatures; and (3) dimensional calculations based upon equations determined empirically from source testing.

09830

Netzley, Arthur B.

WIRE RECLAMATION. In: Air Pollution Engineering Manual. (Air Pollution Control District, County of Los Angeles.) John A. Danielson (comp. and ed.), Public Health Service, Cincinnati, Ohio, National Center for Air Pollution Control, PHS-Pub-999-AP-40, p. 495-503, 1967.

GPO: 806-614-30

Scrap copper wire, with a diameter in the range 14 gage to one inch, which has combustible insulation is reclaimed by burning off the insulation in an incinerator. A great variety of materials composes the combustible insulation: Rubber, paper, cotton, silk, and plastics such as polyethylene and polyvinyl chloride. Moreover, the wire itself may have a baked-on coating of plastics, paint, or varnish. As received for burning, the total combustible content of the insulated wire may vary widely from several percent to over 50 percent by weight. Most commercial wire contains from 20 to 35 percent insulation. Burning in the open is accompanied by copious quantities of dense smoke, disagreeable odors, inorganic materials, and oxygenated hydrocarbons. Burning in single-chamber incinerators produces somewhat less smoke, odors, and other air contaminants than open burning does, since combustion air can be regulated. The only practical industrial equipment available today for controlling emissions from single-chamber insulation-burning

incinerators is an afterburner or secondary combustion chamber. The composition of stack gases from equipment with and without afterburners is presented. Design methods, materials of construction, and operating procedures are discussed and illustrated.

09835

Walters, Donald F.

WASTE-GAS DISPOSAL SYSTEMS. In: Air Pollution Engineering Manual. (Air Pollution Control District, County of Los Angeles.) John A. Danielson (comp. and ed.), Public Health Service, Cincinnati, Ohio, National Center for Air Pollution Control, PHS-Pub-999-AP-40, p. 565-606, 1967.
GPO: 806-614-30

Petroleum refineries must dispose of large quantities of hydrocarbon vent, waste, blowdown, and emergency pressure release gases. Types, design, instrumentation, and operating practices for gas disposal flares are presented. These include elevated and ground level flares, burner design, steam injection, ignition and pilot light systems, flare sizes and capacities, removal of entrained mists, and provision for emergency overloads. Pressure relief systems are also thoroughly discussed. Commonly used terms dealing with relief systems are defined. Design methods and operating procedures for safety valves (standard and balanced), rupture discs, vent lines, vent headers, and vent gas scrubbers are discussed and illustrated.

09838

Cuffe, Stanley T.

CATALYST REGENERATION. In: Air Pollution Engineering Manual. (Air Pollution Control District, County of Los Angeles.) John A. Danielson (comp. and ed.), Public Health Service, Cincinnati, Ohio, National Center for Air Pollution Control, PHS-Pub-999-AP-40, p. 642-652, 1967.
GPO: 806-614-30

The regeneration of catalysts employed in petroleum refining processes, such as fluid and Thermoform catalytic cracking, is accomplished by burning coke and sulfur deposits from the catalyst surface. Combustion gases from regeneration include the pollutants CO, SOx, NOx, NH3, hydrocarbons, and particulate matter. Tables of data collected in 1956 are presented which specify process flow rates, catalyst circulation rates, regenerator air rates, coke burn-off rates, flue gas temperatures, particulate losses, hydrocarbon emission and analysis, and stack gas composition and volumes. Pollution control methods presented and discussed are: wet and dry cyclones, carbon monoxide waste heat boilers, and electrical precipitators. The economy of a CO boiler depends on the catalyst regenerator flue gas volume, temperature, fuel value, and CO2/CO ratio. An analysis of flue gases from CO waste heat boilers is presented for cases where ammonia has and has not been injected into the gas stream before the electrostatic precipitator.

Kinsey, Robert H.

OIL-WATER EFFLUENT SYSTEMS. In: Air Pollution Control District, County of Los Angeles.) John A. Danielson (comp. and ed.), Public Health Service, Cincinnati, Ohio, National Center for Air Pollution Control, PHS-Pub-999-AP-40, p. 652-659 1967.

GPO: 806-614-30

Oil-water effluent systems found in the petroleum industry collect and separate wastes recover valuable oils, and remove undesirable contaminants before discharge of the water to ocean, rivers, or channels. The type of liquid wastes may be classified as waste water with: Oil present as free oil, emulsified oil, or as oil coating on suspended matter; and chemicals include acids, alkalies, phenols, sulfur compounds, clay, and others. The oil-water separator design must provide for efficient inlet construction, sediment collection mechanisms, and oil skimmers. Clarification of final-effluent water streams is accomplished by filtration, chemical flocculation, and biological treatment. The most objectionable contaminants emitted from liquid waste streams are hydrocarbons, sulfur compounds, and other malodorous materials. The method presented may be used to estimate the hydrocarbon loss from oil-water separators. The most effective means of control of hydrocarbon emissions from oil-water separators has been the covering of forebays or primary separator sections with fixed roofs or floating roofs. Isolation of certain odor-and chemical-bearing liquid wastes at their source for treatment before discharge of the water to the refinery waste-water gathering system is an effective and economical means of minimizing odor and chemicals problems. Principal streams that are treated separately are oil-in-water emulsions, sulfur-bearing waters, acid sludge, and spent caustic wastes. Gravity-type oil-water separators are ineffective in breaking the oil-in-water emulsions. Methods of separation include direct application of heat, distillation, centrifuging, filtration, use of an electric field coagulating chemicals, air flotation systems, and biological treatment. Sulfide- and mercaptan-bearing water may be steam stripped, or the sulfides may be oxidized to form acceptable thiosulfates, will produce H. S. Acid sludge is dumped, burned, or processed to recover acid or to produce byproduct. Spent caustic wastes are generally dumped, or can be used in the neutralization of acid wastes.

09840

Kinsey, R. H.

PUMPS. In: Air Pollution Engineering Manual. (Air Pollution Control District, County of Los Angeles.) John A. Danielson (comp. and ed.), Public Health Service, Cincinnati, Ohio, National Center for Air Pollution Control, PHS-Pub-999-AP-40, p. 659-665, 1967.

GPO: 836-614-30

Pumps are used in every phase of the petroleum industry and are available in wide variety of models, sizes, capacities and materials used for construction. All the common machinable metals and alloys, as well as plastics, rubber, and ceramics,

are used. Pumps may be classified under two general headings, positive displacement and centrifugal. Positive-displacement pumps have as their principle of operation the displacement of the liquid from the pump case by reciprocating action of a piston or diaphragm, or rotating action of a gear, cam, vane, or screw. Centrifugal pumps operated by the principle of converting velocity pressure generated by centrifugal force to static pressure. Velocity is imparted to the fluid by an impeller that is rotated at high speeds. The fluid enters at the center of the impeller that is rotated at high speeds. The fluid enters of the impeller and is discharged from its periphery. Power for driving the various types of pumps is usually derived from electric motors, internal combustion engines, or steam drives. Any leak in the pumping equipment causes emission of hydrocarbon vapors and malodorous sulfur compounds. Several means have been devised for sealing the annular clearance between pump shafts and fluid casings to retard leakage. For most refinery applications, packed seals and mechanical seals are widely used. Typical packed seal generally consist of a stuffing box filled with sealing material that encases the moving shaft. Lubrication of the contact surfaces of the packing and shaft is effected by a controlled amount of product leakage to the atmosphere. The second commonly used means of sealing is the mechanical seal. This type of seal can be used only in pump that have a rotary shaft motion. A simple mechanical seal consists of two rings with wearing surfaces at right angles to the shaft. One ring is stationary while the other is attached to the shaft and rotates with it. A spring and the action of fluid pressure keep the two faces in contact. Lubrication of the wearing faces is effected by a thin film of the material being pumped. The wearing faces are precisely finished to ensure perfectly flat surfaces. For cases not feasible to control with mechanical seals, specialized types of pumps, such as canned, diaphragm, or electromagnetic, are required. A pressure-seal-type application can reduce packing gland leakage. A liquid, less volatile or gangerous than the product being pumped, is introduced between two sets of packing at a higher pressure than the product. Volatile vapors that leak past a main seal may be vented to vapor recovery by using dual

09857

D'Imperio, Joseph

OIL AND SOLVENT RE-REFINING. In: Air Pollution Engineering Manual. (Air Pollution Control District, County of Los Angeles.) John A. Danielson (comp. and ed.), Public Health Service, Cincinnati, Ohio, National Center for Air Pollution Control, PHS-Pub-999-AP-40, p. 799-801, 1967.

GPO: 806-614-30

Used lubricants, hydraulic fluids, and solvents are purified to produce usable products by re-refining techniques. Because the profit margin is small there is very little effort or money spent on pollution control in re-refining plants. Odors and hydrocarbon vapors are frequently released without control. A simple control technique is to enclose all emission sources and incinerate the exhaust gasses in boiler fireboxes.

Starkman, E. S., G. E. James, and H. K. Newhall

AMMONIA AS A DIESEL ENGINE FUEL: THEORY AND APPLICATION. Society of Automotive Engineers, Preprint, 20p., 1967. 8 refs (Presented at the Combined Fuels and Lubricants, Powerplant and Transportation Meetings, Pittsburgh, Pa., Oct. 30-Nov. 3, 1967. Paper 670946.)

Theoretical and experimental investigations were carried out for the purpose of predicting and measuring the performance which results from operating of compression ignition engines when anhydrous ammonia is used rather than diesel fuel. Predictions were that ammonia would give slightly increased output but that fuel consumption would also increase 2-1/2 fold. By equipping the engine with a spark ignition system, it was possible to operate successfully on ammonia at normal compression ratios and retain the same fuel injection system. Fuel injection and spark timing were found to be critical. Indicated power output was reduced by about 10%, which differed from prediction. The discrepancy was due to the poor combustion characteristics of ammonia. Predicted increase in fuel consumption were experienced. Because ammonia is not 'smoke limited' as is diesel fuel, it was possible to increase the smoke free output from the engine by going to richer mixtures with ammonia. (Authors' abstract)

Williams, A. F.

OIL FIRING AND ODOUR PROBLEMS. (Due Olfeuerung im Hinblick auf Emissionsprobleme.) Text in German. Schweiz, Arch. Angew. Wiss. Tech. 31(4):105-112, April 1965. (presented at the S.V.M.T. Meeting Zurich, Switzerland, Sept. 11, 1964, Preprint in English.)

Smoke and smells are indicative of incomplete combustion. We propose to deal with underlying causes and curative measures which concern mainly the design and operation of the combustion appliance. We shall discuss the various types of burners which are being used, particularly those which are prevalent in Switzerland for room and whole house heating. These are mainly pressure jet burners with some pot burners rated 15000 kcal/h. and above and operated on distilled gas oil. We shall comment on the relative merits of ON OFF and HIGH/LOW fire operation and quote test results for smoke and unburnt hydrocarbons produced by various burners during continuous firing or intermittent operation. Such unburnt hydrocarbons can give rise to unpleasant odours. We shall show that a low smoke condition is related primarily to good draught and an optimum excess air value inside the fire box. Various new attempts to procure small, highly efficient atomizing burners will be mentioned. These include ultrasonic atomization and the Ventres blue flame, atomizing with vaporising burner. Lastly, in reference to typical Swiss oil quality and the standards set by SNV Institute, we shall give some results showing the influence of aromatic content of the oil on its smoking propensity. Some mention will also be made about sulphur in the fuel and SO₂ emission from the chimney. (Author's summary, modified)

Brubacher, Miles L. and Donel R. Olson

SMOG TUNE-UP FOR OLDER CARS. In: Vehicle Emissions, Part II SAE Progress in Technology Series, Vol. 12, New York Society of Automotive Engineers, Inc., 1966, p. 268-290. 20 refs. (Presented at the SAE Southern California Section, April 1964.)

Surveys of smog forming pollutants from the exhaust of the California car population have shown a tremendous range of emissions between the worst and the best cars. A study was conducted to determine the effectiveness and cost of various tune-up approaches to the auto exhaust emission problem. Four phases of tune-up were explored and pertinent facts and data are included in this paper. Three major engine systems affecting emissions of older cars are ignition, carburetion, and exhaust valve leaks. Exhaust control is predicted to be a \$150,000,000 annual business and the incentive exists to develop more effective and cheaper control systems. The average annual tune-up cost was about \$30. (Authors abstract, modified)

10292

W. J. Mullin, N. Berkowitz

MECHANISMS OF COAL PYROLYSIS VIII--THE ISOTHERMAL DISENGAGEMENT OF CO AND CH₄ IN THE RANGE 570-670C. Fuel, 47(1):63-77, Jan. 1968. 13 refs.

Isothermal rates of disengagement of CO and CH₄ from anthracite, bituminous and sub-bituminous coal chars at temperatures between 570 and 670 C follow pseudo-first order kinetics, but indicate that the initial gas discharge is governed by two concurrent control-mechanisms. Of these, the more sustained can be identified with a diffusion process for which E is less than 5 kcal/mole and D is about 1 times 10 the minus 8th power cc/sec. The other, which superimposes itself on diffusion, appears to be the actual rate of formation of CO (or CH₄) within the decomposing coal mass. The relative importance of these two controls changes with rising reaction temperature, diffusion governing virtually all gas discharge below about 600 C but controlling only about 30-40 per cent of the total CO and CH₄ flow at 670 C. It is suggested that these findings, and, in particular, the dual rate control, are the inevitable consequences of the existence of two partially interconnected but strongly size-differentiated and effectively 'independent' pore systems in coal and coal chars. (Authors' abstract, modified)##

10428

Jenkins, G. I. and R. P. Walsh

QUICK MEASURE OF JET FUEL PROPERTIES. Hydrocarbon Process. Petrol Refiner, 47(5):161-164, May 1968. 2 refs.

Luminometer number, smoke point, aromatics content, and hydrogen content of kerosene type aviation fuels can be calculated directly from the aniline point and gravity by using tables and graphs compiled in this report. Calculated values for these properties have proven to be generally more precise than single experimental determinations.

10429

Juntgen, H. and K. H. Van Meek

GAS RELEASE FROM COAL AS A FUNCTION OF THE RATE OF HEATING. Fuel 47(2):103-117, March 1968. 10 refs.

Fundamental work on the kinetics of coal pyrolysis at continuously rising temperatures is described. The theory of non-isothermal reaction kinetics is used to calculate the dependence of gas releasing reactions on temperature, taking as parameters the reaction order, the activation energy, the frequency factor and the rate of heating. Furthermore, it is possible to calculate the reaction parameters from curves established by measurements under non isothermal conditions. This theory was checked against the thermal decomposition of simple organic molecules and has been found to be in good agreement with experiment. The simplest curves of gas emission rate from coal as a function of temperature are obtained for higher gaseous hydrocarbons. This type of curve is interpreted in terms of a single reaction, whereas the release of methane and hydrogen is more complicated. To show the influence of heating rate, the release of ethane from a finely-ground coal (19.15 VM) was measured at different values between 0.01 and 100,000 deg. C/min. These experiments agreed well with the theory, assuming a first order law with a mean activation energy of 42.1 kcal/mol and a mean frequency factor of 10 to the 11th power per min. Also, the theoretically calculated shift of the reaction to higher temperatures with increasing rates of heating was exactly confirmed by experiment. (Authors' abstract)

10475

Sage, B. H.

PARTIAL OXIDATION PRODUCTS FORMED DURING COMBUSTION. (SUMMARY REPORT.) California Inst. of Tech., Pasadena, Chemical Engineering Lab., 26 p., 1968. 3 refs.

A research program dealing with the influence of oscillatory combustion of various fuels on the residual quantities of nitrogen oxides and other partial oxidation products is summarized. Experiments were conducted at a pressure of 50 lb./sq. in. employing air and a range of fuels including natural gas, ethane, propane, and butane. The highest NOx levels occurred at near stoichiometric mixture levels, with a sharp decrease at richer mixtures, and a more gradual decrease at leaner mixtures. The budget of the program, along with a list of publications and reports and personnel requirements, is presented.

Skvortsova, N. N. and S. N. Kimina

ATMOSPHERIC POLLUTION BY 3,4-BENZOPYRENE IN THE VICINITY OF A TIMBER-CHEMICAL PLANT. ((O zagryazhenii vozdukhnoi sredy 3,4-benzpirenom v raione raspolozheniya usokhimicheskogo proizvodstva.)) Hyg. & Sanit. (English translation of: Gigiena i Sanit.), 33(1-3):159-163, Jan.-March 1968. 6 refs. CFSTI: TT 68-50449/1

A timber-chemical plant with retort, tar-distilling, chemical carburation, drying and other shops, was investigated. Atmospheric pollution by 3,4-benzopyrene, tarry substances, free silicon dioxide, sylvan, phenol, a acetic acid and methanol was measured around the plant. Aspiration samples were taken in summer and snow samples in winter. Samples from wood pyrolysis were investigated to give information concerning accidental discharge of 3,4-benzopyrene. Environmental studies were accompanied by statistical studies of morbidity and mortality among population residing around the plant and in a control area.##

10660

Laffey, William T. and Robert N. Manning

SOLVENT SELECTION FOR THE REDUCTION OF AIR POLLUTION. Hercules Chem., No. 56:1-6, March 1968. 5 refs.

Regulations restricting the use of solvents which partake in photochemical smog reactions have caused the solvent and surface coating industries to develop alternate solvent formulations. A system is presented whereby a restricted solvent can be simulated using combinations of allowable materials. The procedure is graphical and depends on the solvent parameters and solubility characteristics of the materials. When several formulations are found which possess the required solvent properties, the choice of the best one then depends on economic or other factors.##

10662

Cline, E. L. and Lee Tinkham

A REALISTIC VEHICLE EMISSION INSPECTION SYSTEM. Preprint, Clayton Manufacturing Co., El Monte, Calif., Dynamometer Div., ((12))p., 1968. (Presented at the 61st Annual Meeting of the Air Pollution Control Association, St. Paul, Minn., June 23-27, 1968, Paper 68-152.)

A one minute mass vehicle exhaust emission inspection system is described to aid those seeking to establish an appropriate effort in compliance with the Air Quality Act of 1967. This proposed inspection is suitable for both emission controlled and pre-emission controlled automobiles. It is oriented to appropriate Auto Service Industry corrective measures since it provides guidelines as to probable cause of unnecessarily high emissions for each rejected vehicle. This capability is essential to avoid abnormal corrective expense due to excessive repairs or continued high

emissions due to inadequate repairs. Low skill levels may be used during the inspection process, yet results are repeatable and consistent in a plurality of inspection stations. The net gain in lower emissions through inspection of in-use vehicles is large because the point of rejection is no longer dictated by the inherently high emission vehicles. Not more than two rejection standards are required for emission controlled vehicles, and only one for pre-emission controlled vehicles. This includes all domestic and foreign makes. These standards are flexible in that they may be initially liberal and gradually tightened as circumstances warrant. Such policy changes or future spark ignition engine designs will not significantly obsolete the hardware required to perform this inspection. The fundamental techniques employed permit the use of greatly simplified equipment and instrumentation with resultant lower initial cost and increased reliability than previously envisioned meaningful inspection methods. A study of nearly 1000 automobiles over a one year period evolved and documented this proposed inspection system. Qualified persons may study this work to any depth desired by contacting the authors. (Authors abstract, modified)

10734

Charles R. Begeman, and Joseph M. Colucci

BENZO(A)PYRENE IN GASOLINE PARTIALLY PERSISTS IN
AUTOMOBILE EXHAUST. Science, 161(3838):271, July 19, 1968.

On average 36 percent of the benzo(a)pyrene in an automobile's exhaust gas comes from the benzo(a)pyrene originally in the gasoline. Between 0.1 and 0.2 percent of the benzo(a)pyrene in the gasoline survives the combustion process and is recovered from the exhaust; 5 percent accumulates in the crankcase oil. Some of the benzo(a)pyrene in the gasoline is converted into other polynuclear aromatic hydrocarbons and other more polar compounds. For our experiments we used commercial gasoline containing benzo(a)pyrene at 1.0 part per million to which was added benzo(a)pyrene-8,9 to the minus 11th power C at 1.1 parts per million as a radioactive tracer. (Authors' abstract) ##

10741

Chakraborty, B. B., and R. Long

THE FORMATION OF SOOT AND POLYCYCLIC AROMATIC HYDROCARBONS IN
DIFFUSION FLAMES--PART ONE. Combust. and Flame, 12(3):226-236,
June 1968.

The amount of chloroform soluble material, polycyclic aromatic hydrocarbons (PCH) and carbonaceous residue (CR), in the dry soot recovered from an ethylene diffusion flame have been determined and the effects on these of changes in the oxygen index (i.e. the mole fraction of oxygen in the mixture) of oxygen-nitrogen and oxygen-argon mixtures supplied to the flame have been investigated. In the oxygen-nitrogen mixtures, there is a rapid decline in the amount of PCH in the soot as the oxygen index increases from 0.18 to 0.26. The amount of soot reaches a maximum at an oxygen index of about 0.26 and above this value it declines rapidly being then composed almost entirely of

carbonaceous material. The decline in the amounts of individual PCAH in the soot with increase in oxygen index has been investigated. Substitution of nitrogen by argon leads to higher temperatures in the reaction and pyrolysis zones and at lower oxygen indices the effect is to favour the formation of CR and to lead to a reduction in the amount of PCAH in the soot. At higher oxygen indices, the amounts of soot (actually CR) are less. From the point of view of air pollution, the results emphasize the undesirability of either a general, or local, depletion of oxygen. (Author's abstract)##

10748

Fenimore, C. P., and G. W. Jones

COMPARATIVE YIELDS OF SOOT FROM PREMIXED HYDROCARBON FLAMES. Combust. and Flame, 12(3):196-200, June 1968.

Ethylene and acetylene gave eight times more soot when burnt with oxygen. The comparison was made in flames having the same temperature, and about the same pack concentrations of species from which the soot is supposed to grow (hydrocarbon radicals, acetylene and polyacetylene). We suggest that more effective oxidation of the soot aggregates, particularly during their early stages of growth occurred in oxygen flames, and this decreased the yield. Hydrogen chloride added to acetylene-oxygen flames increased the yield of soot without increasing the concentrations of polyacetylenes. Here too, the yield may have been altered mainly by changes in the oxidation of the early soot aggregates. (Authors' abstract)##

10775

Qader, S. A., W. H. Wiser, and G. R. Hill

KINETICS OF THE HYDROREMOVAL OF SULFUR, OXYGEN, AND NITROGEN FROM A LOW TEMPERATURE COAL TAR. Ind. Eng. Chem. Process Design Develop., 7(3):390-397, July 1968. ((11)) refs.

The result of the batch hydrogenolysis of S, O, and N compounds of a low temperature tar in the presence of a WS2 catalyst indicated that all the hetero atoms can be completely removed at 500 degree C. and a pressure of 1500 p.s.i. Cracking, aromatization, and possibly dehydrogenation reactions start at temperatures above 375 degree C. The hydrogenation of aromatic hydrocarbons starts at a pressure of 1250 p.s.i. The hydroremoval reactions of S, O, and N are all first order with respect to the heterocyclic molecules. Sulfur removal follows a true Arrhenius Temperature dependence, but the removal of O and N shows slight curvatures in the Arrhenius plot which can be resolved into two parts, each approaching linearity with a break at 400 degree C. and having different activation energies. The magnitude of energies of activation and enthalpies of activation obtained suggests that chemical reactions but not physical processes are rate controlling. The surface reaction involving the rupture of the C-S, C-O, and C-N bonds of the heterocyclic molecules appears to be the rate-determining step. (Authors' abstract)##

Rispoli, Jose A.

FIGHT AGAINST AIR POLLUTION IN ARGENTINA EDUCATIONAL, LEGAL AND TECHNOLOGICAL ASPECTS. Preprint, Tecnica de Higiene (Argentina), 20p., June 1968. 31 refs.

Air pollution is an increasing problem in the Argentina cities of Buenos Aires, Rosario, La Plata and Mar del Plata. Air pollution control measures are not keeping pace with the growth of industries, which are often located in neighborhoods of populated areas. The Municiple Director of Hygiene supervisors the problems of automotive emissions and industrial and domestic emissions. About one million vehicles travel daily in Buenos Aires. Traffic throughfares are being modified in order to eliminate congested traffic areas. The Director of Hygiene studies daily the chemical control of the pollutants of hydrocarbons, carbon monoxide and sedimented particles. The "Argentina Association for Air Contamination of sanitary education on all levels for the population.##

11143

Dearden, P. and R. Long

SOOT FORMATION IN ETHYLENE AND PROPANE DIFFUSION FLAMES. J. Appl. Chem., (London) 18(8):243-251, Aug. 1968.

Small samples of gas have been withdrawn from the luminous regions of the diffusion flames of ethylene and propane burning on a Wolfhard-Parker burner and these have been analysed by gas chromatography. In general, the parent hydrocarbon is rapidly decomposed on approaching and within the luminous region, acetylene being the major hydrocarbon product found. The concentration of acetylene falls rapidly near the interface with the oxidation zone suggesting that the main hydrocarbon oxidised in the latter is acetylene. The rates of soot collection, the uncorrected temperatures in the flames and the concentration of stable hydrocarbon species have also been measured when oxygen, hydrogen and acetylene respectively were added to the fuel stream. Oxygen, when introduced into the fuel, leads to increased temperatures and sooting rates in the case of ethylene and to increased temperatures but decreased sooting rates in the case of propane. The sooting rates of flames of ethylene will acetylene or oxygen as additives increased linearly with the area under the acetylene concentration profile in the luminous zone (measured at a height of approximately 5 mm above the burner). This area is proportional to the amount of acetylene present in the luminous zone at this height, which corresponds roughly with the onset of luminosity. Acetylene thus appears to be the major stable species via which soot is formed in such flames. Propane flames with oxygen as additive to the fuel, however, behave differently in that although there is an increase in temperature and in the amount of acetylene in the luminous zone the sooting rate decreases. This discrepancy remains unexplained and requires further investigation. (Authors' abstract, modified)

Heller, Austin N.

THE ROLE OF THE SCIENTIST IN URBAN ECOLOGY. Trans. N. Y. Acad. Sci., 30(8):1027-1044, June 1968.

Scientists play a central role in the management of air problems in New York City. An emission inventory procedure has been established for evaluation of the emissions into New York City's air from hundreds of thousands of sources. The principal objective of this inventory is to give an estimate of the spatial and temporal distribution of emissions. The monitoring network is based on a technical evaluation of the complex meteorological problems. Pollutant systems must be viewed from the point of view of multi-components, since the synergistic interaction of pollutants has a profound effect on the problem. The air resource management encompasses economic, sociological, technological, and physiological factors. Only through effective use of computer techniques can the interplay of these diverse problems be handled in a reasonable time.**

11171

Wheatley, R.N and R. J. Barger

WAY TO DETERMINE SULFUR IN PETROLEUM. Hydrocarbon Process. Petrol. Refiner 47(10):133-137, Oct. 1968.

Emphasis upon sulfur-free products for the benefit of man and machine as well as low sulfur refinery feed stocks that permit prolonged life of process catalysts has resulted in a concentrated effort toward sulfur reduction. Because critical areas of analysis are often in the range of 0 to 50 parts per million, a rapid and accurate sulfur method in this range was sought. Such a method was found in the application of the oxy-hydrogen Wickbold burner in which the material is combusted and the reaction products absorbed in water containing a small amount of hydrogen peroxide. The sulfate formed in the combustion oxidation process is titrated with standard barium perchlorate using thorinmethylene blue indicator.

11231

J. H. Wasser, G. B. Martin, and R. P. Hangebrauck

EFFECTS OF COMBUSTION GAS RESIDENCE TIME ON AIR POLLUTANT EMISSIONS FROM AN OIL-PIRED TEST FURNACE. Preprint, Public Health Service, Cincinnati, Ohio, National Air Pollution Control Administration, ((20))p., 1968. 5 refs. (Presented at the National Oil Fuel Institute Workshop, Linden, N. J., Sept. 17-18, 1968.)

The effects of increased combustion gas residence time on air pollution emissions from an experimental oil furnace are described and compared with earlier data to illustrate the resultant reduction of carbonaceous emissions. Particulate matter, smoke, carbon monoxide, and gaseous hydrocarbon emissions were reduced, and satisfactory operation obtained at lower excess

air levels. Sulfur oxides emissions were essentially unchanged. Nitrogen oxides emissions increased by a small amount. Oxygen and carbon dioxide concentrations in the flue gas were closer to theoretical values, indicating a significant improvement in combustion efficiency. Revised combustion chamber design criteria balanced with improved burner design should provide low air pollutant emissions and optimum operating efficiency for fuel-oil-fired domestic furnaces. (Authors' abstract, modified)##

11254

Springer, K. J., G. L. Williams, R. W. Olsen, and Kenneth D. Mills

EMISSIONS FROM GASOLINE-POWERED TRUCKS ABOVE 10,000-LB GVW USING PHS PROPORTIONAL SAMPLING TECHNIQUES. Preprint, American Institute of Chemical Engineers, New York, N. Y., 13p., 1968. 8 refs. (Presented at the 61st Annual Meeting, Symposium on Research and Development in Automotive Air Pollution Control, Los Angeles, Calif., Dec. 1-5, 1968, Paper 53C.)

Exhaust emissions, including hydrocarbons, CO, CO₂, and NO_x, from three gasoline-powered trucks above 10,000-lb gross vehicle weight are presented. Proportional techniques were used to obtain exhaust samples, permitting emissions to be analyzed and reported on a mass basis. A discussion of the preparations and dynamometer test procedures is included. (Authors' abstract)##

11263

Reamer, H. H., Joan Jacobs, and B. H. Sage

OSCILLATORY COMBUSTION AT ELEVATED PRESSURE. EFFECT OF FUEL. Preprint, California Inst. of Tech., Pasadena, Chemical Engineering Lab., ((29))p., ((1966)) 10 refs.

The effect of varying the fuel from natural gas to ethane, propane and n-butane upon oscillatory combustion in a cylindrical chamber 1 in. i.d. and approximately 24 in. in length was investigated experimentally. A significant effect upon the residual quantities of nitrogen and upon the double amplitude of the perturbation in normal stress was noted. Little, if any, effect upon the frequency of the longitudinal perturbations was experienced. The results are presented in tabular and graphical form. (Authors' abstract)##

11265

Reid, William T.

KILOWATTS FOR CARS - A COMPARISON OF ENERGY COSTS FOR ELECTRIC AUTOMOBILES. Boston, Mass., Battelle Memorial Inst., Columbus, Ohio, 7p., 1966. (Presented at the 3rd Annual Meeting, American Institute of Aeronautics and Astronautics, Nov. 29-Dec. 2, 1966, Paper 66-978.)

Success of electric vehicles for passenger service will hinge around costs as well as reliability, size, styling, and such indirect advantages as the elimination of air pollution. Costs, in turn, will depend mostly on the energy package, whatever it may be eventually. Primary and secondary batteries, fuel cells, combined cycles, and linear induction systems all have some place in powering an electric automobile, but their price to the eventual consumer is still uncertain. This paper outlines briefly some of the basic cost factors underlying selection of the optimum energy package. It points out where further scientific and engineering development will be necessary to arrive at a suitable compromise between what the average motorist will want and what he can afford to pay. Many of these costs must be based on engineering assumptions, but reasonable estimates are furnished based on the present state of the art and on expected advances in the foreseeable future. (Author's abstract)##

11457T

Brunner, M., H. Hoffmann, O. Hettche, L. Truffert, W. Hess, T. Muller, D. Hogger, M. Brunner, J. Richter, and R. Frick

AIR POLLUTION BY MOTOR VEHICLE EXHAUST GASES: ((Die Verunreinigung der Atmosphäre durch die Abgase der Motorfahrzeuge.)) Translated from German. Alimenta (Kilchberg), 4(6):213-220, 1965. (Summaries of papers presented at a symposium held by the Swiss Commission for Air Sanitation, Zurich, Sept. 22-23, 1965).

A review of several lectures presented at the Federal Commission for Air Hygiene in Zurich, Switzerland on pollution of the atmosphere by motor vehicle exhaust gases is presented. The following lectures are included in the form of brief communications: 1. The composition of exhaust gases produced by gasoline-burning engines; 2. The composition of exhaust gases of diesel engines; 3. The pollution of the atmosphere in traffic centers of large cities Abroad; 4. Air pollution caused by the exhaust gases from the automobile in Paris and its environs; 5. Survey of investigations of the air conducted in Zurich from 1961 to 1965; 6. The pollution of the atmosphere-observations in Switzerland; 7. Effects of exhaust gases on humans, animals, and plants; 8. The influence of the fuel composition; 9. Traffic sanitation and hygiene of the air; and 10. Police regulations and their enforcement. Pollution of the atmosphere by motor vehicle exhaust gases in Switzerland is emphasized.##

11493

Kaznina, N. I.

AIR POLLUTION BY VOLATILES LIBERATED BY SOME PLASTICS. ((O zagryaznenii vozdukha letuchimi veshchestvami, uydelyaemyimi plastikami.)) Hyg. Sanit. (English translation of: Gigiena i Sanit.), 33(4-6):267-269, April-June 1968.

CPSTI: TT 68-50449/2

The liberation of volatiles from plastics based on polyester resins PN-1 and PN-69 was investigated. Plastic samples

Nos. 1 and 2 contained polyester resin PN-1, isopropylbenzene hydroperoxide, cobalt naphthenate and cement, while sample No. 3 contained resin PN-1 and PN-69, isopropylbenzene hydroperoxide and cobalt naphthenate. Styrene was used as the solvent for the resins. The dynamics of the liberation of volatiles by these plastics as a function of temperature were investigated spectrophotometrically and chemically. The spectral characteristics of samples suggested the liberation of organic substances with an optical density of wavelength range 214-300 m. The concentration of liberated substances was found to be directly related to the temperature. The air of premises in which polymer materials are used is liable to be polluted by a complex mixture of volatiles which are extremely difficult to identify by the available techniques. The chemical and spectrophotometric data suggest that plastics based on polyester resins and manufactured by cold cure liberate appreciable amounts of volatiles, the concentrations of which are a function of temperature.##

11562

Ewald, Herbert and Gustav Emrich

ANALYSIS OF THE INTERESTING COMPONENTS OF EXHAUST GASES.
((Die Analytik interessierender Abgasbestandteile von
Auspuffgasen.)) Text in German. Freiburger Forschungsh.,
(A387):133-161, 1966. 146 refs.

Recent methods for the determination of CO, CO₂, NO, NO₂, hydrocarbons, and hydrocarbon combustion products in air and exhaust gases are reviewed in detail, with a discussion of their relative sensitivity, accuracy, and convenience. Data are also presented on the concentrations of some of these components during the operation of gasoline and diesel engines under various conditions. The sensitivity of various methods for the determination of some of these components and the prices of some of the analytical equipment (gas chromatographs, mass spectrometers, photometers, other spectrometers, and gas analyzers) required are given in tabular form. It is concluded that rapid testing or testing performed in mobile laboratories usually must be made by Orsat analysis or test capsules, while continuous measurements of exhaust gas components for control purposes can be done photometrically. For most purposes, ultraviolet and mass spectrometry have been replaced by gas chromatography, which is cheaper and more informative; however, spectrometric techniques are useful for identifying component detected by gas-chromatograph. Although basically a discontinuous process, gas chromatography can be automated.##

11615

Nowakowski, Paul

LUMINESCENT SMOKE GENERATION FEASIBILITY STUDY (FINAL REPORT).
Missouri Research Labs., Inc., St. Louis, Mo., Contract
N61339-67-C-0095, Task 5709, NAVTRADEVCEEN 67-C-0095-1, 25p.,
May 1968.
CFSTI: DDC AD 675503

The methods, test results and conclusions that comprise the effort of expanding the potential of a smoke generating device into the

realm of fluorescent response are described. In order to satisfy the requirements generated in this task, several areas of investigation were included in this program. To determine sources of fluorescent response and to ascertain the state of the art, literature was surveyed. The next step involved a study of the smoke generating device to determine the potential and the limitations of the smoke generating mechanism. When the most promising candidates for fluorescence had been procured, they were tested in the apparatus varying the solvent and the concentration. This physical testing prompted further work, using procured and tested and when the most promising formulations were ascertained, the stability of the fuel and the characteristics of the smoke cloud were determined. The forments. (Author's summary, modified)##

12084

Fink, C. K. and J. E. Weigel

OXYGENATED SOLVENTS. REFORMULATING NITROCELLULOSE LACQUERS. Paint, Varnish, Prod., 58(12):38-43, Dec. 1968.

Oxygenated solvents in combination with allowable aromatic and exempt hydrocarbon diluents have been accepted as an approach to compliance with air pollution controls. A guide to reformulation based on recent research into solvent composition-solution viscosity relationships is presented. Data are presented relating the composition of complying solvent systems to viscosity of nitrocellulose solutions prepared with these solvents. In addition to viscosity, a solvent mixture must have a balanced evaporation rate. A listing of acceptable solvents by relative evaporation rate is also presented.##

12085

Greaves, D. A. and I. G. Smith

NATURAL GAS CHALLENGES THE GAS INDUSTRY. PART TWO. Gas World, 168(4394):422-426, Nov. 2, 1968.

Natural gas at present supplies 16 to 17% of total world energy needs on a heat content basis and this may rise to about 25% by 1985 with the proportion varying widely from country to country. Some of the problems encountered in burner design are discussed. The need for ways of meeting peak loads cheaply is of importance. Liquefied natural gas is more easily stored and transported. Purification by removal of the acid gases is an important step in liquefaction of natural gas. Some of the methods used are discussed.##

12159

Friesell, J. W.

BURNING DEVICE ELIMINATES AIR POLLUTION IN THE DISPOSAL OF WASTE ALUMINUM ALKYLs. Preprint, Texas Alkyls, Inc., Houston, Texas, 9p., 1964. (Presented at a meeting of the Air Pollution Control Assoc., Houston, Texas, June 1964.)

Disposal of industrial wastes containing aluminum alkyls presents a difficult problem in the control of air pollution. Aluminum alkyls are not toxic or explosive, but they are so active chemically that they ignite and burn spontaneously on contact with air, releasing dense smoke. Their reaction with water is violent and liberates hydrocarbon vapors. The design, construction and performance of a unique smokeless burning device that has provided a safe, efficient and economical method for eliminating air pollution associated with disposal of waste aluminum alkyls is described. The use of this device has been extended to disposal of other materials such as kerosene, benzene and toluene. However, its full potential as a tool for air pollution control remains to be developed. (Author's abstract)##

12161

McKee, Herbert C. and George C. Lawrason

A STUDY OF ETHANOL-GASOLINE BLENDS AS AUTOMOTIVE FUEL. Preprint, Southwest Research Inst., San Antonio and Houston, Texas, 31p., 1964. (Presented at the 57th Annual Meeting of the Air Pollution Control Association, Houston, Texas, June 21-25, 1964.) paper 64-76.

An investigation of ethanol-gasoline blends as a fuel for modern automotive engines was undertaken. Primary emphasis in the early phases of the program was devoted to determining the operating characteristics of typical automobile engines with various amounts of ethanol added to conventional gasoline. Along with this investigation, a few preliminary tests were made to determine the amount of unburned organic vapor emitted in the exhaust, comparing the emission of an ethanol-gasoline blend with the emission of a leaded gasoline of the same octane number. It was immediately evident that a significant reduction in hydrocarbon concentration occurred with the ethanol-gasoline blends, and additional work was performed to investigate this particular factor in more detail. It is concluded, however, that before a large scale change in fuel composition are undertaken, several factors needed extensive investigation.

12521

R. U. Ayers

ALTERNATIVE NONPOLLUTING POWER SOURCES. S.A.E. (Soc. Automot. Engrs.) J., 76(12):40-80, Dec. 1968.

An urban transportation crisis grips the nation--its symptoms: thickening pollution, rising accidents, and ever increasing congestion. Currently, emissions appear to be the most pressing problem, therefore, responsible engineers must now consider alternative nonpolluting power sources. External combustion engines with steam or another fluid as the working medium are available now as an economic alternative to the internal combustion engine. The major virtue of the external combustion engine is an almost complete lack of emissions without compromise of engine performance. Steam engines offer simplifications in power train design as they possess high torque at zero speed eliminating the need for a

transmission. In hybrid systems, a small, constant speed internal combustion or external combustion engine drives a high-speed alternator-inverter which both powers electric motors at the wheels and charges a battery. While overall efficiency would equal that of present engines and emissions would be drastically reduced, the cost penalties for private automobiles would be substantial. Therefore, the use of hybrid systems appears likely only for specialized situations which might include trucks and buses. Electric propulsion systems based on lead-acid batteries are possible now for small, limited performance vehicles. If high energy batteries become an economic reality, small cars comparable to the Volkswagen and Renault will become possible. With the development of low cost fuel cells, fuel cell-battery hybrids will present an attractive alternative since the introduction of the fuel cell into the system would give these vehicles a much needed increase in range. The present state of development and a careful overview of the potential of these alternative energy systems is presented in detail.##

12967

Saito, Takeshi

INFLUENCE OF FUEL TYPES OF COMPOSITION OF AUTOMOTIVE ENGINE EXHAUST. (Jidosha haiki gasu ni oyobosu nenryo sosei no eikyo). Text in Japanese. Nenryo Kyokai Shi (J. Fuel Soc. Japan), 48(3): 148-159, 1969. 8 refs.

A continuation of the investigation of the influence of different fuels on the composition of automotive engine exhaust constituents is reported. The relations between the olefin content of fuel and exhaust constituents are experimentally shown using an internal combustion engine on a dynamometer block. Test fuels included two gasolines of different olefin content, commercial LPG, and pure propane. Carbon monoxide, hydrocarbons, N₂, O₂, CO₂, H₂, and nitrogen oxides were analyzed by gas chromatography. Unsaturated olefins were detected with an absorber reported by W. B. Innes. A special sampling apparatus using a magnetic bulb was constructed for analysis under acceleration. A hydrogen flame ionization detector was used for hydrocarbon analysis; molecular sieve and active charcoal were used for inorganic analyses; phenol disulfuric acid was used for nitrogen oxide determinations. Analytical data are shown for various engine loads and speeds. It is concluded that CO concentration depends on air-fuel ratio only and is not influenced by fuel composition. Differences in total hydrocarbon content of exhausts from different fuels are quantitatively small, but unsaturated hydrocarbons, which contribute to air pollution reactions, increase slightly with the fuel olefins.

13562

Chandler, J. M.

EFFECTS OF ENGINE-OPERATING VARIABLES ON THE COMPOSITION OF AUTOMOTIVE EXHAUST GASES. Proc. Am. Petrol. Inst., Sect. III, 38:324-335, 1958. (Based on a report of the Variables Panel of the Coordinating Research Council Group on composition of exhaust gases, Aug. 1957.)

The effects of engine variables on the concentrations of hydrocarbons and nitrogen oxides in automotive exhausts are discussed. The factors affecting hydrocarbon concentration in exhaust gas are manifold vacuum, engine detuning, and cold as compared to hot engine starting. Manifold vacuum of more than 21.5 in. of mercury accounts for high hydrocarbon concentrations during deceleration. This effect is accentuated by manual transmissions as compared to automatic. Enriched carburetor idle setting increases hydrocarbon emission at cruising speeds up to 30 mph. Spark-plug condition is important because one misfiring plug may more than double the average hydrocarbon concentration. Among the variables affecting nitrogen oxides, air-fuel ratio is of primary importance. Lean mixtures promote the formation of nitrogen oxides and increase the effects of other engine variables. Under full throttle, rich mixture conditions, the concentrations are relatively low. Under road-load cruise conditions and during fuel throttle accelerations, higher speeds produce higher concentrations. During part-throttle accelerations, speed has no effect, and high concentrations may be exhausted even at low speeds. During idling and deceleration, nitrogen oxides concentrations are so low as to be considered insignificant.

13668

Robb, E. W., W. R. Johnson, J. J. Westbrook, and R. B. Seligman

MODEL PYROLYSIS - THE STUDY OF CELLULOSE. Beitr. Tabakforsch., 3(9):597-604, Dec. 1966. 4 refs.

Relating smoke products to smoke precursors is an ambiguous task when burning any naturally occurring plant. To facilitate interpretation, a simple model pyrolysis system was studied using cellulose as the smoke precursor and monitoring benzo(a)pyrene as the smoke product. Data obtained show how pyrolysis was affected by changes in atmospheres, varied pyrolysis temperatures, the addition of inorganic materials, and chemical modifications of the cellulose molecule. It is hypothesized that cellulose can undergo pyrolysis by two different modes to form benzo(a)pyrene. Large quantities of the hydrocarbon can be formed by high-temperature (850 C) isothermal pyrolysis of cellulose via an efficient gaseous reaction route. In this reaction, the benzo(a)pyrene yield decreased in the presence of iron, cobalt, and nickel, while the yield increased with increasing temperatures and with the introduction of oxygen into the system. In contrast, graduated heating experiments demonstrated that benzo(a)pyrene began to form at 450 C. This reaction was inefficient with respect to benzo(a)pyrene yield and was unaffected by the presence of metals. The benzo(a)pyrene precursors appeared to be nonvolatile, being formed from the solid decomposition of cellulose. This reaction was inhibited by nitric oxide or salts generating nitric oxide. Additionally, oxidation of the cellulose molecule at the C6 position produced a decreased benzo(a)pyrene yield. (Author summary modified)

13795

Lawson, S. D., Sr., J. Byrne, A. R. Cunningham, D. L. Hendrickson, and E. L. Winkler

ECONOMICS OF CHANGING VOLATILITY AND REDUCING LIGHT OLEFINS--
U. S. MOTOR GASOLINE. Proc. Am. Petrol. Inst., Div. Refining,
vol. 48:643-704, 1968. 28 refs.

Three simulated refineries were used to evaluate five changes in gasoline specification. These included one higher and two lower levels of motor gasoline volatility and two levels of reduced light olefin content at constant volatility. The results were then extrapolated to obtain information applicable to the entire U. S. Summaries of added costs and investments for the various cases studied are tabulated. The costs are presented relative to two reference points, the base case and the modified case. The base cases resulted from a rigorous simulation of the actual refining operations conducted in the year 1965, including the proportion of zeolite cracking catalyst which was actually being used during that year. The modified base cases were obtained by allowing for the increased use of zeolite catalyst from 30 to 100% and the addition of capital investment. It is concluded that it is technically possible with present refining technology to manufacture motor gasoline of substantially lower volatility or reduced light olefin content.

13951

Sorenson, S. C. and H. K. Newhall

KINETICS OF HYDROCARBONS IN ENGINE EXHAUST SYSTEMS. Preprint, Combustion Inst., Central States Section 5p., 1968. (Presented at the Meeting of the Central States Section of the Combustion Inst., Columbus, Ohio, March 1968.)

Chemical reactions possibly occurring in engine exhaust systems are oxidation of hydrocarbons with an attendant reduction in emissions and modification of hydrocarbon structure giving rise to a change in photochemical reactivity or smog-forming potential of the exhaust products. This work consists of a theoretical estimation of the various hydrocarbon reactions which might be of importance. A mathematical model of an isothermal, well-mixed steady-flow system was used. Theoretical results indicate that pyrolysis and oxidation mechanisms may both be of importance in exhaust gas reactions, and that the hydrocarbons ultimately found in the exhaust gas may be significantly different from the parent hydrocarbons. The results also indicate that the time required for complete oxidation is approximately 4 millisecc at the high temperatures and free radical concentrations employed. These are extreme values and representative of only a completely insulated exhaust system. The oxidation process is accompanied by a large increase in the rate of energy release due to chemical reaction. Preceding oxidation, a large increase in the concentrations of free radicals and non-fuel hydrocarbons occurs. Significant pyrolysis products building up prior to oxidation include ethylene, acetylene, and methane. All of these are ultimately destroyed in the oxidation process, given sufficient time. (Author abstract modified)

Lindberg, Walter

AIR POLLUTION IN NORWAY. I. THE GENERAL AIR POLLUTION IN NORWEGIAN CITIES AND INDUSTRIAL TOWNS. (Den alminnelige luftforurensning i Norge. I. Generelt om luftforurensning i byer og tettbygde strøk.) Translated from Norwegian. Oslo Univ. (Norway), p. 1-65, 1968. 12 refs

General information is presented on air pollution in Norway with attention focused on (1) the sources and types of pollutants: motor vehicles, heating plants, incinerators, (2) air pollution levels in the cities, including dustfall, SO₂, and smoke measurements in Oslo, Sweden, (3) special investigations (sulfuric acid fog), the chemical composition of solid particulates in smoke and suspended dust, polynuclear hydrocarbons and particulates, trace elements, (4) pollutants in Norwegian cities other than Oslo, (5) directions for medicohygienic evaluation of pollution levels in cities and other densely populated districts and industrial regions, and (6) an evaluation of the economic consequences of air pollution.

14033

Pahnke, Alden J. and James F. Conte

EFFECT OF COMBUSTION CHAMBER DEPOSITS AND DRIVING CONDITIONS ON VEHICLE EXHAUST EMISSIONS. Preprint, Society of Automotive Engineers, Inc., New York, N. Y., 24p., 1969. 15 refs. (Presented at the International Automotive Engineering Congress, Detroit, Mich., Jan. 13-17, 1969, Paper 690017.)

Hydrocarbon exhaust emission levels of new cars driven under consumer-type conditions increase during the initial 5000 to 10,000 miles of operation; the magnitude of the increase is less with vehicles equipped with exhaust control systems. The role of combustion chamber deposits in increasing hydrocarbon exhaust emission levels during the initial period of vehicle operation was considered. Analyses have shown these deposits to contain high concentrations of lead salts originating from the combustion of lead alkyls present in gasoline. Two consumer-type vehicle tests to determine the effect of leaded and unleaded gasoline on exhaust emissions were completed. One test involved 122 cars without exhaust control systems and the other, 36 cars with exhaust control systems. In both tests, hydrocarbon exhaust emissions of the leaded and unleaded cars increased during the initial period of mileage accumulation and then leveled out as equilibrium was reached. Average hydrocarbon emission levels of the leaded cars were higher than those of the unleaded cars with the difference or net lead effect amounting to 7% in both the 122-car and the 36-car tests. No significant differences in carbon monoxide or nitrogen oxide emission levels were observed. Photochemical reactivity levels were essentially the same for the leaded and unleaded car groups in the two tests. A limited study of the effect of mileage accumulation conditions on exhaust emission levels was carried out. Results obtained under rapid or accelerated mileage accumulation conditions did not correlate with consumer test results. (Author abstract modified)

Davis, H. P., O. A. Uyehara, and P. S. Myers

THE EFFECTS OF KNOCK ON THE HYDROCARBON EMISSIONS OF A SPARK-IGNITION ENGINE. Preprint, Society of Automotive Engineers, Inc., New York, 9p., 1969. 12 refs. (Presented at the International Automotive Engineering Congress, Detroit, Mich., Jan. 13-17, 1969, Paper 690085.)

To determine the effects of knock in a spark ignition, single-cylinder engine with cooled exhaust upon the exhaust composition, exhaust products (CO, CO₂, and total hydrocarbons) were measured by non-dispersive infrared analyzers (NDIRA) and by a flame ionization detector (FID). Individual hydrocarbons were separated on a gas-liquid chromatograph. In fuel-rich mixtures, the FID indicated noticeable decreases in the hydrocarbon concentrations in the presence of knock. The NDIRA did not indicate a decrease in the hydrocarbons at knock of lower intensities but showed decreases in hydrocarbons at knock of higher intensities. Chromatograms indicated a preferential decrease in acetylene at the time of knock, causing different responses at lower intensities. In fuel-lean mixtures, no apparent effect of knock on the hydrocarbons was indicated. Thus, it was concluded that in fuel-rich to stoichiometric regions, knock generally decreases the hydrocarbon concentration in the exhaust and the extent of the decreases is greater with the intensity of knock. (Author abstract modified)

14074

Leggewie, G. and I. Skunca

SOOT FORMATION TENDENCY OF LP-GAS IN ATMOSPHERIC BURNERS. (Untersuchungen ueber die Russbildungsneigung von Fluessiggasen in atmosphaerischen Brennern). Text in German. Intern. Z. Gaswaerme, 18(3):122-123, March 1969. 3 refs.

Using the cooker burner of a multi-gas range, the authors determined the tendency to form soot when the range was supplied with hydrocarbon gases under equal pressure. The input of primary air was so adjusted as to cause incipient yellow flame tips to occur. The tendency to form soot increases in the order: propane, butane, propylene, and butylene.

14116

Hurn, R. W.

AIR POLLUTION AND THE COMPRESSION-IGNITION ENGINE. Preprint. Combustion Institute, Pittsburgh, 14p., 1968. 9 refs. (Presented at The Combustion Inst. Twelfth International Symposium on Combustion, Poitiers Univ., France, July 14-20, 1968, Paper 61-7.)

The compression-ignition engine, popularly known as the diesel, is examined as a contributor to metropolitan air pollution. Smoke and odor are recognized as the primary targets of public

objection to the diesel, and factors relevant to the smoke and odor problem are discussed. Problems of diesel smoke are seen as readily manageable, but a satisfactory solution to the diesel odor problem is not yet available. Other pollutants, e.g., unburned or partially burned hydrocarbons, oxides of nitrogen, and carbon monoxide, are significant products of diesel combustion. Of these, only nitrogen oxides and possibly the aldehydes are typically discharged in quantities that in equivalent volumes may exceed the quantities discharged by spark ignition reciprocating internal combustion engines. Features unique to the diesel combustion process are discussed as factors relevant to generation or avoidance of objectionable pollutants. The high temperatures and oxygen availability in diesel combustion are seen as serious impediments to satisfactory reduction of the yield of nitrogen oxides, but they are favorable in holding concentrations of pollutants in other categories to acceptable low levels. To compound this advantage, the diesel has advantages both in fuel economy and in higher heat value of diesel fuel compared with lighter fuels. Thus, it would appear that diesel power offers an excellent opportunity for continued and expanded application to meet increasingly stringent clean air requirements. (Author abstract modified)

14124

Elmenhorst, H. and W. Döntenwill

CARCINOGENIC HYDROCARBONS IN THE SMOKE FROM CHARCOAL GRILLING. (Nachweis cancerogener Kohlenwasserstoffe im Rauch beim Grillen über Holzkohlenfeuer). Text in German. Z. Krebsforsch., vol. 70:157-160, Nov. 1967. 9 refs.

The smoke which is formed during the charcoal grilling of bacon was analyzed for its content of polycyclic hydrocarbons. The following polycyclic hydrocarbons were found: fluoranthene, perylene, phenanthrene, pyrene, benzo(a)pyrene, benzo(e)pyrene, chrysene, dibenzanthracene, anthracene, and benzanthracene. The amount of carcinogenic benzo(a)pyrene in the smoke was 129 micrograms/kg of grilled bacon, and it was assumed that the carcinogenic hydrocarbons in the grill smoke were produced by pyrolysis of the fat which dropped on the glowing charcoal. (Author summary modified)

14127

Stone, R. K. and B. H. Eccleston

VEHICLE EMISSIONS VS. FUEL COMPOSITION. Preprint, American Petroleum Institute, Montreal, Can., Div. of Refining, 50p., 1968. 9 refs. (Presented at the Session on Air and Water Conservation, 33rd Midyear Meeting of the American Petroleum Institute Division of Refining, Philadelphia, Pa., May 16, 1968, Preprint No. 43-68.)

Reduction of evaporation losses from motor vehicles was investigated as a means of lessening the amount of pollutants reaching the atmosphere. The effect of fuel volatility and of front-end fuel composition on the quantity, composition, and

photochemical reactivity of vehicle emissions including both tailpipe and fuel-system losses were studied. In addition, the test variables included engine fuel-system features and ambient temperature, which was varied over a range of 20-95 F. Results of tests on eight 1966 model cars are given. Driving cycle and instrumentation typical of current practices for emission studies were used. Test results showed that at high ambient temperatures, a large reduction in evaporation losses accompanied a reduction in front-end fuel volatility. However, there was also a small adverse effect on exhaust emissions from volatility reduction. Reactive hydrocarbon emissions from evaporation were reduced substantially by either volatility reduction or saturation of light olefins. Light olefin reduction also reduced exhaust reactivity. Carbon monoxide emissions showed a small increase as fuel volatility was reduced, while nitrogen oxides and aldehydes showed no significant fuel effect. (Author abstract modified)

14461

Hall, C. A., A. E. Felt, and W. J. Brown

EVALUATING EFFECTS OF FUEL FACTORS ON STABILIZED EXHAUST EMISSION LEVELS. Preprint, Society of Automotive Engineers, Inc., New York, 20p., 1969. 5 refs. (Presented at the International Automotive Engineering Congress, Detroit, Mich., Jan. 13-17, 1969, Paper 690014.)

Single-cylinder engine studies showed that the severity of the test cycle used for deposit accumulation markedly affects the level of exhaust emissions obtained with stabilized combustion chamber deposits. These studies also show that the relative stabilized emission levels with non-leaded and leaded fuels vary significantly with the aromatic content of the base fuel. An extensive evaluation in three groups of passenger cars operated by their owners in normal service showed no significant difference between the stabilized emission levels obtained with commercial non-leaded and leaded fuels. A dynamometer engine test procedure was developed that simulates short-trip, city-type operation. The accelerated cooldown procedure allows for rapid accumulation of test mileage. Use of this dynamometer procedure showed that a prototype highly aromatic non-leaded fuel produced a higher deposit stabilized emission level than that obtained with an average presently used leaded fuel. (Author abstract modified)

14462

Gagliardi, J. C. and F. E. Ghannam

EFFECTS OF TETRAETHYL LEAD CONCENTRATION ON EXHAUST EMISSIONS IN CUSTOMER TYPE VEHICLE OPERATION. Preprint, Society of Automotive Engineers, Inc., New York, 19p., 1969. 9 refs. (Presented at the International Automotive Engineering Congress, Detroit, Mich., Jan. 13-17, 1969, Paper 690015.)

Effects of various concentrations of tetraethyl lead on exhaust emissions were investigated. Eight Ford Galaxies equipped with production non-exhaust emission-equipped 289-CID, 2-V engines were operated in customer service for 18,000 miles in the Detroit area. Four fuel blends were used in mileage accumulation. All

engines were operated on the same petroleum base engine lubricant. Exhaust emissions were monitored at approximately 3000-mile intervals using the California Motor Vehicle Pollution Control Board seven-mode procedure. Additional seven-mode tests were obtained on each engine after combustion chamber deposits were removed at the completion of the mileage accumulation phase. The increase in exhaust hydrocarbon emissions of vehicle operation on the leaded fuels was substantially higher than the hydrocarbon increase of vehicles operated on Indolene Clear (a full boiling range non-lead gasoline). At the 12,000 mile point, for example, the average hydrocarbon increase for the leaded fuels was approximately 100 ppm as hexane, while the hydrocarbon increase on Indolene Clear was negligible. No deleterious effect, due to the fuel used, was observed on any engine component. (Author abstract modified)

14487

Shoji, H., K. Nishida, M. Komatsu, S. Yamada, T. Denda, S. Takada, and A. Hasegawa

THE STUDIES ON THE AIR POLLUTION DUE TO AUTOMOBILE EXHAUST GASES (REPORT 12). TOTAL AMOUNT OF EXHAUST GASES IN KYOTO-CITY. Jidosha haiki ni yoru taiki osen no kenkyu (Dai 12 ho). Kyoto-shi ni okeru haiki seibun no hai shutsu). Text in Japanese. Nippon Eiseigaku Zasshi (Japan J. Hyg.), 24(1):92, April 1969.

A method for calculating total automotive exhaust gases in Kyoto is based on estimates of the average amount of exhaust gases per automobile per running cycle and the ratio between traffic density in center city and the surrounding areas. Assuming that (1) the ratio between center city and outlying traffic is 2.2 to 1.0; (2) the total number of cars varies between 200,000 to 300,000/day; (3) all have gasoline engines; and (4) the running cycle for center city is the BC type and for the circumferential area the HI type, the total amount of exhaust would be 124.0 to 127.2 tons CO/day and 17.8 to 18.8 tons of hydrocarbons per day for 200,000 cars and 186.0 to 198.8 tons CO/day and 26.8 to 28.2 tons of hydrocarbons per day for 300,000 cars.

14619

Cejka, Milan

DIESEL ENGINE EXHAUST GASES. (Vyfukove plyny z naftovych motoru). Text in Czech. Ropa Uhlie, 9(6-7):208-211, 1967.

Composition of engine exhaust gases depends largely on the fuel-air ratio, which varies in accordance with the loading of the engine from 18:1 to 100:1, and this greatly influences the combustion process. In addition, the content of exhaust gases is determined by the shape of the combustion chamber, the type of fuel injection, whether the engine is two or four stroke, habits of the driver, etc. Analysis gave evidence of 47 different compounds in engine exhaust gas. Nitrogen oxides comprised 40-85% of the emissions from diesel engines compared to 10% from combustion engines. The content of aldehydes in smoke is the main cause of toxic effects in humans. It is believed that lighter fuels reduce smoke, but

they yield more irritant compounds. In a garage for 200 buses whose engines were in good condition, the measured concentration of carcinogens was 2.7 to 2.9 micrograms/100 cu m, which is less than values found in ambient air from burning coal. The setting of maximum allowable concentration standards is very difficult because of the wide range of individual reactions to engine exhausts. Reduction of pollution may be effected by supplying specially treated fuel with low sulfur content, after burning of gases as practiced in the U. S., and regular inspection of engines.

14680

Wagner, T. O.

COMPOSITION OF DIESEL EXHAUST HYDROCARBONS. Franklin Inst. Research Labs., Philadelphia, Pa., Materials Science and Engineering Dept. and Public Health Service, Durham, N. C., National Air Pollution Control Administration, Proc. First Natl. Symp. on Heterogeneous Catalysis for Control of Air Pollution, Philadelphia, Pa., Nov. 1968, p. 241-252.

The technology required to develop an odor standard for diesel engines is being acquired. However, diesel exhausts contain such a wide range of compounds that sampling and analytical procedures are difficult. When no more than an inventory of hydrocarbon compounds is desired, capillary-column chromatographic analysis of a bag sample is adequate, even though many 'heavy' hydrocarbons are lost. Such an analysis revealed the presence of C1 to C18 paraffins. Few, if any, of the light and mid-boiling compounds were present in the fuel. Compounds causing diesel odor are in the C8 to C18 range. Diesel exhaust contains many oxygenated compounds which may be relevant to odor, but their concentrations are low. The effect of fuel on diesel emissions is small. Concentrations of hydrocarbons in diesel exhaust, adjusted for excess-air dilution, are generally below passenger car emission standards.

14697

Klinksiek, K. E.

PARTICULAR PROBLEMS WITH EXHAUST GAS ANALYSES AT VOLKSWAGENWERK AG. Preprint, Society of Automotive Engineers, Inc., New York, 12p., 1968. 6 refs. (Presented at the Automotive Engineering Congress, Detroit, Mich., Jan. 8-12, 1968, Paper 680122.)

Emission and durability tests of 1968 Volkswagens are reported. Exhaust emissions from cars made in Europe and the United States were measured by a dynamometer and analyzed for hydrocarbon and carbon monoxide content by infrared and flame ionization detection methods. To determine if any correlation exists between present or proposed emission standards and test procedures, European, Japanese, and American tests were used to calculate exhaust gas flows and quantity of pollutants. Carbon monoxide concentrations in the European test procedure are 1.3 times higher than in the official U. S. test procedure. Concentrations of hydrocarbon in the European test procedure is

lower than in the U. S. procedure, reflecting the influence of deceleration which is more rapid in the U. S. test. If U. S. emission standards were based on mass emission rather than on concentration, mass emissions of carbon monoxide would be higher in U. S. test procedures. This is attributed to the relationship between carbon monoxide and exhaust gas volume. Higher average speed in the U. S. test results in a higher exhaust gas volume. Fuel consumption does not correlate significantly with emissions, but combustion tends to be better with the U. S. test procedure. Worldwide legislation on emission standards with one common test procedure is recommended.

14767

Markus, G. A., Yu. G. Ozerskii, and V. I. Oratovskii

DISCHARGES TO ATMOSPHERE AT THE PHENOL WORKS. Coke Chem. (USSR) (English translation from Russian of: Koks i Khim.); no. 1:37-39, 1969. 9 refs.

The quantity and composition of discharges from the phenol works were determined. Discharges come from breather valves in operational equipment as a result of evaporation from equipment operating under a vacuum which discharges drawn-off gases, and from spent gas leaving the unit for springing sodium phenolates with carbon dioxide. The vacuum pump discharges contain hydrogen sulfide and ammonia. Impurities such as pyridine bases, phenols, neutral aromatic hydrocarbons, hydrogen sulfide, and ammonia enter the common collector. Measurements revealed that the volume of the gas-air mixture discharged to the atmosphere through the collector is 600-800 cu m/hr. Two-liter samples were taken over a 30-min period and analyzed. The fluctuations of the various contents were ascribed to changes in the composition of the raw materials that were processed and in the operating conditions of the plants. The maximum concentrations of the noxious discharges were calculated. The results indicated that the content of phenols, hydrogen sulfide, and other impurities exceeded the maximum standards and must be reduced 10-20 times. It was concluded that work should be done to reduce the volume of discharge by strict observance of the process conditions to ensure that minimum discharges and effective equipment be developed to trap noxious impurities.

14798

Liedmeier, G. P.

PREVENTION OF ATMOSPHERIC POLLUTION IN PETROLEUM REFINERIES. (La prevention de la pollution atmospherique dans les raffineries de petrole). Text in French. Pollut. Atmos. (Paris), 11(Special):3-8, Feb. 1969.

A review of atmospheric pollution and problems in controlling it in the refineries of Europe is presented. The author discusses the founding of CONCAWE (Conservation of Clean Air and Water--Western Europe), which is a group of oil companies and societies representing 80% of the refining capacity in Western Europe. Its functions are to process information pertaining to pollution

by refineries and the joint study of pollution problems. It now has working groups in the following areas: study of the height of chimneys and atmospheric dispersion; liquid effluents; petroleum pipelines; subterranean migration of petroleum; and noise abatement. The sources and effects of refinery pollution, particularly by sulfur oxides, hydrocarbons, and malodorous gases are reviewed. Particulate matter and nitrogen oxides are considered of secondary importance. A brief review of methods for combatting pollution is also included.

14892

Durrant, T.

TOWARDS CLEANER SKIES. *Aeroplane*, 116(2966):16, 20-21, Aug. 21, 1968.

The main contaminants produced by aircraft burning kerosene fuels are exhaust smoke, unburned hydrocarbons, carbon monoxide, and sulfur and nitrogen oxides. The presence of smoke in the engine exhaust is a failure to control carbon production or consumption processes or both, but experience has shown that elimination of smoke is difficult at increased engine pressure ratios. By changing combustion-chamber design and including airspray fuel injectors, it is expected that new large transport gas-turbine engines will have a barely visible level of smoke emission. Annular chambers now being introduced have a smaller flame tube wall surface area and therefore use less cooling air than the tuboannular system. Consequently, unburned hydrocarbon and carbon monoxide concentrations at idle and taxi conditions will be lower on new engines than on those currently in service. The most difficult contaminants to control are nitrogen oxides, although concentrations are low compared with the automobiles. Intensive investigations are being conducted to reduce these emissions; it is suggested that one method of reducing their concentration may be by running with a richer primary combustion zone, although this is contrary to smoke-control requirements and would involve design compromises.

15310

Friedlander, S. K. and J. H. Seinfeld

A DYNAMIC MODEL OF PHOTOCHEMICAL SMOG. *Environ. Sci. Technol.*, 3(11):1175-1181, Nov. 1969. 19 refs.

A simplified kinetic scheme is proposed as a dynamic model for photochemical smog reactions. Unlike previous diffusion models, which have been concerned with nonreacting pollutants, the formulation of this model takes into account both the chemical reaction and turbulent mixing aspects of the photochemical smog problem. In the first part of the paper, a simplified kinetic mechanism is presented for the formation of photochemical smog from nitric oxide and unburned hydrocarbons. In the second part, diffusion models based on the general equation of conservation of species are discussed. The model is a combination of the transport and chemical kinetic equations and predicts the behavior of a reacting pollutant cloud. The roles of sulfur oxides and aerosols are not considered. Calculations based on the

model lead to concentration dependence on time, similar in form to the experimental results for laboratory reaction chambers. The Lagrangian similarity hypothesis for the diffusion of nonreactive components is extended to reacting species to take into account the effect of atmospheric mixing. This leads to a set of ordinary differential equations for the reactive species of the type describing a chemical reactor of variable volume. As a preliminary example of the application of the model, a calculation was made for a single bimolecular reaction.

15352

Scofield, Francis

AIR POLLUTION FROM SOLVENTS. Am. Chem. Soc., Div. Org. Coatings Plastics Chem., Preprints, 29(2):393, 1969. (Presented at the 158th Meeting of the Am. Chem. Soc., Div. Organic Coatings and Plastics Chemistry, New York, Sept. 1969.)

The organics and plastics coatings industries are among the major contributors to photochemical smog. A significant contribution arises from the evaporation of organic solvents. The reactivity of solvents varies over a wide range and a substantial reduction in the amounts of reactive materials contributed by solvent evaporation may be achieved without a corresponding reduction of the total solvents. The only effective way to date of establishing the relative reactivity of these compounds is an empirical method which exposes a mixture of the solvent and nitrogen oxides to irradiation. A number of photochemical reactors of this type are in operation and many of them provide for the direct determination of eye irritation. It is very difficult to predict reactivity of individual solvents, and since there is a wide variety of reactions which may take place, not all of which lead to eye irritation or other damaging products, even a high degree of reactivity is not necessarily an indication that a solvent is objectionable. An accepted order of reactivity by classes of compounds is that, in general, olefins are the most reactive and should be controlled at the lowest level. Aromatic compounds are less objectionable but still require control, while most oxygenated and aliphatic materials are relatively innocuous and under present conditions do not appear to require control. However, within each of these classes a wide range of reactivity can be encountered. More information in this area is necessary in order to guide the writing of future regulations and possibly the revision of current controls.

15367

Eberan-Eberhorst, R.

PROBLEMS OF EXHAUST GASES FROM OTTO ENGINES - RESULTS OF OTHERS AND ORIGINAL MEASUREMENTS. (Probleme der Abgase von Ottomotoren - Ergebnisse frender und eigener Messungen). Text in German. ATZ (Automobiltechnische Zeitschrift) (Stuttgart), 70(2):40-45, 1968. 19 refs.

Tests of the Otto engine on a dynamometer showed that all carbon monoxide and hydrocarbons can be easily eliminated in the load

and speed range of the engine. Only when the engine acts as a vehicle brake does the hydrocarbon (CH) content exceed 1000 ppm. Optimum spark timing and diminishing of the valve overlap reduces the idle rpm to 730 with a CH content of less than 1000 ppm. Above 1550 rpm, extremely high CH concentrations of more than 5000 ppm occurred. This phenomenon was studied in greater detail. For this purpose, the combustion pressure in the cylinder was induced, and PV diagrams were obtained with a piezo quartz pressure pick-off and a cathode ray oscillograph at 2000 rpm and slowly closing throttle valve. Initially the combustion was rather complete, as the emission concentrations of 0.15% CO by volume and CH less than 30 ppm, show. By further closing of the throttle valve, the pressure decreased from 4.0 to 0.28 kg force/sq cm, combustion became markedly irregular but still complete, and emissions decreased. At an underpressure of 488 mm Hg in the intake pipe, the engine began to act as a brake, but the emissions were still only 50 ppm CH. Upon closing of the throttle valve to 8 degrees, emissions increased to 4000 ppm CH. There are two ways to avoid high emission concentrations of CO and CH caused by misfiring; namely, by prevention of the development of toxic exhaust components in the engine, or by destroying the toxicants in the exhaust system. A review of the major methods developed by the various automobile manufacturers is given. In conclusion, a regulator is described which maintains a constant fuel supply and a constant underpressure in the intake pipe during all operating states.

15392

Bean, Samuel L. and Howard Wall, Jr.

ATMOSPHERIC EMISSIONS FROM HYDROCHLORIC ACID MANUFACTURING PROCESSES. Public Health Service, Durham, N. C., National Air Pollution Control Administration and Manufacturing Chemists Association, Washington, D. C., Pub. AP-54, 59p. Sept. 1969. 15 refs.

The basic characteristics of the manufacture of hydrochloric acid are presented, including growth rate of the industry, manufacturing processes, product uses, and the number of producing plants in the United States. The Mannheim, Hargreaves, and Laury processes are discussed with respect to their historical interest, even though the number of plants that use them is decreasing. The concentration of hydrogen chloride emitted to the atmosphere is usually less than 0.5% of the tail gas volume emitted to the atmosphere. Emissions from hydrochloric acid plants are adversely affected by high temperatures in the absorption system, improper balance of absorption area and contact time, faulty equipment, and inadequate tail gas scrubbing systems. No correlation exists between exit gas volumes and plant production rates because of the diverse methods of production. However, smaller volumes of exit gas usually show greater hydrogen chloride concentrations due to the varying amounts of inert materials in this gas stream. Thus, the amount of hydrogen chloride emitted in pounds per ton of acid produced gives a more accurate description of the contaminant emissions. The hydrogen chloride emissions are usually reduced by scrubbing in a packed tower located behind the process tower. Water scrubbers can reduce the concentration to less than 0.1 pound per ton of acid produced. Hydrogen chloride absorption systems

include falling film and adiabatic absorbers. Other contaminants such as chloride, chlorinated organic compounds and other hydrocarbons emitted to the atmosphere are mentioned.

15399

NATURE AND CONTROL OF AIRCRAFT ENGINE EXHAUST EMISSIONS. Northern Research and Engineering Corp., Cambridge, Mass. Contract PH22-68-27, Report 1134-1, 388p., Nov. 1968. 208 refs.

The results of a study of the emissions of air pollutants by aircraft engines in the U. S. are presented. The study included four aspects of aircraft engine emissions: the nature of aircraft engine emissions and quantities emitted, the effects or impact of aircraft engine emissions on the populace, the reduction of emissions, and governmental control of the emissions. In addition, emission control requirements were considered and guidelines developed for determining the degree of control needed. The principal conclusion drawn from the study is that the nature and extent of air pollutant emission by aircraft can be assessed with sufficient accuracy to allow a comparison between aircraft and other emissions sources. On that basis, aircraft are a small contributor of pollutants in metropolitan areas. In the vicinity of air terminals, however, the density of pollutant emission by aircraft and the resulting pollutant concentrations are comparable to emission densities and concentrations in adjacent communities of the same pollutants from other sources. Thus, the principle impact of aircraft is local in nature and is expected to become more severe in future years. It is also likely that aircraft emissions will constitute a more significant portion of community-wide pollutant loadings as new aircraft are introduced and as emissions from other sources are reduced. It is further concluded that whenever a reduction of aircraft emissions becomes desirable, a variety of practical approaches exist to reduce both the quantities of pollutants emitted and their impact on the community. Specific conclusions relative to emission reduction and emission control are presented. A program of activity with regard to aircraft emission is recommended. All emission data is tabulated.

15769

Pursall, B. R.

POLLUTION IN ROAD TUNNELS. Consulting Eng., 33(8):57-58, Aug. 1969. 9 refs.

The sources and causes of the build-up of pollutants in road tunnels are discussed. The two main sources of poisonous exhaust gases are gasoline and diesel engines. Diesel exhaust emits a smaller percentage of carbon monoxide than the gasoline engine, but because the diesel engine is larger, it emits a larger volume. The diesel engine also produces more nitric oxide and nitrogen peroxide. Vehicles emit up to 50% more carbon monoxide on the up-gradient than on the level; on the down gradient, they emit 40% less. In calculations for two-way tunnels, an average figure for carbon monoxide emission can safely be taken. Tests showed that the amounts of carbon monoxide and other combustion

products vary directly with speed. Differences in tunnel concentrations for the Sumner Tunnel in Boston and the Central Tunnel in London were attributed to different vehicle speeds and variations between British and American vehicles and fuels. The variations resulted in higher concentrations of lead and hydrocarbons in the Sumner Tunnel; carbon monoxide concentrations were similar for average daytime periods in both tunnels. The effects of carbon monoxide, nitrogen oxides, and lead compounds are briefly discussed. It was concluded that if the concentration of CO can be diluted to below 100 ppm, the concentration of nitrogen oxides and other gases should be relatively harmless. Visibility should also be satisfactory under these conditions. In a 2 way tunnel, the maximum ventilation rate was calculated to be 200 cu ft/min/ft. With one way traffic, ventilation is induced from the portals by the moving vehicles, but additional artificial ventilation would be necessary when the traffic is stopped or moving slowly. In most large tunnels, alarms operate if the CO concentration exceeds 250 ppm.

15883

Winkler, G. L., S. S. Lestz, W. E. Meyer

EXHAUST GAS SAMPLING TECHNIQUE FOR RELATING EMISSIONS AND CYCLE CHARACTERISTICS. Preprint, Society of Automotive Engineers, Inc., New York, 5p, 1968. 10 refs. (Presented at the National Fuels and Lubricants Meeting, Tulsa, Okla., Oct. 29-31, 1968, Paper 680770.)

For investigating whether or not there is a correlation between the irregularity of combustion processes in spark engine ignitions and undesirable emissions, a sampling system was developed which collects bag samples from specified cycles only. It consists of an analog portion for obtaining pressure and rate-of-pressure change signals, a digital logic portion for discriminating between signals according to selected criteria, and an electrically actuated sampling valve in the engine exhaust system. Since signal analysis and discrimination are instantaneous, gas sampling is done during the exhaust stroke of the same cycle for which the logic generated the command to sample. An analysis of the total unburnt hydrocarbons from 600 bag samples shows that there is a separation in the amount of unburnt hydrocarbons according to the magnitude of the peak rate of pressure change. The separation is repeatable for a given engine condition and supports the assumption of a relationship between exhaust gas composition and the physical characteristics of the cycle. (Author abstract modified)

15996

Campbell, Frank Leslie and Willis Conrad

INSECTICIDE COMPOUND AND METHOD OF DISPENSING AN INSECTICIDE. (Assignee not given.) U. S. Pat. 2,381,257. 2p., Aug. 7, 1945. (Appl. July 24, 1941, 3 claims).

The invention provides an insecticide in a liquid or solid form which decomposes at atmospheric pressure and room temperature, to release a toxic gas for the destruction of insects. The method

consists of exposing insects to a compound of sulfur dioxide and acetone which decomposes to release sulfur dioxide and acetone vapors in a toxic volume. Other compounds for use as insecticides include SO₂ and ethylene oxide, SO₂ and dioxan, SO₂ and trimethylamine, SO₂ and triethylamine, and SO₂ and dimethylaniline. The invention makes it possible to pack and ship sulfur dioxide in a readily usable form.

16017

Kurtzweg, J. A. and D. W. Weig

DETERMINING AIR POLLUTANT EMISSIONS FROM TRANSPORTATION SYSTEMS. Preprint, Association for Computing Machinery, New York, N. Y., 22p., 1969. 18 refs., (Presented at the Association for Computing Machinery, Symposium on The Applications of Computers to the Problems of an Urban Society, New York, Oct. 24, 1969.)

Internal combustion vehicles are a source of five major air pollutants: carbon monoxide, hydrocarbons, nitrogen oxides, particulates, and sulfur oxides. Because vehicular pollution is essentially a problem of urbanization, analysis of its source must be carried out on a metropolitan or smaller scale. A method is presented for estimating the quantity and spatial distribution of motor vehicle emissions in a metropolitan area from established speed-emission relationships and transportation study data. On-the-road sampling of exhaust emissions from a representative sample of automobiles indicates there is a consistent relationship between average route speed and the quantity of carbon monoxide and hydrocarbons emitted. Metropolitan transportation study agencies developed detailed descriptions of future street and highway networks. The Seattle, Washington, metropolitan area was selected for the initial application of the vehicle emission estimation method because of the transportation characteristics of the area and the nature of the transportation study data available. Emissions are calculated for two 1985 street and highway networks, one based on the land use pattern predicted if existing trends within the region continue, and one based on a pattern which will exist only if certain development policies are implemented. The calculated vehicular emissions and estimated emissions from non-vehicular sources can be used with a meteorological diffusion model to predict future air quality. (Author abstract modified)

16024

Styles, H. E., J. Vrebos, and J. Lawther

PUBLIC HEALTH ASPECTS OF AIR POLLUTION FROM DIESEL VEHICLES. Preprint, World Health Organization, Geneva, Switzerland, 36p., Aug. 18, 1966. 8 refs. (WHO/AP/67.28.)

Diesel and gasoline engines are compared with regard to differences between their design and operating characteristics and differences between their exhaust products. Satisfactory combustion in a diesel engine does not require the production of an explosive admixture of vaporized fuel and air. Complete combustion is largely a matter of ensuring a correct pattern of

fuel spray from injector nozzles and a suitable degree of air swirl by proper combustion chamber design. In a diesel working at rated capacity, an excess of oxygen is always present during combustion and, in a properly maintained engine, the exhaust seldom contains more than mere traces of carbon monoxide, even though a haze of smoke is produced. As shown by analyses of smoke from intentionally maladjusted engines, diesels are not a major source of polycyclic hydrocarbons. While diesel soot has produced tumors in laboratory animals, no excess of lung cancer has been found among workers exposed to diesel exhausts. Diesel engines can be developed which meet emission standards such as those contained in the Belgian Royal Decree of 1964. Properly adjusted and maintained, these engines will not emit dangerous or dirty smoke. The use of smoke meters is recommended to check diesel smoke. Included in the appendix are measures taken to reduce air pollution by diesel buses and coaches in London.

16125

Masek, V.

DEPOSITION OF COAL AND PITCH DUST ON AND AROUND COKE OVENS. Coke Chem. (USSR) (English translation from Russian of: Kaks i Khim.), vol. 4:29-31, 1969.

The results of investigations on the amounts of dust, the composition, and the method of dissemination in pitch-coke batteries and coke oven batteries was described. Most of the dust deposited on the pitch-coke batteries was in the form of spherical particles with a minimum diameter of 0.3-0.5 micron. The majority of the dust particles which settled on coke-oven batteries had a characteristic crystalline structure. Samples of dust deposited on the top of and in the vicinity of five coke-oven batteries were analyzed. No striking differences were obtained under winter and summer conditions. Homogeneous samples were collected to determine the contents of vitrain, clarain, durain, fusain, coke, and other constituents. It was established that the major component is vitrain. Results showed that with increasing distance from the battery, the deposits contain larger proportions of particles below 0.2 mm and smaller amounts of 3,4-benzopyrene. The highest content of 3,4-benzopyrene was found in the pitch and dust on and around coke-oven batteries. The amount of dust deposited on the coke-oven batteries depends on the charging procedure. Observations showed that ramming reduces dust emissions and loose charging increases the emissions. The results support the conclusion that strict adherence to battery operating instructions secures a major reduction in dust pollution. A further improvement can be effected by adopting the smokeless charging technique.

16135

Hashimoto, Michio and Masahiro Fujiwara

EFFECTS OF AUTOMOBILE EXHAUST GAS EMISSION ON AIR POLLUTION. (Jidoshahaikigasu no taikiosen eno eikyo). Text in Japanese. Jidosha Gijutsu (Automobile Eng.), 23(11):1151-1163, 1969. 25 refs.

In 1968, automobile production in Japan was almost 4,100,000 cars, a million more than produced in West Germany, and second only to the United States production of 11,000,000 cars in the same year. While the United States, West Germany, France, England, and Italy show no annual increase, automobile production in Japan is increasing at an annual rate of 25-30%. If this rate is maintained, the approximate annual output should match that of the United States by 1974. It is difficult to imagine the extent of pollution by automobile engine exhaust when automobile production in a country approximately the area of California approximates that of the United States. Based on the results of measurements in several cities, the following aspects of pollution by automobile exhaust are discussed in detail: carbon monoxide emissions; dust fall including lead and pyrene; photochemical contaminations; hydrocarbon emissions; and odors. The toxicity of air pollutants for humans and vegetation is also examined. Although work on carbon monoxide began late in Japan, air quality criteria are now being formulated with respect to carbon monoxide. Air pollution from automobile exhaust is found to be increasing by approximately 10-15%. It is hoped that control policies will be in effect before automobile production reaches one car for every two individuals.

16263

Ludwig, John H.

SEMINAR ON AIR POLLUTION BY MOTOR VEHICLES. Preprint, Assistant Commissioner, Science and Technology, Washington, D. C. 64p., 1970. 27 refs.

The contribution of motor vehicle emissions to community-wide air pollution problems depends on several related factors: the extent of community, commercial, and industrial sources as compared to vehicle sources; the size of the community and the distribution of these sources; topographical and meteorological factors; and the degree of control exercised for sources. The relative importance of motor vehicle emissions can be approached by evaluating specific effects, specific pollutants, and sources with respect to pollutant emissions of all types. Average emissions by sources are presented for Los Angeles County, Louisville, Detroit, and 11 Pennsylvania counties. Sources of gaseous emissions from motor vehicles are reviewed, as well as the sources of hydrocarbon and smoke emissions from diesels. California standards are reported for vehicle smoke and odor emissions, carbon monoxide, and nitrogen oxides levels. Also reported are 1970 Federal Standards for exhaust emissions from automobiles and light trucks. An attempt is made to assess specific hydrocarbon constituents in gasoline engine exhaust, crank case ventilation, and evaporation losses, and diesel exhausts and their relationship to photochemical reactions occurring in the atmosphere. The need of continued laboratory research and detailed examination of exhausts produced by control devices is stressed.

Fiala, Ernst and Ernst-Georg Zeschmann

ANNOYANCE CAUSED BY ODOROUS EXHAUST GASES. (Laestigkeit von Abgasgeruch). Text in German. VDI (Ver. Deut. Ingr.) Z. (Duesseldorf), 109(24):1139-1141, 1967. 5 refs.

The intensity of odors caused by automobile exhaust gases was evaluated by measuring the odor intensity of dilutions of the exhaust gas with fresh air that exceeded the odor threshold. The tests were performed with a water-cooled four-cylinder, four-stroke Otto engine. The measurements were based on the following considerations. At low traffic density i.e., on well-ventilated streets, the exhaust gas odor is not noticeable; the odor threshold is not reached. With increasing traffic density, i.e., less ventilation, odor threshold is exceeded. The mass flows emitted under the latter condition were indicative of the dilution which was the measure for the odor intensity. The results showed the familiar independence of carbon monoxide and hydrocarbon concentrations from engine operating state. Test personnel could smell the exhaust gas independently of the operating state at 800- to 1000-fold dilution. The carbon monoxide and hydrocarbon concentrations at the moment the odor threshold was exceeded were between 1 and 100 ppm and 0.6 to 8 ppm, respectively. Addition of air in the exhaust system reduced the concentrations, but increased the odor intensity.

16318

Risebrough, Robert and Virginia Brodine

MORE LETTERS IN THE WIND. Environment, 12(1):16-26, Jan.-Feb. 1970. 15 refs.

The accidental release to the atmosphere of toxic polychlorinated biphenyls (PCB) is discussed. Like DDT, PCB contains chlorine, hydrogen, and carbon; is soluble in fat and insoluble in water; and is extremely persistent in the environment. It is found in natural and synthetic rubber, electrical products, floor tile, printer's inks, coatings for paper and fabrics, brake linings, paints, varnishes, asphalt, adhesives, and resins. In addition, PCB is used to suppress the vaporization of chlorinated insecticides. Its detection began in 1967 with the identification of 1980 ppm PCB in the fat of North American peregrine falcons and 17,000 ppm in the fat of Swedish white-tailed eagles. It is unlikely that the insecticide is the only source of contamination. Other suspected sources are stacks of the plant manufacturing polychlorinated biphenyls, industrial wastes, and the gradual wear and weathering of PCB-containing products. Little data is available about PCB in people, but a sampling of mothers' milk in Berkeley and Los Angeles showed average concentrations of 0.06 ppm of whole milk. Small amounts were present in a sample of cow's milk and higher concentrations in fish eaten by humans. Establishment of tolerance limits of PCB in food is clearly essential. It is also necessary to identify the sources of the environmental PCB residues and to trace the paths by which they move through the environment.

Del Vecchio, V., P. Valori, C. Melchiorri, and A. Grella

AROMATIC POLYCYCLIC HYDROCARBONS FOUND IN THE EXHAUST GASES OF ENGINES RUN ON GASOLINE AND LIQUEFIED PETROLEUM GAS. (Idrocarburi policiclici aromatici nel gas di scarico di motori alimentati a benzina e a gas liquido). Text in Italian. Nuovi Ann. Igiene Microbiol (Rome), 20(2):174-190, March-April 1969. 33 refs. (Presented at the Symposium on the Chemical Aspects of Air Pollution, Cortina d'Ampezzo, July 9-10, 1969.)

Liquefied petroleum (LP) gas is seldom used for motor vehicles on the highway, even though its use would reduce air pollution problems, but is used in industry and commercial establishments to operate the motors of lift trucks for loading, unloading, transporting, and stacking goods. A series of experiments were made with a Towmotor model lift truck, type 461 HF, with a 4-cylinder continental motor, 2400 rpm, lifting power 2000 kg. The truck was operated for a total of 8450 hours during the experiment. The fuels used were 84 NO gasoline and propane-butane (LP gas). It was operated under simulated operating conditions with a load of 1000 kg as well as in an idling state at approximately 500 rpm. The exhaust gases were collected, dried, and filtered through glass wool and cellulose triacetate. Aspiration was by means of a vacuum pump, with a constant flow of 2813 l/m. Extracts were prepared in a Soxhlet apparatus with cyclohexane for a period of 20-30 hours. The extract was adsorbed in a column of alumina and separated chromatographically. Quantitative determinations of aromatic polycyclic hydrocarbons (APH) were made by spectrophotometry. The gasoline exhaust contained 19 identifiable APH, some of which were known to be carcinogenic. The LP gas exhaust contained 18 APH. Qualitative differences were very slight, but the APH emissions from the gasoline exhaust were considerably higher in quantity, with the exception of fluorene, anthracene, and antanthrene. Tests with an idling motor at 500 rpm produced considerably less concentrations of the individual hydrocarbons for both fuels, with the exception of naphthalene.

16494

Akamatsu, Isao, Hiroshi Kamishima, and Yutaka Kimura

DEODORIZATION OF EXHAUST GAS IN KRAFT PULPING. (PART I). ON THE FORMATION OF MALODOROUS COMPONENTS IN KRAFT PULPING. (Kurafuto-parupu seizo kotei haishutsu gasu no mushuka (1 ho): Jokai-chu ni okeru akushu-seibun no seisei ni tsuite). Text in Japanese. Kami-pa Gikyoshi (J. Japan Tech. Assoc. Pulp Paper Ind.), 22(8): 406-410, Aug. 1968. 3 refs.

The formation of malodorous substances, methyl mercaptan (MMA) and dimethyl sulfide (DMS), in the process of kraft pulping was studied in two types of Japanese pulp woods: softwoods (red pine, cedar and Japanese cypress) and hardwoods (beech, poplar, cherry and pasania oak). Alkaline (Na2O) and sodium sulfide (NaS) were added to a 400 g dried pulpwood block in an electric autoclave and boiled for 5-1/2 hours at 185 C. Then 5 cc of exhaust gas (raw blow gas) was sent into the cyclone-separator (a cylinder with the diameter

of 3 cm and the length of 18 cm) and analyzed for malodorous substances (MMA and DMS) by the use of Yanagimoto GCG-5DH type gas chromatograph. Larger amounts of MMA and DMS, especially MMA, were produced by pulping hardwoods than by pulping softwoods. In pulping the same wood type, the amount of malodorous substances was increased with the increase of cooking hour and temperature, and the concentration of NaS. The white lauan produced the same malodorous substances in quality and quantity as obtained in the pulping of Japanese hardwoods. When the pulping was performed by a batch system, the concentration of DMS was decreased to trace with the depression of pressure in the autoclave.

16498

Heuser, A. R.

TRENDS IN AIR CONSERVATION IN THE GRAPHIC ARTS INDUSTRY. Gravure, 1969:22-25, 45-48, Feb. 1969. (Presented at the Fifth Graphic Arts Conference of the Technical Association of the Pulp and Paper Industry, Chicago, Nov. 1968.)

The main sources of pollution from processes involving printing and coating operations is exhaust from ovens and dryers. The principal contaminants are hydrocarbons from the solvents used in the inks and coatings. In addition, there can be some hydrocarbon residue from incomplete combustion of the fuel in flame dryers and ovens. Odors are also a problem, attributed to complex organic products of cracking and partial oxidation of resinous materials in solvents. In general, the solvents themselves are not responsible for odor complaints. Solvent emissions can be limited by direct-flame incineration or catalytic combustion, the latter technique being the more economical. Because of the possibility of catalyst poisoning or suppression, catalytic combustion may not meet Los Angeles air pollution regulations limiting solvent emissions to a maximum of 8% olefins and 20% toluene. Direct-flame ionization has been approved by the Los Angeles Air Pollution Control District. A newer approach to curtailing emissions from graphic art processes involves the use of inks and coatings which do not pollute air or require expensive effluent treatment. Ways by which this goal might be met are examined.

16526

Wheatley, G. A. and J. A. Hardman

INDICATIONS OF THE PRESENCE OF ORGANOCHLORINE INSECTICIDES IN RAINWATER IN CENTRAL ENGLAND. Nature, 207(4996):486-487, July 31, 1965. 5 refs.

Rainwater samples collected from a locality in central England were analyzed for organochlorine insecticides by both thin-layer and gas/liquid chromatographic techniques. Quantitative estimates (90% for dieldrin, 70% for gamma benzene hexachloride (BHC), and 50% for DDT) were obtained by comparing the peak heights on the gas chromatograms of samples extracted with hexane with those given by standards prepared from analytical grade specimens of the insecticides. All the rainwater samples examined yielded solutes identical in behavior to gamma-BHC and dieldrin in both the thin-layer and gas/liquid chromatographic systems. A solute corresponding to the behavior of p,p' DDT was also detected.

The concentrations of the solutes varied from month to month and appeared to be independent of the total monthly recorded rainfall. It is concluded that apparent increases in residues in untreated droplets could not be accounted for by fallout of insecticide in the rain, since calculations showed that one part of solute could deposit only 2.7 mg of solute per acre for a 24-in. annual rainfall.

C. ATMOSPHERIC INTERACTION

00139

E. R. Allen and R. D. Cadle

A STUDY OF THE EFFECT OF MOLECULAR OXYGEN ON ATOMIC OXYGEN-HYDROCARBON REACTIONS. Photochem. Photobiol. 4, 979-87, 1965.

Investigations of the systems atomic oxygen-methane and atomic oxygen-n-butane have been made, using techniques for producing atomic oxygen in the presence and absence of ground state molecular oxygen. The results indicated that the initial rate of removal of atomic oxygen from both systems was accelerated by the presence of molecular oxygen, whereas the initial rate of removal of hydrocarbon, for n-butane, was affected little if at all.##

00173

R. J. Engelmann, R. W. Perkins, D. I. Hagen, and W. A. Haller

WASHOUT COEFFICIENTS FOR SELECTED GASES AND PARTICULATES. Battelle Memorial Inst., Richland, Wash., Pacific Northwest Lab. (BNWL-SA-657.) (Presented at the 59th Annual Meeting, Air Pollution Control Association, San Francisco, Calif., June 20-24, 1966, Paper No. 66-118). 31 pp.

Precipitation scavenging is the primary cleansing mechanism for airborne gases and fine particulates. Scavenging below cloud base, called washout, acts to remove these from pollution clouds. Advances in radiochemical techniques allow the measurement of such washout coefficients during natural rain and snow. Washout coefficients (fraction washed out per unit time) are presented for several gases as a function of precipitation rate. Deviations from theoretical predictions are discussed.##

00177

H. Buchberg, M. H. Jones, K. G. Lindh, and K. W. Wilson

AIR POLLUTION STUDIES WITH SIMULATED ATMOSPHERES. California Univ., Los Angeles, Dept. of Engineering. (Rept. No. 61-44.) July 1961. 185 pp.

Part I of this report deals with the statistical relations among interacting atmospheric variables. Also contained in this report are the results of several auxiliary or supporting studies as follows: Air Purification Studies; Development of an Eye

Mask for the Measurement of the Threshold of Eye Irritation; Development of an Omnidirectional Solar Radiometer for a Limited Spectral Region Centered about 0.36 microns; A Comparison of Concentration and Duration as Measures of Threshold for Eye Irritation; A Comparison of Threshold to Eye Irritation Resulting from Reacted Air Mixtures Sampled at Different Points in the Exposure System; A Comparison of Odor Threshold and Eye Irritation Threshold for Formaldehyde, Acrolein, and Ozone. (Author)**

00242

W.W. Heck, C.S. Brandt, J.A. Dunning, F.L. Fox

ECOLOGICAL FACTORS INFLUENCING PLANTS AS MONITORS OF PHOTOCHEMICAL AIR POLLUTION. Preprint. (Presented at the 59th Annual Meeting, Air Pollution Control Association, San Francisco, Calif., June 20-24, 1966, Paper 66-48.)

The response of plant systems to the oxidant complex of the air must be interpreted in terms of the influence of the total environment. Photoperiod, light intensity, carbon dioxide concentration, soil conditions, time of day, plant age, and frequency of exposures affect the response of pinto bean and tobacco to ozone. Tobacco is suggested as a relatively simple monitoring system for obtaining some data on photochemical pollution. (Authors' abstract)**

00302

A. P. Altshuller

ATMOSPHERIC REACTION STUDIES RELATED TO AIR POLLUTION. Arch. Environ. Health 8, 27-30, Jan. 1964.

Studies of air pollution in urban and adjacent rural areas by particles and trace gases need to be related to studies of composition of the earth's atmosphere. Man's activities generate pollutants which in themselves or through photochemical reactions contaminate the general atmosphere. Cooperative efforts need to be made by air pollution and atmospheric science laboratories to obtain monitoring data. Areas of such research in measurement of pollutants and nonpollutants, measurement methods, instrumentation, and biological and chemical effects are reviewed by the author. The proper selection of synthetic atmospheres for laboratory studies so that real conditions are reflected is emphasized. An important problem still requiring solution is the obtaining of support, personnel, and facilities for research and development on instrumentation for specialized applications.**

00344

W. L. Faith

RELATIVE REACTIVITY OF HYDROCARBONS IN PHOTOCHEMICAL SMOG FORMATION AND ITS PRACTICAL IMPLICATIONS. Preprint. (Presented at the 59th Annual Meeting, Air Pollution Control

Adequate and intelligent control of photochemical smog requires a knowledge of the relative reactivity of the hydrocarbons emitted from motor vehicles and a method of measuring them. An extensive survey of the literature yields the following general classification of hydrocarbons: (1) reactive (all olefins and all aromatics except benzene and toluene) and (2) nonreactive (all paraffins, acetylene, benzene and toluene). Within the olefin series, there is a wide range of reactivity; ethylene is far less reactive than other olefin species. In fact, ethylene provides a good line of demarcation between reactive and unreactive compounds, so far as photochemical smog formation is concerned. A simple method of analysis that will distinguish between reactive and non-reactive hydrocarbons is sorely needed. At present, an instrument that would distinguish between olefins and nonolefins would be useful. (Author)##

00345

J. C. Romanovsky, R. M. Ingels, and R. J. Gordon

ESTIMATION OF SMOG EFFECTS IN THE HYDROCARBON-NITRIC OXIDE SYSTEM. Preprint. (Presented at the Air Pollution Control Assoc. Annual Meeting, June 20-24, 1966, San Francisco, Calif., Paper No. 66-42).

The complex role of nitric oxide in photochemical smog has led to conflicting conclusions concerning its relationship to end effects. The confusion has not been dispelled by the tendency to employ kinetic parameters of the photochemical reactions accompanying the formation of smog as indicators of the end effects. In an attempt to resolve these differences a detailed study was carried out to examine the effects of varying the concentrations and reactant ratios of NO and "hydrocarbon" on a number of smog effects as well as on various functions of the reaction rate. Hydrocarbon components increasing in complexity from propylene through a simulated auto exhaust to authentic auto exhaust were irradiated in the presence of NO in large chambers instrumented for measurements of numerous variables. Eye irritation was measured using a selected panel of human subjects; formation of ozone and formaldehyde was followed analytically. From other analytical data it was possible to derive half-lives for NO, NO₂, and hydrocarbon, as well as maximum reaction rates for propylene, either as the sole hydrocarbon or as a component of the exhaust. The various dependent variables are presented as functions of the reactant concentrations by means of contour diagrams derived by computer treatment. The effect of "hydrocarbon" and NO levels on smog effects are discussed; the observed relationships between end effects and reaction rates are considered. The study simulated the effects of varying degrees of vehicular emissions control over one or both reactants and has a bearing on the establishment of vehicle emission standards in California. (Author)##

J.P. Detrie

(METHODS AND TECHNIQUES CARRIED OUT IN FRANCE IN THE FIGHT AGAINST ATMOSPHERIC POLLUTION.) Methodes et Moyens en Oeuvre en France pour Lutter contre la Pollution Atmospherique. Rev. Soc. Roy. Belge Ingrs. Ind. (Brussels) No. (5):207-217, May 1966. Text in French

Legislative proposals put into effect in the Paris region over the last five years are reviewed. There is a close liaison established between private organizations, representing the hygiene specialists and private industry and public powers. Studies carried out to determine the extent of pollution, that is, emission, dispersion, type of environment and its effect on pollution, demonstrated the problems involved with means of combating pollution. The solution cannot be found in generalized formulas which are too often recommended, and which mask the detailed effort necessary to obtain good carburetion and combustion of fuels and proper construction of buildings and equipment. (Author summary)##

A.P. Altshuller

AN EVALUATION OF TECHNIQUES FOR THE DETERMINATION OF THE PHOTOCHEMICAL REACTIVITY OF ORGANIC EMISSIONS. J. Air Pollution Control Assoc. 16(5):257-260, May 1966.

The concept that control of organic substances in emissions should be based on the relative ability to cause the effects associated with photochemical air pollution (reactivity) rather than on gross emission levels has gained wide acceptance. Two general types of reactivity response scales have been proposed. One of these is based on rates of hydrocarbon reaction or nitrogen dioxide formation. This scale covers a wide range because of the very high rates associated with olefins having internal double-bonds. The other scale is based on product yields combined with biological measurements. This type of scale is considered superior to one based on rates. This latter scale covers a narrow response range because olefins with internal double bonds have only slightly higher product yields and biological effects than do other reactive olefins and alkylbenzenes. Use of a response scale based on product yields and biological effects also permits use of less detailed instrumental procedures. A simple subtractive column technique combined with a flame ionization analyzer should be sufficient to estimate hydrocarbon emissions. Gas chromatographic analyses of hydrocarbon emissions are of value when used with either type of reactivity response scale. However, detailed gas chromatographic analyses are essential for a response scale based on rates. The response scale based on product yields and biological effects indicates much less improvement in reactivity from fuel composition changes than would be predicted from a response scale based on rates. The most desirable approach is to use a variety of control and engine modification techniques to reduce all reactive organics to the lowest level possible.##

W. J. Hamming, W.G. MacBeth, R.L. Chass

THE PHOTOCHEMICAL AIR POLLUTION SYNDROME AS EXHIBITED BY THE ATTACK OF OCTOBER 1965. Arch. Environ. Health., 14(1):137-149, Jan. 1967. (Presented at the American Medical Association Air Pollution Medical Research Conference, Los Angeles, Calif., March 2-4, 1966.)

The photochemical air pollution syndrome which occurred on the days of October 26, 27, 28, 1965, was typical and it followed the pattern set by previous smog attacks. These factors are: (1) low wind speeds to concentrate the pollution in one area, (2) low inversion heights so that little vertical mixing can occur to dilute the emitted materials, (3) a trajectory which carries the emitted pollution to Los Angeles Civic Center and to Pasadena and Azusa or Burbank in the afternoon, and (4) sufficient sunlight to photodissociate the NO₂ formed, and to form nitric oxide and atomic oxygen. The results are high oxidant or ozone and large quantities of sub-micron size particles. In addition, eye irritants and "plant damaging" chemicals are formed. Some of these are, it is believed, formaldehyde, acrolein, PAN, chemical free radicals, other nitrates or nitroso compounds, and a peroxyformyl activated complex. Authors present sixteen (16) charts and tables to substantiate the events in this air pollution episode. They include meteorology, concentrations of various oxidants, pulmonary blow resistance, and variations in eye irritation.##

00510

M. Neiburger

METEOROLOGICAL ASPECTS OF AIR POLLUTION IN RELATION TO BIOLOGICAL RESPONSES. Arch. Environ. Health 14(1):41-45, Jan. 1967. (Presented at the American Medical Association Air Pollution Medical Research Conference, Los Angeles, Calif., Mar. 2-4, 1966.)

This report presents a brief review of the meteorological aspects of air pollution, as a background for the implications they have on biological and medical effects. The meteorological factors enter because they determine the rates of diffusion of pollutants, and thus the concentrations of contaminants in the air, given the configuration and intensity of the sources. The two factors which enter are the wind velocity and the vertical temperature gradient or lapse rate. Meteorological considerations will have to enter into the final determination of the air purity standards which will have to be met. Much research will be needed regarding the rates of diffusion from line and area sources, and especially the rates of removal of pollution. Much data will be required to define the air pollution potential of regions throughout the world. But we cannot await the answers to this research before requiring controls to the full extent presently feasible. Regulations are needed to enforce limiting every emission into the atmosphere to the lowest possible level, at the same time as we push research and development programs seeking means of reducing further the contamination of the atmosphere.##

J.N. Pitts, Jr., J.K. Foote, J.K.S. Wan

SOME CORRELATIONS BETWEEN SPECTROSCOPIC AND PHOTOCHEMICAL PROCESSES. Photochem. Photobiol. Vol. 4:323-333, 1965. (Presented at the Photochemistry and Photobiology Symposium, Fourth International Congress of Photochemistry and Photobiology, July 26-30, 1964, Oxford, England.)

By applying the modifier 'Space' to the terms 'Photochemistry' and 'Spectroscopy' one implies a concern with electromagnetic radiation of wavelengths less than that found at the earth's surface and with energetic particles, particularly electrons. It has been observed that for certain classes of organic compounds useful empirical correlations exist between reactions induced by electron impact, non-ionizing ultraviolet radiation and ionizing radiation. These correlations allow qualitative or semi-quantitative predictions of specific reactions and/or reaction mechanisms which will occur during photolysis or radiolysis, based on known optical or mass spectra. In accord with recent spectroscopic evidence, benzene and toluene do not significantly react photochemically in their first absorption band (at about 2500 angstroms); however, they react with a quantum yield approaching unity in their second and third absorption bands (at about 2000 and 1850 angstroms respectively). The products of this decomposition are primarily carbon and/or polymer which deposit on cell windows, however, small yields of stable products have been isolated. Another example of this extrapolation from one technique to another deals with the correlation of cyclic elimination reactions observed in the mass spectra, photochemistry and radiation chemistry of various classes of organic compounds. Classic examples of this type of reaction are the photolytic and radiolytic elimination of olefins from esters and ketones having a hydrogen gamma to the carbonyl group (i.e., the elimination of ethylene from ethyl acetate and of propylene from methyl n-butyl ketone). Based on mass spectral correlations with the above reactions, the same type of elimination should be expected from a great number of compounds which contain hydrogens gamma to unsaturated groups. In those cases where the photochemistry or radiation chemistry of these compounds have been studied, an intramolecular cycloelimination of olefin has been observed to be an important process. It is suggested that mass spectra are a useful diagnostic tool for at least gross predictions in 'space photochemistry' and 'space photobiology', as well as in considering reactions of importance under primitive earth conditions. (Author abstract)##

00618

E. A. Schuck, J. N. Pitts, Jr., J.K.S. Wan

RELATIONSHIPS BETWEEN CERTAIN METEOROLOGICAL FACTORS AND PHOTOCHEMICAL SMOG. Intern. J. Air Water Pollution Vol. 10(10):689-711, Oct. 1966. (Presented at Photochemistry Symposium, Robert A. Taft Sanitary Engineering Center, Cincinnati, Ohio, Apr. 20-22, 1964.)

By a method of averaging, involving a large amount of atmospheric monitoring data, it has been shown that

interesting and perhaps valid information on the formation and intensities of smog symptoms can be obtained. For example, it has been shown that the concentration of maximum daily oxidant is a function of day of the week and that this function might be related to automotive traffic patterns. Thus for certain time periods maximum daily oxidant was at a minimum on weekends at stations in the northern portion of the Los Angeles Basin (Burbank, Pasadena, Azusa). During this same time period the maximum daily oxidant was found to be at a maximum on weekends near certain cities in the southern portion of the Basin (Inglewood, Long Beach). These two distinctly different weekend patterns correspond in part to the recreational activities of the populace, and in addition, indicate that mixing is less than complete in the Los Angeles Basin. In spite of this lack of complete mixing the maximum daily oxidant at stations within a 600 to 800 square mile area are directly proportional to each other in a predictable fashion. The weekend daily temperatures are also affected presumably by the same factors which influence the weekend oxidant intensity. Changes in inversion height and wind speed appear to account for twofold changes in maximum daily oxidant values. Maximum daily oxidant concentration was also found to be directly related to the square root of light intensity with little if any dependence on temperature. This study also indicates that pollution levels are proportional to each other over large areas of the Basin. The analysis of atmospheric data indicates that variable hydrocarbon to oxides of nitrogen ratios do exist in the atmosphere and that there exists a dependence of atmospheric smog symptom intensity upon this ratio.**

00629

P. Ausloos and S. G. Lias

H₂S AS A FREE-RADICAL INTERCEPTOR IN THE GAS-PHASE RADIOLYSIS AND PHOTOLYSIS OF PROPANE. J. Chem. Phys. Vol. 44(2):521-529, Jan. 1966.

The gas-phase photolysis (1236 Angstrom units) and the gamma-ray radiolysis of C₃D₈ has been investigated in the presence of varying concentrations of H₂S. When 10% or more H₂S is added to C₃D₈, the majority of the D, CD₃, C₂D₃, and C₂D₅ radicals abstract an H atom from H₂S to form HD, CD₃H, C₂D₃H, and C₂D₅H, respectively. The fully deuterated molecules formed in these mixtures result from the unimolecular elimination of a stable molecule from C₃D₈ or C₃D₈(plus) and from fast bimolecular processes such as ion-molecule reactions. The mechanisms of the radiolysis and the photolysis proposed in earlier studies have been re-examined in the light of the information derived from the C₃D₈ - H₂S experiments and of some additional photolysis experiments on CD₃CH₂CD₃ - NO mixtures. The modes of decomposition of the neutral excited propane molecule are indicated. The internally excited C₂D₄, C₂D₅, C₃D₆, and C₃D₇ species formed in these primary processes decompose to form D, CD₃, C₂D₂, C₂D₃, and C₂D₄ unless they are collisionally stabilized. In the radiolysis of C₃D₈ - H₂S mixtures, yields of the free radicals can be adequately accounted for by taking into account the modes of fragmentation of the parent ion and of the excited propane. The C₂D₅ (plus) ions are shown to react with H₂S in part by the

deuteron-transfer reaction. The effect of pressure and the effectiveness of HI as a free-radical interceptor in the radiolysis have been examined. (Author abstract)##

00757

A.P. Altshuller J.J. Bufalini

PHOTOCHEMICAL ASPECTS OF AIR POLLUTION: A REVIEW.
Photochem. Photobiol., Vol. 4, 97-146, 1965.

Materials that are emitted in the atmosphere are subjected to a number of interesting and unusual reactions. These reactions lead to many products whose deleterious effects have now been recognized as one of the most pressing problems in urban areas throughout the world. These effects can be observed in reduced visibility, eye irritation, plant damage, cracking of rubber, and corrosion of metals. This paper is concerned with the present state of the problems in air pollution, with emphasis on recent literature. The chemical aspects are covered in some detail through 1963. The biological effects are surveyed more briefly, with literature reviewed up to the fall of 1963.##

00773

J.J. Bufalini A.P. Altshuller

KINETICS OF VAPOR PHASE HYDROCARBON - OZONE REACTIONS. Can. J. Chem. 43,2243-2250, 1965.

The reaction of nine olefinic and aromatic hydrocarbons with ozone in the vapor phase have been investigated in static and dynamic systems. Some of the rate constants for the olefin-ozone reactions are in good agreement with previously published data, whereas others are larger than values previously reported. Rate constants for trans-2-butene-, isobutene-, and ethylene-ozone reactions were measured between 30 and 100 degrees C. The activation energies for the reaction of ozone with trans-2-butene, isobutene, and ethylene are 0.2 plus or minus 0.3, 2.8 plus or minus 0.4, and 4.2 plus or minus 0.4 kcal/mole. In general, the reactions of hydrocarbons with ozone are nonstoichiometric. However, these reactions do appear to be second order. The rates of reaction between alkylbenzenes and ozone are too low to be of importance in air pollution studies. (Author abstract)##

00783

D.A. Lynn, B.J. Steigerwald, J.H. Ludwig

THE NOVEMBER-DECEMBER 1962 AIR POLLUTION EPISODE IN THE EASTERN UNITED STATES. Public Health Service, Cincinnati, Ohio, b8div. of Air Pollution. (999-AP-78) 1964. 28pp.

This report documents the subject "episode" with respect to meteorology, air quality, and public reaction. Particulate and gaseous air quality data are reported and discussed. Meteorology and public reaction are discussed with reference to

the Public Health Service program of Air Pollution Potential Forecasts. Epidemiological aspects are not considered. (Author abstract)**

00789

J.N. Pitts, Jr., L.D. Hess, E. J. Baum, E.A. Schuck, J. K. S. Wan

THE TRANSFER AND CONVERSION OF ELECTRONIC ENERGY IN SOME "MODEL" PHOTOCHEMICAL SYSTEMS. Photochem. Photobiol., Vol. 4:305-21, 1965. (Presented at the Rapporteur Session, the Fourth International Congress of Photobiology, Oxford, England, July 26-30, 1964.)

Recent studies of the effects of molecular structure and reaction environment on the mechanism of primary photochemical processes involving transfer and conversion of electronic energy in relatively 'simple' organic molecules are presented and discussed. A quantitative i.r. spectroscopic method for studying intramolecular and intermolecular photoprocesses of u.v. irradiated substrates dispersed in solid alkali halide matrices at room temperature is described. Current data for the substrates ortho-nitrobenzaldehyde, anthracene and benzophenone-benzhydrol are presented. A series of 'model' ketones containing cyclopropyl groups have been synthesized and while their adsorption spectra are similar, the efficiency of vapor-phase photodissociation into radicals is shown to be strongly dependent on molecular structure. Butyrophenone and a series of ring substituted derivatives have been photolyzed in the liquid phase using the quantum yield of the photo-elimination of ethylene (Type II split) as a "probe" to determine the effect of substituents on the internal H atom abstracting power of the excited carbonyl chromophore. $\Phi_{C_2H_4}$ is very sensitive to ring substitution, dropping from 0.24 in butyrophenone to 0.20, 0.058 and 0.00 in the p-CH₃, p-OCH₃ and p-NH₂ derivatives respectively, and to 0.00 in both ortho and para hydroxy derivatives. This effect is correlated with their absorption spectra in terms of the lowest states of these alkyl aryl ketones. While several 'classic' photochemical reactions, unimolecular and bimolecular, proceed efficiently in solid KBr matrices giving the same product as in liquid systems, the 'model' cyclopropyl compounds and the alkyl aryl ketones did not undergo their usual intramolecular processes. Implications of this molecular environment effect are pointed out. (Author abstract)**

00834

C.S. Benson

ICE FOG: LOW TEMPERATURE AIR POLLUTION (DEFINED WITH FAIRBANKS, ALASKA AS TYPE LOCALITY). Alaska Univ., College, Geophysical Inst. Nov. 1965. 196 pp.
CFSTI, DDC: AD 631553

Ice fog crystals are an order of magnitude smaller than diamond dust, or cirrus cloud crystals, which in turn are an order of magnitude smaller than common snow crystals (0.001, 0.1 and 1 to 5 mm respectively). The differences in size are shown to result from differences in cooling rates over

5 orders of magnitude. Most of the ice fog crystals have settling rates which are slower than the upward velocity of air over the city center. The upward air movement is caused by convection cells driven by the 6 C "heat island" over Fairbanks. This causes a reduced precipitation rate which permits the density of ice fog in the city center to be three times greater than that in the outlying areas. The inversions which occur during cold spells over Fairbanks begin at ground level and are among the strongest and most persistent in the world. They are three times stronger than those in the inversion layer over Los Angeles. Thus, the low-lying air over Fairbanks stagnates and becomes effectively decoupled from the atmosphere above, permitting high concentrations of all pollutants. The combustion of fuel oil, gasoline, and coal provides daily inputs of: 4.1×10 to the sixth power kg CO₂; 8.6×10 to the third power kg SO₂; and 60, 46 and 20 kg of Pb, Br and Cl respectively, into a lens-like layer of air resting on the surface with a total volume less than 3×10 to the ninth power cubic meter. The air pollution over Fairbanks during cold spells couldn't be worse, because the mechanisms for cleaning the air are virtually eliminated while all activities which pollute the air are increased. (Author abstract modified)##

00929

CONTINUOUS AIR MONITORING PROGRAM IN CINCINNATI, 1962-1963. Public Health Service, Cincinnati, Ohio, Div. of Air Pollution, (999-AP-21). Jan. 1965. 193 pp.

This report presents results of the operation of the Public Health Service Continuous Air Monitoring Program (CAMP) in Cincinnati, Ohio, during 1962 and 1963. Data on atmospheric levels of sulfur dioxide, nitric oxide, nitrogen dioxide, total oxidants, total hydrocarbons, and carbon monoxide are analyzed and discussed. The data are tabulated as hourly, daily, and monthly mean concentration. Background information about Cincinnati and descriptions of the instrumentation are included. (Author abstract)##

00935

J. N. Pitts, Jr., R. Simonaitis, and J. M. Vernon

LIQUID PHASE PHOTOLYSIS OF γ -BUTYROLACTONE. Tetrahedron Letters, No. 36:3209-3213, 1965.

In view of the variety of interesting photochemical reactions reported for saturated cyclic ketones and acyclic esters and the lack of similar studies on lactone, the authors have photolysed representatives of the latter class of compounds and report here preliminary results with γ -butyrolactone. Vacuum degassed butyrolactone was irradiated in a quartz cell (9 ml) with a Hanovia medium pressure SH lamp, and gaseous products were separated by conventional high-vacuum techniques. The major products, carbon monoxide, carbon dioxide, cyclopropane and ethylene (relative amounts 2.5 : 0.9 : 0.9 : 1.0), were identified by comparison of gas chromatographic retention times (Hexadecane, 25 degrees) and mass spectra with those of authentic materials. In addition, traces of ethane, propane and propylene were characterized by gas chromatographic comparisons.##

A. C. Harkness and F. E. Murray

GAS PHASE OXIDATION OF METHYL SULFIDE. Preprint. (Presented at the 59th Annual Meeting, Air Pollution Control Association, San Francisco, Calif., June 20-25, 1966, Paper No. 66-58.)

Methyl sulfide and oxygen react explosively at temperatures as low as 210 degrees. At 195 degrees, the nonexplosive reaction exhibits an initiation stage and a main stage. The rate of the main stage as determined from pressure-time curves is linearly dependent on initial oxygen pressure, but substantially independent of initial methyl sulfide pressure. The activation energy of the main stage is 42 kcal/mole. The extent of the initiation stage is reduced by increasing oxygen pressure. The main oxidation products are sulfur dioxide and carbon monoxide. Even with an excess of oxygen not all methyl sulfide reacts. (Author abstract)##

01027

R. J. Gordon

PHOTOCHEMICAL MEASUREMENTS OF ULTRAVIOLET SUNLIGHT. Preprint. (Presented at the 59th Annual Meeting, Air Pollution Control Association, San Francisco, Calif., June 20-24, 1966, Paper No. 66-38.)

Measurements of solar ultraviolet radiation intensity were made, using two photochemical reactions. These were the gas-phase bag photolysis of NO₂ in nitrogen and the photoisomerization of o-nitrobenzaldehyde in liquid solution. Results of the two methods were converted, as nearly as possible, to absolute light intensities. The two sets were compared and, as applied, it appears that the solution method is simpler and gives more consistent results. It should be noted, however, that atmosphere NO₂ will affect the two methods to different degrees. A continuous recording actinometer based on the solution method was developed and gave satisfactory initial trial runs.##

01194

E. Grovenstein, Jr.

PHOTOCHEMICALLY INDUCED REACTIONS OF ACETYLENES WITH AROMATIC COMPOUNDS (FINAL REPT.) Georgia Inst. of Tech., Atlanta, Engineering Experiment Station. Aug. 1965. 30 pp.
DDC: AD 470946

Irradiation with ultraviolet light of a mixture of benzene and acetylene under a variety of experimental conditions gave, at best, only a trace of cyclooctatetraene. No photo-adduct could be found of acetylene with dimethyl phthalate, naphthalene, or anthracene. Vinylene carbonate underwent no detectable photochemical reaction with benzene. Chlorovinylene carbonate, however, upon irradiation in benzene or cyclohexane solution undergoes reduction to give vinylene carbonate in good yield. Benzene with a solution

of the monopotassium salt of acetylenedicarboxylic acid gives, upon ultraviolet irradiation, a different product from that obtained with dimethyl acetylenedicarboxylate. Naphthalene, upon irradiation with a solution of dimethyl acetylenedicarboxylate, gives a complex mixture of products which appear to be the result of an initial 1,2-addition of the acetylenic ester to the various aromatic multiple bonds of naphthalene. From the reaction mixture a crystalline derivative has been isolated which seems to have been derived from addition of dimethyl acetylenedicarboxylate to the 1,2-position of naphthalene. Furthermore, vapor phase chromatography (v.p.c.) provisionally indicates the presence of dimethyl phthalate, dimethyl naphthalene-2,3-dicarboxylate, dimethyl cyclooctatetraene-1,2-dicarboxylate, as well as naphthalene and dimethyl acetylenedicarboxylate in the purified reaction product. Since it was demonstrated that all of the naphthalene should have been removed by the purification process, the v.p.c. results indicate that the naphthalene adducts are undergoing pyrolysis under the conditions of the v.p.c. analysis. Reaction schemes are proposed to account for the observed products. Preliminary experiments show that phenanthrene reacts readily with dimethyl acetylenedicarboxylate upon irradiation with ultraviolet light. In experiments in which benzophenone was added as a photo-sensitizer, benzophenone was found to undergo addition of alcohol, especially methanol, to give considerable amounts of mixed pinacol. (Author abstract)##

01244

J. J. Bufalini and J. C. Purcell

NITROGEN: FORMATION BY PHOTOOXIDATION OF ETHYLENE IN THE PRESENCE OF ITS OXIDES. Science 150, (3700) 1161-2, Nov. 26, 1965.

The apparent lack of nitrogen balance for the photooxidation systems containing olefin and nitrogen oxides can be explained by evidence for the production of molecular nitrogen; molecular nitrogen was identified by gas chromatography and mass spectrometry. (Author abstract)##

01264

F. C. Alley, G. B. Martin, and W. H. Ponder

APPARENT RATE CONSTANTS AND ACTIVATION ENERGIES FOR THE PHOTOCHEMICAL DECOMPOSITION OF VARIOUS OLEFINS. J. Air Pollution Control Assoc. 15, (8) 348-50, Aug. 1965.

The photochemical reaction of various olefins and nitrogen dioxide was studied under conditions of controlled temperature, pressure, and humidity in a 200 liter stirred glass reactor. The hydrocarbon concentration in the reactor during four and five hour irradiation periods was monitored with a flame ionization chromatograph. Reaction rate constants, based on three consecutive first order reactions, were calculated for reactor temperature of 20, 25, 30, and 35 degrees centigrade. Activation energies for the three consecutive reactions were calculated from the Arrhenius equation. Branched and straight chain olefins were studied at initial concentrations of 5.0 to 10.0 parts per million. (Author abstract)##

Nader, J. S. (ed.)

PILOT STUDY OF ULTRAVIOLET RADIATION IN LOS ANGELES, OCTOBER 1965. (A REPORT ON CONCURRENT MEASUREMENTS MADE BY COOPERATING ORGANIZATIONS BY VARIOUS METHODS.) Public Health Service, Cincinnati, Ohio, National Center for Air Pollution Control, PHS-Pub-999-AP-38, 91p., (Presented at the Fourth International Biometeorological Congress, Rutgers Univ., New Brunswick, N.J., Aug. 26 - Sept. 2, 1966.)

Measurements of 300-380-nm UV radiation in Los Angeles were conducted under varying conditions of smog environment, below and above the urban smog layer, and at various elevations through the smog atmosphere in October 1965. The UV energy incident on a horizontal plane surface detector near ground level at solar noon on a clear day (no smog) was 31 w/m square meter or 37% of the maximum possible for that date based on the value of 85 w/sq m of UV radiation entering the earth's atmosphere. Attenuation of UV radiation varied with smog intensity. Transmission through the atmosphere from 5700 feet (Mt. Wilson) to 350 feet (Laboratory rooftop) above sea level, average through the day, was 87% for a clear day and 65% for a moderate-to-heavy-smog day. Outgoing radiation was significantly increased by the smog environment. In heavy smog, values were higher by a factor of about 2 than those obtained in a no-smog environment. Outgoing radiation also tended to increase exponentially with elevation. UV scatter or transmission measurements appear to offer potential as a sensitive method of monitoring environmental smog levels as an alternative to visibility which is subjective and semiquantitative. The high scattering capability of a smog atmosphere points to the need of measurements of UV radiation in all directions, particularly as this applies to photochemical reactions in the atmosphere, and a correlation of such measurements with measurements of vertical components. (Author's summary)##

01504

W. J. Hamming and J. E. Dickinson

CONTROL OF PHOTOCHEMICAL SMOG BY ALTERATION OF INITIAL REACTANT RATIOS. J. Air Pollution Assoc., 16(6):317-323, June 1966.

A study of the variation in eye irritation with irradiation time demonstrates that the time at which eye irritation measurements are taken is important in understanding the entire photochemical mechanism underlying the smog problem in the summer in Los Angeles. The data analyzed were obtained from 5 experimental studies conducted under a variety of conditions. Analysis of the data from chamber irradiation experiments indicate that eye irritation is noted at the same time as the max. concentration of nitrogen dioxide. The chamber data have shown that the initial concentrations of the 2 principal reactant contaminants, hydrocarbons, oxides of nitrogen, and the relationship between them, must be considered in studying the production of eye irritation from photochemical smog. To determine how the initial reactant concentrations affect the degree of eye irritation which can be produced, the available data from several experimental studies were analyzed.##

01587

G.J. Doyle

MODEL AEROSOLS FOR ATMOSPHERIC SMOG. Stanford Research Inst., South Pasadena, Calif., Southern California. 1961. 18pp.

One model reaction for formation of aerosol in the atmosphere requires the presence of sulfur dioxide at fractions of a part per million in photooxidizing mixtures of olefin and nitrogen oxide at part per million concentrations. An experimental study of this type of reaction and the results to date are described, with particular emphasis on 2-methyl-2-butene as the olefin.##

01602

E.A. Schuck

THE NATURE OF EYE IRRITANTS IN SMOG. Stanford Research Inst., South Pasadena, South Pasadena, Southern California Labs. 1961. 8 pp.

Three ppm of individual hydrocarbons were mixed in pure air along with 1 ppm of nitric oxide or nitrogen dioxide. During the subsequent two hour irradiation with near-ultraviolet light the mixture was monitored with a long-path infrared spectrophotometer. The major products formed by photooxidizing many individual hydrocarbons were readily identified and their concentrations measured. In general, it was found that most olefins react rapidly and generate irritation while saturated hydrocarbons are relatively unreactive and do not result in irritating mixtures. In the absence of specific knowledge of the types and concentrations of the components of smog-producing atmospheres, control of olefins rather than oxides of nitrogen appears to be the more practical approach to control of eye irritation. The effect of control measures on eye irritation will be a function of several factors. Some of these factors are: the olefin-to-oxides of nitrogen concentration ratio; the type of olefin or olefin mixture involved, and the length of irradiation time and intensity of sunlight. To the extent that these auto exhaust mixtures are typical, it is concluded that ethylene and propylene are the most important precursors of eye irritation in such mixtures.##

01649

C. H. Nicol and J. G. Calvert

RELATIONS BETWEEN PHOTODECOMPOSITION MODES AND MOLECULAR STRUCTURE IN THE SERIES OF CARBONYL COMPOUNDS, $n-C_3H_7COR$. Preprint. (Presented in part at the Gordon Conference on Organic Photochemistry, Tilton, N.H., July 1965.)

The vapor phase photolysis of a series of carbonyl compounds of general structure $n-C_3H_7COR$ was studied at 3130 Å as a function of temperature and pressure. The R group was varied in the series, H, CH_3 , C_2H_5 , $n-C_3H_7$, iso- C_3H_7 , $n-C_4H_9$,

iso-C₄H₉, sec-C₄H₉, tert-C₄H₉, in order to evaluate the effect of structure upon the individual primary photodissociative processes and the relationship between these processes. Quantum yields of carbon monoxide and ethylene products were used as measures of the type I (n-C₃H₇ COR + h ν yields n-C₃H₇CO + R and n-C₃H₇ + COR) and type II (n-C₃H₇COR + h ν yields C₂H₄ + CH₂=C(OH)R primary photodissociative modes in the ketones. A number of correlations were noted between the structural features and the efficiency of the Type II rearrangement. One striking effect was the relation between φ_{II} and the extent of alkyl substitution on the alpha-carbon atom of the R group. An empirical rule was formulated which relates molecular structure and the φ_{II} values for the n-propyl ketones. (Author abstract)##

01650

B. E. Saltzman , A. I. Coleman, and C. A. Clemons

HALOGENATED COMPOUNDS AS GASEOUS METEOROLOGICAL TRACERS:
STABILITY AND ULTRASENSITIVE ANALYSIS BY GAS CHROMATOGRAPHY.
Anal. Chem. 38, 753-8, May 1966.

Tracer compounds added to moving air masses are useful for demonstrating the transfer of pollutants from one local area or city to another. A study of gaseous compounds resulted in the selection of three suitable materials: sulfur hexafluoride, bromotrifluoromethane, and octafluorocyclobutane. These materials are non-toxic, are rare in the atmosphere, and can be readily dispersed from weighed tanks containing them in liquid form under pressure. An appropriate mixture can be employed if necessary to reduce possible errors caused by interfering emissions, and the components in air can be determined with high sensitivity in a single 10-minute run. An ultrasensitive gas chromatographic procedure with an electron-capture detector was developed which utilized carefully purified carrier gas and optimized columns, detectors, and operating parameters. Sensitivity of 10 to the minus five power ppm was achieved for sulfur hexafluoride without concentration of the sample. Convenient procedures for sampling and calibration were established. Reactivities of these materials with ordinary atmospheric pollutants such as automobile exhaust, hydrogen sulfide, nitrogen dioxide, ozone, and sulfur dioxide were studied at various humidities, both with and without irradiation equivalent to sunlight. Good stability was indicated. Losses by washout due to rainfall appeared to be negligible. These techniques should be very useful both for tracing local emissions and for long-range meteorological studies of movement of air masses. (Author abstract)##

01761

T. Kato

GAS CHROMATOGRAPHY OF SMALL AMOUNTS OF HYDROCARBONS IN THE ATMOSPHERE. Nenryo Kyokaishi (J. Fuel Soc. Japan, Tokyo) 45, (470) 406-13, June 1966.

Gas chromatographic analysis in practical air pollution research was studied. Low temperature trapping and adsorption were most important. In each method, sampling, concentration, G.C. analysis and examples of the results were described. In the

former, sample air was introduced into a vacuum glass bottle, which was evacuated through a concentration tube filled with adsorbent and cooled with liquid oxygen to -183°C , then trapped pollutants were transferred to G.C. sampling tube and analyzed. For total analysis of air sample, sample air was introduced into the adsorption tube filled with charcoal, then adsorbed pollutants were desorbed by heating to 350°C , transferred to a G.C. sampling tube and chromatographed. (Author summary)##

01825

S. L. Kopczynski

PHOTO-OXIDATION OF ALKYL BENZENE-NITROGEN DIOXIDE MIXTURES IN AIR. Intern. J. Air Water Pollution. 8, 107-20, 1964.

Measurements of the relative reaction rates of various alkylbenzenes in photo-oxidative reactions with NO_2 in the air are reported. The reaction rates are compared with the relative basicities of the compounds. A partial analysis of the gas phase and condensed phase products is also reported. It appears that as much as 50 per cent of the reacted carbon atoms may be contained in the condensed phase. The several irradiation and analytical techniques employed are compared. The photo-oxidation reactions of olefins and alkylbenzenes are compared. Free radical chains appear to play a more important role in the photo-oxidation reaction rates of certain alkylbenzenes than in the reaction rates of olefins. Hyperconjugative interaction of the methyl groups with the aromatic ring is proposed as a possible explanation of the order of reactivity of various isomers of the methylsubstituted benzenes. (Author abstract)##

01828

A. P. Altshuller, G. C. Ortman, B. E. Saltzman, and R. E. Neligan

CONTINUOUS MONITORING OF METHANE AND OTHER HYDROCARBONS IN URBAN. J. Air Pollution Control Assoc. 16, (2) 87-91, Feb. 1966.

Continuous measurements of total hydrocarbons (and other organic substances) and of methane were made in Cincinnati and Los Angeles for three-month periods. Some of the measurements were made during episodes of photochemical air pollution. Two instruments, one for measurement of total hydrocarbons and the other for methane, were operated in parallel. Both incorporated flame ionization detectors having greater sensitivity than commercial flame ionization instruments. The flame ionization analysis for methane was made specific by use of an adsorbent carbon column preceding the analyzer to retain all organic substances except methane. Subtracting the methane concentration values from those for total hydrocarbons gave nonmethane hydrocarbon concentrations. The data showed diurnal patterns of concentrations of methane and nonmethane hydrocarbons in the atmosphere. Average hourly values for methane were strikingly similar in Los Angeles and in Cincinnati (2.6 and 2.4 ppm, respectively); those for nonmethane hydrocarbons were four

times as high in Los Angeles (3.0 and 0.8 ppm, respectively). A bimodal frequency distribution pattern of the concentrations suggested that atmospheric ventilation was either good or poor, with less than a random amount of time in intermediate stages. The width of the methane frequency distribution peak was about half the width of that for nonmethane hydrocarbons, indicating a different and more constant source for the former. (Author abstract)##

01984

A. P. Altshuller and I. R. Cohen

STRUCTURAL EFFECTS ON THE RATE OF NITROGEN DIOXIDE FORMATION IN THE PHOTO-OXIDATION OF ORGANIC COMPOUND-NITRIC OXIDE MIXTURES IN AIR. Intern. J. Air Water Pollution, 7, 787-97, 1963.

The rapid conversion of nitric oxide to nitrogen dioxide occurs in the presence of certain organic species and of ultraviolet radiation below 4000 Å. The reaction is an important and critical step in the over-all reactions of organic compound-nitric oxide photochemical systems. These systems in turn are an important part of the reaction complex associated with the photochemically initiated type of air pollution. The eye irritation and plant damage effects found in photo-chemical "smog" have been simulated by the irradiation of certain hydrocarbon-nitrogen oxide systems (Leighton, 1961). Until recently the available experimental data on the photochemically initiated conversion of nitric oxide to nitrogen dioxide has been restricted almost entirely to work on olefinic hydrocarbons including isobutene, trans-2-butene, and 1,3-butadiene (Leighton, 1961; Tuesday, 1961). Recently, preliminary work has been reported on other organic species including the aromatic hydrocarbons (Altshuller et al. 1962a). It was shown that a number of dimethyl and trimethylbenzenes participate in this reaction about as effectively as do the 1-alkenes and appreciably more rapidly than ethylene. In the present work this study is extended to additional aromatic hydrocarbons, aldehydes, ketones, paraffinic hydrocarbons, and alcohols. Analyses for oxidant concentrations have been made on some of the systems studied. Some data have been obtained on the formation of aliphatic aldehydes in the reactions of aromatic hydrocarbon-nitric oxide systems. (Author abstract)##

02359

S.L. Kopczynski A.P. Altshuller

PHOTOCHEMICAL REACTIONS OF HYDROCARBONS WITH SULFUR DIOXIDE. Intern. J. Air Water Pollution, 6, 133-135, 1962

Gas mixtures of SO₂ and hydrocarbons n-butane, isobutane, neopentane, 3-methyl-1-butene irradiated by either a mercury arc or sunlamp, produced appreciable quantities of condensate on the walls of the experimental flasks. A carbonyl band was present at 5.7 microns. In several experiments with isobutane as the hydrocarbon, a strong band at 5.7 microns was observed along with other IR bands assigned to the acetone molecule. A set of 3 strong bands in the 9.5 to 10 micron region characteristic of methanol was observed also. At 1 mm partial pressure of SO₂ and n-butane or isobutane, a slight film

of condensate could be observed when the Hg arc was used, but not when the sunlamp provided the UV radiation. Acetone and methanol were indicated by spectral data on the more dilute mixtures. At concentrations of 0.05 to 0.1 mm, no film could be detected from SO₂ and isobutane or 1-pentene mixtures irradiated by sunlamp; with the Hg lamp only weak IR bands could be obtained after 20 hours. Evidence indicates that photooxidation of SO₂ in the presence of saturated hydrocarbon at concentrations found in the atmosphere does not significantly contribute to formation of aerosols in air pollution situations in comparison with aerosol results from other reactions involving SO₂ in combination with NO and olefins.##

02352

J.J. Bufalini A.P. Altshuller

SYNERGISTIC EFFECTS IN THE PHOTOOXIDATION OF MIXED HYDROCARBONS: Environ. Sci. Technol. 1, (2) 133-8, Feb. 1967.

Since there is considerable disagreement in the published values for rate constants for olefin-atomic oxygen and olefin-ozone reactions, the reality of the so-called excess rate has been questioned. If the excess rate is not real, then the rate of oxidation of a given olefin should depend only on light intensity and NO₂ concentration. If a second olefin of different reactivity is added to a given olefin, then no effect other than the influence of different O-atom and ozone concentrations should be observed on the given olefin and the hypothesis that the principal mode of disappearance of olefins is due to O-atom and ozone reactions is correct. As a test of this hypothesis, 1-butene was irradiated at three light intensities with NO₂, both alone and in the presence of trans-2-butene and 1,3,5-trimethylbenzene separately. Synergistic effects were observed that could not be explained by O-atom and ozone reactions alone. (Author abstract)##

02476

E. R. Stephens.

REACTIONS OF OXYGEN ATOMS AND OZONE IN AIR POLLUTION. Intern. J. Air Water Pollution 10, 649-63, Oct. 1966 (Presented at the Symposium on Photochemical Aspects of Air Pollution, Cincinnati, Ohio, April 1965.)

The reactions of free oxygen atoms and ozone as they apply to air pollution and the factors which govern the oxygen atom and ozone concentrations are reviewed. The role played by reactions of oxygen atoms with oxides of nitrogen is discussed as it affects the determination of light intensity by photolysis of nitrogen dioxide. The relationship of these inorganic reactions to the attack on hydrocarbon molecules is discussed along with the various attempts which have been made to account for the rate of disappearance of hydrocarbon in terms of its reactions with oxygen atoms and ozone. Since most of these attempts have indicated that these two reactions fall short of accounting for the observed rate of reaction, it has been suggested that free radical attack may play a

role. Some difficulties with this concept are pointed out. Experiments on the reaction of olefins with ozone have produced discordant results and are discussed. (Author abstract modified)*

02777

A. P. Altshuller, I. R. Cohen, and T. C. Purcell

PHOTOOXIDATION OF HYDROCARBONS IN THE PRESENCE OF ALIPHATIC ALDEHYDES. Science 156 (3777), 937-9, (May 19, 1967). 1966.

A new group of gas-phase reactions has been shown to contribute to the photooxidation of hydrocarbons. The photooxidation of aliphatic aldehydes in the part-per-million range at wavelengths below 3400 Å produces intermediates that react with olefinic and aromatic hydrocarbons. The reactions have been investigated with laboratory ultraviolet radiation sources and solar radiation. Although the reaction rates are slower than those associated with the corresponding nitrogen oxide induced photooxidations, the rates are significant in terms of the time scale of interest in urban atmospheric reactions. These results may cause modifications of current considerations of whether control of nitrogen oxides will effectively reduce photochemical air pollution. (Author abstract)**

03064

Cadle, R. D. and J. W. Powers

SOME ASPECTS OF ATMOSPHERIC CHEMICAL REACTIONS OF ATOMIC OXYGEN. Tellus (Uppsala), 18(2):176-186, 1966. 44 refs.

Some features of atmospheric atomic oxygen chemistry that have received little attention, that need to be re-evaluated in the light of recent data, that have been studied in the author's laboratory, or that encompass some combination of these three are discussed. Newly-calculated values for the concentrations of excited atomic oxygen below 100 km are so low that it is unlikely that its reactions contribute appreciably to the concentration of any atmospheric component in that region with the possible exception of excited molecular oxygen. Reactions of ground state atomic oxygen may constitute a sink for methane and a source of sulfate in this atmospheric region. Many chemionization reactions probably occur in the atmosphere, and three possible types are considered in detail. (Author abstract)**

03381

M. Neiberger, "Chairman."

THE DISPERSION AND DEPOSITION OF AIR POLLUTANTS OVER CITIES. (Air Over Cities Symp., Cincinnati, Ohio, 1961.) pp. 155-71. HEW A 62-5

In setting limits for the control of pollution sources in industrial and urban complexes, limits must not be established solely on the basis of individual stacks and plants; the basic concept must be the area-source strength, in terms of total emissions per square mile, since the emissions from separate

stacks and plants are additive as the air moves across them toward residential and commercial communities. The dispersion of pollutants from vehicle exhaust along congested streets and roads deserves attention. Such questions as the influence of heat from motor and the motion of the vehicles need examination. Studies of dispersion have generally assumed flat uniform terrain and wind conditions in which the direction is steady and the average speed is high compared to turbulent fluctuations. Studies must be performed on the dispersion of pollutants over an irregular complex of buildings and under the influence of wind conditions in which the average speed is low and the magnitude of windspeeds in fluctuations is as great or greater. (Author summary) ##

03673

Bainbridge, A. E. and Leroy E. Heidt

MEASUREMENTS OF METHANE IN THE TROPOSPHERE AND LOWER STRATOSPHERE. Tellus (Uppsala), 18(2):221-224, 1966. 18 refs.

Two profiles of air samples have been collected over southern U.S.A. (30 deg N lat.) between ground level and 23 km and analysed for methane. The results show, with increasing altitude, a mixing ratio nearly constant to the tropopause and decreasing rapidly in the lower stratosphere. The results suggest that the troposphere is the major region of destruction of methane. (Authors' summary) ##

03858

A. P. Altshuller, S. L. Kopczynski, W. A. Lonneman, T. L. Becker, R. Slater

CHEMICAL ASPECTS OF THE PHOTOOXIDATION OF THE PROPYLENE--NITROGEN OXIDE SYSTEM. Environ. Sci. Technol., 1(11):899-914, Nov. 1967. 29 refs.

Although it is not possible to fully represent all of the diverse effects associated with photochemical air pollution by studies of a single hydrocarbon, propylene was chosen as a representative reactive hydrocarbon. The propylene-nitrogen oxide or propylene nitrogen oxide-sulfur dioxide system when irradiated reacts readily to produce oxidant, formaldehyde, acetaldehyde, carbon monoxide, peroxyacetyl nitrate (PAN), and methyl nitrate, along with light scattering, and causes ozone and PAN-type plant damage and eye irritation. Thus, all of the major "smog" manifestations are reproducible, but not necessarily at the intensities experienced in the ambient atmosphere. The chemical and physical measurements of the photooxidation of propylene-nitrogen oxide or of propylene nitrogen oxide-sulfur dioxide over a range of reactant concentrations, at several light intensity levels, and under static or dynamic flow conditions are reported. Biological indicator measurements will be reported in another paper. (Authors' abstract, modified) ##

D. E. Loudon

REQUIREMENTS FOR SAFE DISCHARGE OF HYDROCARBONS TO ATMOSPHERE.
 Proc. Am. Petrol. Inst., Sect. III. 43, 418-33, 1963.
 (Presented at the 28th Midyear Meeting, American Petroleum
 Inst. Division of Refining, Philadelphia, Pa., May 15, 1963.)

Current knowledge, opinion, and service experience relative to the disposal of released hydrocarbons, is assembled with emphasis on atmospheric discharge. Potential hazards to personnel and equipment associated with the release of hydrocarbon vapor to the atmosphere include: 1, ignition of outflow, either immediate or delayed; 2, explosive release of energy from delayed ignition; 3, flame radiation; 4, condensation of vapor; 5, noise; and, 6, pollution. The present state of knowledge relative to these hazards is discussed. This leads directly to an appreciation of aspects where general knowledge, experience data, or fundamentals are inadequate or totally lacking. The individual subjects requiring attention are summarized. (Author abstract modified)**

04245

N. A. Krylova

COLORIMETRIC AND SPECTROPHOTOMETRIC DETERMINATION OF
 PHENYLURETHYLANE IN FACTORY AIR. Hyg. Sanit. 31, (8) 250-5,
 Aug. 1966. Russ. (Tr.)
 CFSTI: TT-51160/7-9

Phenylurethylane solution boiled with an alkali hydrolyzes to aniline and sodium acetate. Thus, the determination of phenylurethylane can be based on the determination of aniline. In the present work the diazotizing reaction of aniline was used and followed by the reaction of the diazo compound with alpha-naphthylethylenediamine. Colorimetric analysis was recommended for separate investigations of the two substances, phenylurethylane and aniline, when present together. Spectrophotometric determination of phenylurethylane in samples was also recommended. This method is non-specific as aniline interferes by yielding an absorption maximum in the same range.**

04246

F. D. Krivoruchko

DETERMINATION OF AERIAL CONCENTRATION OF DECOMPOSITION AND
 OXIDATION PRODUCTS OF CERTAIN ORGANOALUMINUM COMPOUNDS (TEA,
 DEAC, TIBA, AND DIBAC). (Opredelenie produktov
 razlozheniya i okisleniya v vozdukh nekotorykh
 alyuminiorganicheskikh soedinenii (TEA, DEAKh, TIBA i DIB-
 AKh.) Hyg. Sanit. 31, (8) 256-9, Aug. 1966. Russ. (Tr.)
 CFSTI: TT 66-51160/7-9

In connection with studies of working conditions in the manufacture of triethylaluminum (TEA), diethylaluminum chloride (DEAC), triisobutylaluminum (TIBA) and diisobutylaluminum chloride (DIBAC) it was necessary to determine health hazards in

the factory air. Determination in air of substances formed by the decomposition and oxidation of TEA, DEAC, TIBA and DIBAC formed the purpose of the present work. Organoaluminum compounds in sealed glass ampules were used. Investigations were performed in 100 l chambers with a fan for uniform distribution of the decomposition products from organoaluminum compounds. The ampules with samples were broken with a special rod. The breaking of an ampule was followed by the formation of a white aerosol in the chamber (obviously, aluminum oxide) which persisted for 1.5-2.5 hr and then was slowly deposited on the chamber walls. Air samples were taken from the chamber at different time intervals (from 2 min to 3.5 hr). Aluminum oxide aerosols were sampled on an ashless filter paper of "Blue Band" grade in a Plexiglas cartridge. Samples for other toxic substances were taken by means of absorbers, placing filter paper in front of the absorber in order to exclude aluminum oxide. Investigations showed that the processes liberated aluminum oxide aerosol, isobutylene, lower and higher alcohols, aldehydes, carbon monoxide and hydrogen. Moreover, the decomposition and oxidation of DIBAC yielded hydrochloric acid aerosols while the decomposition and oxidation of DEAC yielded ethyl chloride.##

04933

Niemeyer, L. E. and R. A. McCormick

SOME RESULTS OF MULTIPLE-TRACER DIFFUSION EXPERIMENTS AT CINCINNATI. J. Air Pollution control Assoc., 18(6):403-405, June 1968. 7 refs. (Presented at the 60th Annual Meeting, Air Pollution Control Association, Cleveland, Ohio, June 11-16, 1967. Paper 67-86.)

A number of diffusion experiments during near-neutral stability conditions are described which utilize the simultaneous dissemination of up to three gaseous and one particulate tracer material. The gases are sulfur hexafluoride (SF₆), octafluorocyclobutane (C₄F₈), and bromotrifluoromethane (CBrF₃). The fourth tracer was a particulate, zinc-cadmium sulfide (ZnCdS), referred to as FP. The magnitude and sources of "non-meteorological" errors are analyzed with respect to a single experiment using but one tracer. The relation of observed ground-level concentrations out to distances of the order 125 km from the source to those estimated by the extrapolation of shorter-range experimental results is also discussed. The magnitude of nonmeteorological errors in diffusion experiments is shown to be as high as plus or minus 50%. The primary causes for these non-meteorological errors lie in the analytical techniques, the loss of particulate tracer material, sampling errors, and uncertainties in source strength. Nevertheless, a limited number of long-range tracer experiments demonstrate that both the SF₆ and FP tracer techniques can be used to obtain quantitative diffusion data over ranges (greater than 100 km) for which precise knowledge is almost non-existent.##

04988

R. D. Cadle H. S. Johnston

CHEMICAL REACTIONS IN LOS ANGELES SMOG. Proc. Natl. Air Pollution Symp., 2nd, Pasadena, Calif., 1952. pp. 28-34.

Chemical reactions in smog are either reactions between two or more man-introduced contaminants or between an impurity and the natural components of the atmosphere. This paper discusses (1) certain well-known reactions which must certainly occur, (2) experiments to determine the nature of other reactions expected to occur under conditions which exist in the Los Angeles atmosphere, and (3) speculations about some reactions which may occur. Several investigators have discussed certain types of reactions which possibly occur in smog. Haagen-Smit has suggested that reaction products of olefins with ozone and oxides of nitrogen in the presence of sunlight are responsible for some of the unpleasant properties of smog. Johnstone has discussed the oxidation of sulfur dioxide to sulfur trioxide in the atmosphere, which would result in the formation of a mist of sulfuric acid. Blacet has proposed several photochemical reactions which could contribute to the ozone content of smog; in particular, he considered photoactivation and photolysis of nitrogen dioxide, sulfur dioxide, and aldehydes.##

05575

G. P. Larson, J. R. Taylor, and W. J. Hamming

STUDIES OF POLLUTION LEVELS IN RELATION TO AIR MOVEMENT IN THE LOS ANGELES ATMOSPHERE. Proc. Natl. Air Pollution Symp., 3rd, Pasadena, Calif., 1955. pp. 33-42.

Samples were collected in dustfall jars from a large number of stations in the Los Angeles Basin. The results are plotted in tons per square mile for SO₂, salt, total dustfall, and water insoluble solids. The results of a nitrogen dioxide survey are also plotted showing surface trajectories for air, cross sections, and area distribution. Subsequent to these studies, 50 wind stations were established throughout the basin making it possible to demonstrate the effects of two separate source areas on adjoining areas. To determine the variations that could occur during smoggy periods when one source area might influence the other, the variations in air flow trajectory were studied. CO, nitrogen oxides, and hydrocarbons were measured hourly at several locations in both areas. The oxidation of hydrocarbons to produce eye irritation was also studied. These investigations illustrated the importance of relating the air movement to the sources of pollution, in order to anticipate influences that may be effected in the surrounding areas.##

05533

Altshuller, A. P., S. L. Kopczynski, W. Lonneman, and D. Wilson

PHOTOCHEMICAL REACTIVITIES OF EXHAUSTS FROM 1966 MODEL AUTOMOBILES EQUIPPED TO REDUCE HYDROCARBON EMISSIONS. J. Air Pollution Control Assoc., 17(11):734-737, Nov. 1967. (Presented at the 60th Annual Meeting, Air Pollution Control Association, Cleveland, Ohio, June 11-16, 1967, Paper 67-6.)

In the summer of 1966, some automobiles from the Cincinnati phase of the GSA study were used in an irradiation chamber study to evaluate the photochemical air pollution potential of

representative models of equipped and unequipped automobiles. Only one set of automobiles, the unequipped Chevelles, produced exhaust capable under irradiation of forming significant levels of oxidant and PAN. Neither the equipped Chevelles nor any of the Fords or Plymouths, whether equipped or unequipped, produced exhaust having the characteristics necessary to form oxidant or PAN upon irradiation. The eye irradiation level reported by the panel upon irradiation of exhaust from unequipped Chevelles was much higher than that produced by the irradiated exhausts from any of the other types of automobiles. Overall, there does appear to be some small improvement with respect to eye irritation in comparing equipped automobiles with unequipped automobiles. To a large extent, the improvement in the air pollution potential of exhausts from equipped Chevelles compared to the unequipped Chevelles can be attributed to the reduction in the hydrocarbon to nitrogen oxide ratio. The irradiated exhaust from equipped Chevelles, except for aldehyde levels, is about the same in photochemical air pollution potential as are the exhausts from unequipped Fords and Plymouths. Such irradiation chamber measurements are related to exhaust reactivities. Hydrocarbon reactivities can be obtained by direct measurement of reactive and nonreactive hydrocarbons in the automotive emissions.##

05817

E. R. Stephens

THE REACTIONS OF AUTO EXHAUST IN SUNLIGHT. Preprint.
(Presented at a Session of the Conf. Air Pollution Research on "Atmospheric Reactions of Constituents of Motor Vehicle Exhaust," Los Angeles, Calif., Dec. 5, 1961.)

When auto exhaust is diluted with air and exposed to sunlight chemical changes take place which lead to a variety of noxious products. Among these are eye irritants, plant toxicants, and aerosols. These effects can also be observed when dilute mixtures of hydrocarbons, nitrogen oxides, and sulfur dioxide with air are irradiated. A number of the noxious products have been identified. Ozone and a new series of compounds called the peroxyacyl nitrates (PAN) are the principal plant toxicants formed by this reaction. The various members of the PAN family are powerful eye irritants as are the formaldehyde and acrolein produced in this oxidation reaction. The formation of products such as PAN and alkyl nitrate indicates the presence of organic free radicals since these compounds most probably arise through the reactions of the appropriate radicals with nitrogen dioxide. The corresponding reactions with nitric oxide probably lead to its oxidation to nitrogen dioxide, a phenomena which is observed and which is required to account for the formation of ozone.
(Author abstract)##

05818

E. R. Stephens, W. E. Scott, P. L. Hanst, and R. C. Doerr

RECENT DEVELOPMENTS IN THE STUDY OF THE ORGANIC CHEMISTRY OF THE ATMOSPHERE. Preprint. (Presented at a Session on Smoke and Fumes, 21st Midyear Meeting, (American Petroleum Inst., Division of Refining, Montreal, Canada)), May 16, 1956.)

A long-path IR cell, with which it is possible to detect many compounds in the air at concentrations in the parts-per million range, is being used to study reactions of air pollutants. Field studies of the Los Angeles smog by other investigators have shown that photochemical reactions caused by sunlight play an important role in its development. In the laboratory it has been demonstrated that O₃ is formed when mixtures of NO₂ and an organic compound in air are irradiated with artificial sunlight. This paper presents the results of further studies on this and other reactions of air-pollution chemistry. IR analysis of the products of the photochemical reaction between NO₂ and an organic compound frequently reveals, in addition to bands of known compounds, several unidentified absorption bands which apparently belong to a single compound produced in significant quantity. Although this compound is unstable, moderately pure samples of it can be condensed if the reaction products are drawn through a cold trap. Physical and chemical properties of this condensate, referred to as compound X, are consistent with the belief that it is an acyl-nitrogen compound, but its structure is not unequivocally determined. The importance of compound X in an explanation of the chemistry of the atmosphere is stressed. O₃ is formed when compound X is irradiated, with or without added gasoline. O₃ formation is slower with added gasoline, perhaps because the olefins present in the gasoline react with some of the O₃. O₃ is also formed when nbutyl nitrite is photolyzed in O₂. The rate of formation of O₃ was only slightly changed when SO₂ was present in an irradiated mixture of olefin and NO₂. Since the SO₂ disappeared very slowly, it was concluded that neither the O₃, the free radicals, nor any peroxides which are formed will oxidize SO₂ to SO₃ at a significant rate. (Author abstract modified)##

06043

M. Neiburger

METEOROLOGICAL ASPECTS OF OXIDATION TYPE AIR POLLUTION. (In: The Rossby Memorial Volume.) California Univ., Los Angeles, Dept. of Meteorology. 1959. pp. 158-69.

The replacement of coal by petroleum products as an energy source, instead of eliminating air pollution, has led to a new type of air pollution characterized by the presence of oxidizing substances, chiefly ozone, and the occurrence of eye irritation, damage to vegetation, and reduction to visibility. It has been shown that photochemical reactions involving hydrocarbons and nitrogen dioxide in concentrations of a few parts per million can produce all these manifestations. The photochemical reactions require the combination of (1) sources of reagents, (2) conditions which prevent their dispersal, and (3) adequate solar radiation. The tremendous concentrations of automobile traffic, the exhaust from which is estimated to contain 7 percent of the hydrocarbons put into the fuel tank, in all metropolitan centers in the U.S. constitute sources which are at least as large as industrial sources (refineries). However, only on the subtropical west coasts of continents do the meteorological conditions for accumulation of pollutants, namely persistent light winds and temperature inversions, occur consistently together with adequate solar radiation. The outstanding example of this combination is Los Angeles, California. Studies of the relationship of air trajectories to the smog manifestations in Los Angeles are

presented. These studies demonstrate the contribution of automobile exhaust as a principal source. (Author's abstract)##

06235

Goetz, A. Stoeber, W. and T. Kallai

SYNERGISTIC PROPERTIES OF AEROSOLS (FINAL PROGRESS REPT. JAN. 20, 1961-Nov. 15, 1961) California Inst. of Tech., Pasadena, 49 pp. Nov. 15, 1961.

The general subject of this Report is the interaction of air-borne particulates with gaseous trace components of the atmosphere which leads to their accumulation upon these nuclei and causes what is commonly called "aerosol formation". An understanding of these processes is important because this accumulation of irritating substances may produce their synergistic intensification, and the growth of these particulates increases their capacity for diffuse light scattering and causes the well-known visibility restriction by smog-like aerosols. The studies reported center on the physical aspects of aerosol formation, particularly on those resulting from photochemical reactions between NO₂ and olefinic hydrocarbons. Instrumentation and methods, especially developed for the synthetic production of such aerocolloid systems, are described in detail -- as well as the procedures resulting in the quantitative size and mass distribution of such aerosols. Experiments of exploratory nature are discussed which demonstrate that such reaction products form temporary condensates on artificially introduced particulates whenever present during photoactivation.

06482

J. R. Hicks

IMPROVING VISIBILITY DURING PERIODS OF SUPERCOOLED FOG. Army Cold Regions Research and Engineering Lab., Hanover, N.H. (Rept. No. 181.) (Dec. 1966). 40 pp.
CFSTI, DDC: AD 648 484

Six tests of dispersal systems using propane were conducted in Hanover, New Hampshire during winter 1964-65 and a like number in Greenland during summer 1965 mainly on supercooled fogs and in a few instances when air temperatures were within the lower 2 meters at or slightly above freezing. Propane was introduced into the fog as a liquid aerosol to induce spontaneous nucleation either by cooling or by clathrate reaction which may be important in fog modification. The tests show that liquid propane will improve visibility in fogs, is safe to use, and no standby time is needed. The system may be permanently installed with either radio or manually controlled valve units, and is expensive, a cost of \$20/hr estimated to keep an airport approach zone clear of fog. Details of the individual tests conducted are given. The dispensing apparatus, flammability tests, and the theory of formation, growth, and precipitation of ice crystals, thermal reaction, and the clathrate concept are discussed. (Author summary)##

A. Goetz and R. Pueschel

BASIC MECHANISMS OF PHOTOCHEMICAL AEROSOL FORMATION. Atmos. Environ. 1, 287-306 (1967).

A photochemical reactor was applied to studies of the effects of sulfur dioxide humidity, and order of mixing of reactants on the photochemical production of aerosol from 1-octene and nitrogen dioxide in air. The effects of all three parameters are complex but explainable from a few reasonable assumptions, the most important of which is probably that initial contact between the aerosol nuclei and the more polar reactants has a governing effect on the nature of the product. The experimental results presented are obviously still lacking in sufficient detail for formulation of an adequate description of the complex reaction patterns which lead to the formation of photochemical aerosols in the presence of SO₂ under various humidity conditions. Nevertheless, the data definitely indicate that the presence of stable particulates is a dominant factor, not only as centers of accumulant formation, but also as loci for the concentration of reactant gas molecules (H₂O, NO_x, SO₂) in their immediate environment. The subsequent photoactivation will thus be more efficient at these centers than in the free volume between them. The existence of such localized statistical "order states" appears to be the most likely interpretation for the effect of the contact sequence order between reactants and particles.##

06994

S. Millman, G. Pressman, P. Warneck

OZONOSPHERIC MODIFICATION BY MISSILE EXHAUST. Geophysics Corp. of America, Bedford, Mass. (GCA Technical Rept. No. 62-14-G. Scientific Rept. No. 9.) 65 pp. (Dec. 1962).

A possible consequence of the increased launching of large rocket missiles is the large-scale local or worldwide modification of the atmosphere, in particular the occurrence of perturbations that might disturb the existing equilibria by causing chain, cyclic, or catalytic processes. This report considers these possible missile exhaust chemically induced changes in the ozonosphere, the lower reactive portion of the atmosphere. The possibility of chain, cyclic or catalytic processes initiated by one of the components in a rocket's exhaust trail that might cause appreciable changes in the composition of the atmosphere is studied. Chain, cyclic, and catalytic type processes are of greatest interest since destruction (or creation) of ozone on the basis of 1 molecule of ozone per molecule of initiating material would require immense amounts of material released into the atmosphere. In particular, possible reactions that occur when large quantities of OH or H radicals are uniformly released into the atmosphere at a height of 30 kms from hydrocarbon - lox systems are considered. Suggestions for experimental work are made in order that some of the preliminary estimates may be rendered less tentative. The results obtained indicated that large scale perturbations of the ozonosphere are possible under certain circumstances.##

Khan, A. U., J. N. Pitts, Jr., and E. B. Smith

SINGLET OXYGEN IN THE ENVIRONMENTAL SCIENCES: THE ROLE OF SINGLET MOLECULAR OXYGEN IN THE PRODUCTION OF PHOTOCHEMICAL AIR POLLUTION. ((Environ. Sci. Technol.)), 1(8):656-657, Aug. 1967. 14 ref.

CFSTI; DDC 675 969

A new mechanism is proposed to explain the rapid conversion of NO into NO₂ with a concurrent disappearance of hydrocarbons and appearance of oxidants in photochemical air pollution. Singlet oxygen generated by triplet energy transfer from strongly absorbing polynuclear aromatic hydrocarbons to normal oxygen produces excited singlet molecular oxygen which attacks olefins to give unstable peroxides. A mechanistic chain is set up involving free radicals generated by decomposition of these peroxides. A solution of differential equations relating to the proposed mechanism yields a set of rate-time curves for NO-NO₂-O₃ which have the same general characteristics as those observed in actual smoggy atmospheres. The presence of singlet oxygen in urban atmospheres has potentially great implications in the environmental sciences. (Authors' abstract)##

07518

Yantovskii, S. A., I. Yu. Sidorina, and M. V. Chernyak

CONDITIONS OF SAFE OXIDATION OF TOLUENE BY ATMOSPHERIC OXYGEN. Text in Russian. Neftekhimiya, 6(1):105-111, 1966. 22 refs. Engl. transl. Intern. Chem. Eng., 7(1):144-149, Jan. 1967.

The maximum permissible amount of oxygen and the limiting temperature to assure safe conditions for the liquid-phase oxidation of toluene at pressures from 1 to 20 atmospheres was determined. In order to assure safe conditions for the liquid-phase oxidation of toluene on an industrial scale it is necessary to maintain minimum oxygen concentration after the reactor at about 6%. In order to maintain a constant safe concentration of the toluene + air mixture in the reactor, in which the amount of oxygen can be brought up to 21%, it is necessary to maintain the temperature above the limiting temperature. At 10 atm. the temperature of the reactor should not be less than 130 deg. This value is 35-45 deg below the oxidation temperature of toluene, which is recommended for the optimum conditions.##

09430

Liberti, Arnaldo and Giuseppe Devitofrancesco

EVALUATION OF SULPHUR COMPOUNDS IN ATMOSPHERIC DUST. In: Air Pollution. Proceedings of the Symposium on the Physico-chemical Transformation of Sulphur Compounds in the Atmosphere and the Formation of Acid Smogs. Organisation for Economic Co-operation and Development, Paris Directorate for Scientific Affairs, Paper 6, Dec. 1967, p. 47-51.

Extensive research on the physical constitution and chemical composition of atmospheric dust and physico-chemical transformation of sulphur compounds is discussed. Surface area was determined for dust collected in various Italian cities by using a gas adsorption technique. The surface area was found to be about 6.2 sq. m./g. Volatile compounds were analysed by infrared spectroscopy. CO₂, CO, CH₄, NH₃, N₂O, nitro-compounds, and ethylene were detected. Sulphur content of atmospheric dust was determined by combustion and the sulphate by extraction with dilute mineral acid. No detectable amount of sulphur dioxide and of free acidity was found.##

10018

Fensterstock, Jack C. and Robert K. Fankhauser

THANKSGIVING 1966 AIR POLLUTION EPISODE IN THE EASTERN UNITED STATES. Public Health Service, Durham, N.C., National Center for Air Pollution Control, Publication N/. AP-45, 45p, July 1968. 12 refs.

The Thanksgiving 1966 Air Pollution Episode in the Eastern United States is documented in terms of daily meteorology and ambient air quality. Analysis of the available air quality data indicates that the Air Pollution Potential Forecast Program (APFP) of the Public Health Service and Weather Bureau did forecast the stagnation. Meteorological data for selected cities were based on the diurnal average temperature, cloud cover, afternoon mixing depths, average wind speed through mixing depth, ventilation, resultant wind direction and the average surface wind speed. Air quality measurements on the gaseous pollutants sulfur dioxide, oxides of nitrogen, hydrocarbon and carbon monoxide were made daily. Suspended and settling particulate of solids and liquids were also measured diurnally. The high level of air pollution in the eastern U. S. during the period Nov. 24 through 30, 1966, created adverse health effects. Researchers in New York City found an increase in the death rate of approximately 24 deaths per day during the period.

11004

Schmidt, F. H.

METEOROLOGICAL ASPECTS OF ATMOSPHERIC POLLUTION AND ATMOSPHERIC CHEMISTRY. Atmos. Environ., 2(4):423-426, July 1968.

Discussions are made in this report on the following topics: network of stations for measuring background pollution; sampling techniques from the meteorological point of view; meteorological factors influencing the dispersion of atmospheric pollution; boundary layer observations; special pollutants; forecasting pollution problems.##

11052

R. O. Weedfall, B. Linsky

A MESOCLIMATOLOGICAL CLASSIFICATION SYSTEM FOR AIR POLLUTION ENGINEERS. Preprint, West Virginia Univ., Morgantown, Dept. of Civil Engineering, 59p., 1968. 21 refs. (Presented

at the 61st Annual Meeting, Air Pollution Control Association, St. Paul, Minn., June 23-27, 1968, Paper 68-53.)

A method of deriving 3 air pollution potential indexes based on selected climatic data and meso-climate topographic factors has been developed, through not yet adequately field tested, for use by engineers in choosing between alternate factory sites. Three indexes, one for general air pollution, one for photoreactive air pollutants, and one for fog-reactive air pollutants, the latter two based on the first one plus sunshine and humidity factors respectively, are presented. These indexes vary with locations, not with air pollutants or time. Weaknesses and possible uses of the various stagnation indexes are discussed. (Authors' abstract, modified) ##

11225

Hilst, Glenn R.

AN AIR POLLUTION MODEL OF CONNECTICUT. Preprint, Travelers Research Center, Inc., Hartford, Conn., 33p., 1967. (Presented at the IBM Scientific Computing Symposium, Yorktown, Hgts, N. Y., Oct. 24, 1967.)

A working air pollution simulation model for the State of Connecticut is presented. The model is capable of simulating air pollution concentration patterns for conservative pollutants within the State of an hour-by-hour basis, given the time and space variability of the sources of that pollutant within the State, the flux of that pollutant across the State border (also a time and space variable), and the time and space variability of atmospheric flow and diffusion patterns within the State. Reduced to its bare essentials, the problem of predicting air pollution concentrations in any arbitrary volume of the atmosphere requires specification of the following factors: (1) The immediate past trajectory of that volume of air - where has it been? (2) The emissions of pollutant at each locality over which the air has passed during the time of passage - how much pollution has been injected into the volume? (3) The lateral and vertical mixing of pollutants between this volume and adjacent volumes-how much has each incremental input of pollutant been diluted with air or other pollutants during its time of flight? (4) The loss or alteration of the pollutant by chemical reaction, deposition, sorption processes-how much of each incremental input of pollutant has been altered or lost during its time of flight? The Connecticut model structures the first three of these factors.##

11479

Gusev, M. I. and R. S. Gil'denskiol'd, B. K. Baikov, and E. V. Elfimova

DETERMINATIONS OF THE COMBINED EFFECT OF TOXIC SUBSTANCES IN PREDICTIONS OF ATMOSPHERIC POLLUTION. ((Ob uchete summarnogo deistviya toksicheskikh veshchestv pri prognozirovanii zagryazneniya vozdukhmogo basseina.)) Hyg. Sanit. (English translation of: Gigiena i Sanit.), 33(4-6):88-80, April-June 1968. ((17)) refs.

CFSTI: TT 68-50449/2

Several investigations of the combined effect of several pollutants present simultaneously in the atmosphere have been recently made. The results are listed. The data provide convincing proof that as a rule the combined effect of toxic substances in the atmosphere at the levels of liminal and subliminal concentrations are in accordance with the principle of simple summation. Data from many specialized institutes and organizations suggest that in most cases calculations of the expected atmospheric pollution are based on the maximum permissible concentrations established for individual pollutants, so that the results of mathematical determinations are compared only against such standards. There is a definite gap between theory and practice in the establishment of standards for atmospheric pollutants and the application of its recommendations. It is a matter of common knowledge that the implementation of the necessary hygienic measures at an operating enterprise is undoubtedly more complex and difficult than the prevention of marked air pollution at the planning stage. All these considerations point to the necessity for the planner to take account of the complex effects on man of any combination of industrial pollutants discharged into the atmosphere. The results of comprehensive investigations of the reflex effects produced by combinations of substances and the largely uniform findings of such investigations make it possible to recommend, with a high degree of reliability, that for practical predictive purposes the approved formula for calculations of combined effects should be extended to all combinations of substances present in discharges from a specific industrial enterprise or a complex of enterprises.##

14019

Altshuller, A. P.

COMPOSITION AND REACTIONS OF POLLUTANTS IN COMMUNITY ATMOSPHERES. Bull. World Health Organ. (Geneva), 40(4):616-623, 1969. 26 refs.

Data are presented showing the composition of gaseous and particulate substances in community atmospheres, based on measurements in various cities in the United States. Many of the pollutants react further, usually to produce substances as undesirable as the original ones, or more so; most of these reactions involve thermal oxidation or photooxidation. Because of the importance of considering air pollution on a regional or even continental scale, a general framework of residence times of pollutants is postulated: up to several days under adverse conditions in many regions, but less than 24 hours across large urban areas under more usual conditions of wind speed and movements of weather fronts. Pollutants and other atmospheric substances are categorized as either reactants--those substances emitted directly into the atmosphere from combustion, industrial, and biosphere processes; or products such as nitrogen dioxide and sulfates. Some substances may fall into both groupings. Data are given on rates of various reactions, and the nature of the products is described. In general, the measurements showed 1% to 15% conversions of gaseous to particulate species on a long-term basis; rates of conversion of nitrogen dioxide to nitrate were consistently lower than those of sulfur dioxide to sulfate. Recent work on particle size distributions of various metallic and non-metallic ions in particulates in U. S. cities is reviewed, with data

given in terms of mass median diameters. It is pointed out that the biosphere is a source of, as well as a sink for, pollutants, and that urban levels of methane or nitrous oxide, for example, reflect to a considerable extent biosphere, rather than urban, emissions. Reactions originating in biosphere processes may contribute significantly to regional pollution, particularly during periods of stagnation. The need for increased emphasis on atmospheric investigations, as opposed to laboratory work, and for improved sensitivity and specificity in monitoring and sampling is discussed.

15308

Bockian, A. H., Frank Bonamassa, Herbert Faigin, and Herman Pinsky

USE OF THE INTEGRATING NEPHELOMETER TO MEASURE AEROSOL FORMATION FROM HYDROCARBONS. Preprint, California Air Resources Board, Los Angeles, 9p., 1969. (Presented at the Am. Chem. Soc., 158th Natl. Meet., New York, 1969.)

A recently-designed integrating nephelometer was used in environmental chamber experiments to measure light scattering resulting from the irradiation of different hydrocarbons in the presence of nitric oxide at ppm levels. In some of the experiments, 2 ml of gasoline were used; in others, several individual alkene and aromatic components of gasoline, in concentrations of 2 ppm each, were irradiated separately in the presence of 0.4 ppm nitric oxide for about 5 hrs. Six ppm of some alkanes found in gasoline were also allowed to react individually with 0.4 ppm NO. Several other experiments were performed in which the hydrocarbon was allowed to react with ozone in the dark. Agreement in the amount of light scattering between duplicate runs was excellent. In several cases, large amounts of aerosol were produced while the net oxidant concentrations were at a fairly low level. It was shown that some short-chain olefins, which may be very reactive in producing oxidant and eye irritation, produced little or no aerosol; in contrast, many paraffins which were found to be non-reactive in eye irritation studies produced aerosol. A great many aerosol producers contain seven or more carbon atoms and do not seem to be restricted to any class of hydrocarbon; a possible synergistic action between a short-chain high oxidant producer and a large molecule which produces aerosol remains to be investigated. The agreement between nephelometer readings and visual measurements of visibility was excellent.

15712

WHERE DOES IT ALL GO. Stanford Res. Inst. J., 23:4-8, Dec. 1968.

The Environmental Research Department of Stanford Research Institute undertook a global study of the atmosphere. The world and its surrounding atmosphere were considered as a complete system. Estimates were made of the amount of sulfur compounds, nitrogen compounds, organic compounds, and inorganic carbon compounds discharged to the air by automobiles, home furnaces, or power plants. Calculations were made of the amount of the material in the atmosphere. By comparing the two figures it was possible to estimate how effectively nature removes pollutants from the atmosphere. Included in the atmospheric balance was the

amount of material contributed by nature since there are natural sources for a wide variety of gaseous materials and particles which are classed as air pollutants when they are emitted by man's activities.

15729

Kozyrev, B. P. and V. A. Bazhenov

THE ROLE OF N_2O , CH_4 AND CO IN ATMOSPHERIC ABSORPTION IN THE INFRARED. (Rol' malykh atmosferynykh primesey v pogloshchenii infrakrasnoy radiatsii). Text in Russian. Fiz. Atm. i Okeana (Moscow), 5(7):738-744, 1969. 8 refs.

The transparency of minor atmospheric impurities is interpreted in the form of a function of the mass of absorbing gas divided by the equivalent mass of gas needed for 50% absorption at a given wavelength. This function fits available data with a scatter of not more than 8%. When taking into account, the non-uniformity of the atmosphere by the effective mass method, the selection of the fitting parameter (n) may lead to significant error in calculating transparency (T). If the average radiation absorption (A) at the center of the nitrous oxide methane and carbon monoxide bands varies from 10-90%, then (n) may be selected so that the maximum absolute error in calculating transmission will not exceed plus or minus 14%. Taking into account the variability of (n) with the mass of the gas and the pressure reduces the error in calculating the transparency of minor components to plus or minus 5-7%. Calculating the transparency of various air masses in the centers of N_2O , CH_4 and CO absorption bands indicates the significant role of minor atmospheric components in the attenuation of infrared radiation.

D. MEASUREMENT METHODS

00011

E. Sawicki, T. W. Stanley, and H. Johnson

DIRECT SPECTROPHOTOFLUOROMETRIC ANALYSIS OF AROMATIC COMPOUNDS ON THIN-LAYER CHROMATOGRAMS. Microchem. J., 8(3):257-284, Sept. 1964.

A simple method has been introduced by means of which fluorescence spectra can be obtained directly from a thin-layer chromatogram. The usefulness and sensitivity of the method have been demonstrated for a wide variety of polycyclic compounds. Some of the spectral differences between the dry and wet spots have been found to be useful analytically. The ease of applicability of the method has been proved through the characterization of the spots obtained from the thin-layer chromatogram of a coal-tar-pitch basic fraction. Benzo(h)quinoline, methylbenzo(h)quinoline, dimethyl(or ethyl)benzo(h)quinoline, benz(c)acridine, and methylbenz(c)acridine have been identified in the sample. (Author)**

00036

T.A. Bellar, M.F. Brown, J.E. Sigsby, Jr.

DETERMINATION OF ATMOSPHERIC POLLUTANTS IN THE PART-PER-BILLION RANGE BY GAS CHROMATOGRAPHY; A SIMPLE TRAPPING SYSTEM FOR USE WITH FLAME IONIZATION DETECTORS). Anal. Chem., Vol. 35:1924-1927, Nov. 1963.

A simple procedure is described for the determination of atmospheric pollutants at concentrations as low as 0.1 p.p.b. Hydrocarbons in the part-per-billion range in 100cc. gas samples can easily be determined. A simple trapping system provides for high collection efficiencies over a wide range of flow rates. Most samples can be handled by this system in less than 10 minutes. This collection system is used in combination with analysis by flame ionization gas chromatography. Data are shown for analyses for atmospheric olefins and paraffins derived from automobile exhaust. The general utility of the method is evaluated and described. (Author)**

00051

J. S. Nader E. C. Tsivoclou (Co-Chairmen)

SYMPOSIUM - ENVIRONMENTAL MEASUREMENTS - VALID DATA AND LOGICAL INTERPRETATION. Public Health Service.

Cincinnati, Ohio, Div. of Air Pollution and Div. of Water
Supply and Pollution Control. July 1964. 332 pp.
GPO: 814-105-12, HEW: 999-AP-15

This collection of papers on air and water environmental measurements contains material pertaining to the data acquisition fields of air pollution. The systems operated by the Los Angeles County Air Pollution Control District and the U.S. Public Health Service (Continuous Air Monitoring Program) are reviewed. Other articles connected with air and air pollution information include those on data acquisition systems for fields of meteorology, physiology, and data interpretation.##

00060

F.J. Woods, M.E. Umstead, J.E. Johnson

A STUDY OF THE IONIZATION PRODUCED BY THE CATALYTIC COMBUSTION
OF HYDROCARBONS. NAVAL RESEARCH LAB., Washington, D.C.
(NRL Rept. 6316.) Oct. 15, 1965. 15 pp.
CPSTI,DDC: AD 623014

Ionization produced during the catalytic combustion of hydrocarbons has been studied for its usefulness in applications such as chromatographic detection. When a Pt filament is heated above 500 C in an atmosphere containing the hydrocarbon, the formation of ions takes place during oxidation of the compound. The number of ions produced by the hydrocarbons is an exceedingly small fraction of the number of C atoms oxidized and varies widely depending upon the molecular structure of the hydrocarbon and the catalyst temperature. Branched hydrocarbons produce greater ionization than straight-chain compounds, although the ease of oxidation is opposite. H and CO burned in the combustion cell exhibit no ionization current, even when completely oxidized. Because of the marked effect of molecular structure on ionization and the response of the method to low concentrations of hydrocarbons in air, the procedure may find future use as a specific detector in gas chromatography. (Author)##

00068

M.W. Korth

DYNAMIC IRRADIATION CHAMBER TESTS OF AUTOMOTIVE EXHAUST.
Public Health Service, Cincinnati, Ohio, Division of Air
Pollution, PHS-999-AP-5. Nov. 1963, 59p.

A dynamic irradiation chamber facility was designed and built for investigations of irradiated auto exhaust under conditions of continuous mixing. The facility consists of a programmed chassis dynamometer, an exhaust dilution system, a dilution-air purification system, two irradiation chambers, and various exposure facilities. Three variables were considered in this first series of tests: (1) initial exhaust concentration (approximately 13 ppm carbon and 35 ppm carbon), (2) average irradiation time (85 and 120 minutes), and (3) fuel composition (14% and 23% olefins). The effects of varying these test parameters were determined by use of

appropriate test criteria including NO2 formation rate, oxidant production, total hydrocarbon losses and reaction of specific species, aldehyde production, plant damage, and bacteria kill. Of the three variables studied, the exhaust concentration at the start of irradiation appeared to produce the most significant effects. Fuel composition had a lesser influence on some of the test criteria; vdry little difference was noted in the effects produced at the two average irradiation times. (Author)**

00092

M. Drexler M. Barchas

CHEMO-ELECTRICAL SENSING DEVICE. Airkem, Inc., New York City, June 1961, 142p.
CFSTI, DDC: AD 262502

This report describes an investigation of the feasibility of utilizing gas adsorption phenomena for the identification and quantitative determination of various gaseous materials. A discussion is presented of the factors influencing the performance of the various components of an experimental gas analyzer based on the measurement of characteristic adsorption energies. Reasons are given for the attempted use of this principle in such an instrument together with a theoretical discussion of the basis for concluding the instrument to be non-feasible in practice within the limitations of the original specifications. A review of material obtained from available literature sources as well as information resulting from experimental work is included in this report. (Author)**

00108

A. P. Altshuller

AIR POLLUTION - PART IV - ANALYSIS OF POLLUTANTS. CHAPTER 18 - ANALYSIS OF ORGANIC GASEOUS POLLUTANTS. Preprint. 1966.

The development of analytical procedures for organic gases and vapors has progressed rapidly in recent years. Almost all of these methods are available only as laboratory techniques and very few have yet been adapted for monitoring instruments. The need for total hydrocarbon or organic analysis became evident when it was realized that organic substances and particularly hydrocarbons were important reactants in the photochemical type of air pollution. Ideally, a hydrocarbon analyzer should show little or no response to the unreactive substances and high response to the reactive substances. No analyzer has been developed that can perform such analyses directly on emission or atmospheric samples; however, subtractive techniques can be used to remove olefins, aromatics, and aldehydes, and to determine these constituents by difference. Mass spectrometry, dispersive and nondispersive infrared instrumentation, and flame ionization analyzers have been applied to analysis for total organics in emissions or in polluted atmospheres. Since each technique entails a different response to various organic substances, considerable care is needed in interpreting and applying the results of such measurements.**

00114

E. Sawicki, T. W. Stanley, W. C. Elbert, J. Meeker
and S. McPherson

COMPARISON OF METHODS FOR THE DETERMINATION OF BENZO(A)PYRENE
IN PARTICULATES FROM URBAN ATMOSPHERES AND AIR POLLUTION SOURCE
EFFLUENTS. Atmospheric Environ. (London) 1, (2) 131-45, Mar.
1967.

Fourteen methods for the determination of benzo(a)pyrene in air
and in other complicated mixtures are compared. Many of the
methods are introduced in this paper and all have been applied to
the determination of benzo(a)pyrene in airborne particulates. The
precision and accuracy of the methods, the man-hours of actual
work, and the time to complete an analysis are compared. Specific
recommendations are given for methods by means of which a high
order of selectivity, a maximum amount of information, a
considerably reduced analysis time, or a low cost of analytical
operation are possible. (Author)##

00122

D. L. Klosterman and J. E. Sigsby, Jr.

APPLICATION OF SUBTRACTIVE TECHNIQUES TO THE ANALYSIS OF
AUTOMOTIVE EXHAUST. Environ. Sci. Technol. 1, 309-14 (Apr.
1967). (Presented before the Division of Water, Air, and
Waste Chemistry, American Chemical Society, Atlantic City,
N.J., Sept. 12-17, 1965.)

A simple system has been developed for chemical class analysis of
hydrocarbons found in automotive exhaust. The technique should
prove useful for evaluating the contributions of automotive
emissions to photochemical air pollution. A system of scrubbers
permits the sample to be analyzed for paraffins, olefins and
acetylenes, and aromatics. Benzene may be determined with either
the paraffinic or aromatic hydrocarbons. The system may be used
with existing standard hydrocarbon analyzers without requiring
their modification. (Author abstract)##

00141

A. Zdrojewski, L. Dubois, and J. L. Monkman

INSTRUMENTATION FOR AIR POLLUTION MONITORING. Preprint.
(Presented at the Annual Symposium AID Division, Instrument
Society of America, Houston, Tex., May 11-13, 1966.)

The design of instruments for the continuous measurement of air
pollution is discussed. Particular reference is made to two
instruments, a carbon monoxide analyzer and a total hydrocarbon
analyzer. (Author)##

00142

R. G. Hinnners, J. K. Burkart, and G. L. Contner

ANIMAL EXPOSURE CHAMBERS IN AIR POLLUTION STUDIES. Preprint. 1966.

Recent developments in animal exposure chambers and their use in studying the biological effects of air pollution are described. The various atmospheres studied include irradiated and non-irradiated auto exhaust atmospheres, oxides of sulfur, and oxides of nitrogen. (Author)**

00146

E. Sawicki and J. Pfaff

ANALYSIS OF COMPOUNDS CONTAINING THE P-NITROANILINE PHOSPHOR AND ANALOGOUS GROUPS BY PHOSPHORIMETRY AND BY ROOM-TEMPERATURE AND LOW TEMPERATURE FLUORIMETRY. Preprint. Microchem. J. 12, (1) 7-25, Mar. 1967.

Since aromatic nitro compounds usually give poor absorption spectra and do not fluoresce, and since the nitrophenylhydrazines are useful colorimetric reagents for analysis of a wide variety of compounds, the phosphorimetric properties and the room-temperature and low-temperature fluorimetric properties of these types of compounds were investigated. Results showed that 4-nitrophenylhydrazine could be a valuable reagent for the analysis of aromatic carbonyl compounds present in auto exhaust fumes and that low-temperature fluorimetric trace analysis is a tool well worth exploiting. Most of the aliphatic aldehyde and ketone 4-nitrophenylhydrazones are nonfluorescent but strongly phosphorescent, whereas many of the aromatic aldehyde and ketone 4-nitrophenylhydrazones are nonphosphorescent but strongly fluorescent in solvents of low dielectric constant and are highly fluorescent in all types of solvents at liquid-nitrogen temperatures. Examples are given of compounds that are neither fluorescent at room temperature nor phosphorescent but are intensely fluorescent at liquid-nitrogen temperature. Phosphorimetry and low-temperature and room-temperature fluorimetry are three powerful complementary tools, much more valuable when used together in trace analytical research than when used singly. (Author)**

00155

Sweeney, M. Patrick and Miles L. Brubacher

EXHAUST HYDROCARBONS MEASUREMENT FOR TUNEUP DIAGNOSIS? In: Vehicle Emissions, Part II, SAE Progress in Technology Series Vol. 12, New York, Society of Automotive Engineers, Inc., 1966, p. 307-316. 5 refs. (Presented at the SAE Automotive Engineering Congress, Detroit, Mich., Jan. 10-14, 1966.)

With an activated control program in California and its imminent prospect nationwide, recently attention has been focused on simplifying exhaust hydrocarbon measurement for potential use as a

tuneup garage diagnostic tool. Work has been underway to evaluate new instrumentation and procedures for hydrocarbon measurement suitable for field use. It is concluded that: (1) With a "one minute" cycle, measured emissions seem to correlate adequately with the California procedure; (2) There are prototype instruments which are inherently much less susceptible to environment of use; and (3) For engine diagnostic purposes, the principal uses of hydrocarbon measurements would be: (a) an initial check (almost any engine malfunction raises hydrocarbons, if low, engine does not need tuneup work); and (b) recheck after tuneup (an increase in hydrocarbons indicates a tuneup oversight or error, and the car would then be checked further). (Authors' abstract)##

00188

G. A. Cleeves, T. J. Lemmons, and C. A. Clemons

A LOW-LEVEL AIR SAMPLING AND METEOROLOGICAL SOUNDING SYSTEM. J. Air Pollution Control Assoc. 16, (4) 207-11, Apr. 1966.

A captive-balloon borne radio transmitting device measuring temperature and humidity at desired levels in the lower thousand feet of the atmosphere over a city is described. A companion device which captures a sample of air at a desired altitude and a method of later determining trace gas concentrations in the sample is presented. Temperature, humidity, and methane concentrations in air samples taken above Cincinnati were determined and are presented as examples of the system's capabilities. (Author)##

00203

E. Sawicki, T. W. Stanley, and W. C. Elbert

COMPARISON OF FLUORIMETRIC METHODS OF ASSAY FOR BENZ(C)ACRIDINE AND BENZO(H)QUINOLINE IN URBAN ATMOSPHERES AND AIR POLLUTION SOURCE EFFLUENTS. J. Chromatog., Vol. 26:72-78. 1967.

Five methods for the estimation of benz(c)acridine in urban particulate samples are compared, as are three methods for benzo(h)quinoline. The methods involving thin-layer chromatography followed by some form of fluorimetry are compared with the column chromatographic absorptiometric procedure for aza compounds. Through the quick estimation of benz(c)acridine, the analyst should be able to determine the presence and amount of the polynuclear aza heterocyclic compounds in urban atmospheres and other appropriate samples. (Authors' abstract)##

00214

T. R. Hauser and D. W. Bradley

THE SPECIFIC SPECTROPHOTOMETRIC DETERMINATION OF OZONE IN THE ATMOSPHERE USING 1,2-DI-(4-PYRIDYL)ETHYLENE. Anal. Chem. 38, 1529-32, Oct. 1966.

A new method for the sampling and analysis of ozone in the atmosphere is described. Atmospheric ozone is collected in a solution of 1,2-di-(4-pyridyl) ethylene in glacial acetic acid. The collected ozone reacts with the 1,2-di(4-pyridyl) ethylene to form an ozonide that undergoes cleavage to yield pyridine-4-aldehyde for which a simple spectrophotometric determination was developed. The relationship between the micrograms of pyridine-4-aldehyde generated per microgram of ozone sampled has been determined, so that pyridine-4-aldehyde may be used for calibration. Various other oxidizing or reducing substances do not interfere with the method, at least not in the concentrations in which they are found in the atmosphere. The method offers good sensitivity, reproducibility, and excellent stability for delayed analysis after sampling. (Authors' abstract)##

00224

M. Shepherd, S. M. Rock, R. Howard, and J. Stormes

ISOLATION, IDENTIFICATION, AND ESTIMATION OF GASEOUS POLLUTANTS OF AIR. Anal. Chem. 23(10):1431-1440, Oct. 1951.

Previous attempts to concentrate air pollutants in a cold trap and analyze the concentrates by mass spectrometer have had disappointing results. A new method by which the air of Los Angeles County has been examined combines the isolation of gaseous pollutants on a filter at liquid oxygen temperatures, separation of the isolated frozen concentrate by isothermal distillation or sublimation at low temperatures and pressures, and identification and estimation of distillates by the mass spectrometer. The method is capable of determining as little as 0.0001 ppm of some pollutants from a 100-liter sample of air; with larger samples, 0.000001 ppm of some substances can be determined. The gaseous phase of the Los Angeles smog was found to be of the order of 0.5 ppm of the air. About 60 chemical compounds or families of compounds were identified or tentatively identified, and the amounts of some of these were determined. It was shown that the gaseous phase of the smog was primarily a mixture of hydrocarbons, and of hydrocarbons combined with O, N, and Cl. These hydrocarbons, principally the unsaturated ones, when oxidized with O₃ and NO₂ in the presence of UV light, produce substances which constitute a large proportion of the smog concentrates. These oxidation products cause eye and respiratory irritations such as are produced by the real smog, and smell like spectra of the smog concentrates may eventually indicate the presence of other irritants. The new method may be applied to special problems in air pollution over large areas or inside industrial plants. (Authors' abstract)##

00230

D.F. Bender, E. Sawicki, R.M. Wilson, Jr.

CHARACTERIZATION OF CARBAZOLE AND POLYNUCLEAR CARBAZOLES IN URBAN AIR AND IN AIR POLLUTED BY COAL TAR PITCH FUMES BY THIN-LAYER CHROMATOGRAPHY AND SPECTROPHOTOFUOROMETRY. Intern. J. Air Water Pollution, (London) Vol. 8, 633-643, 1964. (Presented at the Air Pollution Symposium, Chicago, Ill., Aug-Sept., 1964.)

The presence of carbazole in urban air samples and of polynuclear carbazoles in certain source samples is shown for the first time. Carbazole is found in the benzene soluble particulate and in the aromatic fraction of the benzene-soluble particulate from urban air. Certain source samples contain 1H-benzo(a)carbazole and 8H-benzo(c)carbazole in addition to carbazole. The already known presence of these polynuclear carbazoles and of 5H-benzo(b)carbazole in coal tar pitch samples can be demonstrated readily with thin-layer chromatography and spectrophotofluorometry in alkaline N,N-dimethylformamide. The characterization procedure consists of two thin-layer chromatographic separations followed by running the fluorescence emission and excitation spectra of the extract of the appropriate spots in neutral and alkaline N,N-dimethylformamide. Samples containing carbazole include the composite benzene-soluble particulate from the air of 150 United States communities, the aromatic fraction of the benzene-soluble particulate from the air of a city, air polluted by coal tar pitch tarring operations, and a coal tar pitch sample. (Author)##

00264

R. H. Wade, J. M. Ross and H. M. Benedict

A METHOD FOR THE DETECTION AND ISOLATION OF TRACES OF ORGANIC FLUORINE COMPOUNDS IN PLANTS. (FINAL REPT.) Stanford Research Inst., South Pasadena, Calif., Southern California Labs. Apr. 1963. 20 pp.

A method for the detection and isolation of submicrogram quantities of organic fluorine compounds from plant materials in the presence of much larger amounts of inorganic fluoride is presented. The procedure consists first of a rapid screening step for use with large numbers of vegetable samples and extracts and, second, of a chromatographic step to isolate and characterize any fluoro-organics found. These methods are developed in light of specific chemical characteristics of organic fluorine compounds as a general class. A modification of Soep's quantitative submicro fluoride analytical method is presented as applicable to these isolation methods. Microgram quantities of organic fluorine compounds were found in the plant materials investigated but at a level too low for isolation and identification. (Authors' abstract)##

00275

J. R. Dewhurst and C. G. Holbrook

A TEST FOR THE SOOTING PROPENSITY OF TOWN GAS. Inst. Gas Eng. J. (London) 6, (6) 387-400, June 1966.

A new test is described in which the sooting propensity of town gas may be assessed as a Sooting Number. Laboratory tests and district experience have been used to define the maximum Sooting Number that is acceptable for British appliances adjusted for G4 gas. When the appliances are adjusted for other groups, the test burner is similarly adjusted so that the same Sooting Number limit is obtained. A simple method has been developed for calculating the Sooting Number of a gas from its composition. (Authors' summary)##

00277

R. S. Spindt

COMPUTER ANALYSIS OF THE CALIFORNIA CYCLE. J. Air Pollution Control Assoc., 17(3):166-167, Mar. 1967. (Presented at the 59th Annual Meeting, Air Pollution Control Association, San Francisco, Calif., June 20-24, 1966, Paper 66-72.)

The State of California, through its Motor Vehicle Pollution Control Board, has specified a characteristic driving cycle to be used to evaluate the exhaust gas emissions of a motor vehicle. The standard method of analysis may take several hours to complete. While there are a number of short cuts that have been used, most of these are suspect if "correct" data are to be obtained. If one uses a data logger, then improvement of the analytical capability will permit more extensive data analyses. The California cycle requires measurement of only CO₂, CO, and hydrocarbons by means of nondispersive infrared analyzers. By adding an oxygen analyzer, data on air/fuel ratio can be calculated for each driving condition. The system selected consists of a coupler, scanner, digital voltmeter, recorder, and manual entry keyboard. The driver starts the car and the logger is started before the first acceleration. Data are recorded to the end of the run. The bag sample data (total exhaust gas collection) and final zero and span data are each recorded with their preceding manual entry code in a similar manner. (Author's abstract)##

00293

E. C. Tabor and G. V. Smith

NATURE OF THE BENZENE-SOLUBLE FRACTION OF AIR PARTICULATE MATTER. Preprint. (Presented at the 59th Annual Meeting, Air Pollution Control Association, San Francisco, Calif., June 20-24, 1966, Paper 66-121.)

Annual composites of the benzene-soluble portion of air particulate matter were obtained from suspended particulate samples collected at 78 urban and 32 non-urban stations of the National Air Sampling Network. These samples of benzene-soluble organics were separated into the following functional groups of organic compounds: water-soluble, acids, bases, aliphatic hydrocarbons, aromatic hydrocarbons, and oxy-neutral compounds. Tables are presented showing the composition of the individual samples and frequency distributions of percentage values for the different fractions. Results are discussed and suggestions made concerning causes of unusual results. Infrared absorption curves are presented to illustrate similarities and differences. (Authors' abstract)##

00328

H. Watanabe and T. Nakadoi

FLUOROPHOTOMETRIC DETERMINATION OF TRACE AMOUNTS OF ATMOSPHERIC OZONE. J. Air Pollution Control Assoc. 16, (11) 614.7. Nov. 1966. (Presented at the 59th Annual Meeting, Air

This work has initiated in an effort to obtain a better method for the manual determination of trace amounts of atmospheric ozone. The method described depends upon the fact that ozone oxidizes nonfluorescent 9,10-dihydroacridine to fluorescent acridine. When the ethyl alcohol solution of acridine is acidified by 6N acetic acid, the fluorescence maximum occurs approximately at 482 millimicrons and its intensity is sufficiently strong to be useful in this analysis. Linear relationships between acridine concentrations and fluorescence intensities were obtained from 0.1 to 3.5 micrograms per ml. by measurement with a commercial fluorophotometer. The results indicated that the low concentrations of experimentally prepared ozone measured by this method were in good agreement with those obtained by the phenolphthalin method. This method appeared to be about twice as sensitive as the phenolphthalin method but it is subject to some interference from nitrogen dioxide. (Authors' Abstract)##

00386

E. Sawicki and J. D. Pfaff

QUENCHOPHOSPHORIMETRIC ANALYSIS FOR CONJUGATED COMPOUNDS.
Mikrochim. Acta (1-2) 322-33, 1966.

A new method of analysis that incorporates many of the reagents found useful in quenchofluorometry is introduced. Since many types of non-fluorescent and weakly fluorescent compounds can be analyzed, quenchophosphorimetry is a complementary tool. This method of analysis is superior to colorimetry and fluorometry in simplicity, sensitivity and selectivity for many types of compounds. Examples of this technique are given. One striking example is the determination of p-nitroaniline in the presence of carbazole, p-hydroxyacetophenone, triphenylamine and tri-phenylene all of which are usually intensely phosphorescent. New types of functional group analyses for individual compounds and families of compounds should be possible with quenchophosphorimetry. (Author)##

00399

W. C. Elbert and T. W. Stanley

A STUDY OF THE ELUTING POWER OF SOLVENT SYSTEMS ON THIN LAYERS OF FLORISIL. Chemist-Analyst. 54, 68-9, July 1965.

This paper presents the results of investigation of the eluting power of single solvent systems on thin layers of Florisil with standards of immediate and future importance in air pollution studies. A polynuclear aromatic hydrocarbon, aza and imino heterocyclic hydrocarbons, an aromatic amine, a quinone, and a ring-carbonyl compound were selected for the study. Clean glass plates (20 by 20 cm) were coated with a 500-micron layer of Florisil from a slurry of 70 ml. of water and 35 g. of substrate, which had been mixed for 3 min. The coated plates were activated at 110 C and stored in a desiccator. Chambers containing the solvent systems were lined on one side with Whatman No. 1 filter paper and allowed to equilibrate for 16

hrs (or over-night) at room temperature. Plates spotted with the standards were allowed to develop to a height of 15-cm.; spots on the developed chromatogram were outlined and the movement of the standards relative to the solvent front was determined by observation under UV light. This study showed that the order of solvents in terms of development on a plate varies with the type of compound being separated. Because of this phenomenon, two-dimensional development on a Florisil plate can be useful in the separation and analysis of organic airborne particulates.##

00426

G. Lundeen and R. Livingston

CHEMILUMINESCENCE OF HYDROCARBON OXIDATION. Photochem. Photobiol. Vol. 4:1085-96, 1965.
CFSTI, DDC: AD 631111

That chemiluminescence accompanies autoxidations and decompositions of some peroxides has been known for some time. Recently mechanisms have been proposed to explain such chemiluminescence. This paper is a report of an experimental study of the luminescence which accompanies the autoxidation, spontaneous and induced by the decomposition of benzoyl peroxide, of tetralin and amyl benzene. Anthracene, 9,10-diphenyl anthracene and 9,10-dibromo-anthracene were used as intensifiers of luminescence.##

00440

E. Sawicki and H. Johnson

CHARACTERIZATION OF AROMATIC COMPOUNDS BY LOW-TEMPERATURE FLUORESCENCE AND PHOSPHORESCENCE: APPLICATION TO AIR POLLUTION STUDIES. Microchem. J. 8(1):85-101, Mar. 1964.

Characterization through low-temperature fluorescence and phosphorescence properties of aromatic molecules under neutral, acid, and alkaline conditions has been investigated. Compounds that are fluorescent at room temperature are usually fluorescent at liquid-nitrogen temperatures. Many polar compounds that are nonfluorescent at room temperature become strongly fluorescent at low temperatures. Many azulene and azo derivatives that are not fluorescent under neutral conditions give vivid fluorescence under liquid nitrogen. Many of the investigated compounds have vivid phosphorescence properties. Many of the compounds show differences in fluorescence and phosphorescence dependent on whether they are dry or in solution on the paper. Both paper and thin-layer chromatograms can be examined for room-temperature fluorescence, low-temperature fluorescence, and phosphorescence in neutral, acid, or alkaline media. Examples of the more difficult thin-layer chromatogram procedure with air pollution samples are given. An example of an applied paper-chromatographic procedure is given also.##

H. Konosu and Y. Mashiko

TECHNICAL ANALYSES BY OPTICAL METHODS (XI) DESIGN OF A NONDISPERSIVE ULTRAVIOLET GAS ANALYZER AND ITS APPLICATION TO QUANTITATIVE MEASUREMENT OF TRACES OF TOXIC GASES AND VAPORS IN AIR.) Tokyo Kogyo Shikensho Hokoku 61(2):62-68, Feb. 1966., Text in Japanese

Details of a nondispersive ultraviolet gas analyzer, designed to determine traces of toxic gases and vapors in air, are presented. The analyzer measures small transmission differences between a standard gas and the sample gas. The principal parts of the instrument are an ultraviolet source (hydrogen discharge lamp), a double-beam optical system, measuring cell of 50 cm length, a secondary electron photomultiplier detector, and a measuring meter (ammeter). The sensitivity of detection in ppm for gas and vapors in 50 cm cell is: SO₂-3, CS₂-28, C₆H₆-27, CH₃COCH₃-32, CH₃COC₂H₅-34, CHCl₃-12-13. This method has a precision to plus or minus 9.0% for the range of 0-100 ppm, to plus or minus 4.0% for 100-1,000 ppm and to plus or minus 1.5% for 1,000-1,250 ppm SO₂. The equipment is relatively simple, and its rapid response permits measurements to be made in less than 1 minute. (Author summary)

00451

H. Sakabe, H. Matsushita, H. Hayashi, K. Nozaki, Y. Suzuki

MINERAL COMPONENTS AND 3,4-BENZOPYRENE IN AIR POLLUTANTS OF TOKYO. Ind. Health (Japan) 3(3-4):126-139, Dec. 1965.

Minerals and 3,4-benzopyrene in particulate pollutants in winter air of Tokyo were studied by the methods developed by the authors. Minerals in air pollutants of Tokyo were quartz, feldspar, cristobalite, mica and kaolin minerals which were the mineral assemblage of Kanto loam constituting earth surface of Kanto plain. The highest concentration of quartz in the air during this survey was 0.034 mg/cu m and mean concentration of 3,4-benzopyrene in Tokyo air was 15.1 micrograms/1000 cu m. Data were discussed in relation to "Tokyo-Yokohama asthma" and lung fibrosis. (Authors' abstract) **

00469

G.D. Jaros, N.R. Parkin, J.G. Mingle, W.H. Paul

THE FATE OF OXIDES OF NITROGEN THROUGH A DIRECT FLAME AFTERBURNER IN THE EXHAUST OF A GASOLINE ENGINE. Preprint. (Presented at the Second Annual Meeting, Pacific Northwest International Section, Air Pollution Control Association, Portland Oreg., Nov. 5-6, 1964, Paper No. 64-AP-10.)

This paper deals with a study which was made to determine the concentration of N oxides before and after a direct-flame afterburner connected to the exhaust of an internal-combustion

engine. The scope of the work covered in this investigation is being confined to a single engine and one afterburner. The laboratory setup consisted of a 6-cylinder overhead camshaft engine direct-connected to an electric dynamometer. Steel flywheels mounted on the dynamometer shaft made possible the simulation of vehicle road operation during acceleration and deceleration. Operation of the engine was automatically controlled to the California sevenmode cycle. Analysis of NOx was accomplished by drawing exhaust gas samples every 2-1/2 sec during the 129 sec of the 7-mode cycle. NOx determinations were made by an instrument partially designed and totally built at Oregon State University. Other constituents of the exhaust gas (CO, CO2 and unburned hydrocarbons) were recorded with continuous, nondispersive infrared detectors. Plotted profiles of instantaneous NOx concentration during the 7-mode cycle time show results before and after the direct-flame afterburner for both rich and lean mixture operation.##

00479

E. Sawicki, T. W. Stanley, S. McPherson, and M. Morgan

USE OF GAS-LIQUID AND THIN-LAYER CHROMATOGRAPHY IN CHARACTERISING AIR POLLUTANTS BY FLUOROMETRY. Talanta Vol. 13:619-629, 1966.

Relatively large amounts of alkylated derivatives of the polynuclear aromatic hydrocarbons are present in some urban atmospheres. These compounds are believed to be derived from industrial sources. Because alkylation of the tetracyclic aromatic hydrocarbons can confer carcinogenic activity on the derivatives, the presence of substantial amounts of these alkylated compounds in the air needs thorough study. The R sub f value and the retention time, by themselves, are inadequate for characterisation of the polynuclear compounds. Gas liquid chromatography followed by fluorometric examination of the eluent bands, and mixed-adsorbent two-dimensional thin-layer chromatography followed by direct fluorometric examination are very useful in characterising all types of organic compound in the organic fractions of airborne particulates and effluents from air pollution sources. (Author Abstract)##

00484

Holma, B.

SHORT-TERM LUNG CLEARANCE IN RABBITS EXPOSED TO A RADIOACTIVE BI-DISPERSE (6 AND 3 MICRON) POLYSTYRENE AEROSOL. In: Inhaled Particles and Vapours II. (Proc. Intern. Symp. Brit. Occupational Hyg. Soc., Cambridge, England, 28 Sept. -1 Oct. 1965.) C. N. Davies (ed.), London, Pergamon Press, 1967, p. 189-203. 8 refs.

This paper presents a technique for external measurement which can be used for studying the rate of lung clearance for two monodisperse aerosols, i.e. a "di-disperse" aerosol simultaneously in a single animal. Using this technique, the lung clearance of 6 micron and 3 micron polystyrene particles, tagged with Au(198)

and Sc(46) respectively, has been studied in 8 rabbits for 48 hours after exposure. The results show that the clearance rate is faster for the larger than for the smaller particles. (Author abstract) **

00492

F. E. Ordoveza and P. W. West

MICRODETERMINATION OF CAFFEINE USING THE RING OVEN TECHNIQUE.
Anal. Chim. Acta Vol. 30:227-233, 1964.

A rapid and highly selective method for the microdetermination of caffeine of special interest for air pollution studies is presented. With the ring oven technique and with solutions of acetylacetone in sodium hydroxide and p-dimethylaminobenzaldehyde in hydrochloric acid, as little as 0.5 microgram caffeine on the ring can be determined with an average error of 3%. Compounds containing purine bases which would be likely to give the same color reaction as caffeine do not interfere. Of the organic air pollutants which might be collected from the atmosphere during the sampling for caffeine, benzo(alpha)pyrene and formic acid do not interfere. Interferences from formaldehyde and urea are easily eliminated. (Authors' summary) **

00542

T.A. Bellar J.E. Sigsby, Jr.

EVALUATION OF VARIOUS SILICA GELS IN THE GAS CHROMATOGRAPHIC ANALYSIS OF LIGHT HYDROCARBONS. Environ. Sci. Technol. 1(3):242-246, March 1967. (Presented at American Chemical Society, Pittsburgh, Pa., Mar. 23-24, 1966.)

The paper describes the separations of light hydrocarbons obtained with columns packed with the following Davison silica gels: Types No. 08, 15, 35, 58, 62, 81, 113, and 950. experimentally these silica gels were classified in 2 groups: (1) high-activity silica gels with average pore diameter around 25 angstroms, and (2) medium-activity silica gels with average pore diameter around 150 angstroms. Light-hydrocarbon chromatograms characteristic of the 2 groups are shown. The effects of various polar liquid phases and water upon the silica gels of 150 angstroms pore diameter are discussed in detail. A system is described that can be used for analyzing C1 to C5 paraffins, C2 to C4 olefins, and acetylene in automotive emissions and in ambient air. Some of the advantages of using solid adsorbents for such analysis are also discussed. (Author's abstract) **

00584

C.A. Clemons A.P. Altshuller

PLASTIC CONTAINERS FOR SAMPLING AND STORAGE OF ATMOSPHERIC HYDROCARBONS PRIOR TO GAS CHROMATOGRAPHIC ANALYSIS. J. Air Pollution Control Assoc. 14, (10) 407-8, Oct. 1964.

The results of the present work indicate that Mylar containers should prove adequate for sampling and long-term storage of C1 to C5 aliphatic hydrocarbons prior to gas chromatographic analysis. Long-term storage of aromatic hydrocarbons in these containers should be avoided. Containers made of plastic films fabricated from various fluorinated polymeric materials may prove more useful for the storage of aromatic hydrocarbons. Difficulties in storage of atmospheric samples containing higher-molecular-weight hydrocarbons or polar substances for periods of weeks should not deter workers from using these containers for short-term storage of synthetic calibration mixtures or atmospheric samples. Mylar containers have proved satisfactory for storage of a wide variety of reactive substances for periods of a few hours to several days. (Authors' abstract) ##

00610

A. P. Altshuller

ATMOSPHERIC ANALYSIS BY GAS CHROMATOGRAPHY. Preprint. 1966.

A number of the gas chromatographic procedures developed for atmospheric analysis have received little application. Several investigators have done atmospheric analysis for hydrocarbons and peroxyacetyl nitrate directly without concentration. Monitoring gas chromatographs could be built for obtaining large quantities of atmospheric analyses. Such equipment has not yet been fabricated. A related problem is the read-out of the large number of peaks or areas generated by making analyses every 10, 15 or 30 min. for 24 hrs. a day. Integration equipment capable of handling such outputs is available; such equipment is already in routine use in measuring hydrocarbons in auto exhaust studies. The application of the electron capture detector to analysis of low-molecular-weight halogenated substances, pesticides, and tracer materials in air has been demonstrated. The capability to measure such substance by gas chromatography is excellent. Many future applications in atmospheric chemistry should make use of such procedures. (Author abstract) ##

00620

W.D. Conner J.S. Nader

AIR SAMPLING WITH PLASTIC BAGS. Am. Ind. Hyg. Assoc. J. Vol. 25:291-297, June, 1964.

An inexpensive sampler has been developed whereby air samples can be collected in plastic bags without pump contamination and shipped to a laboratory for analysis. Data are presented to illustrate how well these bags contain (1) sulfur dioxide, nitrogen dioxide, and ozone in samples collected from synthetically prepared mixtures, and (2) hydrocarbons in samples collected from an auto exhaust irradiation chamber. The inorganic samples were in the concentration range of 0.5 to 1.5 ppm, and the hydrocarbon samples were in the concentration range of 7 to 20 ppm. The samples were stored for periods of several days. (Author abstract) ##

G.C. Ortman

CONTINUOUS SELECTIVE MONITORING OF HYDROCARBONS:
APPLICATION TO DETERMINATION OF METHANE. Preprint. 1964.

Described is an instrument system for selective monitoring of trace hydrocarbons. It is comprised of sample pump, treated column of adsorbent material, hydrogen flame ionization detector, electrometer amplifier, and recorder. In operation a continuous flow of sample air is pumped through the column to the detector. The column removes unwanted hydrocarbons while passing unaltered the one of interest. A prototype field instrument for monitoring atmospheric methane is detailed and typical results characterizing its operation reported. Response is linear and independent of the direction of change of the measured variable. Principles, design factors, application, and performance of the system are discussed and experimental data presented. (Author abstract)##

00624

E. Sawicki, T. W. Stanley, W. C. Elbert

CHARACTERIZATION OF POLYNUCLEAR AZA HETEROCYCLIC
HYDROCARBONS SEPARATED BY COLUMN AND THIN-LAYER
CHROMATOGRAPHY FROM AIR POLLUTION SOURCE PARTICULATES. J.
Chromatog. Vol. 18:512-519, 1965.

By column and thin-layer chromatography approximately 200 spots have been obtained in the analysis of various air pollution sources. With the help of direct spectrophotofluorometric analysis of the spots on the thin-layer chromatograms 25 aza heterocyclic and 8 polynuclear aromatic hydrocarbons were characterized according to the present ring structure. Eleven of the aza heterocyclic hydrocarbons were identified unequivocally. The following carcinogens have been found in air pollution source effluents: dibenz-(a,h)acridine and dibenz(a,j)acridine. In addition, alkyl derivatives of benz(a)acridine and benz(c)acridine were obtained, some of which could be carcinogenic. (Author summary)##

00728

S.S. Epstein K. Bush

A SIMPLE PHOTODYNAMIC ASSAY FOR POLYCYCLIC ATMOSPHERIC
POLLUTANTS. Preprint. (Presented at the 58th Annual
Meeting, Air Pollution Control Association, Toronto, Canada,
June 20-24, 1965, Paper No. 65-111.)

The photodynamic bioassay employed in this study is simple, rapid, and reproducible. However, the significance of data acquired with this technique is, at present, not easy to interpret. It appears that the assay provides an in vivo measure of the concentration of photosensitizing compounds in atmospheric

particulates, and yields results which discriminate between pollutant fractions from the same source, and between pollutants from different sources. Whether these differences would be paralleled in non-composite samples cannot be assessed at present. The inter-source variations cannot be accounted for merely by a concomitant difference in the concentration of atmospheric particulates. Although there appears to be a general association between the BaP concentration and photodynamic potency of benzene-soluble extracts, the chemical data are, at present, too restricted for more meaningful correlations. Apart from this, while the presence of BaP may account for the major part of the potency of benzene-soluble and aromatic fractions, it obviously does not account for photodynamic potency in oxy-neutral or basic fractions. Both these fractions are frequently very potent and while largely chemically undefined, are devoid of BaP. The presumptive isolation of carcinogenic alkylated benz(c)acridines from basic fractions probably accounts for their occasional high potency and should serve to direct biological attention to this small but, hitherto, largely ignored fraction. (Author's summary modified)**

00747

R.D. Stewart, H.C. Dodd, D.S. Erley, B.B. Holder

DIAGNOSIS OF SOLVENT POISONING. J. Am. Med. Assoc., 193(13):1098-1100, Sept. 27, 1965.

The diagnosis of solvent poisoning or exposure can be rapidly established by breath analysis. The analytical methods employed specifically identify the solvent and are sufficiently sensitive to permit detection hours to weeks after exposure, depending upon the amount of solvent absorbed, its rate of metabolism, and its rate of excretion. Serial breath analyses after a solvent exposure allow the construction of an excretion curve which can then be compared to the excretion curves of humans previously exposed to known amounts of a given solvent. In this manner the total body burden or total body burden of total amount absorbed may be estimated. Based upon the identity of the toxic agent and the amount present within the body, a reasonable prognosis can be advanced and appropriate therapy begun. The breath samples are collected in saran gas bags or glass pipettes and analyzed directly for their solvent content in a long path-length gas cell of an infrared spectrometer or in a capor phase chromatograph. (Authors' abstract)**

00765

E. Sawicki, D.F. Bender, T.R. Hauser, R. M. Wilson, Jr., J.E. Meeker

FIVE NEW METHODS FOR THE SPECTROPHOTOMETRIC DETERMINATION OF ALKYLATING AGENTS INCLUDING SOME EXTREMELY SENSITIVE AUTOCATALYTIC METHODS. Anal. Chem. 35(10):1479-86, Sept. 1963.

The presence of alkylating agents in the air and in various air pollution sources has been demonstrated with the new reagents. Because of the wide range of toxic effects caused by alkylating agents, a more thorough investigation of the composition of the

air in terms of alkylating agents is necessary. Four new sensitive reagents for the determination of alkylating agents are introduced. A much more sensitive 4-(4-nitrobenzyl)-pyridine procedure is described for the determination of the relative reactivity of over 90 alkylating agents. A new type of spectrophotometric method for the analysis of organic compounds involves an autocatalytic reaction for determining alkyl iodides in trace quantities. For example, in the 4-pyridinecarboxaldehyde 2-benzothiazolylhydrazone procedure for the determination of 1-iodobutane a molar absorptivity of 1,500,000 can be obtained. The determination limit is about 50 nanograms of 1-iodobutane. These reagents can be used to determine very low concentrations of iodine and iodine precursors through an autocatalytic reaction. For example, in the determination of iodine with 4-pyridinecarboxaldehyde 2-benzothiazolylhydrazone a molar absorptivity of 6,000,000 can be obtained. The determination limit for iodine with this reagent is 15 nanograms. Several new methods use the new reagents for the detection of acylating agents. The relative activity of many functional groups is discussed. (Authors' abstract)##

00766

J.D. Pfaff E. Sawicki

DIRECT SPECTROPHOSPHORIMETRIC ANALYSIS OF ORGANIC COMPOUNDS ON PAPER AND THIN-LAYER CHROMATOGRAMS. Chemist-Analyst, 54(1):30-31, 1965.

Author discusses the advantage of phosphorimetric analysis of organic compounds and concludes that it is a more sensitive and more selective method of analysis.##

00767

E. Sawicki H. Johnson

THIN-LAYER CHROMATOGRAPHIC CHARACTERIZATION TESTS FOR BASIC POLYNUCLEAR COMPOUNDS. APPLICATION TO AIR POLLUTION. Mikrochim. Acta (Vienna), (2-4) 435-50, 1964.

A group of methods for the characterization and differentiation of various classes of basic aromatic compounds has been described. Polycyclic hydrocarbons, aromatic carbonyl derivatives, aromatic ring carbonyl compounds, aza heterocyclic compounds, and polycyclic aromatic amines show changes in fluorescence color with sulfuric acid on the thin-layer plate and in solution. The piperonal color test gave some selective reactions on the thin-layer plates with various polycyclic aromatic hydrocarbons. A trifluoroacetic color test for oxidizable aromatic compounds containing nitrogen atoms was investigated. Compounds containing carbazole rings gave positive results. The piperonal test, the trifluoroacetic acid oxidation test, and the trifluoroacetic acid test for compounds more basic than the hydrocarbons were applied to the study of the spots separated through thin-layer chromatography of organic airborne particulates. Carbazole in amounts greater than 0.03% in an organic air sample could be estimated after thin-layer chromatography. With the help of thin-layer chromatography and the trifluoroacetic acid vapor test, organic airborne

particulates were found to contain fairly large amounts of compounds more basic than the polycyclic hydrocarbons. A spectral procedure for characterizing and differentiating aromatic hydrocarbons, aromatic carbonyl derivatives, aza heterocyclic compounds, and aromatic amines has been described. (Author summary modified)##

00768

D.F. Bender, E. Sawicki, R.M. Wilson, Jr.

SPECTROPHOTOMETRIC DETERMINATION OF ALKYLATING AGENTS WITH 4-PICOLINE AND O-DINITROBENZENE. Analyst, 90(1075):630-634, Oct. 1964.

An accurate, sensitive spectrophotometric method has been developed for determining alkylating agents. The method involves the alkylation of 4-picoline at 100 c in 2-methoxyethanol, with subsequent reaction of the 4-picolinium cation with o-dinitrobenzene in the presence of alkali to produce the chromogen. With 2-phenylethanol as the solvent, the method is autocatalytic at 100 C. The variables in the procedures were studied, and the methods were compared to one another and to methods in literature. Some preliminary studies of other possible methods for alkylating agents are discussed. (Authors' abstract)##

00772

T.A. Bellar, M.L. Bellar, J.E. Sigsby, Jr.

GAS CHROMATOGRAPHIC ANALYSES OF PARAFFINS AND OLEFINS IN COMPLEX HYDROCARBON MIXTURES: CHEMICAL FRACTIONATION WITH DUAL HIGH-CAPACITY TUBULAR COLUMNS. Preprint. (Presented at Pittsburgh Conference on Analytical Chemistry and Applied Spectroscopy, Pa., Mar. 2-6, 1964.)

Auto exhaust and other complex hydrocarbon samples are analyzed directly for over 40 paraffins and cycloparaffins and numerous olefins in 70 minutes. By means of a unique valving system, a sample of exhaust is separated into two fractions by a silver nitrate-ethylene glycol column and each fraction is trapped individually. The fractions are then analyzed simultaneously on separate columns, one fraction for paraffins and cycloparaffins and the other for olefins. The latter fraction also contains the remaining hydrocarbons of the exhaust sample excepting aldehydes and acetylenes, which appear to react irreversibly with the fractionating column. (Authors' abstract)##

00845

SELECTED METHODS FOR THE MEASUREMENT OF AIR POLLUTANTS.
Public Health Service, Cincinnati, Ohio, Div. of Air
Pollution. May 1965. 53 pp.
GPO: 820-519, NEW: 999-AP-11

This manual is an effort to assist in the development of uniform standard methods of analysis of air pollutants. It makes available the judgment and knowledge of a large group of chemists in the Public Health Service. Methods of determining pollutants of common interest are presented in uniform format by chemists on the staff of the Division of Air Pollution. The methods were critically reviewed by the Interbranch Chemical Advisory Committee, which is composed of representatives of the professional chemical groups in all branches of the Division. Methods presented are as follows: For determination of sulfur dioxide, the West and Gaeke and the hydrogen peroxide methods; for determination of nitrogen dioxide and nitric oxide, the Saltzman method; for determination of oxidants, the neutral buffered-potassium iodide and the alkaline potassium iodide methods; for determination of aliphatic aldehydes, the 3-methyl-2-benzothiazolone hydrazone hydrochloride method; for determination of acrolein, the 4-hexylresorcinol method; for determination of formaldehyde, the chromotropic acid method; for determination of sulfate in atmospheric suspended particulates, the turbidimetric barium sulfate method; and for determination of nitrate in atmospheric suspended particulates, the 2,4 xylenol method. (Author abstract)##

00862

R.A. Vomela

GENERATION AND DECAY OF SMALL IONS. SECTION IV: THE CHARGING AND MOBILITY OF CHAIN AGGREGATE SMOKE PARTICLES (PROGRESS REPT.). Minnesota Univ., Minneapolis, Dept. of Mechanical Engineering. (Particle Lab. Publication No. 95.) June 1, 1966.

Using a modified electrical particle counter, an experimental study was made of two typical linear aggregate aerosols. These were an aerosol generated by exploding a fine copper wire with a high current pulse and one produced by the burning of a mixture of kerosene and benzene in air. The electric charge acquired by the particles by diffusion of ions in a pure diffusion charger, the electrical mobility of the particles, and their size, were measured and correlated. This information was then used to calculate the dynamic mobility of the particles and the charge-size relationship. The charge acquired by spherical methylene blue dye particles under similar charging conditions was also measured and compared to the data on chain aggregates.##

00867

E. Sawicki, T.W. Stanley, T.R. Hauser, W. Elbert, J.L. Noe

SPOT TEST DETECTION AND COLORIMETRIC DETERMINATION OF AROMATIC AMINES AND IMINO HETEROAROMATIC COMPOUNDS WITH 3-METHYL-2-BENZOTHAZOLONE HYDRAZONE. Anal. Chem. 33(6):722-725, May 1961.

A new analytical method is introduced for the detection and determination of organic compounds containing the aromatic amine grouping. Among these compounds are the aromatic primary amines,

aralkyl amines, aryl dialkylamines, diarylamines, indoles, carbazoles, and phenothiazines. In a preliminary survey of this reaction, limits of identification, wave length maxima, and molar absorbance values have been given for approximately 100 compounds. Noteworthy were the brilliant intense colors obtained with aniline, N-alkylanilines, and N,N-dialkylanilines and their ring-substituted derivatives. Many carcinogenic amines were found to be capable of analysis by the colorimetric method. The colorimetric determination of N,N-dimethylaniline was studied and found to be extremely sensitive and reproducible. Beer's Law was obeyed from 4-64 micrograms of N,N-dimethylaniline/ml of test solution. The shortcomings and limitations of this procedure are also discussed. In an alternative procedure modified for use only with the basic aromatic amines Beer's Law was obeyed from 0.4 to 8 micrograms of N,N-dimethylaniline/ml of test solution. The absorptivity of the chromogen obtained from N,N-dimethylaniline was 0.70/micrograms ml/cm. (Author summary) **

00868

E. Sawicki J.D. Pfaff

ANALYSIS FOR AROMATIC COMPOUNDS ON PAPER AND THIN-LAYER CHROMATOGRAMS BY SPECTROPHOTOPHOSPHORIMETRY, APPLICATION TO AIR POLLUTION. Anal. Chim. Acta Vol. 32:521-543, June 1965.

A new technique is introduced in spectrophosphorimetric analysis by means of which spectra can be obtained directly on an adsorbent after chromatography. With this procedure spectra of the phosphorescent compound, its salts, its reduced or oxidized forms, or its derivatives can be obtained in all types of solvents. A large number of examples of this simple technique are given; detection limits range from 0.1 nanogram to microgram amounts. A new system for the circular paper chromatographic separation of aza heterocyclic hydrocarbons using aqueous formamide is described. Many of these heterocyclic compounds can be separated from each other as can the parent compounds from their alkyl derivatives. Air pollution mixtures separated by column and paper chromatography are analyzed with the phosphorimetric technique. Spots obtained on the paper chromatograms are analyzed directly in the phosphorimeter. With these techniques benzo(f)quinoline, benzo(h)quinoline, benz(a)acridine, benz(c)acridine, and hydrocarbons such as phenanthrene and benzo(e)pyrene are readily characterized. (Author summary) **

00898

M.P. Chovin M.J. Lebbe

(AN EFFECTIVE WORK INSTRUMENT: THE LABORATORY TRUCK USED BY THE MUNICIPAL LABORATORY OF PARIS IN A STUDY OF AIR POLLUTION.)
Un Instrument de Travail Efficace: Le Camion-laboratoire
d'Etude de la Pollution Atmospherique du Laboratoire
Municipal de Paris. Pollut. Atmos. (Paris) 8(29):1-11, Mar. 1966.

A Paris Municipal Laboratory truck used for air pollution studies, principally for automobile emission studies, is described. This mobile laboratory which was set up in 1961 by the Technical Services Department of the Prefecture of Police, helped in a long-term series of studies known as "Operation Carbon Monoxide". It gave great mobility to these studies, and because of the relatively small size of the truck, it could be parked without interfering too much with normal traffic. It was a Citroen H with a lengthened body and a reinforced suspension. It was equipped so that the instruments could be operated with batteries or a central supply of electricity. It was thermally insulated to protect the instruments. The roof was reinforced so that meteorological observations could be made with instruments mounted on top, or the area could be used for visual observations. Scientific equipment in the truck consisted of an analyzer for carbon monoxide (infrared, automatic), a carbon dioxide automatic analyzer, a Perkin Elmer apparatus for unburned hydrocarbons, as well as a Wohstoff apparatus, other types of apparatus specific for sulfur oxides and hydrogen sulfide, equipment for gas phase chromatography and a pump for a Millipore filter. All equipment was mounted on special shock absorbers. The cost was about 200,000 francs.##

00911

E. D. Barber E. Sawicki, and S. P. McPherson

SEPARATION AND IDENTIFICATION OF PHENOLS IN AUTOMOBILE EXHAUST BY PAPER AND GAS LIQUID CHROMATOGRAPHY. Anal. Chem., 36(5):2442-2445, Dec. 1964.

MEASUREMENT METHODS: Automotive exhausts, Gas chromatography, Paper chromatography, Phenols

A method is described for the separation and identification of simple phenols in automobile exhaust by paper and gas liquid chromatography. Extended data are given on the separations in Crump's system on Schleicher and Schuell 2040A and 35 to 40% silica gel-impregnated 966 papers as well as separations on dimethylformamide-impregnated papers in dimethylformamide-hexane. The results of analysis of several samples by paper and gas liquid chromatography are presented. (Author abstract)##

00912

D. F. Bender, E. Sawicki, and R. M. Wilson, Jr.

FLUORESCENT DETECTION AND SPECTROPHOTOFUOROMETRIC CHARACTERIZATION AND ESTIMATION OF CARBAZOLES AND POLYNUCLEAR CARBAZOLES SEPARATED BY THIN-LAYER CHROMATOGRAPHY. Anal. Chem., 36(6):1011-1017, May 1964.

A modification of the solvent medium used in a previous method for carbazole has resulted in considerable stabilization of the carbazole anion. It has improved the earlier spectrophotometric, spectrophotofluorometric, and fluorescent spot test techniques for carbazoles containing acidic hydrogen on the nitrogen. The improved spectral methods have been applied to carbazoles of

higher molecular weight, including polynuclear carbazoles. The fluorescent spot test has been applied to these carbazoles adsorbed on thin-layer chromatographic substrates. The absorption and fluorescent spectra in N,N-di-methylformamide and N,N-dimethylformamide-29% methanolic tetraethylammonium hydroxide (5 to 1), the fluorescent color changes, and the identification limits are reported for carbazoles and polynuclear carbazoles. A number of thin-layer chromatographic systems are described, whereby carbazoles can be separated from other types of compounds and from one another. Commercially pure chrysene is separated readily by thin-layer chromatography into 5H-benzo(b)carbazole and chrysene. (Author abstract)##

00926

E. Sawicki, H. Johnson, and K. Kosinski

CHROMATOGRAPHIC SEPARATION AND SPECTRAL ANALYSIS OF POLYNUCLEAR AROMATIC AMINES AND HETEROCYCLIC IMINES. Microchem. J. Symp. Ser., 10(1-4):72-102, Jan. 1966. (Presented at the International Symposium on Microchemical Techniques--1965, Pennsylvania State Univ., University Park, Aug. 22-27, 1965.)

Many polynuclear aromatic amines are carcinogenic. Consequently, methods of separation and analysis for these compounds have been developed. The separation methods include the use of column and thin-layer chromatography. Various methods of characterization for approximately 45 polynuclear aromatic amines and heterocyclic imines on the thin-layer plate and in solution have been compared. The absorption and fluorescence spectra of aromatic amines and their cationic and anionic salts have been discussed. The use of direct fluorometric examination of thin-layer plates for aromatic amines was useful in the nanogram to microgram range. Quenching techniques were shown to make the fluorometric analysis of aromatic amines and heterocyclic imines much more selective. (Author summary)##

00927

E. Sawicki and T. W. Stanley

A SENSITIVE NEW PROCEDURE FOR THE ANALYSIS OF ALIPHATIC, AROMATIC AND HETEROCYCLIC ALDEHYDES. APPLICATION TO AIR POLLUTION. Preprint. 1958.

A new sensitive spot test for aliphatic, aromatic and heterocyclic aldehydes is introduced. Limits of identification for over 70 aldehydes are recorded. All aldehydes except chloral and hexadecanal give positive results in the tests. A positive test is revealed by a blue or a green color with wave length maxima ranging around 610 to 630 mμ. For the determination of total aldehydes the procedure is at best an estimation. (Author summary)##

E. Sawicki

IDENTIFICATION AND DETERMINATION OF UNUSUAL FUNCTIONAL GROUPS. Pure Appl. Chem., 10,101-23, 1965. (Presented at a meeting of International Union of Pure and Applied Chemistry, Pennsylvania State Univ.) 1965.

Functional group methods of analysis with sensitivities in the nanogram to microgram region are described for the following types of compounds: aromatic compounds more basic than benzene and with the highest electron density at an unsubstituted aromatic carbon atom, azulenes with an unsubstituted 1-position, compounds with a cyclopentadiene CH₂ grouping by itself or as part of a polynuclear ring system, compounds containing a fluoranthenic ring system, pyrene and its derivatives, pyridine and its derivatives, polynuclear aza heterocyclic compounds, various types of aromatic amines, heterocyclic imines, 3-indoly-methylene compounds, heterocyclic imines containing the -NH-CH₂-CH₂- grouping, quinones of various types, p-hydroxystyryl compounds, formic acid and formates, and acylating agents. In addition, quenchofluorometric methods and quenching reagents of value in thin-layer chromatography are considered. (Author summary)##

00931

E. Sawicki, S. P. McPherson, T. W. Stanley, J. Meeker, and W. C. Elbert

QUANTITATIVE COMPOSITION OF THE URBAN ATMOSPHERE IN TERMS OF POLYNUCLEAR AZA HETEROCYCLIC COMPOUNDS AND ALIPHATIC AND POLYNUCLEAR AROMATIC HYDROCARBONS. Intern. J. Air Water Pollution, Vol. 9:515-524, 1965. (Presented at the Air Pollution Symposium, 149th American Chemical Society Meeting, Detroit, Mich. Apr. 4-9, 1966.)

Nineteen polynuclear aza heterocyclic compounds have been found in the Nashville atmosphere. Of these compounds dibenz(a,h)acridine, dibenz(a,j)acridine, and possibly some of the alkylated derivatives of dibenz(a,j)acridine and benz(c)acridine are known carcinogens. Because of this finding, a quantitative study has been made of the atmospheres of six large American cities in terms of polynuclear aza heterocyclic compounds and polynuclear aromatic hydrocarbons. In addition, the quantitative composition of a composite sample (consisting of the yearly accumulation of airborne particulates from over 100 American communities) has been determined in terms of long-chain aliphatic hydrocarbons, polynuclear aza heterocyclic compounds, and polynuclear aromatic hydrocarbons. (Author abstract)##

00934

E. Sawicki, T. W. Stanley, W. C. Elbert, and M. Morgan

COLUMN AND THIN-LAYER CHROMATOGRAPHIC SEPARATION OF POLYNUCLEAR RING-CARBONYL COMPOUNDS. Talanta, Vol. 12:605-616, 1965.

Methods for the separation of polynuclear ring-carbonyl compounds by alumina column chromatography and alumina and cellulose thin-layer chromatography are described. A method for the thin-layer chromatographic separation of acridones and phenanthridones from other types of polynuclear compound is also described. Compounds on a thin-layer chromatogram are located by fluorescence methods employing trifluoroacetic acid fumes and tetra-ethylammonium hydroxide solution. Fluorescence spectra of these compounds on the thin-layer chromatogram and in solution are also reported. (Author summary)##

00942

D. F. Adams

IMPROVED SULFUR-REACTING MICROCOULOMETRIC CELL FOR GAS CHROMATOGRAPHY. Anal. Chem., 38(8)1094-1096, July 1966. (Presented at the Air Pollution Symposium, 150th Meeting, American Chemical Society, Atlantic City, N.J., Sept. 1965.)

Because of the differences in electron requirements for oxidation of H₂S, SO₂, mercaptans, and organic sulfides and disulfides, it is necessary to standardize the titration cell against each type of compound or calculate the electron equivalents for each oxidation reaction for quantitative gas chromatographic analysis. To increase the sulfur specificity and to eliminate the need for individual compound calibration, the column effluents may be either oxidized to SO₂ or reduced to H₂S in a suitable furnace prior to introduction into the microcoulometric titration cell to obtain an equivalent response for an equivalent number of sulfur atoms. The furnace oxidation prior to titration should also destroy any olefinic compounds which might be present in complex gas mixtures, be titrated by bromine, and be erroneously reported as sulfur. Reduction to H₂S rather than oxidation to SO₂ has the added advantage of providing a four-fold increase in sensitivity because of the greater electron change required for the bromine oxidation of H₂S. Although the need for individual calibration for each compound favors the use of a furnace between the chromatography column and the detector, it complicates the analytical system and thus may not be suitable for process control analysis under mill conditions. (Author summary)##

00966

S. S. Epstein

TWO SENSITIVE TESTS FOR CARCINOGENS IN THE AIR. J. Air Pollution Control Assoc. 16, (10)545-6, Oct. 1966. (Presented at the 59th Annual Meeting, Air Pollution Control Association, San Francisco, Calif., June 20-25, 1966, Paper No. 66-19.)

This report describes briefly 2 new bioassays, the photodynamic and mouse neonate, which have been developed recently as indirect and direct measures, respectively, of the carcinogenicity of organic atmospheric pollutants. The photodynamic assay measures concentrations of photosensitizing polycyclic compounds in organic extracts of atmospheric particulates, and reflects the ability of

these compounds to sensitize cells to the otherwise non-toxic effects of long-wave ultraviolet light. The relevance of this assay to carcinogenicity depends on the previous demonstration, in a large series of polycyclic compounds of a strong positive association between photodynamic toxicity, using the motile ciliate *Paramecium caudatum*, and carcinogenicity attributable to polycyclic compounds. The use of neonatal animals for the carcinogenicity testing of pure chemicals is well documented. Neonates have been shown to be highly sensitive to defined carcinogens, administration of which in very low concentrations, in general, results in high tumor yields with relatively short latency periods. The present studies, although primarily methodological, established the high sensitivity of neonatal mice to carcinogens extracted from air.##

00977

R.S. Yunghans W.A. Munroe

CONTINUOUS MONITORING OF AMBIENT ATMOSPHERES WITH THE TECHNICON AUTOANALYZER. In: Automation in Analytical Chemistry, 6pp. (Presented at the Technicon Symposium, "Automation in Analytical Chemistry," New York City, Sept. 8, 1965.)

A variety of air contaminants can be monitored continuously with Auto/Analyzers. Instrument sensitivity, precision, and response time are more than adequate. The basic modules are all interchangeable, the instrument does not become obsolete as chemical procedures change or are modified, new approaches can be programmed easily, and the equipment is useful in methods research. In addition, automatic baseline programing and restandardization are decidedly advantageous as is the capability for introducing liquid calibration standards at any time.##

00998

E. Sawicki, T.W. Stanley, J.D. Pfaff, W.C. Elbert

THIN-LAYER CHROMATOGRAPHIC SEPARATION AND ANALYSIS OF POLYNUCLEAR AZA HETEROCYCLIC COMPOUNDS. Anal. Chim. Acta, Vol. 31:359-75, 1964.

Many thin-layer chromatographic systems can be used for the general separation of aza heterocyclic compounds from polynuclear aromatic hydrocarbons. Several can be used for the separation of the aza compounds from each other. With alumina as the adsorbent the sterically hindered aza heterocyclic compounds can be readily separated from the non-hindered aza compounds. The use of the trifluoro-acetic acid spot test on the thin-layer plate is discussed. Spectral data for the aza compounds are presented and discussed. (Author summary)##

01023

R. Buchwald

ACTIVATED SILICA GEL AS AN ADSORBENT FOR ATMOSPHERIC CONTAMINANTS. Occupational Health Rev. (Ottawa) Vol. 17(4):14-18, 1965.

The use of activated silica gel as an adsorbent for atmospheric contaminants is reviewed. The basic principles influencing the adsorption of substances on silica gel are discussed. The advantages and disadvantages in the use of silica gel are highlighted by some studies on the adsorption of such common solvents as acetone, aromatic hydrocarbons and some halogenated hydrocarbons. (Author abstract)**

01178

I. H. Williams

GAS CHROMATOGRAPHIC TECHNIQUES FOR THE IDENTIFICATION OF LOW CONCENTRATIONS OF ATMOSPHERIC POLLUTANTS. Anal. Chem. 37, (13) 1723-32, Dec. 1965.

Methods have been developed for collecting low concentrations of volatile organic compounds from the atmosphere and qualitatively analyzing them by gas chromatographic and related techniques. An inert substrate at -80C is used as a collecting agent while subtractive techniques, two different types of detectors and retention times on two columns of differing polarity are used in identifying the collected compounds. Over thirty organic compounds have been identified. These include a large number of paraffins, some aromatics, particularly benzene and toluene, some chlorinated hydrocarbons and on a few occasions ethyl nitrate and methyl disulfide. The pattern of compounds present has varied very little over the period studied, though concentrations have varied by a factor of twenty or more. (Author abstract)**

01205

D. Truitt and J. W. Robinson

RESEARCH ON NEW TECHNIQUES IN ABSORPTION AND EMISSION SPECTROSCOPY (QUARTERLY PROGRESS REPT.). Louisiana State Univ., Baton Rouge. Jan 25, 1966. 17 pp.
DDC: AD 479-241

A demountable hollow cathode was designed and constructed. The signal was erratic and electrical shorting across the electrodes took place. The cathode was modified and tested. The emission spectra of aluminum, copper, helium, fused ammonium dihydrogen phosphate and naphthalene has been recorded. The $\text{NH}_4 \text{H}_2\text{PO}_4$ (in helium) gave emission lines characteristic of aluminum, PO and NH. Emission from metallic elements in sealed hollow cathodes can be greatly intensified with an electron beam. Initial experiments with molecules indicate that electrons can be transported from one electrode to another without causing emission. (Author abstract)**

E. R. Stephens and F. R. Burleson

ANALYSIS OF THE ATMOSPHERE FOR LIGHT HYDROCARBONS. J. Air Pollution Control Assoc. 17, (3) 147-53, Mar. 1967. (Presented at the 59th Annual Meeting, Air Pollution Control Association, San Francisco, Calif., June 20-25, 1966, Paper No. 66-108.)

A procedure has been developed for the analysis of trace quantities of light hydrocarbons in air. A freeze-trap filled with chromatographic packing was installed in place of the gas sample loop of a flame ionization chromatograph. An air sample of 0.1 to 0.5 liter volume was passed through the trap which was chilled with liquid oxygen. The trap was then brought to ice temperature and its contents simultaneously swept into the column. The resulting chromatogram could be used to determine about twenty-five hydrocarbons through n-hexane. The minimum detectable concentration was below one ppb for these hydrocarbons. With such sensitivity it is possible to make useful measurements even on samples of light air pollution. Air samples from the Riverside area were analyzed in this fashion starting in the summer of 1965. The relative amounts of these hydrocarbons were then compared with the distribution reported for the various known hydrocarbon sources. The attenuation of the more reactive hydrocarbons by photolysis was also observed. A system for irradiating trapped air samples was also constructed. Samples were collected in five gallon brosilicate bottles which were then irradiated with ultraviolet radiation and the concentration changes followed. (Author abstract)##

E. S. Jacobs

RAPID GAS CHROMATOGRAPHIC DETERMINATION OF C1 TO C10 HYDROCARBONS IN AUTOMOTIVE EXHAUST GAS. Anal. Chem. 38, (1) 43-8, Jan. 1966. (Presented at the 149th Meeting, Division of Water, Air and Waste Chemistry, Detroit, Mich., Apr. 1965.)

A gas chromatographic procedure is described for the rapid determination of C1 to C10 hydrocarbons in automotive exhaust gas. The method features the application of a programmed temperature run from -55 C. to plus 140 C. with a single open tubular column and flame ionization detector. As many as 85 C1 to C10 paraffins, olefins and aromatic hydrocarbons may be determined within 13 minutes. Automatic integration of the flame detector signal is used to provide instantaneous quantitative analysis for as little as 1 ppm (v./v.) of each hydrocarbon. The equipment and operating conditions of the chromatographic method are discussed and an analysis of exhaust gas is illustrated. (Author abstract)##

01230

N. L. Soulagés

SIMULTANEOUS DETERMINATION OF LEAD ALKYLs AND HALIDE SCAVENGERS IN GASOLINE BY GAS CHROMATOGRAPHY WITH FLAME IONIZATION DETECTION . Anal. Chem. 38, (1) 28-33, Jan. 1966.

A gas chromatographic method with flame ionization detection for the determination of lead alkyls and scavengers in gasoline is described. These compounds are separated in a partition column and hydrogenated using a nickel catalyst, and the resulting methane and/or ethane is separated from gasoline hydrocarbons on an absorption column. The equipment employed and its application to the continuous analysis of leaded gasolines are discussed. The reliability of results and the lack of interferences are verified with both laboratory-prepared and commercial samples. (Author abstract)##

01232

E. Sawicki, T. W. Stanley, and W. C. Elbert

DIRECT FLUOROMETRIC SCANNING OF THIN LAYER CHROMATOGRAMS AND ITS APPLICATION TO AIR POLLUTION STUDIES . J. Chromatog. 20, 348-53, 1965.

A direct method is presented for automatic fluorometric scanning of thin-layer chromatograms with much greater selectivity and sensitivity than has hitherto been possible. By use of the proper excitation and emission spectral bands, a chromatogram can be examined for an individual compound or for a family of compounds. In addition, quenchofluorometric techniques applied to the thin-layer plate eliminate many interferences and further improve the sensitivity.##

01238

L. DeMaio and M. Corn

GAS CHROMATOGRAPHIC ANALYSIS OF POLYNUCLEAR AROMATIC HYDROCARBONS WITH PACKED COLUMN (APPLICATION TO AIR POLLUTION STUDIES). Anal. Chem. 38, (1) 131-3, Jan. 1966.

A method utilizing gas chromatography for the analysis of polynuclear aromatic hydrocarbons has been suggested for general use. The method was developed for use in analyzing polycyclic hydrocarbons associated with particulate matter in the air; however, it can be used wherever it is required to analyze for polynuclear aromatic hydrocarbons. The primary advantages of this method when compared to the methods now used are the ease of performance and time differential. One man can easily complete the analysis in two hours after the sample is extracted from the filter. Previously, several analysts required two days to complete the procedures.##

R. D. Fleming, B. Dimitriadis, and R. W. Hurn

PROCEDURES IN SAMPLING AND HANDLING AUTO EXHAUST. J. Air

Both the composition and discharge rate of auto exhausts vary widely and rapidly as speed and load demands upon the engine are changed. Moreover, among the combustion products are compounds that are highly reactive under proper conditions and others that are readily bound by receptive surfaces or absorbents. Under these conditions both the sampling procedure and subsequent sample handling must be such that (1) the sample that is recovered contains all or a fixed proportion of each incremental volume of the total to be represented and (2) the products so sampled are not allowed either to react with each other or to be lost or diminished in sample storage or transfer. Experimental research and development relevant to each requirement have been carried out, and results are reported and discussed. Two methods have been used for recovering small-volume samples representative of the total volume produced during any combination of steady or transient engine modes. One employs a servo-followup system appropriately coupled to both the engine air-intake and to the sampling element; the sampling rate is continuously controlled to bear at all times a fixed ratio to the engine air-intake rate. The second method employs variable dilution, involving addition of diluent gas necessary to maintain a constant total of (exhaust plus diluent). If the mixture is sampled at a constant rate, the sample will contain exhaust appropriately proportioned. Experiments have shown differences in both hydrocarbon and NOx values determined for comparable samples obtained by the two methods. The seriousness of this problem is discussed in relation to the sampling and sample handling procedures that are used. (Author abstract)##

01278

K. Grob

GAS CHROMATOGRAPHY OF CIGARETTE SMOKE, PART III. SEPARATION OF THE OVERLAP REGION OF GAS AND PARTICULATE PHASE BY CAPILLARY COLUMNS. J. Gas Chromatog. 3, 52-6, Feb. 1965. (Presented in part at Tobacco Chemists' Research Conference, Raleigh, N.C., Oct. 22, 1964.)

Following the investigation of gas phase constituents boiling within the range of 20-100C, the section of less volatile substances with boiling points between 100 and 200C has been studied. The separation by capillary columns is demonstrated, and 64 substances are indicated as probable gas phase constituents. The partition of certain substances between gas phase and particulate phase is shown to be of great importance. Some influences upon the partition equilibrium, for instance charcoal filters, are discussed. (Author abstract)##

01289

M. Feldstein, S. Balestrieri, and D. A. Levaggi

STUDIES ON THE GAS CHROMATOGRAPHIC DETERMINATION OF MERCAPTANS.
J. Air Pollution Control Assoc. 15(5):215-7, May 1965.
(Presented at the Sixth Conference on Methods in Air
Pollution Studies, California Dept. of Public Health,
Berkeley, Calif., Jan. 6-7, 1964.)

A series of partitioning agents were studied to determine their ability to separate organic sulfur compounds by gas chromatography. Several columns showed promise, but did not separate organic sulfur compounds from normally occurring atmospheric hydrocarbons. Higher concentrations of organic sulfur compounds in stack gases are separated as metallic salts in a series of impingers. The nature of the precipitated sulfur compound can be determined by gas chromatography after regeneration of the compound by addition of acid to the metallic precipitate. (Author abstract)##

01302

S.S. Epstein, M. Small, E. Sawicki, H.L. Falk

PHOTODYNAMIC BIOASSAY OF POLYCYCLIC ATMOSPHERIC POLLUTANTS.
J. Air Pollution Control Assoc., Vol. 15(4):174-176, April 1965. (Presented at the Sixth Conference on Methods in Air Pollution Studies, California Dept. of Public Health, Berkeley, Calif., Jan. 6-7, 1964.)

A photodynamic bioassay which can be conducted on one mgm amounts of organic atmospheric particulates is described. The results of a pilot study on pollutants from several American cities indicate that the assay may provide a rapid, simple and economical biological index of potential carcinogenic hazard attributable to polycyclic compounds. The utility of the assay for this purpose is under further evaluation. (Author abstract)##

01304

W.B. Barlage, Jr. F.C. Alley

SAMPLING AND MASS SPECTROMETER ANALYSIS OF REACTION PRODUCTS FROM THE PHOTOCHEMICAL DECOMPOSITION OF VARIOUS OLEFINS. J. Air Pollution Control Assoc., 15(5):235-238, May 1965.

Results of this investigation have shown the sampling technique described in this paper to have potential for mass spectrometer analysis of trace products from the photochemical decomposition of olefins. In addition, preliminary results of this investigation using 1-pentene and 1-hexene as reactants, along with nitrogen dioxide in air mixtures, have shown the presence of compounds or ion fragments of compounds with molecular masses as high as 166 and possibly higher. More work is needed to determine if these compounds are indeed peroxyacyl nitrites or nitrates, "compound X," or perhaps some from of a polymer produced in the photochemical reactions.##

E.A. Boettner F.C. Dallos

ANALYSIS OF AIR AND BREATH FOR CHLORINATED HYDROCARBONS BY INFRARED AND GAS CHROMATOGRAPHIC TECHNIQUES. Am. Ind. Hyg. Assoc. J. Vol. 26:289-293, June 1965. (Presented at the Annual Meeting, American Industrial Hygiene Association, Philadelphia, Pa., April 28, 1965.)

This paper is a report of an investigation establishing the sensitivity of gas chromatography and infrared techniques for the chlorinated aliphatic hydrocarbons listed in the booklet "Threshold Limit Values for 1963." The gas chromatographic measurements include those made with the following detection methods: thermal conductivity, flame ionization, argon ionization, and electron capture. The infrared work was done with the aid of scale expansion techniques and multipass cells up to 40 meters in length. The analytical technique used and the sensitivities attained in the analysis of air and exhaled breath are presented. (Author abstract)##

01333

A. Y. Ping, L. R. Clayton, T. E. McEwen, and J. S. Paydo

THE APPLICATION OF SILICA GEL IN SOURCE TESTING. PART I: COLLECTION OF SAMPLES. Preprint. (Presented at the 59th Annual Meeting, Air Pollution Control Association, San Francisco, Calif., June 20-25, 1966, Paper No. 66-79.)

The engineering of air pollution control deals with testing gas effluents for air contaminants and their concentrations. In this endeavor, the Bay Area Air Pollution Control District has developed and improved a technique of using silica gel adsorption tubes for determining test data on the organic compound emissions from commercial and industrial operations. This paper discusses a phase of source testing for such gaseous emissions from solvent-user operations. General details, involving the sample probe, sampling train, and pressure drops are included in the paper. Some typical test data and calculations are also given. (Author abstract)##

01356

C.W. Louw

THE QUANTITATIVE DETERMINATION OF BENZO(A)PYRENE IN THE AIR OF SOUTH AFRICAN CITIES. Am. Ind. Hyg. Assoc. J., Vol. 26:520-526, Oct. 1965.

The atmospheres of three South African cities have been investigated for the presence of polynuclear hydrocarbons. Standard techniques were improved and applied for separation of benzo(a)pyrene from other polynuclear hydrocarbons. Ultraviolet-visible spectrophotometry at the 402 m micron peak was employed for quantitative determination of benzo(a)pyrene. A correction factor for the interference of benzo(k)fluoranthene

at the 402 m micron peak was determined experimentally and applied to the results. It is believed that this method is more reliable than those presently used. Some benzo(a)pyrene concentrations are presented. (Author abstract)**

01392

C.L. Fraust, E.R. Hermann

CHARCOAL SAMPLING TUBES FOR ORGANIC VAPOR ANALYSIS BY GAS CHROMATOGRAPHY. Am. Ind. Hyg. Assoc. J., 27(1):68-74, Feb. 1966.

Variation in efficiency of recovery of organic vapors collected on activated charcoal and desorbed into carbon disulfide, was studied with respect to certain parameters of the process. Chemicals used were methylethyl ketone, toluene, trichloroethylene, butyl acetate, 2-methylcyclohexanol, and styrene. Analyses were performed with a gas chromatograph. The effects of charcoal mesh size, sampling rate, volume collected, and vapor concentration were considered. Mesh sizes of carbon granules studied were 10/20, 20/30, 30/40, and 40/50. Also, a special vapro adsorption charcoal, 60/80 mesh was used. Effects of sampling rate were determined over a 100 ml/min range. From 0.5 to 1.5 liters of sample were collected for experiments dealing with volume collected. In studying the effect of carrying concentration, a range of 1 TLV to 5 TLV was employed. (Author abstract)**

01395

R. Tye, A.W. Horton, I. Rapien

BENZO(A)PYRENE AND OTHER AROMATIC HYDROCARBONS EXTRACTABLE FROM BITUMINOUS COAL. Am. Ind. Hyg. Assoc. J., Vol. 27:25-28, Feb. 1966.

Benzo(a)pyrene, benz(a)anthracene, and other polycyclic aromatic hydrocarbons have been shown to be present in bituminous coal. Extraction with toluene, chromatography on alumina, the Diels-Alder reaction, solubility in concentrated sulfuric acid, and catalytic iodination on alumina were coupled with ultraviolet spectrophotometry and mass spectrometry to obtain quantitative estimates of these compounds in the extracts. (Author abstract)**

01419

A. Turk, J. I. Morrow, S. H. Stoldt, and W. Baecht

ENHANCED DESORPTION OF ATMOSPHERIC SAMPLES FROM ACTIVATED CARBON. J. Air Pollution Control Assoc. 16(7):383-385, July 1966. (Preliminary portion of this work was presented before the Division of Water and Waste Chemistry, 144th Meeting, American Chemical Society.)

It has been previously shown that the desorption of either a chemisorbed or a physically adsorbed gas can be enhanced by the

subsequent introduction of a foreign gas. Under conditions in which desorption recovery of butane from activated carbon was 50 to 65%, subsequent adsorption of CC14 enhanced the recovery of butane to 100%. Recovery of CC12F2, originally 79%, was enhanced to 99% by the same method. The method of enhanced desorption was applied to the recovery of samples from activated carbons exposed to atmospheres in Chicago, New Orleans, Philadelphia, Washington, D. C., and Cincinnati. Three different types of carbons, characterized by different distributions of pore diameters, were used simultaneously in the Cincinnati sampling. In general, the enhanced desorption technique was advantageous in providing analytical information on adsorbed samples recovered from carbon media. The enhancement effect is especially marked with hydrocarbon material. The effects of these structural attributes of the carbon media are evaluated by detailed consideration of infrared adsorptions. (Author abstract)##

01430

V. R. Huebner, H. G. Eaton, and J. H. Chaudet

A GAS CHROMATOGRAPH FOR THE APOLLO SPACECRAFT (PRELIMINARY REPT .) J. Gas Chromatog., Vol. 4:121-125, April 1966.

Gas chromatographic columns and detectors suitable for monitoring the atmosphere within a space vehicle are described. Molecular sieve, liquid coated Teflon, and liquid coated Chromosorb columns were developed to achieve a high degree of separation and freedom from adsorption for the most likely atmospheric contaminants. Miniature cross-section ionization detectors have been designed to provide better than 10 ppm sensitivity for most of these contaminants. The chromatographic system has been designed to operate at a flow rate of only 12 ml/min, thus assuring a long operational time from a small gas container. (Author summary modified)##

01451

M. J. Prager

DETECTION OF 1,1-DIMETHYLHYDRAZINE BY FRUSTRATED MULTIPLE INTERNAL REFLECTION SPECTROSCOPY. Am. Ind. Hyg. Assoc. J., Vol. 27:272-277, June 1966.

The detection of vapors, especially of the missile propellant fuel, 1,1-dimethylhydrazine, by frustrated multiple internal reflection (FMIR) spectroscopy was studied. This method is most sensitive to substances with high boiling points; however, it can be used to detect microgram quantities of substances with relatively low boiling points by coating the FMIR plate with a thin adsorptive film or by dissolving the samples in a suitable solvent. (Author abstract)##

01461

A. J. Chiantella, W. D. Smith, M. E. Umstead, and J. E. Johnson

AROMATIC HYDROCARBONS IN NUCLEAR SUBMARINE ATMOSPHERES. Am. Ind. Hyg. Assoc. J., Vol. 27:186-192, Apr. 1966.

An analytical study has been directed to the identification and determination of individual aromatic hydrocarbons present in nuclear submarine atmospheres in concentrations of parts per million or less. Hydrocarbon oil samples were desorbed from activated carbon which had been exposed in submarine atmospheres. The aromatic hydrocarbon content of these oils was approximately 25 to 30% of the total. The quantitative distributions of individual aromatic hydrocarbons found in submarines were strikingly similar to those of typical petroleum distillates in the same boiling range. Several commercial products were studied as possible sources of hydrocarbons in submarine atmospheres. (Author abstract)##

01495

A. A. Strong and J. F. Horton

THE INSTRUMENTATION FOR AUTOMATIC MEASUREMENT AND RECORDING OF LABORATORY-PRODUCED AUTOMOBILE EXHAUST. Preprint. 1966.

A system that automatically measures and records the concentration of six different gases from twelve animal exposure chambers supplied with diluted, laboratory-produced automobile exhaust and other gases is described. The gases are sequentially fed from the animal exposure chambers to the appropriate gas analyzing instrument. Multipoint recorders connected to the output of the gas instruments register the concentrations and control the sequence of the gas measurements. A data acquisition system is also connected to the output of the gas instruments to record on a punched paper tape the time of measurement and the gas concentration. The data are punched on cards or inserted directly into a digital computer for analysis. (Author abstract)##

01499

E. E. Campbell and H. M. Ide

AIR SAMPLING AND ANALYSIS WITH MICROCOLUMNS OF SILICA GEL. Am. Ind. Hyg. Assoc. J. 27, (4) 323-31, Aug. 1966.

This paper describes a simple microcolumn of silica gel, its behavior under experimental conditions and its applicability to air sampling. Data are presented for the ultraviolet spectral absorbance analysis of selected aromatic hydrocarbons, using a base line correction for background interference. The problems of direct silica gel elution and ultraviolet spectrophotometry are discussed, and resolution of the particulate background problem by base line calculations is shown. The silica gel microcolumn is proved simple, practical, and highly efficient for sampling air contaminants. Although only spectrophotometric analysis of eluates is reported here, other methods of analyzing the sorbed contaminant are suggested. (Author abstract)##

01503

L. E. Green, D. K. Albert, and H. H. Barber

A SEMI-AUTOMATIC GAS CHROMATOGRAPH FOR DETERMINING N-PARAFFINS AND HYDROCARBON TYPES IN GASOLINES. J. Gas Chromatog., 4(9):319-321, Sept. 1966.

A gas chromatographic method for determining aromatics, saturates, and olefins in gasolines recently was extended to include individual C5 to C11 n-paraffins. Three optional analyses with the instrument are described. To determine the accuracy and precision of the semi-automatic method, 6 samples were analyzed and the results compared with those obtained by the FIA method. The instrument is adaptable to routine use and is applicable to samples other than gasolines, and has recently been adapted to the determination of hydrocarbon types in exhaust gases.##

01560

C. J. Domke, D. J. Lindley, and C. N. Sechrist

HOW TO STUDY EFFECT OF BLOWBY GAS. Hydrocarbon Process 45(9):303-306, Sept. 1966.

The character and chemical composition of blowby gases were studied by ducting them from an engine modified with Teflon parts and fractionating them in a series of traps at 32, -100, and -326 F. The fractions were analyzed by infrared absorption, mass spectrometry, and gas chromatography. The hydrocarbons portion of the blowby gas was roughly 50% aromatics, 35% saturates, and 15% olefins. The combined concentration of oxygenated organic compounds present in the blowby gas was found to be less than five parts per million. The analytical data showed that changing air-fuel ratio had little or no effect on the composition of the hydrocarbons being emitted from the crankcase.##

01581

E.D. Barber

IDENTIFICATION OF AROMATIC COMPOUNDS AS SIMPLE AZINES BY PAPER AND THIN-LAYER CHROMATOGRAPHY. J. Chromatog., Vol. 27:398-406, 1967.

A method is described for the separation of carbonyls as simple azines by paper and thin-layer chromatography. Schliecher and Schuell 2040 a gl. papers were used in paper chromatography. Extensive data are given for separations on papers impregnated with N,N-dimethylformamide in (1) N,N-dimethylformamide-cyclohexane; (2) dibutyl ether-tetrahydrofuran - N, N-dimethylformamide; (3) cyclohexane - N,N-dimethylformamide - carbon tetrachloride; (4) cyclohexane - N,N-dimethylformamide - ethylacetate - water and (5) decalin - N,N-dimethylformamide. Separations were also performed on papers impregnated with methylformanilide in cyclohexane-formanilide. Thin-layer separations were performed on silica gel in benzene; ethyl acetate - hexane; benzene - paraffin - acetic acid-water; dibutyl ether tetrahydrofuran; dichloromethane; and decalin - dichloromethane -

methanol. An example of the thin-layer separation of an automobile exhaust sample is given. (Author abstract)##

01592

F.L. Ludwig, D.M. Coulson, E. Robinson, L.A. Cavahagh

SIZE DETERMINATION OF ATMOSPHERIC SULFATE AND ORGANIC PARTICULATES (~INTERIM REPT.). Stanford Research Inst., Menlo Park, Calif. Dec. 1964. 78 pp.

Methods of determining size distributions of sulfate and organic aerosols have been developed and tested in the San Francisco and Los Angeles areas. The methods show promise of providing size distribution information which could significantly add to the understanding of some current public health problems. The heart of the sample collection system is a Goetz Aerosol Spectrometer, which has been modified to prevent loss of sample or entrainment of contaminated air and to allow collection of the particles which are not deposited in the spectrometer itself. Enough data have been collected to prove the feasibility of the methods developed. Furthermore, these initial data provide a preliminary estimate of size distributions of the sulfate and organic aerosols in the tested areas. The Appendix contains discussions of the calculation of size distribution and effect of temperature and humidity on sulfuric acid droplet size.##

01593

METHODS OF MEASURING AIR POLLUTION (~REPORT OF THE WORKING PARTY ON METHODS OF MEASURING AIR POLLUTION AND SURVEY TECHNIQUES). Organisation and Development, Paris, France, Directorate for Scientific Affairs. 1965. 94 pp.

Methods for the measurement of the amounts of the following pollutants in the atmosphere out of doors using relatively simple and inexpensive apparatus were examined: grit and dust - particles coarse enough to settle out under their own weight; suspended matter - particles or droplets fine enough to remain suspended in the air; sulphur oxides; hydrocarbons; and fluorine compounds.##

01683

R. Klein, R.E. Rebbert, R. Stair, R.S. Tipson

AIR POLLUTION PROGRAM, NATIONAL BUREAU OF STANDARDS (QUARTERLY REPT. OCT. 1, 1965 TO DEC. 31, 1965.) National Bureau of Standards, Washington, D.C., Divisions of Analytical Chemistry, Metrology, and Physical Chemistry (Rept. No. 9031). (NBS with PHS Support) 1965.

Progress is reported on: the purification of naphthacene; anthraquinone derivatives; oxidation products of pyrene; oxidation products of perylene; photochemical reaction on the solid particulates anthracene and pyrene; photochemical reactions of

pyrene on Maryland soil; photochemical reactions of pyrene on silica gel-alumina; photosensitized decomposition of 3-methylpentanal; surface chemistry; and solar radiation.##

01693

I.R. Cohen T.C. Purcell

SPECTROPHOTOMETRIC DETERMINATION OF HYDROGEN PEROXIDE WITH 8-QUINOLINOL. Preprint. 1966.

A method is reported for the spectrophotometric determination of microgram quantities of hydrogen peroxide. The analytical procedure makes use of the colored complex obtained upon extraction of titanium-hydrogen peroxide mixtures with a 0.1% solution of 8-quinolinol in chloroform. The method is very specific and more sensitive than that which uses the color given by titanium and hydrogen peroxide alone. The optimum procedural conditions were selected with regard for the effect of temperature, pH, rate of color formation, stability of complex, and the like. Application of the method for the analysis of vapor concentrations is also discussed. (Author abstract)##

01696

H. Johnson, E. Sawicki

SPECTRAL CHARACTERIZATION OF NITROARENES AND POLYCYCLIC ALDEHYDES, KETONES, QUINONES, AND AMINES. Talanta 13, 1361-73, 1966.

Three methods are introduced for the post-chromatographic spectral characterization of carbonyl and nitro compounds. Most often, elution from the chromatogram is necessary, but sometimes fluorescence spectra can be obtained directly from the chromatogram. The usefulness and sensitivity of the methods have been demonstrated for a variety of nitroarenes and polycyclic aldehydes, ketones, quinones, and amines. (Author abstract)##

01714

W. Kutscher and R. Tomingas

INVESTIGATING SOOT AND ATMOSPHERIC DUST IN THE MANNHEIM AREA. STAUB (English Transl.) 26, (6) 5-10, June 1966.

The benzpyrene content of different types of soot was determined quantitatively. Soot from coke firing is practically free from benzpyrene. Soot from oil firing exhibits considerable variations in its chemical composition and benzpyrene content. Soot from hard coal firing has the highest benzpyrene content. In addition, dust collected in a filter plant at a level of 49 m was also investigated. The largest part of benzpyrene is bound to the finest coal particles which penetrate to the deepest alveolar chambers of the lungs. More than 70% of the dust is comparatively free from benzpyrene. Finally, a test is carried out to calculate the amount of dust in air and the amount of benzpyrene to which a breathing person is exposed. (Author summary)##

01720

E. D. Barber and J. P. Lodge, Jr.

PAPER CHROMATOGRAPHIC IDENTIFICATION OF CARBONYL COMPOUNDS AS THEIR 2,4-DINITROPHENYLHYDROZONES IN AUTOMOBILE EXHAUST.
Anal. Chem. 35, 348-50, Mar. 1963.

A method is described for the separation and identification of carbonyl compounds in automobile exhaust by paper chromatography. Extended data are given for separations in a modified Meigh phase as well as for limited separations in DeJonge's system. Although homologous aldehydes are completely separated, ketones show higher Rf values than aldehydes of the same carbon number. The results of analysis of several samples are presented. (Author abstract)##

01729

E. Sawicki, T. W. Stanley, T. R. Hauser, H. Johnson, and W. Elbert

CORRELATION OF PIPERONAL TEST VALUES FOR AROMATIC COMPOUNDS WITH THE ATMOSPHERIC CONCENTRATION OF BENZO(A)PYRENE. Intern. J. Air Water Pollution 7, 57-70, 1963.

Several general methods for the determination of aromatic compounds in polluted air are described and compared. Of these the piperonal test is most thoroughly investigated in respect to precision, color stability, and general usability. The color obtained in the procedure is in compliance with Beer's law. Over the last four years approximately 200 samples of airborne particulates have been analysed for their piperonal test K values and their concentrations of benzo(a)pyrene. These two values show a fair but definite correlation. For some communities, the correlation is good, for a few it is poor. A broad range of values is obtained: a sample from Gulf State Park in Alabama showed a K755 value of 0.009 and a concentration of 0.076 micrograms of benzo(a)pyrene per 1000 cubic meter of air; for a London sample the K755 value was 13 and the benzo(a)pyrene concentration 270 microgram; for an incinerator stack sample the K755 value was 4900 and the benzo(a)pyrene concentration 49,000 microgram benzpyrene per 1000 cubic meter of gas. The correlation coefficients between benzo(a)pyrene concentration in micrograms per 1000 cubic millimeter (X), and the piperonal test K755 values (Y), were 0.95 and 0.89 for 174 urban and 25 non-urban samples, respectively. The corresponding formulae are $X \text{ equal } -0.52 \text{ plus } 19.3Y$ for urban samples and $X \text{ equal } -0.132 \text{ plus } 15.3Y$ for non-urban samples. The piperonal test should be of value in studying combustion processes, the aromatic compound pollution in various parts of a community, and in evaluating the effluents of pollution sources. (Author abstract)##

01735

E. Sawicki, T. W. Stanley, W. C. Elbert, and J. D. Pfaff

APPLICATION OF THIN LAYER CHROMATOGRAPHY TO THE ANALYSIS OF ATMOSPHERIC POLLUTANTS AND DETERMINATION OF BENZO(A)PYRENE. Anal. Chem. 36, (3) 497-502, Mar. 1964.

Rb-values, and fluorescent colors have been obtained through thin-layer chromatography of 20 polynuclear aromatic hydrocarbons with the following absorbents and developers: alumina with pentane: ether (19:1; v./v.); cellulose acetate with ethanol:toluene:water (17:4:4; v./v.); and cellulose:cellulose with dimethylformamide:water (1:1, v./v.). Of the three absorbents, alumina gave the best separation of fluorescent organic compounds from the organic fractions of airborne and air pollution source particulates. The pattern and fluorescent color of the spots of a thin-layer chromatogram varied with the type of pollution. The cellulose acetate absorbent system gave best results for the separation of the benz-pyrene fraction obtained in column chromatography. The cellulose adsorbent system gave the best results for the separation of the polynuclear aromatic hydrocarbons. The greatest range in Rb-values was obtained with this absorbent. Two methods for the estimation of benzo(a)pyrene following thin layer chromatography are described. One method involves ultraviolet analysis at 382 millimicrons, the other method involves spectrophotofluorometric analysis in sulfuric acid. (Author abstract)##

01781

E. Sawicki, T.R. Stanley, J.D. Pfaff, W.C. Elbert

THIN-LAYER CHROMATOGRAPHIC SEPARATION OF BENZO(A)PYRENE AND BENZO(K)FLUORANTHENE FROM AIRBORNE PARTICULATES. Chemist-Analyst 53, 6-8, Jan. 1964.

By column chromatography followed by thin-layer chromatography a better separation was obtained. The latter technic is relatively simple and rapid and offers the advantage that enough material can be readily obtained for spectrophotofluorometric study and, with somewhat more difficulty, for absorption spectral studies. It has been found that using a cellulose acetate adsorbent and ethanol-toluene-water as the solvent benzo(a)pyrene and benzo(k)fluoranthene can be readily separated from each other and from other members of the "benzpyrene" fraction. (Author abstract)##

01784

D.F. Adams, R.K. Koppe, W.N. Tuttle

ANALYSIS OF KRAFT-MILL, SULFUR-CONTAINING GASES WITH GLC IONIZATION. J. Air Pollution Control Assoc. 15, (1) 31-3, Jan. 1965

The technique includes the use of two chromatographic columns in series to separate O₂, N₂, CO, CO₂, H₂O, H₂S, SO₂, and CH₃SH. Column 1, containing Triton 45 on Chromosorb, separates H₂O, H₂S, SO₂ and CH₂SH. Column 2, packed with Molecular Sieve, separates O₂, N₂, CO₂. The conditions required to obtain adequate sensitivity and separation are discussed. (Author abstract)##

E. Sawicki, T.W. Stanley, W.C. Elbert

ANALYSIS OF THE URBAN ATMOSPHERE AND AIR POLLUTION SOURCE EFFLUENTS FOR PHENALEN-1-ONE AND 7H-BENZ(DE)ANTHRACEN-7-ONE. *Mikrochim. Acta* (5-6), 1110-23, 1965.

Through the use of one- and two-dimensional thin-layer chromatography and direct spectrophotofluorometric examination of thin-layer plates, two members of a new family of compounds have been found in the atmosphere. Phenalen-1-one and 7H-Benz(de)anthracen-7-one were identified and determined in particulates obtained from urban atmospheres and air pollution source effluents. Scanning techniques and other methods of analysis were also used in characterization and estimation. Two-dimensional thin-layer chromatography followed by direct spectrophotofluorometric analysis appears to be the most promising chromatographic method for the routine analysis of chemical compounds in complex mixtures. It approaches colorimetric analysis in simplicity and speed and surpasses it in sensitivity, selectivity and the amount of information that can be obtained from one analysis. (Author summary)##

B.D. Tebbens, J.F. Thomas, M. Mukai

PARTICULATE AIR POLLUTANTS RESULTING FROM COMBUSTION. *Am. Soc. Testing Mater., Spec. Tech. Publ.* 352. (Presented at the Symposium on Air-Pollution Measurement Methods, Los Angeles, Calif., Oct. 5, 1962.) pp 3-31, Dec. 1963.

An enormous variety of organic by-products result from both oxidative degradation of fuels and synthesis of complex molecular species occurring simultaneously when combustion is incomplete. Synthesis is demonstrated by the fact that polynuclear aromatic hydrocarbons with molecular weights up to 300 may be derived from incomplete combustion of such a simple fuel as methane. These hydrocarbons are part of the solid phase of combustion by-products and may be filtered from gaseous components. Among them are the arenes naphthalene, anthracene, pyrene, benzo(a)pyrene, dibenz(a,h)anthracene, and others. Additionally, there exist relatively non-volatile oxidation derivatives such as alpha- and beta-naphthol and others. Only a few of the 90 or more individual chemical entities found in these series have been positively identified. Sufficient evidence exists from burning a variety of gaseous, liquid, and solid fuels to state categorically that it is the process of combustion rather than the chemical quality of the fuel which leads to synthesis of these arenes. Fuels studied include natural gas; propane; butane; 1-butene; 1,3-butadiene; ethyne, hexane; 2,2,4 trimethylpentane cyclohexane; 1-hexene; benzene; toluene; and gasoline, as well as the miscellaneous celluloses involved in incineration of paper, wood, tree trimmings, and the like. The same range of aromatic hydrocarbons has been separated from contaminated air in distressed urban atmospheres. Investigation of aldehydes produced by combustion indicated that only formaldehyde decreased with increasing secondary air when combustion was incomplete. However, with complete combustion, use of additional secondary air

was accompanied by an increasing quantity of formaldehyde. Thus using large excesses of secondary air to control smoke may be inadvisable for air-pollution control. The total amount of arenes produced depends in part on the incompleteness of the burning process. While one would assume that the smoking point of fuels would be an index of relative ease of combustion and of relative desirability of fuels for urban usage, the possible production of combustion nuclei is also suggested. Such a criterion may become significant in choosing fuels suitable for use in urban environments. (Author summary modified)##

01802

T.R. Hauser R.L. Cummins

INCREASING SENSITIVITY OF 3-METHYL-2BENZOTHAZALONE
HYDROZONE TEST FOR ANALYSIS OF ALIPHATIC ALDEHYDES IN AIR.
Anal. Chem. 36, (3) 679-81, Mar. 1964.

A modification of the (3-methyl-2-benzothiazolone hydrazone test) procedure is described in which the addition of sulfamic acid, in the oxidizing step of the reaction, gives a solution free of turbidity and capable of colorimetric analysis without dilution by acetone. A reduction in the volume of the oxidizing agent originally added in this step further contributes to the concentration of the color. Although a comparison of this procedure with that of Sawicki shows a loss in molar absorbance, the sensitivity of the method is increased approximately sixfold. This increased sensitivity easily permits the analysis of aliphatic aldehydes in the parts-per-billion range in ambient air.##

01817

E. Sawicki, J.E. Meeker, J. Morgan

COLUMN CHROMATOGRAPHIC SEPARATION OF BASIC POLYNUCLEAR AROMATIC
COMPOUNDS FROM COMPLEX MIXTURES. J. Chromatog. 17, 252-6,
1965.

A new method for the column chromatographic separation of basic polycyclic fractions of extremely complicated mixtures is described. Heterocyclic hydrocarbons sterically hindered at the aza nitrogen atom are readily separated from non-sterically hindered aza compounds. Aza heterocyclic hydrocarbons with the same amount of steric hindrance are eluted in the order of their increasing number of fused rings per molecule. The method has been applied to the separation of the basic fraction of coal tar pitch. An alkylbenzo(h)quinoline, benzo(h)quinoline, benzo(f)quinoline, acridine, benz(a)acridine and benz(c)acridine have been identified. In addition, approximately 100 unknown compounds were believed to be present in the fractions. The evidence for this conclusion was derived from the absorption spectra. (Author summary)##

01823

G.C. Ortman

MONITORING METHANE IN ATMOSPHERE WITH A FLAME IONIZATION DETECTOR. Anal. Chem. 38, 644-6, Apr. 1966.

Complex analytical problems are involved in the study of the reactants and products of atmospheric photochemical reactions. One such problem is the determination of atmospheric hydrocarbons levels and the relation of these to emissions of hydrocarbons from vehicles and other sources. The greatest interest is in those hydrocarbons that participate in photochemical reactions. While methane is innocuous and while it does not participate in photoinitiated reactions, it does constitute a major portion (about 65%) of the total hydrocarbons present in air and nearly all of the nonreactive fraction. A rough correlation may thus be seen to exist between "reactive hydrocarbons" and "total hydrocarbons less methane." Pending the development of a type-specific method for determining reactive hydrocarbons directly, it has been found that a compound-specific method for methane has real value. The system for methane measurement operates by passing a sample air stream through a solid adsorbent which has been stripped of all hydrocarbons and then saturated with 6 to 10 p.p.m. of methane in air. The effluent from a column of air less all hydrocarbons except methane passes into a flame ionization analyzer. (Author abstract)##

01826

W. C. Elbert, and T. W. Stanley

THE FLUORESCENCE-QUENCHING EFFECT IN THIN-LAYER CHROMATOGRAPHY OF POLYNUCLEAR AROMATIC HYDROCARBONS AND THEIR AZA ANALOGS. J. Chromatog. 17, 120-6, 1965.

Fluorescence quenching effects were studied with volatile quencher in the developer, with a relatively non-volatile quencher after development. On the basis of quenching effects the aromatic compounds can be divided for analytical purposes into non-fluoranthenic aromatic, fluoranthenic and aza hydrocarbons. The latter group can be further subdivided. Two systems for the separation of polycyclic aza hydrocarbons elute according to the size of the ring system and the amount of steric hindrance at a ring nitrogen atom. Pyrenoline can be characterized by the specific violet color it forms on the plate. The various methods show promise for use in air pollution studies. (Author summary)##

01831

L. C. Broering, Jr.

AN EVALUATION OF TECHNIQUES FOR MEASURING AIR-FUEL RATIO. Preprint. (Presented at the Annual Meeting, Society of Automotive Engineers, Detroit, Mich., Jan. 10-14, 1965.)

Four methods for determining air-fuel ratio by exhaust analysis are compared. The methods selected for study are all potentially useful with analyses of integrated samples obtained in road tests

or exhaust samples generated in the laboratory. A V-8 engine mounted on an engine dynamometer was used to generate exhaust, from which the air-fuel ratios were determined simultaneously by the various methods. The air-fuel ratio of the mixture delivered to the engine was determined by measuring directly the quantities of air and fuel supplied. This value was compared to those obtained by the four exhaust analysis techniques. Comparisons were made during normal operation and during conditions of deliberate cylinder misfire to simulate the most adverse combustion condition encountered on the road. (Author abstract)##

01832

C. A. Clemons and A. P. Altshuller

RESPONSES OF ELECTRON-CAPTURE DETECTOR TO HALOGENATED SUBSTANCES. Anal. Chem. 38, (1) 133-6, Jan. 1966. (Presented before the Division of Water, Air, and Waste Chemistry, 148th Meeting, American Chemical Society, Chicago, Ill., Sept. 1964.)

Authors' investigation of the responses of the electron-capture detector to halogenated hydrocarbons revealed that the responses varied over about seven orders of magnitude. Low responses are shown by saturated and vinyl-type fluorinated hydrocarbons including those containing one chlorine atom. Compounds with the chlorine atom attached to a vinyl carbon gave lower responses than the corresponding saturated compounds. Attachment of the chlorine to an allyl carbon atom resulted in greater sensitivity than that obtained for the corresponding saturated compound. The response characteristics of the fluorinated cyclobutane ring closely resembled those of compounds with allyl CF₃ groups. The completely fluorinated benzene derivative, C₆F₆, gave a high response. As reported previously, the response decreased in the order I greater than Br greater than Cl greater than F and also increased markedly with increase in the number of Cl, Br, or I atoms in the molecule. One iodine atom in a molecule caused about the same response in the same range as two bromine atoms or three chlorine atoms. Responses in molecules of different structures containing the same number of halogen atoms varied by one to two orders of magnitude.##

01871

CONTINUOUS AIR MONITORING PROGRAM IN WASHINGTON, D.C. (1962-1963). Public Health Service, Cincinnati, Ohio, Div. OF AIR POLLUTION. SEPT. 1966. 222 PP.
HEW: 999-AP-23; GPO: 827-234-15

This report presents the results of the operation of the Public Health Service Continuous Air Monitoring Program (CAMP) in Washington, D.C., during 1962 and 1963. Data on atmospheric levels of sulfur dioxide, oxides of nitrogen, total oxidants, total hydrocarbons, and carbon monoxide are summarized, analyzed, and discussed. The data are tabulated as hourly, daily, and monthly mean concentrations; background information about Washington and a description of the instrumentation used are included. (Author abstract)##

01876

Schuette, F. J.

PLASTIC BAGS FOR COLLECTION OF GAS SAMPLES. California Dept. of Public Health, Berkeley, Div. of Labs., AIHL-19, 8p., Dec. 1965. Also: Atmos. Environ., 1(4):515-519, July 1967. ((12)) refs.

Criteria for judging what kind of film is likely to be most suitable for a given application are delineated. Information concerning supply sources of needed materials is provided.##

01922

E. Sawicki, R.A. Carnes, R. Schumacher

SPECTROPHOTOFUORIMETRIC DETERMINATION OF 3-CARBON FRAGMENTS AND THEIR PRECURSORS WITH ANTHRONE. APPLICATION TO AIR POLLUTION. Mikrochim. Acta, No. 5 929-935, 1967. 5 refs.

Two modifications of an anthrone procedure for the characterization and determination of -CH-CO-CHO and -CH-CHO compounds and their precursors are described. Two main types of fluorescence spectra are obtained. The procedure for analysis of -CH-CO-CHO precursors works well for the aldopentoses; by comparison, aldo and ketohexoses react poorly. Water-soluble fractions of airborne particulates were analyzed by the anthrone procedure. At least three families of compounds were found: two give fluorogens, of which one is a -CH-CO-CHO precursor, and a third gives chromogen(s) absorbing at 423 and 540 microns. (Authors' abstract)##

01926

T. Bellar, J. E. Sigsby, C. A. Clemons, and A. P. Altshuller

DIRECT APPLICATION OF GAS CHROMATOGRAPHY TO ATMOSPHERIC POLLUTANTS. Annal. Chem. 348 (7) 763-58 June 1962.

The use of a flame ionization detector permits direct determination of hydrocarbons at concentrations found in the atmosphere. Prior concentration of samples in a cold trap is not necessary. With the system described, the investigators were able to detect the lower molecular weight hydrocarbons found in automotive emissions in controlled irradiation studies. Ease of operation, high sensitivity, and reproducibility are advantages of the technique. Concentrations as low as 0.001 p.p.m. may be detected in air samples. The experimental parameters required to obtain these results are evaluated. Instrumental modifications required for several applications are discussed, with emphasis upon development of a reliable system with which the hydrocarbons at atmospheric concentrations can be determined routinely. (Author abstract)##

E. Sawicki, H. Johnson, and T. W. Stanley

THE DETERMINATION OF NITRATE OR NITRATE PLUS NITRITE WITH AMINOPYRENE: APPLICATION TO AIR POLLUTION. Anal. Chem. 35, 1934-6, Nov. 1963.

A new procedure is introduced for the determination of nitrate or nitrate plus nitrite. The two ions can be determined together since they produce similar spectra and Beer's law curves. These ions can be determined in the presence of up to 50 equivalents of bisulfite. The new nitrate procedure, which utilizes 1-aminopyrene, is compared with the 2,4-xyleneol, 2,6-xyleneol, phenol-2,4-disulfonic acid, brucine, and chromotropic acid procedures. With the use of sulfamic acid, nitrate can be determined in the presence of 6 micrograms of nitrite ions. The advantages of the 1-aminopyrene procedure are that it is simple and direct and more sensitive than any method found in the literature. Amounts ranging from 0.04 (A equals 0.1) to 1.6 micrograms of nitrate nitrogen per milliliter of aqueous solution can be determined. The 1-aminopyrene procedure has been applied to the determination of soluble nitrates in airborne particulates. Nitrogen dioxide could be determined as nitrate plus nitrite with the new method. The procedure introduced for the determination of nitrate with 1-aminopyrene will be compared with these literature methods. (Author summary modified) ##

01979

A. P. Altshuller

GAS CHROMATOGRAPHY IN AIR POLLUTION STUDIES. J. Gas Chromatog. 1, (7) 6-20, July 1963.

Gas chromatography as a powerful tool in the determination of the chemical composition of trace constituents in sources of pollution and in the atmosphere is reviewed. Topics covered include: Calibration Methods; Subtraction Techniques; Detectors (Thermal-Conductivity Detectors; Infrared CO₂ Detectors; Electron-Impact Ionization Detectors; Argon Type Ionization Detectors; Flame Ionization Detectors; Flame Ionization Analyzers; Electron Capture Detectors); Column Selection; Identification and Quantitative Analysis; Atmospheric Analysis; Synthetic Atmosphere Analysis; Auto Exhaust Analysis; Blowby Emission Analysis; Diesel Exhaust Analysis; Incinerator Effluent Analysis.##

01991

V. Goppers and H. J. Paulus

MACROMOLECULAR COMPOUNDS ISOLATED FROM AIRBORNE PARTICLES BY ELECTROPHORESIS AND PAPER CHROMATOGRAPHY. Am. Ind. Hyg. Assoc. J. 23, 181-5, June 1962.

Paper chromatography and electrophoresis are used to isolate microquantities of two biologically significant compounds, "A" and "B," from samples of airborne particles. Electrophoretic

and chromatographic patterns are presented and discussed. A new rapid electrophoresis method is described which requires only two hours for separating a complicated mixture of aglycones. (Author abstract)##

01994

E. Sawicki, T. W. Stanley, and J. Pfaff

A COMPARATIVE STUDY OF VARIOUS METHODS FOR THE DETECTION OF FORMALDEHYDE. *Chemist-Analyst* 51, 9-11, Mar. 1962.

Identification limits for formaldehyde in various tests are discussed. Tests involving the reaction of CH₂O in H₂SO₄ with chromotropic acid, J-acid, phenyl J-acid and 2-hydroxycarbazole may be considered together since a polynuclear xanthylium dye is formed in all cases. The last reagent is the least selective; the first 3 are highly selective but react with CH₂O-releasing compounds in warm H₂SO₄. Heat is unnecessary with J-acid and phenyl J-acid for good results. Thus, most compounds that only release CH₂O in heated H₂SO₄ do not interfere in these 2 tests. The J-acid test may be conducted spectrophotofluorometrically, allowing 1 part of CH₂O to be detected in 2 x 10 to the 8th power parts of test solution. Acrolein can be differentiated from CH₂O by emission spectra. Three N₂H₄ reagents give positive results with aliphatic aldehydes; with 2-hydrazinobenzothiazole the test is more sensitive for CH₂O than for other aliphatic aldehydes. The 2-nitro-1,3-indandione test is very sensitive, especially when conducted spectrophotofluorometrically. The pure trimethine dye formed in the 1-ethyl-guinaldinium iodide test has a molar absorptivity of about 210,000 liters/mole cm. A similar selectivity was found with 1-ethyl-4-picolinium iodide as the reagent.##

01995

E. Sawicki, T. W. Stanley, J. Pfaff, and A. D'Amico

COMPARISON OF FIFTY-TWO SPECTROPHOTOMETRIC METHODS FOR THE DETERMINATION OF NITRITE. *Talanta* 10, 641-55, 1963.

This paper can be considered as a concise source of spectrophotometric methods for the determination of nitrite. Fifty-two methods, of which about 36 are new, are compared with respect to molar absorptivity, selectivity, sensitivity, simplicity, colour stability, and conformity to Beer's law. A new type of spectrophotometric procedure-autocatalytic in principle-is introduced; a molar absorptivity of 620,000 is obtained. Over 20 new methods have been shown to give higher molar absorptivities with nitrite than any of the Griess type of reagents. Consequently they are worthy of further investigation in respect of their application to the analysis of nitrites and nitrite precursors. (Author summary)##

01997

E. Sawicki and T. W. Stanley

DETECTION AND COLORIMETRIC DETERMINATION OF POLYNITRO AROMATIC COMPOUNDS. Anal. Chim. Acta 23, 551-6, 1960.

A sensitive new spot test for polynitro aromatic compounds is introduced. In most cases a blue to green color is obtained using fluorene (or some other polynuclear cyclopentadiene derivative) as the reagent. A colorimetric procedure for the analysis of o- and p-dinitro compounds is also presented. (Author summary)**

01998

T. W. Stanley

DETECTION OF POLYNUCLEAR DIARYL KETONES: APPLICATION TO AIR POLLUTION. Chemist-Analyst 49, 48 and 56, June 1960.

In air pollution research, the problem exists of assigning the strong carbonyl bands present in the infrared spectra of airborne. This has prompted the development of new tests for specific classes of carbonyl compounds. This paper introduces a new method for the detection of diaryl ketones, ArCOAr' . With the exception of 2-benzoylthiophene, which gives a green color the test is fairly selective for diaryl ketones having an equivalent of three or more aromatic rings. It involves reaction of the ketone with methylmagnesium bromide and subsequent solution in trifluoroacetic acid giving red to blue colors of the diarylmethane dye ($\text{ArC(CH}_3\text{)Ar'}$) (plus). The colors formed are stable and show no fading even after four hours. Aliphatic, alicyclic, and aralkyl ketones do not give colors distinguishable from the yellow color of the blank.**

01999

E. Sawicki and R. R. Miller

DETECTION OF PYRENE, BENZO(A)PYRENE, AND OTHER POLYNUCLEAR HYDROCARBONS. Anal. Chem. 30, (1) 109-10, Jan. 1958.

A new color test has been developed for the detection of polynuclear compounds. A brilliant dark blue color was obtained with pyrene and benzo(a)pyrene. Some eight compounds gave red to violet colors. About 15 other hydrocarbons gave an essentially negative reaction. (Author abstract)**

02048

E. Hunigen, N. Jaskulla, and K. Wettig

(THE REDUCTION OF CARCINOGENIC CONTAMINANTS IN EXHAUST GASES OF PETROL ENGINES THROUGH FUEL ADDITIVES AND CHOICE OF LUBRICANTS.) Die Herabsetzung Krebsfördernder Schadstoffe in Ottomotoren-Abgasen Durch Kraftstoffzusatz und Schmierstoffauswahl. Proc. (Part I) Intern. Clean Air Cong., London, 1966. (Paper VI/12). pp. 191-3.

Data so far published about the content of 3,4 benzpyrene in the exhaust gases of petrol engines vary greatly. A measurement stand was set up to carry out routine tests on GDR made engines, and a quantitative analysis method worked out by the Berlin Institute for Hygiene employed thereby. Numerous measurements indicate that hitherto publications do not permit an objective evaluation of various types of engines. The reason seems to be the considerable degree to which the measurement value of 3,4 benzpyrene depends on the temperature at which the sample is taken from the exhaust gas. Results indicate: the lower the temperature at which the sample is taken the more hyperbolic the increase of the 3,4 benzpyrene content. Hence, comparing the amount of benzpyrene will only be meaningful as long as this is done under clearly defined and identical test conditions-as long as the pertinent causes remain unproven. Investigations of the effect exercised by fuel additives and lubricants which were carried out after the samples had been taken at comparable temperatures indicate that the latter make the 3,4 benzpyrene content practically disappear in the exhaust gases of two-stroke petrol engines, whereas this effect is only exercised at the beginning if the amount of lubricating oil is reduced, and is hardly exercised at all if the ratio is lower than 1:40. However, the hygienic evidence presented by the 3,4 benzpyrene measurements will remain unclear as long as the ways for and means of separating the substance from the carrier particles have not been found, and as long as this is only done by particulates with a magnitude of 100-5,000 nm. Further work should be done in this direction and for the purpose of laying down a MIK value.##

02077

E. Sawicki R. Barry

NEW COLOUR TESTS FOR THE LARGER POLYNUCLEAR AROMATIC HYDROCARBONS. Talanta 2, (2) 128-34, March 1959.

An investigation of the reaction of the aromatic aldehyde-phosphorus pentachloride reagents with polynuclear aromatic hydrocarbons has shown that a number of aldehydes can be substituted for piperonal in this spectral test but only two were specific for the more basic aromatic compounds. The 9-anthraldehyde reagent gives intense bands in the 800-900 millimicron spectral region with the larger hydrocarbons. The 3-nitro-4 dimethylaminobenzaldehyde reagent reacts readily procedure is ideal for the analysis of peri-condensed aromatic hydrocarbons. It was found that trifluoroacetic anhydride could be substituted for phosphorus pentachloride in the test reagent, but no particular advantage was incurred by this substitution. (Author abstract)##

02078

E. Sawicki, T.W. Stanley, W. Elbert

NEW METHOD FOR THE SPECTROPHOTOMETRIC DETERMINATION AND CHARACTERIZATION OF N,N-DIALKYLANILINES, DIPHENYLAMINES AND CARBAZOLES USING 5-NITROISATIN. Mikrochim. Acta 3, 1961.

N,N-Dialkylanilines react with 5-nitroisatin chloride to give a blue-green chromogen with a characteristic absorption spectrum.

Aniline and N-alkylanilines give an essentially negative test. Determination of N,N-dialkylanilines and diphenylamine and carbazole derivatives is possible. (Author summary)##

02079

E. Sawicki W. Elbert

NEW METHODS OF DETECTION OF GLYOXAL. Talanta 5, 63-5, 1960.

In the new colour and fluorescent tests for glyoxal introduced in this paper it was found that a solution of the reactants on filter paper could be heated with one-inch wide jet of steam without any serious loss of solvent or acid. By this technique the reagents 1:2-dianilinoethane, 2:3-diaminonaphthalene and 2-aminothiophenol gave blue, green and blue stains respectively, with corresponding identification limits of 0.1, 0.2 and 0.05 microgram of glyoxal. With 2-hydrazinobenzothiazole a golden-yellow fluorescence and an identification limit of 0.008 microgram of glyoxal was obtained. On the other hand, 0.1 microgram 2-aminothiophenol, 1 microgram 2:3-diaminonaphthalene, and 1 microgram 1:2-dianilinoethane could be detected with glyoxal as the reagent. (Author summary)##

02080

E. Sawicki, T.W. Staley, J. Pfaff, J. Ferguson

NEW METHODS FOR THE SPOT TEST DETECTION AND SPECTROPHOTOMETRIC DETERMINATION OF FORMIC ACID. Anal. Chem. 1962. pp. 62-9.

This paper describes the development of sensitive and selective methods for the detection and determination of formic acid. The following spot tests are discussed: J-acid spot test; HBT (2-hydrazinobenzothiazole) spot test; MBTH (3-methyl-2-benzothiazolone hydrazone hydrochloride) spot test; I-alkyl-quinaldinium spot tests. The optimum selectivity and sensitivity was obtained with I-methylquinaldinium toluene-p-sulfonate; no interference was caused by ketones, aldehydes, and other acids. The other reagents are more sensitive, but extremely sensitive for formaldehyde. The J-acid spot test is the simplest and gives a brilliant yellow fluorescence. In spectrophotometric procedures, water was found to have a drastic effect on the intensity obtained, but high intensities were obtained with the amount necessary for the solution of formate salt. Yield of chromogens in quantitative methods with diverse quinaldinium and lepidinium salts ranged from about 7 to 43% and the sensitivity might well be improved. A decrease in the dilution factor (final vol. test solution vol.) would improve the sensitivities.##

02081

E. Sawicki W.C. Elbert

NEW SPECIFIC ANALYTICAL PROCEDURES FOR THE DETECTION AND CHARACTERIZATION OF 1,4-NAPHTHOQUINONES. Anal. Chim. Acta 23, 205-8, 1960.

A new sensitive and specific color test for 1,4-naphthoquinones is introduced. With the reagent, o-aminothiophenol, a red color is obtained in neutral solution on paper. 1,4-Naphthoquinones containing electron-donor groups in the 2-position give a negative reaction. With additional spectrophotometric studies the quinones giving a positive test can be differentiated. A new specific fluorescence test for 2-hydroxy-1,4-naphthoquinone has also been developed. Reaction with o-phenylenediamine on paper and then treatment with alkali gives a brilliant rose-red fluorescence. (Author summary)##

02083

E. Sawicki W. Elbert

A SIMPLE SPECIFIC TEST FOR INNER-RING O-QUINONES. Anal. Chim. Acta 22, 448-51, 1960.

A simple specific test for inner-ring o-quinones is introduced. The test consists of the reaction of the quinone with 3,4-dimethoxyaniline in hot acetic acid to give dye(s) absorbing near 600 mμ. Spot test and colorimetric modification of the test are described. Other types of quinones and ketonic compounds give negative results. The spectra of the o-quinones in sulfuric acid are also presented. With the new method, fairly specific tests are now available for (a) inner-ring p-quinones, (b) inner-ring o-quinones, and (c) terminal ring o- and p-quinones. (Author summary)##

02084

E. Sawicki, T.R. Hauser, F.T. Fox

SPECTROPHOTOMETRIC DETERMINATION OF ALIPHATIC ALDEHYDE, 2,4-DINITROPHENYLHYDRAZONES WITH 3-METHYL-2-BENZOTHAZOLINONE HYDRAZONE. Anal. Chim. Acta 26, 229-34, 1962.

A sensitive new spectrophotometric procedure is described for the analysis of aliphatic aldehyde 2,4-dinitrophenylhydrazones. The chromogens formed in the procedure absorb at 668 mμ and are approximately three times as intense at this band as the starting aldehyde derivatives are in neutral and alkaline solvent at their wavelength maxima. With further improvement the procedure is capable of even greater sensitivity. Other aliphatic aldehyde derivatives also should be analyzable by this procedure, but 2,4-dinitrophenylhydrazones of ketones do not react. (Author summary)##

02085

E. Sawicki, T.W. Stanley, W. Elbert

SPECTROPHOTOMETRIC DETERMINATION OF AZULENE WITH ELECTROPHILIC REAGENTS. Proc. Intern. Symp. Microchemical Techniques 2, 633-42, 1961.

In a study of the composition of the atmosphere in terms of polycyclic aromatic hydrocarbons, analytical methods for various classes of these compounds have been recently developed. A study

is presented of ten different spectrophotometric methods for the microdetermination of azulene. Seven of these methods are new, and two have been reported on recently. In most cases, electrophilic reagents are chosen that form intensely colored cationic chromogens with azulene. The new reagents are 4-azobenzenediazonium fluoroborate, indole-3-carboxaldehyde, flavylum perchlorate, xanthen-9-ol, 1-anthraquinonediazonium chloride, N,N-dimethyl-4-nitrosoaniline, and 5-nitroisatin chloride. The results with these reagents are compared with those obtained previously with N,N-dimethyl-4-aminobenzaldehyde, 3-methyl-2-benzothiazolone hydrazone, and 2-hydrazinobenzothiazole. In these diverse methods molar absorptivities are obtained ranging from 12,000 to 100,000. Optimum conditions for reactivity, sensitivity, selectivity, and stability are also discussed. (Author abstract)##

02086

E. Sawicki, T.R. Hauser, S. McPherson

SPECTROPHOTOMETRIC DETERMINATION OF FORMALDEHYDE AND FORMALDEHYDE-RELEASING COMPOUNDS WITH CHROMOTROPIC ACID, 6-AMINO-1-NAPHTHOL-3-SULFONIC ACID (J ACID), AND 6-ANILINO-1-NAPHTHOL-3-SULFONIC ACID (PHENYL J ACID). Anal. Chem. 34, (11) 1460-4, Oct. 1962. (Presented before the Division of Water and Waste Chemistry, 142nd Meeting, American Chemical Society, Atlantic City, N.J., Sept. 1962.)

Three highly selective procedures for the determination of formaldehyde and formaldehyde - releasing compounds are introduced. In all cases xanthylium cationic or dicationic dyes are formed. The procedures have sensitivities approximately two and one-half times that of the chromotropic acid method. A sensitive thermochromic blue spot test for formaldehyde with 6-amino-1-naphthol - 3 - sulfonic acid is described, and nine different methods for the determination of formaldehyde are compared. The interference of formaldehyde-releasing compounds is discussed. (Author abstract)##

02087

E. Sawicki, T.W. Stanley, S. McPherson

SPECTROPHOTOMETRIC DETERMINATION OF 1,4-NAPHTHOQUINONE AND ITS 2,3-DICHLORO DERIVATIVE. Chemist-Analyst 50, 103-4, Dec. 1961.

Some new color and fluorescent spot tests for the detection and characterization of 1,4-naphthoquinones have been reported. In the present paper, one of these test is extended to the selective and sensitive spectrophotometric determination of 1,4-naphthoquinone and its 2,3-dichloro derivative employing o-aminobenzenethiol as the chromogenic agent. As described previously, the color-forming reaction involves the formation of a hydroxybenzophenothiazine salt. For both 1,4-naphthoquinone and its 2,3-dichloro derivative, Beer's law is obeyed at 790 and 495 millimicrons over a concentration range of 1 to 27 micrograms per ml. of final solution. The molar absorptivities developed in the procedure at these two

wavelengths by both compounds are respectively, 15,000 and 16,000 liters per mole cm. Various substituted 1,4-naphthoquinones, such as the 2-hydroxy and 2-methyl derivative, give entirely different spectra with bands only 1/4 of the intensity of only 1/20 to 1/50 of the intensity of the 1-4 naphthoquinone. At 790 millimicron, their absorbance is negligible. The non-interference of many other types of compounds in the spectrophotometric procedure can be anticipated from the qualitative findings described previously.##

02088

E. Sawicki, T.R. Hauser

SPOT TEST DETECTION AND COLORIMETRIC DETERMINATION OF ALIPHATIC ALDEHYDES WITH 2-HYDROZINOBENZOTHAZOLE: APPLICATION TO AIR POLLUTION. Anal. Chem. 32, (11) 1434-6, Oct. 1960. (Presented before the Air Pollution Symposium, Division of Water and Waste Chemistry, 138th Meeting, American Chemical Society, New York City, Sept. 1960.)

A versatile new procedure for the detection and determination of aliphatic aldehydes is introduced. all modifications of the new procedure have an especially high order of sensitivity for formaldehyde. On the spot plate 0.01 microgram of formaldehyde, 0.3 microgram of acetaldehyde, and 0.3 microgram of propionaldehyde can be detected; on paper 0.05 microgram of formaldehyde, 1 microgram of acetaldehyde, and 1 microgram of propionaldehyde can be detected. With proper standards, the amount of formaldehyde can be estimated. A tube containing silica gel impregnated with 2-hydrazinobenzothiazole solution can be used to detect or estimate formaldehyde in the air or in auto exhaust gases. A new colorimetric method for the determination of formaldehyde has also been evaluated. It is reproducible and sensitive, and can be applied to the determination of formaldehyde in the air. In all these modifications an easily visible brilliant blue color is obtainable. (Author abstract)##

02089

E. Sawicki, J.L. Noe, F.T. Fox

SPOT TEST DETECTION AND COLORIMETRIC DETERMINATION OF ANILINE, NAPHTHYLAMINE AND ANTHRAMINE DERIVATIVES WITH 4-AZOBENZENE-DIAZONIUM FLUOBORATE. Talanta 8, 257-64, 1961.

Some new sensitive procedures are introduced for the detection and determination of aniline, alpha and beta naphthylamines, and alpha and beta-anthramines, as well as their N-alkyl and N,N-dialkyl derivatives. The chromogens are (p-phenylazophenylazo)-aniline, -naphthylamine and -anthramine dyes. For example with N,N-dimethylaniline, the blue di-cation of N,N-dimethyl-p-(phenylazophenylazo)aniline is formed. The absorptivity of N,N-dimethylaniline obtained in the colorimetric procedure is 0.823 microgram/ml/cm. In the analysis for N,N-dimethylaniline, Beer's Law was obeyed from 0.1 to at least 3.6 microgram per ml of final solution. Because of the widely differing rates of reaction, naphthylamine or anthramine derivatives can be determined in the presence of primary and secondary amines. Spot tests for aniline,

naphthylamine and anthramine derivatives are described, but their sensitivity does not compare with the sensitivities obtained in the colorimetric procedure. (Author summary)##

02090

E. Sawicki, T.R. Hauser, T.W. Stanley, W. Elbert, F.T. Fox

SPOT TEST DETECTION AND SPECTROPHOTOMETRIC CHARACTERIZATION AND DETERMINATION OF CARBAZOLES, AZO DYES, STILBENES, AND SCHIFF BASES. APPLICATION OF 3-METHYL-2-BENZOTHAZOLONE HYDRAZONE, P-NITROSOPHENOL, AND FLUOROMETRIC METHODS TO THE DETERMINATION OF CARBAZOLE IN AIR. Anal. Chem. 33, (11) 1574-9, Oct. 1961. (Presented before the Divisions of Analytical and Water and Waste Chemistry, 140th Meeting, American Chemical Society, Chicago, Ill., Sept. 1961.)

Two new spectrophotometric methods for the determination of carbazole are introduced. Beer's law was obeyed from 4 to more than 90 micrograms of carbazole in the 3-methyl-2-benzothiazolone hydrazone and p-nitrosophenol procedures. Both methods can be used for the estimation of carbazole in the benzene extracts of airborne particulates. Two new spot tests for carbazole are also introduced. With the p-nitrosophenol test, 0.4 micrograms of carbazole can be detected. In strongly alkaline solution 0.2 micrograms of carbazole can be detected through the brilliant blue fluorescence of the anion. Carbazole can be characterized and estimated in the benzene extract of airborne particulates by the p-nitrosophenol spot test and spectrophotometric procedure, by the 3-methyl-2-benzothiazolone hydrazone (MBTH) spectrophotometric procedure, and by the excitation and emission spectra of the material in pentane, dimethyl-formamide, and alkaline dimethyl-formamide. The detection and determination of approximately 50 azo dyes and a smaller group of stilbene and Schiff base derivatives using 3-methyl-2-benzothiazolone are also described. (Author abstract)##

02091

E. Sawicki, T.W. Stanley, W. Elbert

SPOT TEST DETECTION AND SPECTROPHOTOMETRIC DETERMINATION OF AZULENE COMPOUNDS WITH 2-HYDRAZINOBENZOTHAZOLE OR 3-METHYL 2-BENZOTHAZOLONE HYDRAZONE. Microchem. J. 5, (2) 225-32, 1961.

Two sensitive new methods are introduced for the spot test detection and spectrophotometric microdetermination of azulene and its compounds. With 3-methyl-2-benzothiazolone hydrazone, 0.05 microgram of azulene can be detected. (Author summary)##

02092

E. Sawicki, T.W. Stanley, W.C. Elbert

SPOT TEST DETECTION AND SPECTROPHOTOMETRIC DETERMINATION OF AZULENE DERIVATIVES WITH 4-DIMETHYLAMINOBENZALDEHYDE. Anal. Chem. 33, (9) 1183-5, Aug. 1961.

The detection and determination of azulenes with 4-dimethylaminobenz-aldehyde have been investigated. One microgram of azulene; guaiazulene, of 2,4,6-trimethylazulene can be detected on a spot plate. These azulene compounds can be determined spectrophotometrically at 620 or 642 micrograms (for guaiazulene). Their molar absorptivities range around 90,000. The chromogenes formed in the procedure obey Beer's law from 0.1 to 4 micrograms of azulene compound per ml. of final solution. Spectrophotometrically it was possible to detect 1 part of the azulene compound in 5 million parts of test solution. (Author abstract)##

02094

E. Sawicki, T.W. Stanley, W.C. Elbert

SPOT TEST AND SPECTROPHOTOMETRIC DETERMINATION OF NITRITES AND AROMATIC NITROSAMINES WITH BENZALDEHYDE 2-BENZOTHAZOLYHYDRAZONE AND P-PHENYLAZOANILINE. Mikrochim. Acta 6, 891-8, 1961.

Nitrous acid is reacted with p-phenylazoaniline to give the diazonium salt which then combines with benzaldehyde 2-benzothiazolyhydrazone to give a formazan. Addition of alkali gives an intensely blue anion. (Author summary)##

02095

E. Sawicki W. Elbert

THERMOCHROMIC DETECTION OF POLYNUCLEAR COMPOUNDS CONTAINING THE FLUORENIC METHYLENE GROUP. Chemist-Analyst 48, 68-9, Sept. 1959

A large number of aromatic hydrocarbons and their derivatives contain the 6,5,6-fused, aromatic ring system of fluorene. A simple, sensitive, and specific test for this ring system would be of value in air pollution studies and in organic analysis generally. Sprinzak found that fluorene reacts in a strongly alkaline, pyridine medium with oxygen to yield fluorenone. Sawicki and co-workers found that fluorenone and structurally related ketones give a thermochromic reaction in dimethylformamide containing sodium borohydride involving reduction to the fluorenol and its anion. The new color test for the fluorene moiety is based on a combination of these observations. The fluorene derivative in dimethylformamide made alkaline with tetraethylammonium hydroxide forms a carbanion which is readily oxidized by shaking with air to the fluorenone, and the latter is reduced by potassium borohydride at the boiling point to the highly colored fluorenol anion. On cooling and shaking, the less highly colored fluorenone is regenerated.##

E. Sawicki, T.W. Stanley, T. R. Hauser

A THERMOCHROMIC TEST FOR POLYCYCLIC P-QUINONES. Anal. Chem. 30, (12) 2005-6, Dec. 1958.

Many compounds containing a polycyclic quinone structure show a reversible thermochromic reaction in reducing media. This test is useful for unsubstituted polycyclic q-quinones, such as 9,10-anthraquinone, 5,12-naphthacenedione, 6,13-pentacenedione, 7,12-benzo(alpha)anthracenedione, and naphtho(2,3-alpha)pyrene-7,12-dione - e.g., boiling a pink dimethyl-formamide solution of 5,12-naphthacenedione in the presence of potassium borohydride gave a dark blue solution, which upon cooling became pink again. This color change can be repeated at least a dozen times. The color reaction has been applied to air particulate matter in that the presence of polycyclic quinone-like compounds has been demonstrated in the aromatic fraction. (Author abstract)##

02097

E. Sawicki, T.R. Hauser, T.W. Stanley, W. Elbert

THE 3-METHYL-2-BENZOTHAZOLONE HYDRAZONE TEST. SENSITIVE NEW METHODS FOR THE DETECTION, RAPID ESTIMATION, AND DETERMINATION OF ALIPHATIC ALDEHYDES. Anal. Chem. 33, (1) 93-6, Jan. 1961.

Sensitive new analytical methods for water-soluble aliphatic aldehydes have been introduced. Versatile spot plate, paper, silica gel, and colorimetric modifications of the procedure are of value in the detection, estimation, and determination of these aldehydes. In the test procedure an intensely brilliant blue cationic dye is formed. Particularly advantageous is the simple sensitive silica gel procedure for the detection or estimation of aldehydes. The color of the dye obtained in the colorimetric procedure for formaldehyde is much more intense than any of the colors obtained for formaldehyde with well known procedures. In the determination of formaldehyde, Beer's law was obeyed from 5 to at least 125 micrograms per 100 ml. of solution. The silica gel and colorimetric methods can be applied to the analysis of auto exhaust fumes and polluted air. Two simple methods for the synthesis of the reagent, 3-methyl-2-benzothiazolone hydrazone, are described. (Author abstract)##

02098

A.P. Altshuller L.J. Leng

APPLICATION OF THE 3-METHYL-2-BENZOTHAZOLONE HYDRAZONE METHOD FOR ATMOSPHERIC ANALYSIS OF ALIPHATIC ALDEHYDES. Anal. Chem. 35, (10) 1541-2, Sept. 1963.

Presented in this study are results of work on controlled synthetic atmospheres which provide data on collection efficiencies and reproducibility and which give further indications of the

accuracy of the method. Analyses also were made for formaldehyde and acrolein, and results are compared with those for total aliphatic aldehydes.##

02121

M. D. Babina.

DETERMINATION OF CHLOROPRENE IN AIR. J. Anal. Chem. USSR (English Transl.) 20, (11) 1300-2, Nov. 1965.

Chloroprene was sampled by absorption on silica gel treated to free it of chlorine ions at a through-put rate of 0.5-1 liters/min. The chloroprene was then desorbed by the passage of hot air into absorption flasks containing glacial acetic acid. Chloroprene was determined photometrically by coupling with p-nitrophenyl-diazonium. Error in this determination was plus and minus 20%.##

02130

R. Eberaneberhorst

(ENGINE COMBUSTION AND ITS EXHAUST GAS PRODUCTS AS A PROBLEM OF HIGH INCIDENCE). Die Motorische Verbrennung und ihre Abgasprodukte als Häufigkeitsproblem. ATZ (Automobiltechnische Zeitschrift) (Stuttgart) 68(8):263-268, Aug. 1966.

The increasing incidence of gasoline engines necessitates reducing the air pollutants from exhaust gas by 40% within the next 10 years. The influence of engine operation on the emission of carbon monoxide, hydrocarbons and nitrogen oxides is described, e.g., in high gear, while changing gears and speeds (7-mode California test), and in neutral. Limiting values for emissions dependent on motor size and normal usage are suggested. Methods to reduce exhaust gas pollutants included fuel injection systems to replace carburetors and controlled turbulence techniques.##

02135

E. S. Gronsberg

(COLORIMETRIC DETERMINATION OF VINYL CHLORIDE IN THE AIR.) Kolorimetricheskoe Opređenje Khloristogo Vinila v Vozdukh. Khim Prom (Moscow) (7) 30-1, 1966.

The method described in this paper is based on the ability of ethylenic hydrocarbons to be oxidized by permanganate to glycol, which on further oxidation with periodic acid yields formaldehyde. The formaldehyde is then determined colorimetrically by reaction with chromotropic acid. The air to be analyzed was passed over activated charcoal; the charcoal was then extracted with a 1:1 mixture of glacial acetic acid and ethyl alcohol. The data indicate that vinyl chloride in air can be detected accurately in quantities as low as 0.5 mg/liter. Methyl alcohol will interfere with the reaction and must be removed by passage through water and CaCl₂ before the vinyl chloride is absorbed on charcoal. Ethylene also interferes with the determination.##

A. P. Altshuller, T. A. Bellar, and C. A. Clemons.

CONCENTRATION OF HYDROCARBON ON SILICA GEL PRIOR TO GAS CHROMATOGRAPHIC ANALYSIS. Am. Ind. Hyg. Assoc. J. 23, Apr. 1962. pp. 164-6.

In the determination of substances in various atmospheres by gas chromatography the sample often must be concentrated prior to analysis. Silica gel at dry ice-acetone temperatures has been found to be a satisfactory adsorbant for concentration of hydrocarbon and sulfur containing compounds. In the present work recovery efficiencies are obtained for a number of four and five carbon paraffins and olefins. Isomerization reactions of olefins of silica gel at elevated temperature were investigated. Losses of very light hydrocarbons are discussed. Reproducibilities are given for the analyses of several three, four and five carbon hydrocarbons existing at concentrations between 0.005 and 0.2 ppm in synthetic smogs. (Author abstract)##

A. P. Altshuller, L. J. Lage, and S. F. Sleva.

DETERMINATION OF OLEFINS IN COMBUSTION GASES AND IN THE ATMOSPHERE. Am. Ind. Hyg. Assoc. J. 23, 289-95, Aug. 1962.

Four-carbon and higher molecular weight olefins can be quantitatively determined in the gas phase by reaction with p-dimethylaminobenzaldehyde in concentrated sulfuric acid, heating at 100 C, and measurement of the absorbance at 500 millimicrons. The absorptivities are such that less than 0.1 ppm of gaseous olefins can be determined. Interference by formaldehyde is appreciable. Excess amounts of aromatic hydrocarbons and phenols interfere somewhat in the procedure. Simple methods for removing possible interferences in gas mixtures are discussed. The method has been applied to the analysis of automobile exhaust and diluted irradiated exhaust mixtures. (Author abstract)##

A. P. Altshuller and C. A. Clemons.

GAS CHROMATOGRAPHIC ANALYSIS OF AROMATIC HYDROCARBONS AT ATMOSPHERIC CONCENTRATIONS USING FLAME IONIZATION DETECTION. ANAL. CHEM. 34, (4) 466-72, APR. 1961. (PRESENTED BEFORE THE Division of Water and Waste Chemistry, 140th Meeting, American Chemical Society, Chicago, Ill., Sept. 1961.)

In the present investigation, methods were developed for preparing and transferring to the chromatograph vapor state aromatic hydrocarbon in air-mixtures in the 0.05 to 5-p.p.m. range. Quantitative analysis of automobile exhaust for six- to 10- or 11-carbon aromatic hydrocarbons in the 1-to 10-p.p.m. range has been demonstrated. Quantitative analyses of synthetic photochemical "smog" have been made on mixtures containing individual aromatic hydrocarbons in the 0.05- to 1-p.p.m. range. The

accuracy attained is sufficient to permit measurement of changes in aromatic hydrocarbon concentration during irradiation with solar type light sources. These measurements provide evidence that many aromatic hydrocarbons should photooxidize to an appreciable extent in photochemical "smog" reactions in urban atmospheres. (Author abstract)##

02161

A. P. Altshuller and S. F. Sleva.

SPECTROPHOTOMETRIC DETERMINATION OF OLEFINS. Anal. Chem. 33, (10) 1413-20, Sept. 1961.

Four-carbon and higher molecular weight olefins can be determined quantitatively in the gas and liquid phases by reaction with p-dimethylaminobenzaldehyde in concentrated sulfuric acid, under appropriate conditions, and measurement of the absorbance at 500 millimicrons. With gaseous olefins, the absorptivities are such that 0.1 p.p.m. or less can be determined. Interference by formaldehyde and excess aromatic hydrocarbons and phenols is appreciable, and simple methods for their removal and discussed. The method has been applied to the analysis of automobile exhaust and diluted irradiated exhaust mixtures. Liquid olefins have been studied under somewhat different reaction conditions; consequently, the positions, shapes, and intensities of the absorption bands differ somewhat. Although the work on liquid olefins was not as extensive as in the investigation of olefin gases, the results should have applicability in the identification and analysis of small quantities of liquid olefins. (Author abstract)##

02162

A. P. Altshuller and S. F. Sleva.

VAPOR PHASE DETERMINATION OF OLEFINS BY A COULOMETRIC METHOD. Anal. Chem. (Presented before the Division of Water and Waste Chemistry, 140th Meeting, American Chemical Society, Chicago, Ill., Sept. 1961.) 34, (3) 418-22, Mar. 1962

An instrument based on a bromocoulometric method has been evaluated for analysis of olefins at concentrations between 20 and 1000 p.p.m. The instrument has been calibrated for its vapor phase response to a number of olefins, including ethylene, propylene, propadiene, 1-butene, trans-2-butene, cis-2-butene, isobutylene, 1,3-butadiene, 1-pentene, and 2-methyl-2-butene. The possible interference of a number of substances, including sulfur dioxide, nitric oxide, nitrogen dioxide, hydrogen sulfide, n-butyl sulfide, acrolein, phenol, and m-cresol, has been investigated. Sulfur dioxide, hydrogen sulfide, nitrogen dioxide, and acrolein react appreciably with the brominating solution. Nitrogen dioxide lowers the response to olefins. Severe interference is experienced when the nitrogen dioxide concentration equals or exceeds that of olefins. Even when the olefins are present in excess, the interference by nitrogen dioxide is sufficient to necessitate removal of most of the latter. In analyses of samples in containers, direct determination of these vapor phase interference effects may be complicated further by gas

phase reactions of olefin and nitrogen dioxide, and perhaps by reactions within container walls. With this olefin instrument, diluted automobile exhaust and a variety of synthetic mixtures have been analyzed. Results have compared favorably with those obtained by the colorimetric dimethylaminobenzaldehyde method. (Author abstract)##

02188

D. Bersis, and E. Vassiliou.

A CHEMILUMINESCENCE METHOD FOR DETERMINING OZONE. Analyst (Cambridge) 91, (1085) 499-505, Aug. 1966.

A method for determining ozone is described which is characterized by the direct recording and automatic determination of ozone within a wide range of concentrations. The development of the method is based on the use of a chemiluminescent solution that is stable and shows a linear relationship between the light emitted and the ozone concentration. The electronic instrumentation used is simple. Other methods of ozone analysis based on this principle met difficulty, owing to the direct oxidation of the chemiluminescent compound. The present method involves the use of gallic acid as an ozone acceptor, and rhodamine B which remains unchanged during the measurement as a photon emitter. Observations made with an oscillograph of the light emitted by single bubbles of ozonized air passing through the chemiluminescent solution gave valuable information about the response time of the system. (Author abstract modified)##

02205

J.W. Thomas, R.H. Knuth

PATTERNS OF AEROSOL PARTICLES SETTLING IN STREAMLINE FLOW IN A STRAIGHT HORIZONTAL TUBE. Intern. J. Air Water Pollution 10, (9) 569-72, Sept. 1966.

The theory of particles settling in streamline flow in a horizontal tube previously published has been expanded to take into account the influence of the sampling filter in changing the flow lines. Experiments with a 1.305 micron diameter monodisperse polystyrene latex aerosol have shown excellent agreement with the expanded theory. This modification of theory makes possible a new method of determining the settling velocity and density of a monodisperse aerosol. (Author abstract)##

02226

E. Sawicki, F.T. Fox, W. Elbert, T.R. Hauser, J. Meeker

POLYNUCLEAR AROMATIC HYDROCARBON COMPOSITION OF AIR POLLUTED BY COAL-TAR PITCH FUMES. Am. Ind. Hyg. Assoc. J. 23, 482-6, Dec. 1962.

Coal-tar-pitch pollution can be characterized by the large amounts of anthracene, phenanthrene, pyrene and carbazole present

in collected airborne particulates. Carbazole has not yet been found in pollution due to incomplete solid fuel combustion products or auto exhaust fumes. Coal-tar-pitch pollution is characterized by much higher P/BaP/BghiP, and BaP/Cor ratios when compared to other types of pollution. The large amounts of polynuclear hydrocarbons (and especially benzo(a)pyrene) often present in coal-tar-pitch polluted air indicate the necessity of a thorough study of this problem as it affects lung cancer.##

02227

E. Sawicki, E. Elbert, T.W. Stanley, T.R. Hauser,
F.T. Fox

SEPARATION AND CHARACTERIZATION OF POLYNUCLEAR AROMATIC
HYDROCARBONS IN URBAN AIR-BORNE PARTICULATES. Annal. Chem.
32, (7) 810-6, June 1960.

A simplified procedure is described for the characterization of polynuclear hydrocarbons in air-borne particulates. The method involves one pass through a chromatographic column and subsequent ultraviolet, visible, and fluorescence studies on the fractions thus obtained. The final step then involves a destructive method of analysis e.g., spectral analysis in sulfuric acid-or a color test. The ultravioletvisible absorption spectra of analogous fractions obtained from different communities are closely similar. In the air-borne particulates of some 100 communities pyrene, fluoranthene, benzo(a)fluorene and/or benzo(b)fluorene, chrysene, benzo-(a)anthracene, benzo(a)pyrene, benzo(e)pyrene, benzo(k)fluoranthene, perylene, benzo(g,h,i)perylene, anthanthrene, and coronene are found consistently.##

02233

R.L. Stenburg, D.J. Von Lehmden, R.P. Hangebrauck

SAMPLE COLLECTION TECHNIQUES FOR COMBUSTION SOURCES -
BENZOPYRENE DETERMINATION. Am. Ind. Hyg. Assoc. J. 22, (4)
271-5, Aug. 1961, (Presented at the 22nd Annual Meeting,
American Industrial Hygiene Association, Detroit, Mich.,
Apr. 1961.)

In evaluating combustion processes for their contribution of benzo(a)pyrene and other potential carcinogens to the atmosphere, the materials of interest may be lost during sampling unless the collection temperature is controlled. Cooling of the gases under both wet and dry conditions has been tried. This study demonstrates that collection of benzo(a)-pyrene from high temperature gas streams can be effectively accomplished by filtration after cooling the gas stream to or near ambient temperatures. A series of water bubblers and condensate traps immersed in an ice-water bath, followed by a high efficiency filter proved to be a satisfactory technique. (Author abstract)##

P. DiMattei P. Melchiorri

EFFECTS OF ORGANOPHOSPHORUS ESTERS ON THE CILIARY MOVEMENT AND THEIR USE FOR THE DETECTION OF TRACES OF ORGANOPHOSPHORUS COMPOUNDS. Arch. Intern. Pharmacodyn. 153, (2) 339-45, Feb. 1965

A correlation was found between the acetylcholinesterase activity and the ciliary movement in cultures of ciliated epithelium cells. DEP (disopropylfluophosphate) and paraoxon, added to the culture medium at concentration levels of 0.00001M and 0.0001M respectively, inhibited the acetylcholinesterase activity and increased the ciliary movements. Concentrations of 0.0001M of DEP and 0.001M paraoxon slowed the ciliary movements. DFP and paraoxon at concentrations which slightly inhibited the acetylcholinesterase activity increased the stimulatory effect of acetylcholine on the motility of ciliated cells. This effect may be used for the detection of very small quantities of organophosphorus compounds. (Author summary)##

02323

J.P. Flesch, C.H. Norris, A.E. Nugent, Jr.

CALIBRATING PARTICULATE AIR SAMPLERS WITH MONODISPERSE AEROSOLS: APPLICATION TO THE ANDERSEN CASCADE IMPACTOR. Am. Ind. Hyg. Assoc. J., p. 507-516, Nov.-Dec. 1967. 10 refs. (Presented at the American Industrial Hygiene Conference, Pittsburgh, Pa., May 16-20, 1966.

Monodisperse aerosols of methylene blue dye generated via a spinning disk and polystyrene latex aerosols generated via atomization have been applied in calibrating a multi-stage cascade impactor, the Andersen Sampler Model 0203. Previous calibrations of impactors relied almost exclusively upon the size-count method of analysis of test aerosols, usually polydisperse, retained at the deposition sites to determine their collection characteristics. Many difficulties encountered with this method are obviated by using nearly monodisperse aerosols for calibration. Collection efficiency characteristics of the Andersen Sampler are computed directly from mass retained at the deposition sites, since concurrent size distribution information on each aerosol generated indicates that values for number and mass median diameter are nearly equal. Experimental methods of generation, sampling, mass determination, and aerosol evaluation are presented with representative data. Collection efficiency curves obtained for the various stages of the Andersen Sampler are given with computed values of effective stage cutoff diameters for aerodynamically equivalent unit density spheres. Results are compared with those of previous experimenters. (Authors' abstract)##

02336

C. A. Parker and W. T. Rees.

DETERMINATION OF 3:4-BENZOPYRENE IN THE ATMOSPHERE OF A SUBMARINE. Admiralty Materials Lab., Poole, England,

A direct method has been devised for the determination of the carcinogenic 3,4-benzopyrene in the cyclohexane extracts of the particulate matter collected from submarine atmospheres. The method depends on the measurement of the characteristic quasi-line emission spectrum shown by 3,4-benzopyrene when its solution in a mixture of cyclohexane and n-octane is frozen at liquid nitrogen temperature. Concentrations of benzopyrene less than 10 to the -9th power/ml of solution can be reliably identified without separation. The maximum amount found in the present trials corresponded to the concentration of 3,4 benzopyrene produced by the dispersion of the smoke from one cigarette in 70 cubic metres of air. (Author summary)**

02349

A. P. Altshuller.

NEEDS FOR NEW INSTRUMENTATION FOR MONITORING THE ATMOSPHERE FOR ORGANIC GASES AND VAPORS. Proc. Instr. Soc. Am. Natl. Analysis Instr. Symp., Charleston, W. Va., April 30-May 2, 1962. pp. 239-43.

The importance of high sensitivity and specificity in atmospheric monitoring instruments cannot be too strongly emphasized. For almost all organic analysis of urban atmospheres, instruments must be capable of detection at concentrations of 0.01 ppm or lower. Substances are present which can interfere in almost all conceivable analytical procedures for determining either a class of substances or an individual substance. Processes for removing the interferences or methods of correcting for them should be an integral part of the instrument development work. The detection methods suggested in this discussion involve either electrometric sensors or the ionization sensors used in gas chromatography. Alone or in combination with a chromatographic column, such detectors also have satisfactory specificities. These sensors offer considerable opportunity for the development of compact equipment. The range of possible application of these instruments covers many of the classes of organic substances of present interest in air pollution. (Author summary modified)**

02354

K.F. Chrisman K.E. Foster

CALIBRATION OF AUTOMATIC ANALYZERS IN A CONTINUOUS AIR MONITORING PROGRAM. Preprint (Presented at the 56th Annual Meeting, Air Pollution Control Association, Detroit, Michigan, June 9-13, 1963.)

The need for uniformity of instrument calibration among the several stations of the Continuous Air Monitoring Program of the U.S. Public Health Service has prompted the development of a comprehensive program of instrument calibration. The program relies heavily upon static and dynamic checks performed by the station operators. The frequency of these checks varies with each specific instrument; but, in all cases, the checks

are frequent enough to insure the continued accuracy of the recorded data. The routine checks are substantiated and supplemented by dynamic calibrations performed at all stations by the headquarters staff. The dilution board method for the preparation of standard gas mixtures has been adapted to the requirements of compactness and portability, and has been used successfully in this work. In a conscientious effort to insure and maintain the accuracy of the data produced by the program, further refinements in the method will be made and more suitable new methods will be adopted as they are developed.
(Author's summary)##

02358

L.B. Graiff

A RAPID-RESPONSE TOTAL EXHAUST HYDROCARBON DETECTOR. Preprint. (Presented before the Division of Water, Air, and Waste Chemistry, American Chemical Society, Detroit, Mich., Apr. 5, 1965.)

This paper discusses the development and use of a rapid response automotive exhaust hydrocarbon detector based on the hydrogen flame ionization principle. This instrument is ideally suited for monitoring the total exhaust hydrocarbon content of cycling engines. The rapid response exhaust hydrocarbon detector has been used to measure the hydrocarbon emission from a number of cars operated on a chassis dynamometer according to the MVPCB test procedure. A typical exhaust hydrocarbon emission pattern obtained from a car with a carburetted engine during one of the seven-mode warmup cycles is included, from which it is seen that the individual operating modes are well defined. A car with an inlet-port fuel-injection system was found to give a different emission pattern during deceleration from a carburetted car, as illustrated. The fairly positive fuel cut-off with the fuel-injection car during the early stages of deceleration is clearly indicated. The rapid response hydrocarbon detector can be used for purposes other than hydrocarbon emission from automotive engines. For example, the unit has been used to monitor the gases leaving a liquid-air trap in order to design an efficient hydrocarbon trap. The device can probably be used to monitor gas-turbine exhaust for unburned fuel.##

02378

R. Smith, A. H. Rose, and R. Kruse.

AN AUTO-EXHAUST PROPORTIONAL SAMPLER. INTERN. J. AIR WATER Pollution (Presented at the 56th Annual Meeting, Air Pollution Control Association, Detroit, Mich., June 9-13, 1963.) 8, 427-40, Sept. 1964.

The development of an instrument to obtain a proportional sample of auto exhaust gas is described. The proportional sampler is a servo device, which controls the flow of exhaust gas in the sampling line to maintain it at a fixed percentage of the carburetor air flow rate. The flow rates in carburetor and sample line are measured continuously by means of laminar-flow elements and associated pressure-difference transducers. The proportional sampler is used in a vehicle on the road to provide a

representative sample of exhaust gas, which is then analyzed to obtain mole-fraction measurements of various air contaminants in the vehicle exhaust. The total volume of air entering the carburetor is also measured. The values for total air volume entering the carburetor and mole fraction of contaminants are used to calculate the emission rates in pounds of each air contaminant emitted per vehicle mile traveled. (Author abstract)##

02406

A.E. Barrington

INSTANTANEOUS MONITORING OF MULTICOMPONENT EXPIRED GASES. GCA Corp., Bedford, Mass. (Rept. CR-619.) Dec. 1966. 17 pp. CFSTI, NASA

Because of the urgent requirements of the manned space flight program, the prototype gas analyzers described below were developed specifically for aerospace applications. Their design thus inevitably was subject to restrictions of weight, volume and power consumption. Nevertheless, their operational performance has been most encouraging. The sensing element of the gas analyzer is called a mass spectrometer whose concept utilizes two basic physical phenomena: first, gaseous atoms and molecules can readily be charged electrically; second, there is a selective effect by electric and magnetic forces on such charged particles which depends on the atomic or molecular mass. A complete sampling and sensing system for 12 constituent gases, utilizing a magnetic deflection mass spectrometer is shown. It is designed to monitor H₂, CO, CH₄, NH₃, H₂O, N₂, COH, O₂, H₂S, HC, CO₂ AND COOH. IT includes 4 sample inlet capillaries, a calibration sample, a liquid nitrogen chilled sorption pump and an electronic ion pump.##

02415

C.W. Louw

ATMOSPHERIC POLLUTANTS AND THEIR ANALYSIS (SPECIAL REPORT SMOG 2). Council for Scientific and Industrial Research, Pretoria, (South Africa). Air Pollution Research Group 1966. 60 pp.

In view of the recently passed Act on Air Pollution (No. 45 of 1965) in South Africa and the anticipated increase in interest and analytical activity in this field, it was felt that the need existed for an up-to-date survey of air pollutants and their analysis. A review report was consequently prepared and is presented here. Aspects such as the types, sources and occurrence, concentrations and methods of analysis of the various pollutants are discussed. Also, recommendations are made with regard to the selection of suitable analytical methods. (Author abstract)##

K. T. Whitby and R. A. Vomela

EVALUATION OF OPTICAL PARTICLE COUNTERS (PROGRESS REPT.)
 Minnesota Univ., Minneapolis, Dept. of Mechanical Engineering
 (Particle Lab. Publication No. 86) 89 pp., May 1965

Monodisperse polystyrene, India ink, and dioctyl phthalate aerosols have been used to evaluate the Royco, Southern Research Institute and prototype Bausch and Lomb optical counters. The cumulative particle size distributions measured by the counters on the monodisperse aerosols have been compared to the accurately determined microscope size distributions. The size ranges of the monodisperse aerosols used so are: 0.365 to 1.3 microns for polystyrene latex (PSL), 1 to 6 microns for polystyrene (PS), 1 to 10 microns for India ink (I.I.), and 1 to 5 microns for dioctyl phthalate (DOP). These aerosols have been used to evaluate two characteristics of the counters: the ratio of the median size measured by the counter to that measured by the microscope (C/M), and the ability of the counter to resolve a monodisperse aerosol as measured by the geometric standard deviation (og). Analysis of the standard deviation data shows that the resolving power of all three counters is close to the theoretical value for DOP and PSL aerosols larger than 1 micron, but is less than the theoretical value for the PS and I.I. aerosols larger than 1 micron as evidenced by an increase in standard deviation from about 1.3 at 1 micron to over 1.8 at 10 micron. The resolving power also decreases for PSL smaller than 1 micron. Analysis of the C/M data for PS and DOP shows that the counters respond alike to PS and DOP, that the absolute calibration of all three counters is good between 1 and 1.5 microns, but these show significant variations for both larger and smaller aerosols. The C/M ratios of the counters for I.I. varied from 0.2 to 0.5 and showed significant shape effects for aerosols larger than 5 microns. (Author summary modified)##

02439

A. V. Demidov, L. A. Mokhov, and B. S. Levine (Tr.)

RAPID METHODS FOR THE DETERMINATION OF HARMFUL GASES AND VAPORS IN THE AIR. Vol. 10 of U.S.S.R. Literature on Air Pollution and Related Occupational Diseases. Medgiz, Moscow, Russia. (Technical Transl. No. TT 66-11767.) 1962. pp. 114.

Volume 10 of the survey series "U.S.S.R. Literature on Air Pollution and Related Occupational Diseases" is a translation of A. V. Demidov's and L. A. Mokhov's book "Rapid Methods for the Determination of Harmful Gases and Vapors in the Air" (Yekopehhlie Metoubi Oipeuejehnr B B Boeuyxe Bpeuhlix N Iopooapaehlix Bewectb), published by Medgiz of Moscow in 1962. The greater part of the outlined procedures have been developed by U.S.S.R. analytical chemists, while some were taken from literature of other countries. The collection of tests appears to be intended primarily for the detection of dangerous gaseous and vaporous air pollutants in indoor working premises. For each harmful gas or vapor qualitative as well as closely approximate quantitative procedures are given to make possible the early

determination of dangerous harmful gas and vapor concentration in the air of working premises and to forestall the occurrence of serious accidents. The volume was intended to meet the needs of smaller laboratories and of field industrial laboratory workers.##

02460L

F.G. Sherrell J.A. Baltz

A TRACE CONTAMINANT ANALYSIS TEST ON AIR SAMPLES. ARO Inc., Tullahoma, Tenn. (Rept. AEDC-TR-66-42) pp. 84, Mar. 1966
CFSTI, DDC AD 478886 L

A test in which wet air samples were analyzed for trace contaminants was conducted at the Arnold Engineering Development Center for the USAF School of Aerospace Medicine. Sample processing and analysis techniques used during the test are described. The sample processing technique provided a way to transfer the 77K condensables in each sample to a trap of small volume. This trap was designed to allow removal of small portions of both the sample vapor and the liquid for mass spectrometric and chromatographic analyses. The chromatographic and mass spectrometric instrumentation calibrations, and data reduction procedures are described. The basic test results are presented and discussed. Observations are made concerning the utility of the procedures used:##;

02500

A. B. Calongne and J. P. Morris

NEW TECHNIQUES FOR TESTING TRACE HYDROCARBON CONTAMINATION OF GASES. Preprint. (Presented at the Fourth Annual Technical Meeting and Exhibit, American Association for Contamination Control, Miami Beach, Fla., May 25-28, 1965.)

This paper presents techniques for the analysis of total and nonvolatile hydrocarbons. Terminology used to define hydrocarbon limits in specifications include: (1) Total hydrocarbon content, (2) Condensable hydrocarbon content, (3) Oil content, and (4) Nonvolatile residue content. There are basically four methods of analysis which are used for the detection of low hydrocarbon concentrations. These methods are as follows: (1) Gas scrubber - infrared spectrophotometry. (2) Flame ionization. (3) Gas chromatography. (4) Gas cell - infrared spectrophotometry.##

02538

(CHEMICAL AND PHYSICAL CHARACTERIZATION OF POLLUTED ENVIRONMENTS, INHALED OR INGESTED, AND OF ACOUSTICAL "NUISANCES.")
Caracterisation chimique et physique des milieux pollués, inhalés ou ingérés et des "nuisances" acoustiques. In: Les pollutions et "nuisances" d'origine industrielle et urbaine. Tome 1. Leur prévention et les problèmes scientifiques et techniques qu'elle pose en France, pages 27-32. Premier Ministre
Delegation generale a la recherche scientifique et technique.

In discussing the methodology of measuring and evaluating the degree of pollution, the following are considered: infra-red, emission, and mass spectrometers; x-ray and electron diffraction; gravimetric, volumetric, and colorimetric methods; optic and electronic microscopes, and spectrometry for acoustic absorption. In the section on the inhalation milieu, are discussed the composition of the natural atmospheric air and of the air polluted by cities (particles, gases and vapors, and smog); diffusion of pollutants in the atmosphere; chemical reactions in the atmosphere; international standardization of current methods and measurements (deposited material, fumes, sulfur dioxide, and hydrocarbons); cartiography; and principal concerns of research. Discussed in this same section (chapter 2) are pollution of food and water, and problems of noise.**

02544

I. A. Pinigina

COLORIMETRIC DETERMINATION OF ALCOHOL VAPOR IN AIR. (O kolorimetricheskom opredelenii parov spirta v vozdukh.) Hyg. Sanit. 31, (1) 58-60, Jan. 1966.
CFSTI: TT66-51160/1-3

The reaction of alcohols with black vanadium-hydroxyquinoline which produces a vivid orange color was modified by using sodium hydroxide to destroy any excess vanadium-hydroxyquinoline. The need of using xylene is thus eliminated. Benzene was substituted for xylen in the preparation of the scale. The air sample is adsorbed on sorbent-activated charcoal. These modifications increase the sensitivity from 0.01 to 0.002 mg.**

02559

B.E. Seleznev I.A. Chernichenko

SPECTROPHOTOMETRIC DETERMINATION OF THE CONCENTRATION OF CHLORTETRACYCLINE IN THE AIR. Opredelenie kormovogo khlortetatsiklina v atmosfernom vozdukh spektrofotometricheskim metodom.) Hyg. Sanit. 31, (3) 346-8, Mar. 1966.
CFSTI: TT66-51160/1-3

The possibility of using spectrophotometry for the quantitative determination of chlortetracycline in the air was studied. Among the solvents investigated, the most suitable was 0.1 N, HCl solution, since this produced the highest optical density in the ultraviolet. The method is fairly sensitive (0.01 micrograms/ml) but nonspecific, interference being encountered from other organic compounds which absorb similar wavelengths.**

02581

K. Wettig

MODIFIED METHOD OF DETERMINING 3,4-BENZPYRENE IN THE ATMOSPHERE. (Modifitsirovannyi metod opredeleniya 3,4-benzpirena v atmosfernom vozdukh.) Hyg. Sanit. 29, (6) 66-8, June 1964.
CFSTI: TT65-50023/6

For the purpose of determining 3,4-benzpyrene absorbed on dust particles in the atmosphere, benzene extraction is used in the majority of cases. The extract is subjected to chromatographic fractionation on columns; the fractions containing 3,4-benzpyrene are evaporated, and the residue is dissolved in cyclohexane. Benzpyrene is determined from absorption spectra in the ultraviolet region or by fluorescence spectra. The Grimmer method described by author is characterized, when the work is properly performed, by a high degree of sensitivity (0.5-1 microgram of benzpyrene/ml), by a loss of material averaging 10-15%, and by reproducibility of the results. The polycyclic aromatic hydrocarbons interfering with quantitative evaluation of the benzpyrene spectrum (1,12-benzperylene, benzofluoranthene) are particularly well separated. The determination of 3,4-benzpyrene by the method described takes 1 1/2 - 2 days.##

02595

I. M. Al'shits, T. A. Anikina, E. A. Babenkova, and N. M. Grad

DETERMINATION OF STYRENE AND CUMENE HYDROPEROXIDE IN THE AIR WHEN THEY ARE PRESENT TOGETHER. (Opredelenie v vozdukh stirola i giperiza pri ikh sovvestnom prisutstvii.) Hyg. Sanit. 29, (9) 64-7, Sept. 1964.

CFSTI: TT65-50023/9

Of the known methods of determining styrene in air in the presence of cumene hydroperoxide the simplest and most specific is the Ivanov method, based on colorimetry of yellow products of styrene transformation by concentrated sulfuric acid. Of the known methods of determining cumene hydroperoxide in air in the presence of styrene the most sensitive and specific is the Alekseeva method, based on colorimetry of pink combination products of phenol and diazotized p-nitroaniline, obtained from the decomposition of cumene hydroperoxide by the action of concentrated sulfuric acid. Both methods are sufficiently sensitive and specific for the analysis of the air of room containing mixtures of styrene and cumene hydroperoxide.##

02601

V. I. Vashkov, A. P. Volkova, V. M. Tsetlin, and E. Y. Yankovskii

DETERMINATION OF THE TOXICITY OF PROPELLANTS USED IN AEROSOL TANKS. (Opredelenie toksichnosti propellantov, ispol'zuemykh v aerol'nykh ballanokh.) Hyg. Sanit. 29, (10) 74-9, Oct. 1964

CFSTI: TT 65-50023/10

An azeotropic mixture of 60 percent tetrafluoromono-chlorethane (Freon 124) and 40 percent octafluorocyclobutane (Freon C 318) was studied as a propellant for pesticide cylinders. Judging by the elasticity of the saturated vapors and the chemical stability, this mixture resembles that of Freons 11 and 12. The azeotropic mixture of Freons 124 and C 318 with concentrations used for practical purposes is non-toxic for warmblooded animals. A slight irritation of the mucous membranes of the eyes may occur if the concentration is exceeded 20-30 times, i.e., up to 10-15 g/cu. The mixture with the concentration of 15 g/m and over produced a slight narcotic effect. (Author abstract)##

P. A. Korotkov, N. N. Serzhantova, Y. P. Tsyashchenko,
and N. Y. Yanysheva

DETERMINATION OF SMALL CONCENTRATIONS OF
1,2,5,6-DIBENZANTHRACENE. (Opredelenie malykh kontsentratsii
1,2,5,6-dibenzantratsena.) Hyg. Sanit. 29, (12) 59-64, Dec.
1964.

CFSTI: TT 65-50023/12

A sensitive and accurate method is suggested for the analysis of 1,2,5,6-dibenzanthracene. A detailed study of the luminescence of 1,2,5,6-dibenzanthracene in various crystalline matrices at the temperature of liquid oxygen was made. Of the solvents investigated, hexane was found to be the only solvent which gave a characteristic luminescence spectrum consisting of sufficiently narrow lines and bands at the temperature of liquid oxygen. In all other solvents, the bands were wide and amorphous and the corresponding wavelengths were impossible to determine with the accuracy required for the purpose of analysis.##

G. Schonauer

PARTICLE SIZE ANALYSIS OF PARAFFIN AEROSOLS BY ELECTRON
MICROSCOPY. Staub (English Translation) 25, (4) 24-8, Apr.
1965.

CFSTI TT 66-51040/4

A method of determination of particle-size distribution of paraffin aerosol is described which enables spherical particles which are unstable in the electron microscope to be measured with an error below plus or minus 5%. The particles are precipitated in a thermal precipitator and, in order to maintain the spherical shape, are vapour treated with strong cooling. The shadows of the spheres are photographed and measured electron-microscopically. (Author summary)##

H.O. Hettche

THE MEASUREMENT OF POLYCYCLIC AROMATICS IN THE ATMOSPHERE.
Staub (English Translation) 25, (9) 41-4, Sept. 1965.

CFSTI TT 66-51040/9

Methods for collecting, separating and measuring aromatic polycyclic hydrocarbons in air are described. Investigations have shown that concentrations of 13 aromatics contained in dust corresponded, in a medium-size town, large town and industrial town of Nordrhein-Westphalia, to 1:1.5:2.5. In the industrial town the content of anthracene and phenanthrene was comparatively higher, and in the medium-size town the content of coronene as a result of special emission sources.##

02747

W. J. Jacumin and L. A. Ripperton

FURTHER EFFECTS OF TEMPERATURE AND PRESSURE ON PHOTOCHEMICAL OXIDANT PRODUCTION. J. Air Pollution Control Assoc. 14, (3) 96-7, Mar. 1964. (Presented at the 56th Annual Meeting, Air Pollution Control Association, Detroit, Mich., June 9-13, 1963, Paper No. 63-101.)

Oxidant production was observed for a photochemical reactant system NO₂ plus hexene-1 over a pressure range of 640 to 860 mm Hg at temperatures of 14, 25, and 35 C. An apparent inhibition took place around 714 mm at all temperatures. From a low at 714 oxidants values rose to a secondary peak at 700 mm and then dropped with decreasing pressure. The significance of these results is discussed. (Author abstract)##

02785

R. H. Linnell and W. E. Scott

DIESEL EXHAUST ANALYSIS (PRELIMINARY RESULTS). Arch. Environ. Health 5, 616-25, Dec. 1962.

Interest in the emissions from the exhaust of diesel engines on the road is rising mainly because interest in possible sources of air pollution has been steadily increasing. However, the problems of sampling and analysis of diesel exhaust have not been solved yet. This paper outlines of the techniques being used and some being evaluated for the first time for exhaust analysis. Many analytical problems remain to be solved. Some results are presented which are considered preliminary.##

02786

R. H. Linnell and W. E. Scott

DIESEL EXHAUST COMPOSITION AND ODOR STUDIES. J. Air Pollution Control Assoc. 12, (11) 10-5, Nov. 1962.

Some of the techniques being used and evaluated for exhaust analysis are outlined. Results except for some qualitative and tentative findings are shown in tables 1-8. Most values are averages of 2 or 3 determinations. These determinations were made on new samples taken at different times, with intervals of several weeks elapsing in some cases. Particulate matter information in table 1 indicates organic compounds adsorption. This is of interest in eye irritation and odor work since aldehydes may be present on particulate matter in higher concentrations than are present in the gas phase. The CC14 extracts of particulate matter show infrared bands characteristic of hydrocarbons, olefins, aldehydes, and carbonyl. Comparison of hydrocarbon measurements, formaldehyde and acrolein, and miscellaneous compounds are discussed. 26 references.##

E. Sawicki, T. W. Stanley, W. C. Elbert, and J. D. Phaff

APPLICATION OF THIN-LAYER CHROMATOGRAPHY TO THE ANALYSIS OF ATMOSPHERIC POLLUTANTS. Simplified Analysis for Benzo(a)pyrene. Preprint. (Presented at the 152nd Meeting, American Chemical Society, New York City, Sept. 13, 1966.)

RB values and fluorescent colors have been obtained through thin-layer chromatography of 20 polynuclear aromatic hydrocarbons with the following absorbents and developers: alumina with pentane:ether (19/1;v/v), cellulose acetate with ethanol:toluene:water (17/4/4; v/v) and cellulose with dimethylformamide:water (1/1, v/v). Of the three absorbents alumina gave the best separation of fluorescent organic compounds from the organic fractions of airborne and air pollution source particulates. The pattern and fluorescent color of the spots of a thin-layer chromatogram varied with the type of pollution. In samples from communities with different types of pollution different types of patterns were obtained. The different fractions obtained from organic airborne particulates - e.g. aliphatic, aromatic neutral oxygenated, basic, acidic, and water-soluble fractions - exhibited entirely different patterns. The cellulose acetate absorbent system gave best results for the separation of the benzpyrene fraction obtained in column chromatography. The cellulose absorbent system gave the best results for the separation of the polynuclear aromatic hydrocarbons. The greatest range in RB values was obtained with this absorbent. Two methods for the estimation of benzo(a)pyrene following thin-layer chromatography are described. One method involves ultraviolet analysis at 382 microgram; the other method involves spectrophotofluorometric analysis in sulfuric acid. (Author summary)##

02796

Sawicki, E., R. Schumacher, and C. R. Engel

COMPARISON OF MBTH AND OTHER METHODS FOR THE DETERMINATION OF SUGARS AND OTHER ((ALPHA))-GLYCOLIC DERIVATIVES. APPLICATION TO AIR POLLUTION. Microchem. J., 12(3):377-395, Sept. 1967. 15 refs.

Methods for the determination of aldoses, ketoses, and other alpha-glycolic compounds are described. The various methods are compared through their use in the determination of ribose. These methods include the direct and oxidative MBTH, and the azulene, J-acid, orcinol, and pyrogallol procedures. The oxidative MBTH procedure introduced in this paper is especially sensitive for the determination of alpha-glycolic compounds as shown by the high molar absorptivities (=approx. 100,000) obtained for ethylene glycol, glycerol, and other polyols. Airborne particulates obtained from various cities contain a substantial amount of water-soluble alpha-glycolic compounds. In addition, a variety of dust samples have been found to contain a large quantity of water-soluble alpha-glycolic compounds and lesser amounts of adsorbed aliphatic aldehydes. Chromatographic media were found to be contaminated with these chemicals. (Author abstract)##

02797

E. Sawicki, W. Elbert, T. W. Stanley, T. R. Hauser,
and F. T. Fox

THE DETECTION AND DETERMINATION OF POLYNUCLEAR HYDROCARBONS IN
URBAN AIRBORNE PARTICULATES. I. THE BENZOPYRENE FRACTION.
Intern. J. Air Pollution 2, 273-82, Mar. 1960.

A new simple procedure for the determination of benzo(a)pyrene in
complex mixtures is introduced. A comparison of the concentration
of benzo(a)pyrene in the air of nine cities for the month of
November, 1958, is given. Evidence is presented for the
identification of each hydrocarbon found in the benzopyrene
fraction. The relative concentration of benzo(a)pyrene,
benzo(e)pyrene, benzo(k)fluoranthene and perylene in the nine
cities is approximately constant. (Author abstract)##

02798

E. Sawicki, J. Noe, and T. W. Stanley

A NEW TEST FOR THE DETECTION OF ARALKYL AND DIALKYL KETONES
CONTAINING THE OC-CH₂-GROUPING. Preprint. 1960.

A new simple color test for dialkyl and aralkyl ketones containing
the structure, R-CO-CH₂-, is introduced. Limits of
identification for some 50 ketones are recorded. A positive test
is revealed by a blue and occasionally a violet color with wave
length maxima ranging from 560-590 millimicrons. The advantages
and the shortcomings of the test are discussed. (Author
summary)##

02799

E. Sawicki and J. L. Noe

A SENSITIVE NEW METHOD FOR THE DETERMINATION OF NITRITES AND
NITROGEN DIOXIDE WITH 4-AMINOAZOBENZENE-1-NAPHTHYLAMINE.
Anal. Chim. Acta 25, 166-9, 1961.

A sensitive method for the determination of nitrites is
introduced. The method should also be applicable to the
determination of nitrogen dioxide. The test consists of the
reaction of 4-aminoazobenzene and 1-naphthylamine with nitrous
acid to form the blue dication of
4-(p-phenylazophenylazo)-1-naphthylamine. Beer's Law was
obeyed from 0.5 to over 15 micrograms of nitrite ion per 15 ml of
final solution. Spectrophotometrically it is possible to detect
part of nitrite ion in 60 million parts of solution. (Author
summary)##

E. Sawicki, T. W. Stanley, and J. Noe

SIMPLE SENSITIVE TEST FOR COMPOUNDS CONTAINING THE CYCLOPENTADIENE CH₂ GROUPING. APPLICATION TO AIR POLLUTION. Anal. Chem. 32, 816-7, June 1960.

The reaction of 1,2-dinitrobenzene, 1,4-dinitrobenzene and 1,4-dinitronaphthalene in alkaline solution with compounds containing the cyclopentadiene CH₂ group results in a stable blue to green color with long wave length maxima ranging from 600 to 750 millimicrons. The wave length maxima and identification limits obtained from the reaction of 1,2-dinitrobenzene with over 100 fluorene derivatives have been tabulated. In a neutral aromatic fraction this test appears to be specific for the cyclopentadiene CH₂ grouping. The presence of fluorene and benzo(a)-and/or benzo(b)-fluorene in airborne particulates has been confirmed with the help of the test procedure. (Author summary)##

02803

E. Sawicki and T. R. Hauser

SPECTROPHOTOMETRIC DETERMINATION OF 4-AMINOAZOBENZENES, 4-AMINOSTILBENES, SCHIFF BASES, AND ANALOGOUS COMPOUNDS WITH 3-METHYL-2-BENZOTHAZOLONE HYDRAZONE. Preprint. 1961

3-Methyl-2-benzothiazolone hydrazone is shown to be a powerful and versatile electrophilic reagent which can be used for the spectral detection and determination of strongly nucleophilic molecules containing a carbon atom of high electron density. The determination of approximately 50 azo dyes and a smaller group of stilbene and Schiff base derivatives by a new procedure for these compounds is described. 4-amino-, 4-alkylamino, and 4-dialkylamino derivatives of azobenzene can be readily analyzed. The determination of N,N-dialkyl-4- aminoazobenzene was thoroughly investigated. Beer's law was obeyed from 1 to more than 70 micrograms of compound per 10 ml of final solution. The color was stable for approximately 1/2 hour. The molar absorptivity for N,N-dimethyl-4-aminoazobenzene was 70,000. N,N-Dimethyl-p-aminostilbene reacted readily in the procedure; it had a molar absorptivity of 119,000. The procedure should prove of value in the detection and determination of two types of carcinogens, the aminoazobenzenes and the aminostilbenes. (Author summary modified)##

02805

E. Sawicki, T. R. Hauser, and T. W. Stanley

ULTRAVIOLET, VISIBLE, AND FLUORESCENCE SPECTRAL ANALYSIS OF POLYNUCLEAR HYDROCARBONS. Intern. J. Air Pollution 2, 253-72, Mar. 1960. (Presented at the 136th National Air Pollution Symposium, American Chemical Society, Atlantic City, N.J., Sept. 1959.)

A novel approach to the analysis of polynuclear hydrocarbons in mixtures is introduced. On the basis of this approach a new

simple, sensitive, and specific test for benzo(a)pyrene was developed. In a mixture of 50 compounds containing benzene, naphthalene, anthracene, phenanthrene, benz(a)anthracene, benzo(c)phenanthrene, chrysene, pyrene, benzo(5)fluoranthene, benzo(e)pyrene, perylene, benzo(g,h,i)perylene, anthanthrene, and coronene, benzo(a)pyrene can be identified unequivocally. The UV visible, activation, and fluorescence spectra in pentane of a large number of polynuclear hydrocarbons are presented. The fluorescence intensities of the different hydrocarbons are compared. Some, like anthanthrene and perylene, have an extremely high intensity, which simplifies their detection in a mixture. The sensitivity of the fluorometric methods are of the order of millimicrograms per milliliter, or parts per billion. From a comparison of the activation spectra in pentane and sulfuric acid of different hydrocarbons, it can be ascertained whether a given hydrocarbon can be determined in the presence of hydrocarbons of somewhat similar structure. In many instances it is possible to obtain the pure fluorescence spectrum of an aromatic hydrocarbon by determining the spectrum of the mixture at an appropriate activation wavelength maximum of the aromatic hydrocarbon. Thus benzo(e)pyrene can be determined in the presence of benzo(a)pyrene and vice versa. Perylene or anthanthrene can be detected readily in a complicated mixture of some 25 analogous hydrocarbons. Naphtho(2,3-a)pyrene can be detected in a mixture of 50 polynuclear hydrocarbons. Many other possibilities are apparent from an examination of the activation spectra of the hydrocarbons. The quenching effect of a fairly high concentration of miscellaneous compounds in a mixture as it affects fluorometric analysis for some particular hydrocarbons is also discussed. (Author abstract)

02843

E. Sawicki and H. Johnson

NEW METHOD FOR THE PHOTOMETRIC DETERMINATION OF PRIMARY AMINES.
Chemist-Analyst 55, 101-3, Oct. 1966.

A highly selective and sensitive method for the photometric determination of primary amines, including amino acids and aliphatic and aromatic amines has been devised based on the reaction of the amine with succinaldehyde formed in situ from 2,5-dimethoxytetrahydrofuran, and then reaction of the N-substituted pyrrole formed with p-(dimethylamino) benzaldehyde (Procedure A) or with p-(dimethylamino) cinnamaldehyde (Procedure B). Amides, pyrimidine and purine amines, and secondary and tertiary amines do not undergo the reactions and do not interfere.**

02848

Jackson, M. W.

ANALYSIS FOR EXHAUST GAS HYDROCARBONS - NONDISPERSIVE INFRARED VERSUS FLAME-IONIZATION. J. Air Pollution Control Assoc. (Presented at the Instrument Society of America, New York City, Oct. 1962.) 11(12):697-702, Dec. 1966.

An investigation has been made of the suitability of a nondispersive infrared analyzer and two flame-ionization analyzers for measuring the total hydrocarbon concentrations of automobile exhaust gas. The investigation consisted of measuring relative responses of various hydrocarbons, checking for possible exhaust gas interferences and finally comparing exhaust hydrocarbon concentrations indicated by the flame-ionization analyzer to those indicated by the infrared analyzer. The infrared analyzer has high relative responses for paraffins and low responses for olefins, acetylenes, and aromatics. Also, the infrared indicated hydrocarbon concentrations must be corrected for exhaust water vapor interference.##

02854

K. Marcali A.L. Linch

PERFLUOROISOBUTYLENE AND HEXAFLUOROPROPENE DETERMINATION IN AIR. Am. Ind. Hyg. Assoc. J. 27, (4) 360-8, Aug. 1966. (Presented at the 26th Annual Meeting, American Industrial Hygiene Association, Houston, Tex., May 6, 1965)

Both perfluoroisobutylene (PFIB) and hexafluoropropene (HFP) react in methanol with a mixture of pyridine and piperidine to produce a stable yellow color at 25 C which is measured spectrophotometrically at 412 millimicrons or visually compared with permanent secondary standards. In the presence of acetic acid only HFP undergoes the color-forming reaction with piperidine. The PFIB concentration can be determined by difference. The effect of various halogenated compounds with and without the R-C equals CF₂ (R equal -F, -CF₃) function is presented. With a 0.1-cubic-foot sample at 25 C, the method will detect 0.1 ppm of PFIB or 0.02 ppm of HFP. A lightweight easily portable field kit with a "Uni-Jet" aspirator has been developed for field surveys. (Author abstract)##

02875

C. D. Watkins and D. E. Hillman

THE EXAMINATION OF COMMERCIAL SOLVENTS BY GAS-LIQUID CHROMATOGRAPHY. PART I. ALIPHATIC HYDROCARBONS. Chemical Inspectorate, London (England). (CI Memo. 185) Dec. 1965, 17 PP.

DDC AD 483883

Aliphatic hydrocarbon solvents are of major industrial importance and find uses in a wide range of products, e.g. paints, cleaning solvents, fuels, polishes, etc. Gasoline, petroleum ethers, white spirit, kerosene and similar solvents are complex mixtures of aromatic, naphthenic and aliphatic hydrocarbons with the latter type as the main component. In the simplest cases there are comparatively few ingredients but as the boiling range increases the number of possible constituents increases enormously. Such solvents can however be identified by comparing the chromatogram of the sample with that of known solvents under similar conditions. This has been done successfully for many years but occasionally the chromatograms of samples have not matched those of the standards, or alternatively agreement has been only moderate, with

consequent uncertainty as to whether other ingredients have been deliberately added or whether the discrepancy is due to variations between different manufacturers' specifications for what is nominally the same solvent. The main purpose of this report is to list a number of fingerprint chromatograms for such solvents and in some cases to consider the variations between products from different sources. A second purpose is to outline methods for specific separations e.g. of aliphatic and aromatic solvents.##

028861

H. Konosu and Y. Mashiko

DESIGN OF A NON-DISPERSIVE ULTRAVIOLET GAS ANALYZER AND ITS APPLICATION TO QUANTITATIVE MEASUREMENT OF TRACES OF TOXIC GASES AND VAPORS IN AIR. (Hibunsangata Shigaisen Gasu Bunsekikei no Shisaku oyobi Sono Yugai Gasu.Joki Bensekikie no.) Kogyo Kagaku Zasshi 68, 1868-72, 1965. (O.N.I. Translation 2127)
DDC AD 482365

A non-dispersive UV gas analyzer for measuring the concentration of toxic gases and vapors in the air is reported. This analyzer is a device which measures simultaneously the differences in the UV absorption of a standard gas and a test gas over the total range of wave lengths. The optical source employs a hydrogen discharge tube and the optical system is a complex optical path system. The gas cell is 50 cm long and a secondary electron multiplier is used as an optical receiver tube. This analyzer was used to measure 6 types of samples and to compile detection lines. Values for the sample and detection limits (ppm) were 3 for sulfur dioxide, 28 for carbon disulfide, 27 for benzene, 32 for acetone, 34 for methyl ethyl ketone, 13 for trichloroethylene. The relative error below 100 ppm for sulfur dioxide was plus or minus 9.0% plus or minus 4.0% for 100-1000 ppm, and 1.5% for 1000-1250 ppm. This method can be used for 1-min. measurements, for the measurement of toxic gases and vapors in working environments, and for determining lower explosive limits. (Author abstract modified)##

02963

H. W. Schlipkoter

THE INJURIOUS EFFECTS OF ATMOSPHERIC DUSTS. Staub English Transl.) 25, (10) 2-11, Oct. 1965.
CFSTI: TT66-51040/10

Increasing industrialization, growing population, traffic density and closeness of industrial areas and residential districts necessitate the continuous measurement, analysis and control of air pollutants. Each method must be selected critically. Proposals are made for a suitable dust measuring method. The effect of air pollutants on breathing and, in particular, their influence on the purifying action of the lungs must be considered first of all. More attention must be paid to dust as a carrier and catalyst, to soot with its cytotoxic effects and to polycyclic aromatic compounds. Instructions for controlling air pollution should take into account the protection of sick persons. (Author summary)##

H. Devorkin, R.L. Chass, A.P. Fudurich, C.V. Kanter

SOURCE TESTING MANUAL. Los Angeles County Air Pollution Control District, Calif. 181 pp., Nov. 1965

Specialized methods and techniques for the curtailment of contaminants being released into the atmosphere, developed in the laboratory and in the field are described in this manual. These methods are concerned primarily with the measurement of emissions from stationary sources, and in general, with little or no modification, these methods can also be used for testing vehicles or other moving sources. Information obtained from source tests is invaluable as a guide in selecting appropriate control equipment and improving the design of future installations to minimize the discharge of air contaminants. Following topics are discussed: Planning a source test; Determination of gas flow rate; Collection and analysis of particulate matter, and of gaseous constituents; Odor measurement; Source test report. The appendixes deal with rules and regulations, conversion factors and constants, and auxiliary field sampling equipment.##

03059

A. P. Altshuller and I. R. Cohen.

APPLICATION OF DIFFUSION CELLS TO THE PRODUCTION OF KNOWN CONCENTRATIONS OF GASEOUS HYDROCARBONS. Anal. Chem. 32, (7) 802-10, June 1960

Diffusion coefficients have been determined for a number of hydrocarbons, including 2-methyl-1, 3-butadiene, hexane, 1-hexene, heptane, 1-octene, decane, benzene, and toluene. Diffusion coefficients at a number of temperatures have been determined for hexane, 1-hexene, heptane, 1-octene, decane, and benzene. The effect of turbulence at the end of the diffusion tube, resulting from the rapid flow of carrier gas over the top of the tube, has been investigated as a function of gas flow rate, temperature, diffusion tube diameter, and tube length. These results, with related data in the literature, should aid in defining the experimental limits within which a diffusion tube apparatus may be operated so that calculated values of diffusion rate can be used, if one experimental value of the diffusion coefficient is available for the liquid compound of interest. (Author abstract)##

03080

E. Sawicki

THE SEPARATION AND ANALYSIS OF POLYNUCLEAR AROMATIC HYDROCARBONS PRESENT IN THE HUMAN ENVIRONMENT. Chem. Anal. (Warsaw) 53, 24-6, 28-30, 56-62, 88-91, 1964

The steadily increasing rate of lung cancer has stimulated efforts to analyze the polynuclear hydrocarbons which are

a group of carcinogens with which human beings come into contact with in varying degrees. Because the polycyclic hydrocarbons are present usually in very low concentrations together with thousands of other types of compounds, separation is an essential part of their determination. Methods used to accomplish this separation include: sublimation, distillation, solid-liquid extraction, liquid-liquid extraction, column chromatography, paper chromatography, thin-layer chromatography, gas chromatography. These methods are reviewed along with analysis procedures involving absorption spectra, fluorescence spectra and phosphorescent spectra. Two hundred and forty references are included.##

03081

E. Sawicki, T.R. Hauser, S. McPherson

SPOT TEST DETECTION AND SPECTROPHOTOMETRIC DETERMINATION OF COMPOUNDS CONTAINING THE P-HYDROXYSTYRYL GROUP: 3-METHYL-2-BENZOTHAZOLINONE HYDRAZONE PROCEDURE. Chem. Anal. (Warsaw) 50, 68-9, Sept. 1961

In the present study the reagent was applied to the detection and determination of compounds containing the p-hydroxystyryl or p-alkoxystyryl grouping. The test is highly selective for phenols containing a p-vinyl group (and their ethers) as compared to phenols (and ethers) without a vinyl group. It is possible that phenols with an o- or m-vinyl group will react as phenols to give a red-orange color. A p-hydroxy compound having a allyl group, i.e., where a methylene group is placed between the ethylenic double bond and the benzene ring, gives practically no reaction. Eugenol and safrol show this phenomenon and the slight reactions observed are probably due to impurities such as isoeugenol and isosafrole. The spot test procedure was tried with several derivatives of p-hydroxystyrene which gave a reaction in the spectrophotometric procedure. The identification limits ranged from about 0.1 to 0.7 microgram. Phenol and polycyclic phenols gave negative results.##

03096

N.A. Lyshkow

A RAPID AND SENSITIVE COLORIMETRIC REAGENT FOR NITROGEN DIOXIDE IN AIR. J. Air Pollution Control Assoc. 15, (10) 481-4, Oct. 1965 (Presented at the 58th Annual Meeting, Air Pollution Control Association, Toronto, Canada, June 20-24, 1965)

High speed instrumentation requires a colorimetric reagent capable of detecting traces of nitrogen dioxide with little delay for color development. Rate of color development and sensitivity of Griess-type reagent have been improved by adding a promoter (R-salt) and optimizing the concentrations of diazotizing and coupling reagents. Field tests show that the new instrument-reagent combination can resolve short-duration peaks in NO₂ concentrations of 5 to 10 pphm. (Author abstract)##

03103

J. Harkins S.W. Nicksic

STUDIES ON THE ROLE OF SULFUR DIOXIDE IN VISIBILITY REDUCTION.
J. Air Pollution Control Assoc. 15, (5) 218-21, May 1965.

Highly sensitive radiotracer techniques were used to see if the sulfuric acid mist from sulfur dioxide oxidation allows the incorporation of organic matter. Tagged organic compounds were irradiated with and without sulfur dioxide. When the aerosol was filtered off, no radioactivity was found on the filter paper showing the absence of organic matter and the lack of sulfur dioxide synergism. (Author abstract)**

03112

E.R. Stephens M.A. Price

A SEARCH FOR SOME NITRO-OLEFINS IN POLLUTED AIR. J. Air Pollution Control Assoc. 15, (7) 320-2, July 1965.

An electron capture chromatographic method of detecting nitro-ethylene and 1-nitro-1 propene was developed and applied to ambient air samples, photolyzed propene/nitrogen dioxide mixtures and auto exhaust. No trace of either compound was found in ambient air or in the photolyzed mixtures. The detection limit was estimated to be 1 ppb. A single sample of auto exhaust showed several small peaks which, if attributed to nitro-olefin, would amount to insignificant traces. (Author abstract)**

03185

D. L. Venezky and W. B. Moniz.

METHOD FOR ON-SITE DETERMINATION OF RESIDUAL ADSORPTIVE CAPACITY OF CHARCOALS USED IN CLOSED ENVIRONMENTAL SYSTEM. Naval Research Laboratory, Washington, D.C. (NRL Memorandum Rept. 1710). Aug. 31, 1966. 21 pp.
CFSTI, DDC AD 639145

The relationship between the moisture content of adsorbent-type charcoals and their residual adsorptive capacity for organic compounds was studied. Investigation of fourteen charcoal samples from submarine main-carbon filters has shown that the moisture content of the charcoals correlates with the organic loading previously determined by a steam desorption method. A simple apparatus for determining the moisture content of a charcoal sample was devised, in which continuously recirculated air in a closed-loop system transfers water from a charcoal sample to a desiccant. The moisture content of the charcoal is determined by weighing the sample and desiccant tubes before and after water transfer. The on-site determination of the residual adsorptive capacity of main-filter charcoals is suggested by the low cost of the closed-loop apparatus and the simplicity of the method. For a monitoring procedure, a reference charcoal sample, prepackaged for handling ease, could be exposed to submarine atmospheres, thus avoiding the removal of samples from the main-filter bed. Rather than a fixed exposure period, the

remaining adsorptive capacity of the charcoal would determine the time for replacement. Safety is enhanced, since heavy organic loading of the charcoal brought about by unusual circumstances could be rapidly detected. Since 70% of the charcoal samples which were investigated had more than half of their adsorptive capacity remaining, substantial savings should result. Some charcoals meeting the requirements of specification MIL-C-17605A are anomalous with respect to water content; this behavior is being investigated. (Author abstract)##

03253

Sawicki, E. and R. A. Carnes

SPECTROPHOTOFUORIMETRIC DETERMINATION OF ALDEHYDES WITH DIMEDONE AND OTHER REAGENTS. Mikrochim. Acta (Vienna, No. 1:148-159, 1968. 16 refs.

Two new reagents, dimedone and 1,3-cyclohexanedione, are introduced for the fluorimetric determination of aliphatic aldehydes. Six fluorimetric methods for the determination of formaldehyde and other aldehydes are compared. Of the selective methods for the determination of formaldehyde the J-acid procedure is recommended when a high order of sensitivity is necessary, the 2,4-pentanedione method when a high order of selectivity is desirable. The dimedone procedures are recommended when it is necessary to analyze for aldehydes other than formaldehyde. However, the dimedone procedures are the most sensitive for the determination of formaldehyde and can be used for this purpose where conditions are appropriate and maximal sensitivity is necessary. These various procedures should also be useful in the analysis of various types of aldehyde precursors.##

03234

R. S. Tipson, A. Cohen, and A. J. Fatiadi

AIR POLLUTION STUDIES. National Bureau of Standards, Washington, D.C. (NBS Technical Note 405) 1-28, 1966

The oxidation of polycyclic aromatic hydrocarbons is described. Results are reported for the oxidation of naphthalene, anthracene, phenanthrene, pyrene, and perylene with a variety of oxidants. Oxidation products are identified where possible. The results obtained with periodic acid as an oxidant are particularly noteworthy. Studies of photooxidation of the polycyclic hydrocarbons on silica gel, alumina, soil, and air-borne particulate matter have revealed, for each hydrocarbon, products that may arise in contaminated air under smog conditions. (Author abstract)##

03267

M. P. Sweeney and J. N. Pattison

A NEW AUTOMOBILE EXHAUST ANALYTICAL TRAIN. Proc. Tech. Meeting West Coast Section, Air Pollution Control Assoc., 3rd, Monterey, Calif., 1963. 93-105 pp.

Data has been developed to permit the recommendation of the dilution technique with a hexane detector to minimize zero shift problems. It is suggested that the hexane detector may be operated at a span of about 3000 ppm, with dilution ratio of 3 to 1. It is recommended that the flow through the instruments be in parallel. It is concluded that the propylene detector gives results relative to hexane which are in the direction expected for variations between high and low emitting modes and vehicles.##

03291

S. Balestrieri, and M. Feldstein

THE DETECTION AND ESTIMATION OF PART PER BILLION CONCENTRATIONS OF HYDROCARBONS. Preprint. (Presented at the Sixth Conference on Methods in Air Pollution Studies, California Dept. of Public Health, Berkeley, Calif., Jan. 6-7, 1964.)

A liquid nitrogen freeze-out step has been added to the gas chromatographic analysis of hydrocarbons using a flame ionization detector. Concentrations in the low ppb range of C2 and higher hydrocarbons can accurately be determined. Contaminant concentrations of these compounds have been measured in nitrogen, helium and hydrogen cylinders. (Author summary)##

03354L

J. H. Sullivan, D. H. Robertson, and C. Merritt, Jr.

THE DETERMINATION OF THE VOLATILE COMPONENTS OF FOODSTUFFS. III. COFFEE AROMA. Quartermaster Research and Engineering Center, Natick, Mass., Pioneering Research Division. (Research Report Analytical Chemistry Series No. 12.) (Presented before the Division of Agricultural and Food Chemistry, 135th National Meeting, American Chemical Society, Boston, Mass., Apr. 1959.) Sept. 30, 1959. 16 pp. CPSTI DDC 636331

Mass spectrometric analysis has led to the identification of several components of coffee aroma. The volatile compounds from ground roasted coffee are collected by distillation under high vacuum at room temperature into a receiver at liquid nitrogen temperature. Direct fractionation of a "center cut" on the mass spectrometer and subsequent analysis has shown the presence of more than twenty compounds. Among the compounds identified are furans, aldehydes, esters, alcohols, nitriles and sulfur compounds. The techniques which have been used offer the following advantages: (1) The method of collection by vacuum distillation in a closed system is superior to other methods of collection. (2) A minimum of sample handling reduces greatly any loss of material. (3) Direct analysis on the spectrometer permits a complete qualitative analysis in a rapid, efficient manner and also provides for the extension to quantitative analysis, if desired. (Author abstract)##

S. Hantzsch and K. E. Prescher

ANALYZING AMINE TRACES IN ATMOSPHERIC AIR. STAUB (English Transl.) (Duesseldorf) 26, (8) 28-32, Aug. 1966.

A report on the concentration of primary aliphatic amines in air is given. Absorption tests on low concentration of amines in air were carried out in diluted hydrochloric acid, using wash bottles and impingers. Material losses during the concentration of absorption solutions were also evaluated. Practical experience in extracting primary aliphatic C1 to C6 amines with amylic ester is reported. Reaction of primary amines with ninhydrine was used for photometric amine determination. (Author summary)##

03425

S. B. Smith and R. J. Grant.

A NON-SELECTIVE COLLECTOR FOR SAMPLING GASEOUS AIR POLLUTANTS FINAL REPT.) Pittsburgh Coke and Chemical Co., Research and Development Dept. Dec. 15, 1958. 63 pp.

Tests of the retentive power of various adsorbents indicated activated carbon is superior to silica gel and molecular sieves for the non-selective collection of air pollutant gases. When dry ice is used as a refrigerant on a carbon column it is possible to collect methane and all gases of lower volatility in a sample of reasonable size. Certain oxidizing gases such as NO, NO2 and O3 appear to react with activated carbon and must be considered separately. Columns of various sizes were tested over a wide range of gas concentrations and a column containing 55 grams of Pittsburgh HDL activated carbon chosen to sample 20 liters of air for light contaminants. A smaller column for operation at room temperature containing 1.5 grams of the same carbon may be used ahead of the refrigerated column to collect C4 and higher compounds from 100 liters of air. A field collector kit was designed which affords a preliminary filtration and drying of the air sample, positive displacement measurement of the sample volume, continuous flow measurement and mechanical pumping of the air sample. A helium flushing system for the refrigerated collector is also provided to remove the bulk of air adsorbed from the sample. Prototype columns were tested satisfactorily for retention under exaggerated test conditions on selected hydrocarbon vapors. A few recovery runs indicated that good recovery can be confidently expected after further experimental development of recovery techniques. (Author summary)##

03430

E. S. Watson.

SPECTROPHOTOMETRIC AND CHROMATOGRAPHIC METHOD OF MONITORING SPACECRAFT ATMOSPHERES. Perkin-Elmer Corp., Norwalk, Conn., Electro-Optical Div. 24 pp., Jan. 1964.

The basic principles of spectrophotometry and its application to spacecraft atmosphere monitoring, using a miniaturized CO2 sensor

are described. Also included is a brief summary of the elements of gas chromatography and a comparison of spectrophotometric and gas chromatographic techniques that indicates the way they complement each other for space instrumentation.##

03448

A. P. Altshuller and A. P. Wartburg.

PRESSURE-BROADENING EFFECTS ON INFRARED PEAK INTENSITIES OF HYDROCARBONS. Appl. Spectry. 15, (2) 67-9, 1961.

The pressure-broadening effects of one atmosphere of air or of carbon dioxide on various infrared bands of hydrocarbons have been investigated. Large pressure-broadening effects are shown by ethylene at 10.52 microns and acetylene at 3.1 and 13.7 microns, moderate effects by acetylene at 7.4 microns and propylene at 10.95 microns, and small effects by 1-butene at 10.85 microns, trans-2-butene at 10.375 microns, and benzene at 9.50 microns. The variation of absorbance at several of the infrared absorption maxima of ethylene and acetylene was investigated using varying partial pressures of air or carbon dioxide at fixed partial pressures of the 2 hydrocarbons. (Author abstract)##

03449

Farmer, J. R. and J. D. Williams

INTERSTATE AIR POLLUTION STUDY PHASE II PROJECT REPORT. III. AIR QUALITY MEASUREMENTS. Public Health Service, Cincinnati, Ohio, National Center for Air Pollution Control, 182p., Dec. 1966. 71 refs.

The development of an effective air resource management program begins with the determination of what pollutants are in the air, the quantity of each, and where they originate. The aerometric network was designed and operated to determine the nature and extent of air pollution in the Metropolitan St. Louis area. Once the air pollution problem is defined, the emission inventory and the opinion surveys can be used in connection with air quality criteria to set the air quality goals. Then the aerometric network will be used to monitor the air to insure the goals are attained. The salient portions of this report are the tabular data on particulates, gaseous pollutants, and material deterioration.##

03485

M. J. D. Low and S. Coleman

THE MEASUREMENT OF INFRARED EMISSION SPECTRA USING MULTIPLE-SCAN INTERFEROMETRY. Preprint. 1964

A multiple-scan interference spectrometer is described, as are exploratory experiments on the application of the instrument to observe low-temperature emission spectra from solid surfaces. The instrument is highly sensitive and could be used for transmission, reflection, and emission spectroscopy, especially in situations where the signals obtained are weak. (Author abstract)##

03520

R. I. Larsen

PARAMETERS OF AEROMETRIC MEASUREMENTS FOR AIR POLLUTION RESEARCH. Am. Ind. Hyg. Assoc. J. 22, (2) 97-101, Apr. 1961.

A brief description of a continuous gas sampling network is presented in which a number of air pollutants is to be measured in six United States cities beginning about mid 1961. Parameters are presented of aerometric measurements from a two year study of sulfur dioxide in Louisville, Kentucky, to be related to health and other effects. Six equations are developed to depict the frequency, duration, and air pollution dosage. (Author abstract)##

03523

E. Sawicki

ORGANIC SPECTROPHOTOMETRIC ANALYSIS - REVIEW. Record Chem. Progr. (Kresge-Hooker Sci. Lib.) 22, (4) 249-80, 1961.

This paper is not a critical evaluation of procedures in the literature; it is essentially a review of our recent work. The detection and determination of trace amounts of chemicals in the human environment has become one of the prime factors in the necessary attempt to understand and control all aspects of this environment. The chemical composition of the atmosphere is one phase of this problem which is being probed by various methods of trace analysis. These analytical methods are generally applicable to the analysis for microgram or nanogram quantities of organic compounds in extremely complicated mixtures. A knowledge of collection techniques, separation procedures, organic synthetic chemistry, and absorption and fluorescence spectrophotometry (as applied to the ultraviolet, visible, and infrared regions of the spectrum) is invaluable in the origination and application of such methods.##

03527

R. O. McCaldin

EVALUATING AIR POLLUTION PROBLEMS (ACCEPTABLE EQUIPMENT AND PROCEDURES). Arch. Environ. Health 2, 228-33, Mar. 1961.

Some of the more common equipment used in making environmental air quality determination, such as Hi-Volume Samplers, Filter Tape Samplers, Gas Samplers, and simplified monitoring techniques, are discussed. Hi-Volume Samplers are frequently used to measure suspended particulate which may consist of smoke, dust, or other solids small enough to remain air-borne for long periods. This includes particulates under 100 microns in diam, and, for the most part, those less than 1 micron in diam. Fiber glass filters commonly used with this sampler collect practically all particulates down to 0.3 micron in diam. The sampler itself consists of a vacuum cleaner motor with mounting to accommodate an 8-in by 10-in filter. Filter Tape

Samplers are commonly used in the field studies and usually are equipped with a diaphragm pump to draw air through at a rate of about 7 liters/min. Various automatic instruments are used for the continuous collection and recording of gaseous pollutants. However, various manual or semimanually operated bubbler collection trains have been used in the majority of gaseous measurements. Simplified monitoring techniques are discussed in conjunction with dustfall sulfation rates, H₂S, corrosion and fluoride sampling.##

03537

T. R. Hauser, D. W. Bradley

EFFECT OF INTERFERING SUBSTANCES AND PROLONGED SAMPLING ON THE 1,2-DI-(4-PYRIDYL)ETHYLENE METHOD FOR DETERMINATION OF OZONE IN AIR. Anal. Chem., 39(10):1184-1186, Aug. 1967. 4 refs. (Presented at the Division of Water, Air, and Waste Chemistry, 153rd Meeting, ACS, Miami Beach, Fla., April 1967.)

A new method for the sampling and analysis of ozone in the atmosphere involves the collection of atmospheric ozone in a solution of 1,2-di-(4-pyridyl)ethylene (PE) in glacial acetic acid, reaction of the ozone with the PE via the ozonolysis reaction to form pyridine-4-aldehyde, and colorimetric analysis of the resultant pyridine-4-aldehyde using a modification of the 3-methyl-2-benzothiazolone hydrazone method. This paper describes the effect of two additional analytical parameters on the PE method. These parameters, namely the effect of possible interfering substances present in the atmosphere and the effect of prolonged sampling time on final analysis, are very important when any analytical procedure is applied to the field analysis of atmospheric contaminants. The results demonstrate that the method can be used for 24-hr. sampling simply by increasing the volume of absorbing solution since there is no loss of collected ozone from the absorbing solution during a 24 hr. sampling period due to a possible aeration effect.##

03542L

L. Reckner, F. R. Taylor, W. E. Scott, H. J. Wimette

DIESEL EXHAUST COMPOSITION, ODOR AND EYE IRRITATION
(PROGRESS REPORT MAY 1, 1962 TO FEB 15, 1963. Preprint 1963.

Further work with the two-cycle 6-cylinder V-type diesel engine is reported which covers solid and liquid particulate emissions at various operating conditions, odor intensity and eye irritation observations by a human panel at three operating conditions, analyses of the particulate for polycyclic aromatic hydrocarbons and further analyses of the gaseous emissions by long-path infrared and colorimetric techniques. A number of polycyclic aromatic hydrocarbons, including benzo(a)pyrene and several other compounds with reported positive biological activity, have been detected in diesel exhaust by fluorescence spectroscopy. The concentrations of most polycyclics were highest from 1/2 load to 7/8 load with a sharp decrease from 7/8 load to full load. The benzo(a)pyrene concentrations found in diesel exhaust (0.6 to 7.4 micrograms per cubic meter) were

lower than the 8.5 micrograms per cubic meter recently reported for automobile exhaust, but the diesel produced more benzo(a)pyrene (0.15 to 1.3 milligrams) per gallon of fuel than the automobile (0.27 milligrams). Fluorescence analyses of new and used lubricating oil and the rate of oil consumption indicate that the contribution of the oil to the exhaust particulate of this engine is negligible. Values for the emissions of nitrogen dioxide have been revised downward as a result of using an improved sampling technique which minimizes the oxidation of nitric oxide to nitrogen dioxide. Of the three engine operating modes studied, the odor intensities and eye irritation observed by the human panel were lowest at the 1200 RPM-1/4 load condition. It is believed at this time that the eye irritation from the exhaust can be accounted for by the formaldehyde and acrolein found in the exhaust. There is no clear-cut correlation, however, between the concentrations of these aldehydes and the odor differences observed.##

03544

B. E. Saltzman N. Gilbert

MICRODETERMINATION OF OZONE IN SMOG MIXTURES (NITROGEN DIOXIDE EQUIVALENT METHOD). Am. Ind. Hyg. Assoc. J. 20, 379-86, Oct. 1959.

A new method has been presented for conveniently and specifically determining low concentrations of ozone in polluted air, even in the presence of large amounts of other commonly occurring oxidizing or reducing gases. Ozone was stoichiometrically converted to (and determined as) nitrogen dioxide, by addition of controlled amounts of gaseous nitric oxide to the sample air stream and allowing a short reaction flow time. Better than 95% conversion was obtained in a convenient apparatus which was developed, when 1 p.p.m. excess nitric oxide and forty seconds reaction time were used. In the short time allowed, oxidation of nitric oxide by air and organic oxidant was negligible. Results for pure ozone were in good agreement with those of an iodide reagent. For synthetic smog oxidant mixtures (generated by the ozone reaction with 1-hexene) the method appeared specific for ozone, whereas the iodide reagent also responded to organic oxidants. (Thus the mixture could be differentiated into two oxidant components by simultaneous application of the two methods.) Reducing gases such as sulfur dioxide and hydrogen sulfide did not appreciably interfere even in one hundred to one ratio to ozone. The method should make possible interesting new data for polluted air. It should be readily adaptable to automatic recording of ozone in smog without interference from associated pollutants. (Author summary)##

03569

A. J. Andreatch and R. Feinland.

CONTINUOUS TRACE HYDROCARBON ANALYSIS BY FLAME IONIZATION. Anal. Chem. 32, (8) 1021-4, July 1960. (Presented at the Pittsburgh Conference on Analytical Chemistry and Applied Spectroscopy, Pittsburgh, Pa., Feb. 1960.)

An inexpensive, rugged, and portable flame ionization detector has been designed for the continuous analysis of trace amounts of hydrocarbons. The detector is insensitive to inorganic gases but responds to hydrocarbons in proportion to the carbon atom content. A detectable limit of 1 p.p.b. of hexane is obtainable. As an automotive exhaust analyzer, the unit can first measure total unburned hydrocarbons, and then by introducing an 8-inch silica gel column, the unit can determine methane, ethane, ethylene, acetylene, and propylene. (Author abstract)##

03592

S. T. Cuffe

AIR POLLUTANTS FROM POWER PLANTS (TECHNIQUES FOR EVALUATING AIR POLLUTANTS). Arch. Environ. Health 6, 422-7, Mar. 1963. (Presented at the 27th Annual Meeting, Industrial Hygiene Foundation, Pittsburgh, Pa., Oct. 24-25, 1962.)

The objective of the study is to evaluate the emissions of oxides of nitrogen, oxides of sulfur, polynuclear hydrocarbons, total hydrocarbons, total solids, formaldehyde, organic acids, and common metals in the gases emitted from various types of coal-burning power plants which may be useful in establishing the range of atmospheric emissions under various conditions of operation. Determination of the efficiencies of control equipment is also essential for the long-range objective of reducing total air pollution. This paper describes the sampling and analytical techniques used in evaluating the several types of emissions under study.##

03679

A. P. Altshuller and I. R. Cohen

SPECTROPHOTOMETRIC METHODS FOR OLEFINS (COLORIMETRIC DETERMINATION OF CONJUGATED DIOLEFINS). Anal. Chem. 32, (13) 1843-8, Dec. 1960. (Presented at the Division of Water, Sewage, and Sanitation Chemistry, Symposium on Air Pollution, 136th Meeting, American Chemical Society, Atlantic City N. J., Sept. 1959.)

In a new colorimetric method conjugated diolefins are coupled with 2-methoxyethanol-phosphoric acid solvent medium. Isoprene-type diolefins couple to form products with strong absorption near 490 millimicrons, while butadiene couples to form a product with a maximum near 405 millimicrons. The intensities of these maxima are linearly related to concentration between at least 0.3 and 30 millimicrons per ml. for isoprene-type diolefins and 20 and 200 microgram per ml. for 1,3-butadiene. A 2- to 4-hour reaction period is necessary to obtain optimum intensities. No appreciable interference occurs from paraffinic, acetylenic, simple aromatic, and most other types of olefinic hydrocarbons. Some aldehydes, ketones, and phenols interfere moderately. Isoprene has been efficiently collected and determined from dilute isoprene-air mixtures, and in several liquid mixtures containing various other hydrocarbon components, including 1,3-pentadiene, unconjugated diolefins, and various types of mono-olefins. (Author abstract)##

03680

A. P. Altshuller, D. L. Miller, and S. F. Sleva

DETERMINATION OF FORMALDEHYDE IN GAS MIXTURES BY THE CHROMOTROPIC ACID METHOD. Anal. Chem. 33, (4) 622-5, Apr. 1961. (Presented before the Division of Water and Waste Chemistry, 138th Meeting, American Chemical Society, New York City, Sept. 1960.)

The modification of the chromotropic acid method for formaldehyde proposed by West and Sen has been investigated. With only minor variations, the present study confirms the previous findings of reagent concentrations, color stability of the product, and the stability of the reagent solution. A much more detailed investigation of the possible interference of olefins, alcohols, aldehydes and ketones, aromatic hydrocarbons, phenols, and of nitrogen dioxide has been made. Nitrogen dioxide, most aldehydes and ketones, and straight-chain alcohols do not interfere significantly. The interference of olefins and aromatic hydrocarbons can be largely eliminated by the use of appropriate sampling conditions. (Author abstract)##

03684

A. P. Altshuller and I. R. Cohen

DETERMINATION OF PRIMARY NITROPARAFFINS BY THE NITROUS ACID REACTION. Anal. Chem. 32, (7) 881, June 1960.

Nitrous acid reactions with primary nitroparaffins, dinitroparaffins, and a variety of nitroalcohols are reported. To an aqueous solution of a sample containing a nitroalkane, about 0.1 gm of KOH was added to ensure solution; 0.25 gm of KNO_2 and 0.6 ml of 18N H_2SO_4 were added; the solution was shaken with 10 ml of diethyl ether and the layers were separated. The aqueous layer was transferred to the absorption cell. Absorbance at 330 millimicrons was read 5 min after mixing. The final alkaline aqueous extract of 1-nitropropane has an absorption band at 330 millimicrons due to the formation of sodium propylnitrolate. The reaction of HNO_2 with nitroparaffins gives solutions with red-orange or red-brown colors of low intensity, resulting from far weaker absorption in the visible spectrum than that found at 330 millimicrons. The blue color resulting from the reaction of HNO_2 with secondary nitroparaffins is also of low intensity and the visible absorption observed is not usable for determinations in the microgram range. Interferences were determined for a number of other aliphatic nitro compounds. Primary amines as well as large amounts of secondary amines will interfere with the analysis of the primary nitroparaffins.##

03727

A. P. Altshuller, S. F. Sleva, A. F. Wartburg

SPECTROPHOTOMETRIC DETERMINATION OF OLEFINS IN CONCENTRATED SULFURIC ACID. Anal. Chem. 32, (8) 946-54, July 1960. (Presented before the Division of Water, Sewage, and

Sanitation Chemistry, Symposium on Air Pollution, 136th Meeting, American Chemical Society, Atlantic City, N.J., Sept. 1959.)

A new spectrophotometric method for the determination of small quantities of olefins is based on the absorbance produced in the 300 to 310 millimicron range from their reaction with concentrated sulfuric acid. The procedure is insensitive to ethylene under all conditions studied and to propylene concentrations below 1500 p.p.m. Propyl and higher molecular weight alcohols react to form absorbing products at 300 millimicron. Some higher molecular weight aldehydes, nitrogen dioxide, and sulfur dioxide interfere moderately. The method has been applied to the analysis of a number of two component liquid mixtures and to gas mixtures containing butrenes, 1-hexene, or 1-hexene-benzene in air. The experimental evidence favors carbonium ions as the absorbing species. (Author abstract)##

03732

P. Urone J. E. Smith

ANALYSIS OF CHLORINATED HYDROCARBONS WITH THE GAS CHROMATOGRAPH. Am. Ind. Hyg. Assoc. J. 22, (1) 36-41, Feb. 1961. (Presented at the 21st Annual Meeting, American Industrial Hygiene Association, Rochester, N.Y., Apr. 25-28, 1960.)

The qualitative and quantitative behavior of eleven chlorinated hydrocarbons on the gas chromatograph was investigated for possible application to the analysis of their vapors in air. Relative retention volumes and quantitative standardization curves are given. Methods for the sampling and measurement of chlorinated hydrocarbons in air are described. (Author abstract)##

03773

J. May

ODOR THRESHOLDS OF SOLVENTS FOR ASSESSMENT OF SOLVENT ODORS IN THE AIR. STAUB (English Transl.) 26, (9) 34-8, Sept. 1966. Ger (Tr.)

Detection limits of thirty seven (37) solvents were investigated to determine their odor thresholds. Quantitative analyses of vapor concentrations of the solvent mixtures were carried out using gas chromatography. Directives for the limitation of solvent vapor emissions are proposed.##

03828

Pustinger, John V.

ANALYTICAL TECHNIQUES FOR IDENTIFICATION OF GAS-OFF PRODUCTS FROM CABIN MATERIALS. In: Proceedings of the Conference on Atmospheric Contamination in Confined Spaces: 30 March - 1 April 1965, Aerospace Medical Research Lab., (6570th) Wright-Patterson AFB, Ohio, b8contract AF 33(657)-11305, Proj. 6302, AMRL-TR-65-230, p. 276-295, Nov. 1965.

CFSTI, DDC: AD 629622

A program was initiated to identify the gas-off products from a variety of candidate space craft materials and to estimate the concentration and gas-off rates of these potential space contaminants. Eventually 50 materials will be tested and approximately 1000 analyses will be performed. A listing of general types is presented. Some standard procedures for establishing minimum detection levels are needed. The simple methods of weight loss from thermal degradation or olfactory sensing, as used in the Mercury program, will not suffice. As shown in this study, the highly sensitive detection system of gas chromatography and the specific identification possible with supporting mass spectrometry and infrared absorption spectrophotometry fulfill most criteria. The techniques employed in this program were developed for application to survey a wide range of materials. In each material system, more optimum instrument conditions, particularly gas chromatography operation, could be established. It is felt that with improved gas chromatography techniques, considerably lower detection levels can be established. The biggest problems in standardization of methods are sample preparation and handling. There are many variables, e.g., freshness of sample, surface area, mixing, curing, sample uniformity and changes in proprietary mixes, which can influence the nature and degree of gas-off products. Early results indicate that standardization of methods for gas chromatography and mass spectrometry can best be accomplished for individual sample types, e.g., silicone polymers, rather than a single comprehensive approach. Each system produces different gas-off products, which require different analyses. Also, the most significant data can be obtained when the materials are evaluated in the approximate form for final use.##

03829

Saunders, Raymond A.

ATMOSPHERIC CONTAMINATION IN SEALAB I. In: Proceedings of the Conference on Atmospheric Contamination in Confined Spaces: 30 March - 1 April 1965, Aerospace Medical Research Lab., (6570th) Wright-Patterson AFB, Ohio, Contract AF 33(657)-11305, Proj. 6302, AMRL-TR-65-230, p. 296-305, Nov. 1965.

CFSTI, DDC: AD 629622

The Man-in-Seas Program has several important goals, one of which is to make possible the free movement of scuba divers for extended periods of time at depths up to 1000 feet. Present practical dives are limited to a few hundred feet for useful work periods measured only in minutes. More importantly, hours of time may be required after such dives to return the divers safely to the surface. Techniques now being investigated by the Navy, however, are designed to permit divers to work at depths of hundreds of feet for 6 to 8 hours a day, day after day, without the necessity for intervening returns to the surface. Such long dives will permit exploration of large areas of the undersea continental shelf, areas which abound in mineral and food riches. Diving explorations of this magnitude are made possible by eliminating the long decompression periods required for returning divers to the surface. This is accomplished by providing the divers with undersea living accommodations which they may enter or leave at will. After working in the open sea the divers have only to re-enter their undersea home to rest and refresh themselves. They will be able to live comfortably in these quarters for months

at a time, secure from their hostile outer environment. The first U. S. Navy open sea tests of these new concepts were made in the summer of 1964 at Argus Island, a Texas Tower off the coast of Bermuda. The divers' submerged living quarters was called SEALAB I. A description of the facility is presented and methods of analyzing contaminants are discussed. Reference is made to nuclear submarine atmospheres and methods for studying atmospheric contaminants are discussed.##

03866

J. R. Farmer J. D. Williams

INTERSTATE AIR POLLUTION STUDY: PHASE II PROJECT REPORT. III. AIR QUALITY MEASUREMENTS. Public Health Service, Cincinnati, Ohio, National Center for Air Pollution Control. Dec. 1966. 190 pp.

The development of an effective air resource management program begins with identification of the pollutants in the air, and determination of the quantity and origin of each type. The air quality measurement program was designed and operated to make these determinations in the Metropolitan St. Louis area. Once the physical aspects of the air pollution problem are defined, air-pollution-effect data and criteria as well as opinion surveys can be used to set the air quality goals. From this base, with use of the pollutants emission inventory the air resource management emission control plan can be designed. At this stage the air quality measurement program is used to monitor the air quality to assure that the goals are attained. In addition to its use in the air resource management program, this report provides a reasonably complete list of air quality data in a form that will assist research and program personnel in developing activities and attaining program objectives. A population distribution map of the study area is provided to allow comparison between distribution of population, pollutants, and sampling measurement networks.##

03924

V. A. Tret'yakova

THE DETERMINATION OF 4,4'-DIPHENYLMETHANE DUSOCYANATE IN AIR UNDER EXPERIMENTAL CONDITIONS. Hyg. Sanit. 31, (4-6) 73-5, Apr.-June 1966. Rr. (Tr.)
CFSTI, TT 66-51160/4-6

Two methods are suggested for the photometric determination of 4,4-diphenylmethane dusocyanate (DMD). The first method of determination is based on the reaction of DMD with aromatic amines and nitrites for which the sensitivity is 1 microgram in 4.2 ml and the determination error is plus or minus 7%. The second method of determination is based on the reduction of DMD with NO₂ ion. In this case the sensitivity is 20 micrograms/5.5 ml for photometric determination with an FMS-56 instrument, with a mean error of plus or minus 4%; the sensitivity for photometric determinations by the standard series method is 2 microgram/5.5 ml, with an error of plus or minus 10%. DMD vapor is absorbed by acetone when the air is drawn through two absorbing vessels with porous partitions cooled by ice, at a rate of up to 30 l/hr.##

03929

E. G. Kachmar

DETERMINATION OF DIMETHYLAMINOAZOBENZENE IN AIR. Hyg. Sanit. 31, (4-6) 234-5, Apr.-June 1966. Russ (Tr.)
CFSTI, TT 66-51160/4-6

Dimethylaminoazobenzene is a basic azo dye and is used for staining ethyl liquid (antiknock). During the manufacture of this compound, its aerosol pollutes the air of the factory shops. Therefore it was necessary to devise a method for its determination in air. The reaction proposed by Selina for the investigation of another azo compound, viz. o-aminoazotoluene was utilized. The method is based on the reaction of azo compounds with acids, with the formation of colored solution. It was found that the highest sensitivity (0.2 microgram) was achieved by adding 0.2 ml of 15% HCl solution to 2 ml of alcohol solution of dimethylaminoazobenzene.##

03937

O. G. Neronskii

PHOTOELECTROCOLORIMETRIC DETERMINATION OF HIGHER ALIPHATIC AMINES IN AIR. Hyg. Sanit. 31, (4-6) 381-3, Apr.-June 1966. Russ. (Tr.)
CFSTI, TT 66-51160/4-6

The present method was developed for the investigation of air with respect to enrichment of potassium salts in which the flotation agent is represented by aliphatic amines (C16-C20) in the hydrochloride form which are markedly toxic. There is no established maximum permissible concentration for higher aliphatic amines in factories and in the atmospheric air. The method is based on studies of amines in aqueous solutions. The determination is based on the reactions of amines with methyl orange at a pH of 3.0-4.0, forming a yellow compound which is readily soluble in organic solvents (dichloroethane, chloroform). The sensitivity is 1 microgram in the analytical volume in the case of octadecylamine. Ammonia does not interfere. The accuracy of the method (99.8-100%) practically corresponds to the accuracy of the instrument in the interval of 5 to 100 micrograms. Addition of 25 micrograms of a mixture of KCl plus NaCl in the ratio in which they are present in potassium concentrate does not affect the sensitivity and the accuracy of the determination. The method was used in studies of air pollution by amines at the ore-dressing factory of the 1st Soligorsk Potassium Works. Amines were discovered in all air samples, in concentrations of 0.001 to 2.09 mg/cu m.##

03938

G. I. Benzina

SPECTROPHOTOMETRIC DETERMINATION OF PURPURAL IN AIR. Hyg. Sanit. 31, (4-6) 383-5, Apr.-June 1966. Russ. (Tr.)
CFSTI, TT 66-51160/4-6

The use of modern construction materials involves the danger of liberation of toxic substances into the air of the living rooms. A laboratory investigation of samples of chipboard which were subsequently treated with FA monomer (mixture of furfural and acetone) was made. In addition to the chemical methods (Alekseeva) for the determination of furfural concentrations in air, adsorption spectroscopy in the ultraviolet spectrum region was used. The spectrophotometric measurements resulted in the determination of the absorption maximum for furfural and produced its spectral pattern. According to the findings, the determination of furfural can be performed within a period of 20 min to 5 days from the moment of the taking of air samples. The air is drawn through a V-shaped absorption vessel containing 5 ml ethanol at a rate of 0.5 l/min for 20 to 30 min. The spectral patterns of formaldehyde in ethanol containing 0.1 and 0.01 mg/ml were demonstrated. Formaldehyde did not interfere with the determination of furfural. Acetone likewise causes no interference. Interference is caused by the presence of phenol. However, the absorption maximum of phenol is considerably higher and the method described can be used for the investigation of furfural in the presence of formaldehyde and acetone and in the absence of phenol.##

03940

A. S. Filatova, A. I. Kuz'minykh, F. D. Vedernikova,
N. S. Solomennikova

DETERMINATION OF 3,4-BENZOPYRENE LIBERATED BY SUBLIMATION OF ANODE MATERIAL IN ELECTROLYTIC SHOPS OF ALUMINUM PLANTS.
Hyg. Sanit. 31, (4-6) 381-4, Apr.-June 1966. Russ. (Tr.)
CFSTI, TT 66-51160/4-6

An investigation of the group of neutral multinuclear cyclic hydrocarbons with the intention of subsequent isolation and quantitative determination of 3,4-benzopyrene which is the most actively carcinogenic hydrocarbon was undertaken. Samples at the electrolytic shop of an aluminum plant of dust from the anode, from the inlet connector of the cell, from the anode pin and from the "fog" evolving from under the pins as well as at the position occupied by the operator were taken. Air was drawn at a rate of 20 l/min through a filter made of the FPP-15 fabric fixed on a steel funnel, taking larger volumes of air in order to concentrate the small quantities of 3,4-benzopyrene assumed to be present. Since the carrier of carcinogenic substances is represented by tarry substances, the dust samples were extracted in a Soxhlet apparatus and quantitative determinations were made of the yield of tarry substances. Nonfluorescent benzene was used as the solvent. From the complex mixture of tarry substances by 3,4-benzopyrene was isolated by partition paper chromatography and fluorescence. The contents of 3,4-benzopyrene in the air samples taken in the electrolytic shop of an aluminum plant were as follows: 0.0137 to 0.0221 micrograms/l at the worksite, 0.0361 to 0.2250 micrograms/l during the removal of the pins and 0.0519 to 1.3200 micrograms/l in the "fog" issuing from under the anode pins.##

03949

R. Jeltcs

ABSORPTION OF POLAR SUBSTANCES ON THE SOLID SUPPORT OF COLUMN PACKING IN GAS-LIQUID CHROMATOGRAPHIC ANALYSIS OF AIR CONTAMINANTS. J. Chromatog. 24, (2) 402-3, Oct. 1966.

The phenomenon of the adsorption of polar substances on the solid support of nonpolar columns may be used in the qualitative analysis of air contaminants. When this analysis is performed on both polar and nonpolar packed columns very probably polar substances will not be detected on nonpolar packed columns.##

03955

N. Carugno and S. Rossi

EVALUATION OF POLYNUCLEAR HYDROCARBONS IN CIGARETTE SMOKE BY GLASS CAPILLARY COLUMNS. J. Gas Chromatog. 5, (2) 103-6, Feb. 1967.

The detection and identification of polycyclic hydrocarbons in cigarette smoke, airborne particles, and petroleum waxes by gas chromatography with flame ionization detector or electron capture detector is reported. The use of capillary columns affords the opportunity of separating a large number of polynuclear hydrocarbons from complex mixtures. A large number of cigarettes were used for the gas chromatographic analyses. Solutions with polynuclear hydrocarbons in high concentrations were used, as samples introduced in capillary columns must be small for good resolution of the peaks.##

03965

M. J. Boldue and R. K. Severs

A MODIFIED TOTAL COMBUSTION ANALYZER FOR USE IN SOURCE TESTING AIR POLLUTION. Air Eng. 7, (8) 26-9, Aug. 1965.
(Presented before the Division of Water, Air, and Waste Chemistry, 149th National Meeting, American Chemical Society, Detroit, Mich., Apr. 4-9, 1965.)

The development of a Total Combustion Analyzer (TCA) for portable, on-site sampling and analysis of combustion gases for hydrocarbon, carbon monoxide, and carbon dioxide concentrations is described. The TCA was tested in comparison with the Flame Ionization Analyzer and Detector at three industrial sources. The data collected show the TCA unit to be reliable, accurate and capable of on-site use.##

R. S. Braman

FLAME EMISSION AND DUAL FLAME EMISSION-FLAME IONIZATION DETECTORS FOR GAS CHROMATOGRAPHY. Anal. Chem. 38, (6) 734-42, May 1966.

A hydrogen-air flame emission detector was constructed employing interference filters and standard gas chromatography instrumentation. Instrumentation variables were studied. Detection sensitivity was in the microgram range, wavelength dependent and generally greatest for heteroatom - containing compounds. The study of emission response at 589, 515, and 415 millimicrons indicates that the emission intensity attributed to C2 or CH molecules in the flame plasma are dependent upon the structure of the chromatographed compounds. The design and operation of a dual flame emission-flame ionization (FE/FI) detector for gas chromatography is also described. The influence of structure on response ratios was studied on a chlorinated methane series of compounds, an aromatic series of compounds, and a three-carbon series of compounds. The influence of structure on response ratios was demonstrated thus establishing the potential use of the dual detector in qualitative identification of peaks. (Author abstract)##

03971

R. G. Confer and R. S. Brief

MYLAR BAGS USED TO COLLECT AIR SAMPLES IN THE FIELD FOR LABORATORY ANALYSIS. Air Eng. 7, (10) 34-6, 1965.

Mylar plastic bags, as a means of sample collection, were studied to determine bag conditioning effects and decay rates at accepted threshold limit concentrations and to establish a method of sampling. Industrial solvents were of particular interest in the study. It was determined that bag conditioning is necessary to insure that sampled air represents workroom air contaminant concentrations. Samplers collected remained at or above 90% of the initial airborne concentration for several days for some materials.##

03977

D. J. McEwen

AUTOMOBILE EXHAUST HYDROCARBON ANALYSIS BY GAS CHROMATOGRAPHY. Anal. Chem. 38, (8) 1047-53, July 1966.

A new gas chromatographic method has been developed to analyze the complete range of hydrocarbons in both raw and highly diluted automobile exhaust gas. A commercial gas chromatograph was modified to include a separate oven for thermostating a gas sampling valve and a flow - switching valve, a subtractor

column for removing the unsaturated hydrocarbons, and an adsorption column in dual arrangement with a capillary column. Sampling of exhaust gas and hydrocarbon calibration mixtures was investigated. The capabilities of the method are demonstrated with examples of analyses of exhaust gas from different engine operating modes.##

03991

G. G. Esposito M. H. Swann

DETERMINATION OF AROMATIC CONTENT OF HYDROCARBON PAINT SOLVENTS BY GAS CHROMATOGRAPHY. J. PAINT TECHNOL. 38, (498) 377-80, July 1966.

The solvency characteristics of petroleum thinners for alkyd resins can be related to the amount of aromatic hydrocarbons present. Many other synthetic resins require thinners of high aromatic content and there is a need for a rapid, accurate analytical method that can be used for quality control. A procedure is described for the determination of aromatic solvents in petroleum thinners by gas-liquid chromatography (GLC) using a highly selective partitioning liquid. (Author abstract)##

04014

D. Rondia

(ON THE VOLATILITY OF POLYCYCLIC HYDROCARBONS.) SUR LA VOLATILITE DES HYDROCARBURES POLYCYCLIQUES. Intern. J. Air Water Pollution 9, (3) 113-21, Mar. 1965. Fr.

Despite the high boiling point of hydrocarbons, certain polycyclics volatilize rapidly due to air currents with little change in ordinary temperature. It is probable that such products are disseminated from industrial establishments where solid fuel (charcoal) is used. In air pollution sampling, the concentration of particulate polycyclic compounds is estimated by collection of suspended matter on glass or paper filters. This method introduces errors into the results because of evaporation, especially for those compounds which have particularly low melting points. Particle size, volume and temperature of the air flowing through the factors during sampling should be considered as important parameters in this type of sampling. Oxidation of samples during storage is also a possibility to consider.##

04029

E. Sawicki, C. R. Engel, and W. C. Elbert

CHROMATOGRAPHIC LOCATION AND COLORIMETRIC DETERMINATION OF MERCAPTANS, PROLINES AND FREE RADICAL PRECURSORS. Talanta, Vol. 14, p. 1169-1178, 1967. 19 refs.

A new reagent is introduced for the colorimetric determination of free radical precursors, such as cysteine, proline, hydroxyproline, the phenoxazine family, and mercaptans. 7,7,8,8-Tetracyanoquinodimethan (TCNQ) is also useful in the location and characterization on paper or thin-layer chromatograms of proline, hydroxyproline, cysteine, polynuclear compounds, mercaptans, thiocarbonyl amides, and thiosemicarbazones. In addition, amino acid derivatives, such as the N-(phenylthiocarbonyl) amino acids and the 3-phenylthiohydantoin, can be located and characterized on chromatograms. TCNQ has been applied to the location and characterization of atmospheric proline, carbazole, and 11 H-benzo(a)carbazole. For characterization purposes absorption spectra were obtained directly from glass-fiber, paper, or thin-layer chromatograms from about 300 to 900 millimicron. (authors' abstract)##

03966

M. J. Boldue, R. K. Severes, and G. L. Brewer

TEST PROCEDURES FOR EVALUATION OF INDUSTRIAL FUME CONVERTERS (SAMPLING AND ANALYTICAL TECHNIQUES REVIEWED FOR). Air Eng. 8, (2) 20-3, Feb. 1966. (Presented at the 58th Annual Meeting, Air Pollution Control Association, Toronto, Canada, June 20-24, 1965.)

The purpose for development of the source testing outline was to permit systematic evaluation of air pollution control equipment on gaseous organic fume streams. Data were obtained to fulfill the following objectives of the source outline: (1) Determination of combustible emission and conversion efficiency. (2) Determination of particulate matter emissions. (3) Identification of specific emissions by laboratory analyses. (4) Determination of the odor concentration of the effluent stream in conjunction with these objectives of source test measurements, the outlined program was to include: (5) A method to check credibility of sampling and analyses. (6) A technique for future monitoring of the control equipment performance. Source tests were conducted on catalytic fume converter units located on a metal-coating oven, a varnish-cooking kettle, a phthalic anhydride plant and a wire-coating oven. Sampling procedures, analytical techniques and developed equipment are discussed. The results of each of the evaluations of the catalytic fume converters are presented.##

04049

R. A. Duffee, E. J. Schulz, and E. W. Ungar

DISTURBING FACTORS IN PARTICULATE SAMPLING. Preprint. (Presented at the Third Conference on Applied Meteorology, Santa Barbara, Calif., Apr. 5-8, 1960.)

The study reported in this paper, which was carried out in the course of developing a tracer technique for industrial emissions,

was designed to measure the magnitude of the errors resulting from anisokinetic sampling in the atmosphere and the effects of deposition on the filter. Uranine dye, a fluorescent pigment, was utilized as the sample particulate in all the experimental studies. A 10% water-uranine solution was prepared and sprayed from two pneumatic nozzles, with liquid and atomizing air pressures of 40 psig. The water evaporated quickly, leaving dry uranine particles with mass median diameters of 6 and 12 microns as measured by a cascade impactor. Sample analysis consisted of dissolving the dry sample in 20 ml of distilled water and reading the fluorescence on a fluorescent meter. These studies indicate that, for particles with Stokes diameters greater than 10 microns, the error in mass concentration resulting from neglect of deposition may be a factor of two. For particles with Stokes diameters less than 10 microns, this error appears negligible. The effect of variations in sampling velocity on sample concentration, for the range of sampling velocities used in these runs, indicates that a sixfold increase in sampling velocity results in a doubling of the sample concentration. However, in one case, a ninefold increase in sampling velocity resulted in only a 15% increase in sample concentration, and, in another instance, a sixfold increase in sampling velocity resulted in an increase in the sample concentration by a factor of four. The results of these studies serve only to identify some of the potential errors, and their relative magnitudes, involved in the sampling of atmospheric particulates. Differences in the results of the wind-tunnel and atmospheric tests indicate the difficulties involved in measuring true mass concentration in the atmosphere. Perhaps of more importance is the fact that these results point out the dangers inherent in using a measure of one physical property, such as mass concentration, to predict another, such as deposition rates, in a turbulent atmosphere.##

04053

D. Rondia

TESTS TO ESTABLISH ADEQUATE CRITERIA FOR THE HARMFULNESS OF ATMOSPHERIC POLLUTANTS AND SUGGESTIONS FOR A CAMPAIGN TO COMBAT AIR POLLUTION. Essais de Mise au Point d'un Critere Adequate de Novivite des Polluants Atmospheriques et Suggestions sur une Campagne de Lutte Contre la Pollution. Preprint. (Presented at the Inter-Regional Symposium on Criteria for Air Quality and Methods of Measurement, Geneva, Switzerland, Aug. 6-12, 1963.)

In establishing the health hazards of polluted air the measurement of reflection and light transmission of smoke samples is inadequate for two reasons. The first is technological and is due to the insufficient validity of the methods used; the second is biological and is due to the lack of relation between the toxicity of the smokes which contaminate air and their weight as obtained by the sampling. A fluorometric approach to this problem was investigated and it was found that in the particular industrial area in which the study was made there are seasonal factors that would have to be taken into consideration, particularly during the summer, in order to establish a reliable system for pollution measurement. Air pollution programs should establish priorities in their approach to the general problem, giving first priority to toxic contaminants, after which the disagreeable pollutants from a psychological or economic standpoint could be dealt with.##

M. V. Alekseeva, N. A. Krylova, and V. A. Khrustaleva

SPECTROPHOTOMETRIC DETERMINATION OF BENZENE, ISOPROPYLBENZENE, AND ALPHA-METHYLSTYROL IN THE AIR. *Gigiena i Sanit.* 28, (1) 31-6, Jan. 1963. Russ. (Tr.) (Translated by B. S. Levine in U.S.S.R. Literature on Air Pollution and Related Occupational Diseases, Vol. 12.)

The following two problems were investigated: (1) determination of small amounts of benzene, isopropylbenzene and alpha-Methylstyrol in the air, and (2) selection of a solvent medium for the collection of samples of the above substances, which might make possible the quantitative determination of the substances. In this connection the spectrophotometric method is based on the determination of the optical density of the investigated substance in solution at wave length corresponding to its maximum absorption. An essential requisite of this method is that the investigated substance must behave in the selected solution in accordance with Beer's law. Ethanol was finally selected as the solvent in the study here described using spectrophotometer SF-4.##

04085

P. A. Krotkov, N. N. Serzhantova, and V. B. Timofeev

A PHOTOELECTROMETRIC METHOD FOR THE DETERMINATION OF LOW 3, 4-BENZOPYRENE CONCENTRATIONS. *Gigiena i Sanit.* 28, (5) 47-9, May 1963. Russ. (Tr.) (Translated by B. S. Levine in U.S.S.R. Literature on Air Pollution and Related Occupational Diseases, Vol. 12.)

The report published by P. P. Dikun in 1961 contains a quantitative spectrophotometric method for the determination of low 3, 4-benzopyrene concentrations. The sensitivity of the method makes possible the determination of 10 to the minus 8th power micron of 3,4-benzopyrene in 1 ml of solution. The quantitative analytical procedure previously recommended by the same author which was based on fluorescent 3,4-benzopyrene spectra at low temperatures and on the use of a photometer as described by F. Weigart in 1934; V. K. Prokof'ev, 1951; by that procedure 1,12-benzperylene was used as the inside standard. The spectra were recorded photographically. The present authors increase the method sensitivity and rapidity by recording spectral intensities photoelectrically.##

04086

G. S. Salyamon

COLORIMETRIC METHOD FOR TOTAL ALKYL AMINES DETERMINATION. *Gigiena i Sanit.* 28, (5) 50-3, May 1963. Russ. (Tr.) (Translated by B. S. Levine in U.S.S.R. Literature on Air Pollution and Related Occupational Diseases, Vol. 12.)

The following reagents are used in determining amines in the air:

- 1) Ammonia-free distilled water; remove ammonia and acid by boiling the distilled water for 1-1/2 to 2 hours; keep in a bottle with a stopper through which insert an absorber tube containing activated charcoal and ascarite; store so as to prevent contact with air containing ammonia or acid vapor;
- 2) 0.1% solution of O-nitrophenol prepared at 40-50 degrees with intermittent stirring;
- 3) Nessler-Folin solution, prepared from potassium iodide, iodine, mercury, and alkali, as described by D. T. You in 1935;
- 4) Standard 0.1 millimolar (0.1 micro mole/ml) solutions of aliphatic amine and ammonia, prepared by hundredfold dilution of 0.01 M stock solutions, using ammonia-free water; check by titrating 100 ml of the 0.01 M amine solution with a standard 0.1N HCl solution using methyl red as the indicator;
- 5) Ascarite granular 2-4 mm in diameter.

Concentrations of amines in the air was computed on the basis of total bases minus ammonia concentration. The value of M/1000, in the case of methyl amine is 0.031; for dimethyl or ethyl amine it is 0.045, and for triethyl amine, 0.101. The method is accurate to 0.02 micro mole in the colorimetrically analyzed volume; for methyl amines and ethyl amine it corresponds to about 1 gamma, for di- and triethylamine 2 gamma, and for ammonia 0.4 gamma per sample volume. The method was applied in practice and yielded satisfactory results in determining content of aliphatic amines in the air of working premises and in experimental animal exposure chambers.##

04099

M. I. Poletaev

COLORIMETRIC METHOD FOR THE DETERMINATION OF MONOISOPROPYLDIPHENYL IN THE AIR. Gigiena i Sanit. 28, (8) 40-1, Aug. 1963. Russ. (Tr.) (Translated by B. S. Levine in U.S.S.R. Literature on Air Pollution and Related Occupational Diseases, Vol. 12.)

The purpose is to report on attempts to develop a method for the determination of MIPD (Monoisopropyldiphenyl) in the air of working premises. This author used the method based on the colorimetric determination of MIPD by the Yanovskii reaction. Air samples were collected by the aspiration method using the Polezhaev microabsorber which contained 1 ml of a nitro mixture consisting of 10 g of ammonium nitrate in 100 ml of sulfuric acid of 1.82-1.84 sp. gr.; the air was aspirated through this medium at the rate of 0.2-0.4 li/min. Where the concentration of MIPD is suspected to be high, air samples can be collected by the vacuum method into special containers of 100-200 ml capacity. Two ml of the nitro mixture is added to the air sample containing vessel, and let stand for 1 hour periodically washing the walls of the sample container with the nitro mixture. The minimal amount of MIPD determined by the acetone-alkaline medium extraction was 3 microns in colorimetric volume, and by the ether extraction in acid medium, the minimum was 2 microns. In the presence of other aromatic substances, the method is nonspecific.##

R. V. Lindval and I. V. Yermakova

ACETYLENE DETERMINATION IN THE AIR BY INFRARED SPECTROSCOPY.
Gigiena i Sanit. 28, (9) 51-4, Sept. 1963. Russ. (Tr.)
(Translated by B. S. Levine in U.S.S.R. Literature on
Air Pollution and Related Occupational Diseases, Vol. 12.)
CFSTI: TT 66 61429

Acetylene vapor is present in the air of working premises in the production of calcium carbide, in the air of acetylene stations and of plants which use acetylene in their production processes. No maximal permissible concentration of acetylene vapor in the air has as yet been established. A colorimetric method for the determination of acetylene in the air was previously developed. Determination of very low concentrations of acetylene vapor in the air by this method required the collection of large volume air samples, which is time consuming. In addition different samples are characterized by different color shades which makes precise determination at times difficult, if not impossible. By the method described it is possible to determine minute quantities of acetylene in the air with the aid of infrared microscopy. Data presented show that the colorimetric method yielded some-what lower results than the spectral method. A method was described for the quantitative determination of low acetylene concentrations in the air; it was developed on the basis of infrared spectrophotometry and is sufficiently sensitive to determine acetylene vapor in the air within the limits of 0.002-0.5% by volume.##

04143

T. Iritani and Y. Morishita

QUANTITATIVE DETERMINATION OF BENZENE, TOLUENE, AND XYLENE IN SOLVENT AND IN AIR BY GAS-CHROMATOGRAPHY. Japan. J. Ind. Health (Tokyo) 2, (6) 56-67, June 1960. Jap.

The minimum determinable concentration of benzene, toluene, and xylene in solvents was found with gas chromatography to be 0.1% and the error was within 0.5% of the value determined. The quantitative determination of benzene, toluene, and xylene in air using colorimetry after separation by gas chromatography showed gross error and is of no practical use, because the vapors condensed near the outlet. When the air was supplied to the gas chromatograph without preparation, the minimum determinable value was about 75ppm for 10 ml of air, but 75ppm is too high, to be a desirable minimum value. To concentrate the air then, 1 liter of air was passed at the rate of 100 ml/min through a small column filled with 1 g of solid support (DOP) and cooled by dry ice; when the gases are attached to the inlet of the gas chromatograph and heated to 130 degrees C, a satisfactory gas chromatogram is obtained. When the vapor determination is made in air, the adequate column temperature is 100 degrees C instead of 125 degrees C (as with the analysis with solvents), since at 125 degrees C the vapors are not separated sufficiently from steam. In order to prevent disturbance by steam, phosphorus pentoxide must be put around the concentration column during air-sampling. Silica gel and a molecular sieve are inadequate as desiccating agents since they absorb benzene, toluene, and xylene

as well as steam. This method proved reliable when air samples containing known quantities of the vapors were analyzed. The minimum determinable concentration by this method using 1 liter of air is approximately 2ppm for benzene, 4ppm for toluene, and 10ppm for xylene, and these are equivalent to about 0.003mV (4mm) in the peak height of gas chromatograms. Measurements can be taken in the field if the samples are taken into concentration columns with phosphorus pentoxide columns and tightly corked. (Author summary modified)**

04199

H. Konosu

DETERMINATION OF ORGANIC SUBSTANCE VAPOR-AIR MIXTURES BY A NON-DISPERSIVE ULTRAVIOLET GAS ANALYZER. Gov. Chem. Ind. Res. Inst., Tokyo 62, (1) 25-33, Jan. 1967. Jap.

Vapors from organic substances used in chemical processes may have hazardous levels of toxicity or explosibility. A nondispersive ultraviolet gas analyzer, a device for determining the concentration of an ultraviolet-absorbing component in a nonabsorbing mixture of gases, has been developed and applied to toxic or explosive gases. The samples were HCOOCH_3 , HCOOC_2H_5 , $\text{CH}_3\text{COOCH}_3$, $\text{CH}_3\text{COOC}_2\text{H}_5$, $\text{CH}_3\text{CH}_2\text{Br}$, $(\text{C}_2\text{H}_5)_2\text{NH}$, and $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{NH}_2$. The concentrations of the gases in air were determined from calibration curves plotted as absorbance vs. vol%. The analyzer could operate over a wide concentration range from 6 ppm for $(\text{C}_2\text{H}_5)_2\text{NH}$ to 6 vol% for HCOOCH_3 . The coefficients of variation of analysis (percent transmission) were 0.023 and 0.016% for the concentration levels of 137 ppm and 2.74 vol% HCOOC_2H_5 , respectively. Time required for an individual determination was 1 min or less. (Author summary)**

04206

Y. Matsumura and R. Soda

GAS CHROMATOGRAPHIC ANALYSIS OF ATMOSPHERIC POLLUTANTS IN INDUSTRIES. Bull. Natl. Inst. Ind. Health (Kawasaki, Japan) 4, 44-51, 1960.

A description is given of the sampling efficiency of six kinds of sampling bottles used for absorbing organic vapors where the sampling solution is analyzed quantitatively by gas chromatography. Toluene was used as the sampling solvent and benzene as the organic vapor. A sampling solution was fed into the chromatograph and the benzene and toluene peaks recorded. Benzene sampling efficiencies were then determined and various factors affecting efficiency discussed. It was found that bottles having the best efficiencies are long midjet impingers with glass beads at the bottoms. The results of field measurements of methanol, ethyl acetate, benzene, and xylene in a dyeing factory are presented.**

METHODS OF MEASURING AIR POLLUTION. MEASUREMENT OF HYDROCARBONS. (PART 5.) Misura deli Idrocarburi (Parte 5). Pumi Polveri (Milan) 6, (12) 333-6, Dec. 1966. It.

Polycyclic hydrocarbons, present in the air as an integral part of the material in suspension, and volatile hydrocarbons present in the gaseous state, were investigated as pollutants. Polycyclic hydrocarbons can cause cancer. Work on the "anthracene index" and the "method of quinine sulfate" made it possible to define a simple index of the tar material, whether this index could or could not be related to the concentration of individual polycyclic hydrocarbons. Good results for determining the smoke content of tars are possible if contamination by other pollutants, such as lubricating oil, is avoided. The "method of quinine sulfate" can be correlated with the daily measurements of smoke/SO₂ being carried out in various locations. Volatile hydrocarbon pollutants are becoming more prevalent in large cities due to automotive emissions. The principle of the index of the quinine sulfate method is described using fluorometric measurements on the sample and on a reference.##

04219

BENZENE: TOLUENE AND XYLENE: STYRENE (METHODS FOR THE DETECTION OF TOXIC SUBSTANCES IN AIR). Ministry of Labour, London, England. (Booklet No. 4.) 1966. 12pp.

This booklet is one of a series describing chemical methods involving color changes to be used to give a rapid indication of the atmospheric hazard where the primary object is not extreme accuracy. For benzene in the presence of toluene, xylene, and styrene, the toluene and xylene are removed by absorption in a solution of selenous acid in sulfuric acid. The benzene is then determined from the color produced in concentrated sulfuric acid containing paraformaldehyde which is compared with a range of color standards. Toluene, xylene, and ethyl benzene up to 300 ppm and styrene up to 170 ppm do not interfere. Toluene and xylene are determined by comparing the yellow color produced with a sulfuric acid solution of potassium iodate with a range of standard colors. Styrene and ethyl benzene react like toluene and xylene. For styrene, the color with concentrated sulfuric acid is compared with a range of standard colors. Vinyl styrene reacts like styrene. Acetone (500 ppm) and ethyl methyl ketone (200 ppm) reduce the color produced by 100 ppm of styrene by 20% and 10% respectively.##

04248

E. P. Aigina and I. M. Mints

DETERMINATION OF LOW 3, 4-BENZOPYRENE CONCENTRATIONS BY MEANS OF THE SHPOL'SKII EFFECT. (K voprosu o kolichestvennom

opredelenii malykh kontsentratsii 3, 4-benzpirena s pomoshch'yu effekta Shpol'skogo.) Hyg. Sanit. 31, (8) 264-7-, Aug. 1966. Russ. (Tr.)

CFSTI: TT 66-51160/7-9

The use of quasilinear fluorescence spectra for the quantitative determination of 3,4-benzpyrene is said to increase the sensitivity by 2 or 3 orders of magnitude in comparison to the spectrophotometric method. The known procedures suffer from several disadvantages. The purpose of the present work was the development of a better procedure. A new procedure was devised for the quantitative determination of 3,4-benzpyrene without an internal standard, by using the mercury line of wavelength 390.6 nm (3906 Å) as the reference line, and the advantage of using this line was demonstrated. The range of determinable concentrations lies between 0.002 and 0.05 microgram/ml. The relative standard deviation for a single analysis is 26%. A cruder qualitative determination of 3,4-benzpyrene is also possible for lower concentrations of this substance. The new procedure ensures a higher sensitivity than Dikun's procedure (approximately by one order of magnitude) and moreover is considerably simpler, more readily available, and less labor consuming. A procedure was devised for a quantitative determination of 1, 12-benzperylene in the concentration range of 0.02-2 microgram/ml. The relative standard deviation is 36%.#

04254

M. T. Tsupikov, and A. I. Grigorenko

RAPID METHODS FOR THE DETERMINATION OF TERTIARY FATTY ALCOHOLS, LOWER KETONES AND XYLENES IN AIR. ((Bystrye metody opredeleniya tretichnykh zhirnykh spirtov, nizshikh ketonov i ksilolov v vozdukh.) Hyg. Sanit. 31(9):418-421, Aug. 1966. Russ. (Tr.)

CFSTI: TT 66-51160/7-9

The method for determination of tertiary fatty alcohols and lower ketones is based on adsorption of vapors of these substances on silica gel, followed by acid-thermal condensation with vanillin to obtain colored reaction products. The reaction consists of an acid-thermal condensation on silica gel of vanillin as a reagent with active methylene alkyls that are directly bound with the C-OH group in tertiary alcohols or with the CO group in ketones. The intermediate reactions produce unsaturated hydroxy ketones or alcohols resembling curcumin in their chemical structure; these substances are converted to dyes of a complex composition by the acid-thermal factor. The procedure is as follows: A thin short length of rubber tubing is attached to the syringe of the air-sampling device. The narrow end of the tube with silica gel (which is open at both ends) is connected to the air-sampling device and a measured volume of air is pumped through. The tube is disconnected, 4 or 5 drops of the solution of vanillin-sulfuric acid are introduced and the tube is shaken until the silica gel is completely impregnated. The silica gel layer is then heated in a flame. On cooling, the length of the colored silica gel layer is measured. A blank test is performed in parallel, without the pumping through of air. The concentration of substances in the measured volume of air passed through the silica gel is found by means of a graph, in which the

length of the colored silica gel layer is marked on the x-axis (in millimeters), while the concentrations (milligrams) are marked on the y-axis. The concentration is converted to milligrams per liter by means of the formula: $X = a \cdot 1000 / b$, where X is the concentration of the substance in question (mg/l), a is the concentration of the substance in the volume of air passed through the tube (mg), and b is the volume of air (ml). The method for determination of commercial xylene is based on the production of red-colored anils by the reaction of xylenes with urotropinsulfuric acid on silica gel.##

04255

M. S. Bykhovskaya and R. N. Makedonskaya

DETERMINATION OF ALIPHATIC AMINES IN AIR. ((K metodike opredeleniya alifaticeskikh aminov v vozdukh.)) Hyg. Sanit. 31, (9) 421-425, Aug. 1966. Russ. (Tr.)

CFSTI: T 66-55160/7-9

In studies of the primary aliphatic amines, optimum conditions were studied for their determination with ninhydrin, potassium 1, 2-naphthoquinone-4-sulfonate and p-nitrophenyldiazonium. The best reproducibility was achieved in an aqueous-pyridine solution with the addition of a little ascorbic acid. The reaction product imparts a blue-violet color to the solution, as distinguished from the control solution which displays a pinkish-violet color. The maximum light absorption of the solution occurs at the wavelength of 575 OA. The sensitivity is 1 microgram in the volume analyzed. In the concentration range of 1 to 10 micrograms there is a linear relationship between the optical density and the amine concentration in solution. No interference is caused by secondary and tertiary aliphatic amines or by aromatic amines. Any ammonia interferes with the determination, because its presence in the sample to the extent of 1 microgram colors the solution an intense blue-violet. The most selective reaction for the determination of secondary amines is based on the formation of copper dialkyldithiocarbamate. Where an air sample is taken in ethanol, and 0.1 ml of 15% alcohol solution of CS₂, 0.1 ml of 0.1% alcohol solution of copper acetate and 0.1 ml alcohol solution of NH₃ are added to the 2-ml sample. The addition of each reagent is followed by mixing of the solution. After 10 min. the intensity of the colored sample is compared against the standard scales, or else the optical density of the solution is measured in a cell. A method for the determination of trimethylamine in air using a citric acid solution in acetic anhydride was developed. Reactions with citric acid and acetic anhydride as well as those with phosphotungstic or phosphomolybdic acids may also be applied to studies of several tertiary amines, no interference being caused by secondary and (other) tertiary amines.##

04262

J. D. Adams, J. P. Conkle, W. E. Mabson, J. T. Watson, P. H. Wolf, and B. E. Welch

STUDY OF MAN DURING A 56-DAY EXPOSURE TO AN OXYGEN-HELIUM ATMOSPHERE AT 258 MM. HG TOTAL PRESSURE. II. MAJOR AND MINOR ATMOSPHERIC COMPONENTS. Aerospace Med. 37, (6) 556-8, June 1966.

CFSTI: AD 641819, DDC

The atmosphere to which four human volunteers were exposed for 56 days during a study designed to describe the effects of oxygen-helium on man was analyzed for major and minor constituents. The partial pressure of the major constituents, oxygen (175.2 plus or minus 2.4 mm. Hg) and helium (73.9 plus or minus 2.3 mm. Hg), remained within the established experimental parameters. Sixty-eight minor constituents were detected. The concentration of these compounds remained below a level thought to cause a physiologic effect. The instrumental methods employed were sufficient for a comprehensive analysis of the synthetic atmosphere. (Author abstract)##

04318

A. J. Hocker, W. O. Yates, P. M. May, and M. P. Sweeney

CERTIFICATION OF AUTOMOTIVE EXHAUST EMISSION LABORATORIES BY CROSS CHECKS OF THE ANALYTICAL INSTRUMENTS. Instr. Soc. Am., Conf. Preprint. 1965.

Implementation of the California law on auto exhaust emissions required the active participation of laboratory facilities of the industry in determining emission levels of their products. The law authorizes the certification of laboratories. This paper discusses the methods used by the State of California at its official laboratory in testing automotive exhaust emissions and the techniques employed and results of typical cross check pre-certification tests which were conducted to insure that the California motorist will receive 1966 model automobiles that comply with the legal standards. As a result of such work, fourteen private industrial laboratories have been so certified. These companies include six American automobile manufacturers. Similarly equipped and instrumented laboratories in various locations can duplicate the results obtained by another facility: Similar instruments if exposed to the same concentration of contaminants will yield the same results. The technical community has demonstrated the ability to evaluate exhaust emissions in different test laboratories with the same results.##

04328

E. Sawicki, M. Guyer, and C. R. Engel

PAPER AND THIN-LAYER ELECTROPHORETIC SEPARATIONS OF POLYNUCLEAR AZA HETEROCYCLIC COMPOUNDS. Preprint. 1967.

A large number of polynuclear aza heterocyclic compounds have been separated by paper and thin-layer electrophoresis. The pherograms were scanned fluorimetrically. Many of the separated

compounds were capable of being characterized and assayed by the scanning procedure. Analysis by fluorimetric scanning of the pherograms was much more selective when the appropriate excitation and emission wavelengths were used. Samples of urban airborne particulate can be separated and analyzed with the help of paper or thin-layer electrophoresis. (Author abstract)##

04329

T. W. Stanley, M. J. Morgan, and J. E. Meeker

THIN-LAYER CHROMATOGRAPHIC SEPARATION AND SPECTROPHOTOMETRIC DETERMINATION OF BENZO(A)PYRENE IN ORGANIC EXTRACTS OF AIR-BORNE PARTICULATES. Preprint. 1967.

A modification of a recently reported procedure by Sawicki, et al, for thin-layer separation and spectrophotometric determination of benzo(a)pyrene is reported. Modified procedures are discussed and compared with other methods, and the data obtained by different technicians are reported. Procedures involved the spotting of a 0.5-to-5-mg aliquot of a dichloromethane solution of organic residue of air particulates from the bottom of a thin-layer plate. A 2-microgram aliquot of a dichloromethane solution of pure benzo(a)pyrene was added to the same plate. Plates were placed in a development chamber and the solvent was allowed to travel 15 cm from the origin. The developed chromatogram was observed under a 3600 Å light source and the fluorescent area of the pure standard and corresponding area of the sample were scored with a stylus. The amount of benzo(a)pyrene in the sample was determined at 375, 382 and 390 micrograms on a Beckman DU spectrophotometer. The thin-layer chromatograms exhibited 14 distinctively different fluorescent bands similar in spectral characteristics to class-fractions emergent from an alumina column separation. Advantages included: (1) the separation of crude organic extracts required less than 1 hour, and the speed of separation did not affect resolution; (2) benzo (ghi) perylene, which absorbs at 382 millimicron and would constitute a major interference, was contained in a narrow yellow fluorescent band well separated from the benzo(a)pyrene fraction; (3) benzo(k)fluoranthene and several unknown compounds were found in a blue fluorescent band separating the benzo(a)pyrene and benzo(ghi)perylene fractions; (4) samples ranging from 0.5 to 5 milligrams could be resolved on a 250-micron film of the absorbent with no observed changes in the chromatogram; (5) variations in R_f values above 0.5 did not prevent determination of the benzo(a)pyrene present in the sample; (6) over-activated plates that gave poor separations could be returned to normal in several hours by storage in a vacuum desiccator adjusted to 45% RH with freshly prepared aqueous H₂SO₄. The more experienced technician analyzed samples ranging from 0.34 to 3.26 mg; when all results were used the mean benzo(a)pyrene concentration per gram extract was 546 microgram and the relative standard deviation was plus or minus 7%. The investigation showed also that benzo(e)pyrene could be determined in the same fractions eluted for the determination of benzo(a)pyrene.##

04440

E. I. Smith, Jr., and H. E. Moran, Jr.

PORTABLE DETECTOR FOR MIXED HYDRAZINES PROPELLANT FUEL VAPORS AT LOW CONCENTRATION. Naval Research Lab., Washington, D.C., Engineering Research Branch. (NRL Memorandum Rept. 1602.) Apr. 1965. 15 pp.
DDC, AD 614821

Paradimethylaminobenzaldehyde (DMABA) was examined as a color forming agent for the colorimetric determination of mixed hydrazines propellant fuel vapor in air. Contaminated air was drawn through a filter paper disc which had been moistened with DMABA solution. The reaction between the fuel vapor and the indicator until the yellow color matched an arbitrarily selected standard yellow color. The volume of air required to produce the standard color was related to the concentration of fuel vapor in the air over the range of 0.5 to 10 ppm. Several gases which might be found in the air at least occasionally were examined for interference with the fuel vapor test. Ammonia at 50 ppm did not interfere, but higher concentrations either decreased the indicator sensitivity or completely inhibited color formation. Sulfur dioxide at 500 ppm did not interfere with the test; higher concentrations did interfere. Carbon dioxide at concentrations up to 50,000 ppm (5%) did not affect the test. Chlorine at 2 and 5 ppm reduced the sensitivity of the test indicator. Fifty ppm and higher concentrations of chlorine formed brown or green colors with the indicator, thus interfering with the fuel vapor test. (Author abstract)##

04484

S. P. Zhdanov, A. V. Kiselev, Ya. I. Yashin

USE OF COARSE POROUS GLASS IN GAS-ADSORPTION CHROMATOGRAPHY FOR THE SEPARATION OF LIQUID HYDROCARBONS. Neftekhimiya (Russia) 3, (3) 417-24, 1963. Russ. (Tr.)
DDC, AD 630970

The possibility of using coarse porous glass for the separation of normal alkanes and aromatic hydrocarbons with boiling temperatures up to 150 degrees by the method of gas-adsorption chromatography was investigated. The dependence of the effectiveness of the coarse porous glass column on the linear speed of the gas-carrier indicated the possible use of such columns at great linear speeds. From the chromatograms taken at various temperatures, the adsorption heats of a series of hydrocarbons on the hydroxylated surface of silicon were determined. The adsorption heats of normal alkanes and normal alkyl benzenes increase linearly with the increase in the number of carbon atoms in the molecule. The adsorption heat of ethylene is greater than that of benzene, and that of alkyl benzene is greater than that of the corresponding n-alkanes because of the specific interaction, primarily of the electron bonds with the hydroxyl groups of the surface. The values determined from the chromatograms of heat adsorption were close to those obtained calorimetrically.##

M. Feldstein and S. Balestrieri

THE DETECTION AND ESTIMATION OF PART PER BILLION CONCENTRATIONS OF HYDROCARBONS. J. Air Pollution Control Assoc. 15, (4) 177-8, Apr. 1965.

The addition of a freeze-out step in liquid nitrogen prior to analysis by gas chromatography with flame ionization detection permits the accurate determination of C2 and higher hydrocarbons in the part per billion (ppb) range. The procedure involves passage of an accurately measured volume of approximately one liter of gas sample through a freeze-out trap immersed in liquid nitrogen. After flushing with a measured volume of He to remove trapped N2 and O2, the hydrocarbons are flushed into the gas chromatograph analytical column by immersing the trap in a beaker of hot water. Concentrations of C2 and higher hydrocarbons have been measured in commercial cylinders of N2, He and H2. Using a 150 ml sample of gas, recovery of ppb concentrations is 95 to 100%. (Author abstract modified)##

04547

A. Turk, J. I. Morrow, B. E. Kaplan

OLEFIN ISOMERIZATION IN ADSORPTIVE SAMPLING ON ACTIVATED CARBON. Anal. Chem. 34, (4) 561-4, Apr. 1962. (Presented before the Division of Water and Waste Chemistry, 140th Meeting, American Chemical Society, Chicago, Ill., Sept. 1961.)

To assess the validity of adsorptive sampling of atmospheres for gases and vapors, it is necessary to determine the degree to which the sample is altered prior to analysis. In sampling atmospheres for olefinic vapors, the known proclivity of some structures to undergo double bond or skeletal rearrangement and the importance of the molecular location of the double bond in determining the degree to which the olefin may act as a smog precursor, make the study of isomerization important. In this investigation, bimethallyl, biallyl, and 1-hexene were selected for study of olefin isomerization in adsorption and desorption with activated carbon. Bimethallyl, which is particularly labile to isomerization to conjugated dienes, produces 5 to 15% rearranged products. Biallyl, which is generally more resistant to change, yields 1 to 2% rearrangement. The mono-olefin, 1-hexene, gives no detectable change. It is concluded that most gasoline-range hydrocarbons can be sampled on carbon and recovered for analysis without serious double bond migration or skeletal rearrangement. New designs for desorption apparatus are described. (Author abstract)##

04596

R. Smith

PROGRAM DEVELOPMENT THROUGH APPLYING MEASUREMENTS AND MONITORING KNOW-HOW. Proc. Natl. Conf. Air Pollution, Washington, D.C., 1962. pp. 233-45. 1963.

Author directs our attention to the problem of appropriate air quality. Many large communities are able to deal with the direct nuisance problem in which there is a specific individual source of pollution and some rather direct social or economic effects on adjacent inhabited areas. While such programs eliminate many source of complaint, they seldom provide a community with an overall air quality of a desirable nature. Although this problem is complex and knowledge is imperfect, author discusses simple guidelines through which reasonable long-range objectives can be delineated. Such objectives are capable of periodic evaluation as knowledge and techniques improve.##

04631

J. Tighe, R. B. Engdahl, and E. J. Center

DIRECT INFRARED SPECTRAL ANALYSIS OF CONTAMINANTS IN THE ATMOSPHERE (A PRELIMINARY STUDY). Preprint. 1953.

A preliminary study of the application of infrared spectral analysis to the direct examination of the atmosphere for contaminants has been made. A Beckman IR-2 infrared spectrometer and auxiliary equipment have been assembled and infrared-absorption spectra obtained for compounds in the air in the concentration range of 0.2 to 25 ppm (vol/vol). This range is of interest in air-pollution work. Improvement of the equipment should lower the minimum detectable concentration by a factor of at least five. The work indicates that a commercial infrared spectrometer, together with simple and inexpensive auxiliary equipment, may be made mobile to permit direct spectral atmospheric analyses in the field.##

04635

W. F. Serat, F. E. Budinger, and P. K. Mueller

TOXICITY EVALUATION OF AIR POLLUTANTS BY USE OF LUMINESCENT BACTERIA. Atmos. Environ. (London) 1, (1) 21-32, Jan. 1967. (Presented at the Seventh Conference of Methods in Air Pollution Studies, Los Angeles, Calif., Jan. 25-26, 1965.)

Cells of a species of luminescent bacteria were treated with a gas stream containing products formed by the photochemical oxidation of cis-2-butene and NO. Luminescence and viability decreased with the time of irradiation of reactants. The rate of luminescence decrease was dependent on the ratio of the initial concentrations of cis-2-butene and NO with a ratio of giving the most rapid loss. Known photochemical oxidation products, ozone,

NO₂, formaldehyde, acetaldehyde, and PAN were examined individually. Aldehydes did not appear to contribute to the decrease in luminescence but ozone and PAN did. Although NO₂ alone up to 0.5 ppm produced no decrease, it may contribute to the luminescence loss in the total irradiation mixture. The total oxidant concentration produced upon irradiation gave luminescence decreases which were matched by comparable concentrations of pure ozone. However, this does not imply that luminescence losses caused by photochemical oxidants are due only to ozone. A possible mechanism of the toxic effect and the interpretation of this bioassay in relation to other organisms are briefly discussed. (Author abstract)##

04648

Y. Matsumura

THE ADSORPTION PROPERTIES OF ACTIVE CARBON. II. PRELIMINARY STUDY ON ADSORPTION OF VARIOUS ORGANIC VAPORS ON ACTIVE CARBON BY GAS CHROMATOGRAPHY. Ind. Health (Japan) 3, 121-5, Dec. 1965.

Gas chromatography was used to observe the retention times of thirteen organic vapors on active carbon. The compounds were n-alcohols of C₄-C₆, n-paraffins of C₅-C₆, acetone, methyl ethyl ketone, diethyl ketone, ethyl acetate, cyclohexane, benzene, and carbon tetrachloride. The active carbon was a commercial activated wood charcoal produced for gas mask canisters. The retention times of the organic vapors depended upon the temperature of the column in accordance with Arrhenius' equation in the range of 60-250 C. In the homologous series of n-alcohols and ketones, the logarithmic retention times were in linear relation with their boiling points respectively at each temperature of 150, 200, and 250 C. Retention time of each compound was extrapolated to 60 C. by Arrhenius' relation to obtain their relative retention times to compare with that of carbon tetrachloride at that temperature. (Author summary modified)##

04667

R. K. Sharma, D. R. McLean, J. Bardwell

AN APPARATUS FOR THE ANALYSIS OF COMBUSTION PRODUCTS OBTAINED DURING THE OXIDATION OF HYDROCARBONS. Indian J. Technol. (India) 3, (7) 206-8, July 1965.

A gas chromatographic apparatus with several improved features, permitting the analysis of complex mixtures of combustion products obtained during the oxidation of hydrocarbons is described. The improved features are (1) a sampling device that avoids the use of stopcock grease and permits operation at elevated temperatures and pressures; (2) six-way valves that facilitate sample injection; and (3) a dual-column gas chromatograph permitting separation of compounds with widely varying boiling points. The products obtained by the low temperature (284 C.) oxidation of propane and butane have been analysed using this apparatus. Although the

gas chromatographic method is particularly appropriate for most types of combustion products, it is less satisfactory for certain highly reactive products, namely hydrogen peroxide, formaldehyde and organic acids. The presence of formaldehyde in the combustion gases has a detrimental effect on the gas chromatographic analysis for certain other compounds, notably methanol. (Author abstract modified)##

04716

S. L. Sachdev, J. W. Robinson, and P. W. West

EFFECT OF MIXED ORGANIC SOLVENTS ON ATOMIC ABSORPTION SPECTROPHOTOMETRY OF REFRACTORY METALS. Anal. Chim. Acta 37, 156-63, 1967.

The effect of various organic solvents on the absorption signal of vanadium in fuel-rich oxy-acetylene flames and nitrous oxide-acetylene flames was investigated. The absorption of the 3183.9 Å line of V was greatly enhanced by the use of various mixed organic solvents when fed to oxy-acetylene flames. In general, the solvents' effect was in the following order: Propanol-2 greater than ethanol which was greater than methanol. Results showed that absorption was maximum in highly reducing flames and increased as the concentration of organic solvent increased. Maximum absorption was observed when the solution contained more than 70% of the respective solvents. In the case of nitrous oxide-acetylene flame, the addition of diethylene glycol (about 8% in the final solution), and similar compounds, to the aqueous solution of V increased the absorption by about 50%.##

04742

H. Sakamoto and T. Kozima

RELIABILITY OF MEASUREMENT OF EVAPORATED BENZENE HOMOLOGUE CONCENTRATIONS WITH THE BENZENE-DETECTION TUBE. Japan J. Ind. Health (Tokyo) 3, (8) 419-21, Aug. 1961. Jap.

A study was made of the reliability of measurement with the benzene detection tube, widely used to measure the amount of benzene and its homologues in the air of workshops. The richer the benzene concentration in the air, the larger the probable error of the mean of obtained values, whereas the coefficient of variation of obtained values is at a minimum when a benzene detection tube is used. The same results were obtained in cases of toluene and its mixture with benzene in the air of workshops. When the benzene-like mist in the workshop air which evaporated from sprayed paint was examined, the values obtained with the benzene-detection tubes showed half of the values obtained by the sulfuric acid-formalin method. (Author summary modified)##

M. Alperstein and R. L. Bradow

COMBUSTION GAS SAMPLING VALVE. Rev. Sci. Instr. 36, (7)
1028-31, July 1965.

A valve suitable for extracting a sample of high temperature, high pressure gases and introducing this sample into a low pressure regime has been developed and successfully operated for two years. Slow combustion reaction studies in a normally-fired spark-ignition engine are being accomplished with the aid of this gas sampling valve located in the combustion chamber end-gas region. The valve exhibits excellent sealing, achieves choked flow conditions, and permits sampling times on the order of 1 msec. The construction, operation, and monitoring of this gas sampling valve are described. (Author abstract) ##

04796

J. E. Sigsby, Jr., L. J. Lage, T. Bellar, and M. L. Eisele

CHEMICAL METHODOLOGY IN AUTO EXHAUST STUDIES. Preprint.
(Presented at the 54th Annual Meeting, Air Pollution Control Association, New York City, June 11-15, 1961.)

A major auto exhaust research project requires extensive chemical analytical support. Such compounds as NO, NO₂, acrolein, and the individual hydrocarbons and such classes of compounds as olefins and oxidants are determined routinely. Sampling schedules and conditions are important in the over-all program. This paper describes the specific analyses and the general laboratory program that provide the greatest amount of significant chemical information. The procedures discussed include IR spectroscopy, wet chemical analysis and gas chromatography. Wet chemical analyses are made for NO₂, NO, four-carbon and higher olefins, acrolein, and formaldehyde. All samples for wet chemical analysis are taken with bubblers. A Beckman Spectrophotometer, Model DU, is used to determine absorbance. For hydrocarbon analysis the gas chromatograph used is a modified three-stage instrument. The first and second stages are operated in series, using thermal conductivity detectors and helium carrier gas. The third stage operates separately with a flame ionization detector and a silica gel column to determine the higher hydrocarbons. The first two stages are used in conjunction with a double trapping system to determine four-carbon and higher materials. The utilization of this array of testing methods and equipment requires careful planning, if each experiment is to yield maximum information. On one occasion 50 samples were analyzed in a 4-hour period; this is more than one sample every five minutes, and is typical of the quantity of data that may be obtained if necessary. Normally, the reproducibility of the chemical results is better than 10%. ##

M. Malanchuk

CONTINUOUS AUTOMATIC DETERMINATION OF SULFUR DIOXIDE IN THE PRESENCE OF AUTO ENGINE EXHAUST. Am. Ind. Hyg. Assoc. J. 28, 76-82, Feb. 1967.

An instrument normally used for measuring nitrogen oxides was found suitable for the continuous automatic monitoring of sulfur dioxide under conditions that exist in animal exposure chambers. This was accomplished by substituting a ferric-phenanthroline solution for the Saltzman reagent that is required for nitrogen oxides in such an instrument. The arrangement has the advantage of being specific for SO₂ determination under conditions similar to those mentioned above. The conductimetric-detector instrument employing water for the absorption medium has severe limitations in accurately determining SO₂ in the complex engine exhaust composite. The conductimetric instrument using hydrogen peroxide has fewer limitations. Typical of colorimetric methods involving an absorption step and a color-developing period, this instrument has a 20- to 30- minute delay in response. Modification of the equipment to suit the analytical method should result in faster response, greater sensitivity, and wider range. For example, thermostating the absorption section for operation at a higher temperature, such as the 50 C would yield greater sensitivity. A lesser coil and sample cell volume would produce a faster response.##

04839

R. K. Stevens and R. E. Painton

APPLICATION OF A HOT WIRE IONIZATION DETECTOR TO AUTOMOTIVE EXHAUST GAS ANALYSIS. Micro Tek Instruments Corp., Baton Rouge, La. Mar 17, 1967. 26 pp.

The objective was to investigate the application of a catalytic combustion ionization detector to the determination of hydrocarbons in automotive exhaust. The catalytic element is a coiled platinum hot wire of the general type used in conventional catalytic combustion detector cells in which thermal effects are measured. In the present device the effect measured is the ion current resulting from charged radicals formed during the process of catalytic combustion. A major feature of this technique for auto exhaust gas analysis is its complete selectivity to C₂+ hydrocarbons in the presence of CO, H₂, CH₄, CO₂, air and H₂O. The effect of operating parameters on selectivity to different types of hydrocarbons was examined, results are compared to those obtained with the Flame Ionization Detector, and typical results on actual auto exhaust samples are reported. The CCID (Catalytic Combustion Ionization Detector) can be a critical component in a composite "black box" analyzer to be used for field surveillance of automobile exhaust with regard to emission of hydrocarbons and carbon monoxide. (Author summary modified)##

G. Dimitriades

DETERMINATION OF NITROGEN OXIDES IN AUTO EXHAUST. J. Air Pollution Control Assoc. 17, (4) 238-43, Apr. 1967.

A new procedure for determining nitrogen oxides in automobile exhaust has been developed. The new procedure was included in a Bureau of Mines comparative study that aimed at evaluating various widely used methods for determining NO_x in auto exhaust. The methods included in the evaluation study follow: (1) Static oxidation in tank (ST method). The method involves oxidation of NO in residence with O₂ in a stainless steel tank. (2) Bureau of Mines method (BM method). The method involves application of the ST procedure in exhaust samples from which the hydrocarbons have been removed by combustion over catalyst. (3) Chevron Research method (CR method), as described in the literature. (4) Phenoldisulfonic acid method (PDS method), as described in the literature. The principal objective of this study was to generate experimental evidence which would lead to defining an optimum procedure for converting NO, present in exhaust gas, into NO₂; this conversion is desired so that the total of NO + NO₂ can be determined quantitatively in the form of NO₂. In pursuing this objective, the procedures prescribed by the foregoing methods were comparatively tested. The results indicated that all four methods are subject to error, the extent of which depends on the conditions employed. The BM method was superior from the standpoint of accuracy because it was less affected by interferences due to hydrocarbon-NO₂ reactions. (Author abstract)##

04880

B. C. Newbury

THE USE OF THE CORRELATION SPECTROMETER IN THE STUDY AND CONTROL OF AIR POLLUTION. Preprint. (Presented at the Air and Water Pollution Conference, Sacramento, Calif., Feb. 2-3, 1967.)

The Barringer Correlation Spectrometer is a highly specific instrument offering great advantages in pollutant monitoring: (1) It is a physical measurement and does not require frequent renewal of reagent solutions; (2) It can operate through a wide range of temperature: it does not require constant temperature enclosures, or even protection from freezing; (3) It requires no pumps or valves. The passive model requires power only for the electronics and remote operation using solar cells if possible; and (4) The basic instrument is suitable for a large number of compounds, reducing drastically, the spare parts and expertise required, in comparison with the usual range of unrelated instruments. The Barringer Tape Sampler is a modular sampler of improved design and with a very flexible timing control unit. The sequential sampler module will be additive for extended sampling schedules.##

04881

A. R. Barringer

NEW INSTRUMENTATION AND TECHNIQUES FOR POLLUTION MONITORING.
Preprint. (Presented at the Air and Water Pollution
Conference, Sacramento, Calif., Feb. 2-3, 1967.)

Correlation spectrometers utilize an internal memory of the spectrum which it is desired to detect. Real time correlation is carried out against the spectrum of the incoming radiation. The first of these devices uses a conventional grating spectrometer. A photographic replica of the spectrum of the gas being detected is installed in the position normally occupied by the slit of a dispersive spectrometer. A spectrometer is used to make the replica mask, by exposure through a cell of the gas, matching exactly the dispersion and aberration characteristics of the spectrometer. The unknown spectra of the incident light is caused to vibrate across the correlation mask, by using a refractor plate oscillating in a rotary fashion to displace the entrance slit image from side to side. Phase locked detection of the output of the photo-multiplier is carried out in synchronism with the oscillations of the refractor plate. Integration of the synchronous detection can be made over a period varying from a fraction of a second to several seconds. A telescope may be incorporated in the instrument. Alternative means may be employed for oscillating the slit image such as a high stability tuning fork and dual refractor plate assembly. An instrument of this type has been programmed for sulfur dioxide detection. It is capable of detecting concentrations as low as ten parts per billion over a one hundred meter pathlength. It is highly specific for sulfur dioxide having an excellent immunity to interferences. Operation is in the ultraviolet region between 2,900 and 3,150 Angstroms where there is sufficient solar spectral radiant flux penetrating the atmosphere to enable the equipment to function passively using natural daylight. An automatic gain control system operates on the average DC value of the photomultiplier output. The AC signal under these conditions is directly proportional to the percentage modulation caused by sulfur dioxide.##

04895

R. N. Thompson, C. A. Nau, and C. H. Lawrence

IDENTIFICATION OF VEHICLE TIRE RUBBER IN ROADWAY DUST. Am.
Ind. Hyg. Assoc. J. 27, (6) 488-95, Dec. 1966.

A technique combining pyrolysis and chromatography for the detection of vehicle tire abrasion products in roadway dust is described. Samples of elastomers used in tire formulations were volatilized and separated by gas-liquid chromatography to provide characteristic chromatograms. These identifying patterns appeared consistently in the chromatographic separations of the pyrolyzates of compounded tire rubber and various roadway dusts. To confirm the technique, two chromatographic procedures were used for the identification of specific components of the thermal degradation products of raw elastomers, compounded rubbers, and roadway dusts. (Author abstract)##

Hauser, T. R.

THE DETERMINATION OF POLYNUCLEAR AROMATIC HYDROCARBONS IN AIR PARTICULATE MATTER. Preprint, ((Public Health Service, Cincinnati, Ohio, Div. of Air Pollution,)) ((19))p., 1965. 12 refs.

The determination of the polynuclear aromatic hydrocarbon content of air particulate matter is described. Air particulate samples are collected on glass fiber filters using a high volume air sampler. The samples are then extracted with benzene in a Soxhlet extractor to obtain a benzene soluble fraction of air particulate matter which is normally referred to as the "organic fraction." This organic fraction is then further separated into approximately 30 to 40 sub-fractions by means of column chromatography of alumina using increasing amounts of diethyl ether in pentane as the eluent. Each of the sub-fractions is dried, dissolved in pentane, and spectrophotometrically analyzed for polynuclear aromatic hydrocarbon content. The polynuclear aromatic hydrocarbons that can be effectively separated and analyzed by this technique if they are present in a particular air sample are anthracene, phenanthrene, fluoranthene, pyrene, benz(a)anthracene, chrysene, benzo(a)pyrene, benzo(e)pyrene, perylene, benzo(g,h,i)perylene, anthanthrene, and coronene. Reference is made to review articles which discuss other techniques for the analysis of polynuclear aromatic hydrocarbons, particularly in urban air and from coal tar pitch.##

04931

R. J. Charlson, H. Horvath, and R. F. Pueschel

THE DIRECT MEASUREMENT OF ATMOSPHERIC LIGHT SCATTERING COEFFICIENT FOR STUDIES OF VISIBILITY AND AIR POLLUTION. Atmospheric Environ. 1 (4), 469-78 (July 1967)

The integrating nephelometer of Beuttel and Brewer has been modified for studies of air pollution. The instrument, which is simple, stable, and inexpensive to construct, has been operated continuously for several months. Interpretation of the data is simplified by use of a theoretical approach which indicates that the measured light scattering coefficient is proportional to the mass of suspended particulates for well-aged atmospheric aerosols. (Author abstract)##

04960

S. W. Nicksic and R. E. Rostenbach

INSTRUMENTATION FOR OLEFIN ANALYSIS AT AMBIENT CONCENTRATIONS. J. Air Pollution Control Assoc. 11, (9) 417-20, Sept. 1961. (Presented at the 54th Annual Meeting, Air Pollution Control Association, New York City, June 11-15, 1961.)

This paper describes a bromination and coulometric system and the instruments developed to measure olefins in automobile exhaust and in the atmosphere. The concentration of olefins in automobile exhaust considered here is over 100 ppm while that in the atmosphere is usually less than 4 ppm. The method is based on the observation that the olefins, excluding ethylene, can be quantitatively brominated by passing a gas sample through a solution of appropriate composition. The method is based also on the principles of coulometric titration. The system differs from the conventional coulometric practice in the bromination is carried out before coulometry. The excess of bromine to do this is about 0.00002 moles per liter. In this system, the gas sample is passed through the sensing solution and the time is measured to generate the bromine absorbed by the sample. The two Olefin Analysers developed - one for atmospheric use and one for auto exhaust analysis are self-contained portable instruments for automatic, continuous olefin analysis of a gas sample or stream. These were designed for operation with a recorder modified slightly for this purpose.##

04973

P. L. Magill

TECHNIQUES EMPLOYED IN THE ANALYSIS OF LOS ANGELES SMOG. Proc. Natl. Air Pollution Symp., 1st, Pasadena, Calif., 1949. pp. 61-8.

An analysis of smog was undertaken with the major objectives being the determination of the materials responsible for the reduction of visibility and those responsible for eye irritation. The instruments and methods used for collecting particulate and gaseous matter from the atmosphere are described. A new method for semi-quantitative analysis of samples by proton bombardment is explained. A tabular summary of the components of Los Angeles smog is provided. The effects of particulate matter on visibility are described and a simulation experiment is mentioned which shows eye irritation to be the result of the synergistic effect of several substances.##

05042

J. E. Johnson, Chiantella, A. J., W. D. Smith, and M. E. Umstead

NUCLEAR SUBMARINE ATMOSPHERES. PART 3. AROMATIC HYDROCARBON CONTENT. Naval Research Lab., Washington, D. C., Chemistry Div. (NRL Rept. 6131.) Aug. 24, 1964. 32 pp.

A detailed analytical study has been directed to the identification and determination of the amounts of aromatic hydrocarbons present in nuclear submarine atmospheres. Many individual aromatic hydrocarbons have been identified and their occurrence in a number of nuclear submarines has been established. The hydrocarbon oil samples were desorbed from activated carbon which had been exposed in nuclear submarine atmospheres. The

aromatic hydrocarbon content of these oils was found to be approximately 25 to 30 percent of the total. The quantitative distribution of individual aromatic hydrocarbons was very similar from submarine to submarine with this distribution strikingly similar to that of typical petroleum distillates in the same boiling range. (Author abstract)##

050561

50561

R. A. Stuart

APPLICATION OF GAS-LIQUID CHROMATOGRAPHY FOR DETERMINATION OF TRACE HYDROCARBONS IN AIR AND COMPRESSED BREATHING GASES.

Naval Research Establishment, Dartmouth, Nova Scotia, Canada, Defense Research Board. Mar. 1963. 10 pp. (NRE Rept. No. 63/3.)

A method for gas-liquid partition chromatographic analysis of the hydrocarbons commonly found in petroleum vapors is described. The relative retention times of some hydrocarbons are listed and preliminary evidence of their distribution in gasoline vapors is given. Modifications which allow the use of conventional gas chromatographic apparatus for the detection of these hydrocarbons at or below 1 p.p.m., and the technique as it can be applied to the determination of such contaminants in compressed breathing gases are discussed. (Author abstract)##

05084

K. Rothwell,* and J. K. Whitehead

COMPLEX FORMATION, ISOLATION, AND CARCINOGENICITY OF POLYCYCLIC AROMATIC HYDROCARBONS. Nature 213, (5078)' 797, Feb. 1967.

Methods for the isolation of polycyclic aromatic hydrocarbons which are based on partition, adsorption or complex formation used singly or in combination, are reviewed. A new electrophoretic method and its possible relationship to carcinogenic activity is considered. Using curtain paper electrophoresis with platinum electrodes in troughs at the top and bottom of the paper, complexes of polycyclic aromatic hydrocarbons with both caffeine and 1:3:7:9-Tetramethyluric acid (TMU) have been found to migrate readily. Complexes were formed before spotting on the paper; the solvent was a solution of 2 g purine in 90 ml. water-10 ml. ethanol-2 ml. ammonia and the potential and current were 30-35 V/cm and 3-4 m.amp/cm. The twenty-five complexes of polycyclic aromatic hydrocarbons examined all migrated as discrete spots which completely left the baseline. Using the same method, it was later shown that these polycyclic aromatic hydrocarbons could be separated from twelve times their own volume of 'Vaseline'. In large scale applications of the method, as much as 1 g. of hydrocarbon mixtures containing polycyclic aromatic hydrocarbons has been adsorbed on 80-100 g silica and the residue packed into a column 38 mm in diameter. By applying a potential of 1,200-1,500 V to the column and slowly eluting with

The solvent already mentioned, almost all the species which could be detected by electron capture during gas-liquid chromatography have been separated from the bulk of the mixture which remained on the column. Furthermore, in experiments in which radioactively labelled polycyclic aromatic hydrocarbons were incorporated in the hydrocarbon mixture, 97-98 per cent of the labelled polycyclic aromatic hydrocarbons were isolated. The exact experimental details of the method, which is now being used with most encouraging results to examine the condensate of cigarette smoke, are to be published subsequently.##

O5092

M. G. Zigler, and W. F. Phillips

A THIN-LAYER CHROMATOGRAPHY METHOD FOR ESTIMATION OF CHLOROPHENOLS. Environ. Sci. Technol. 1, (1) 65-7, Jan. 1967.

A highly sensitive, rapid, and selective thin-layer chromatographic method is used for the determination of m-chlorophenol, 2,4-dichlorophenol, 2,4,5-trichlorophenol, 2,4,6-trichlorophenol and pentachlorophenol in a raw and treated water. The two-directional thin-layer chromatographic technique employs two supplementary reagents, aminoantipyrine and silver nitrate, both of which provide independent sensitivities of less than 1 p.p.b. The technique has been applied to surface waters before and after treatment and should be useful to investigators studying the effects of water treatments. Concentrations of 0.1 microgram per liter or more can be determined using 1-liter samples and the silver nitrate reagent. Confirmation of 0.5 microgram per liter or more can be readily achieved with the 4-aminoantipyrine reagent, again using 1 liter as the sample size. The use of two separate chromogenic reagents, one of which responds to phenols and the other to the halogen, in conjunction with thin-layer chromatography, provides a very high degree of specificity. The method is rapid, offers good recovery and reproducibility, and has been found satisfactory for all samples of waters encountered.##

O5135

J. E. Sigsby, Jr.

DISCUSSION ON GAS CHROMATOGRAPHY - MEASURING EXHAUST HYDROCARBONS DOWN TO PARTS PER BILLION BY L. J. PAPA. Preprint. (Presented at the Mid-Year Meeting, Society for Automotive Engineers, Chicago, Ill., May 18, 1967.)

A critical discussion of the subject paper is presented. The subtractive technique, when applied to simple instrumentation, may yield considerable information on internal composition without producing vast masses of data. Schemes for the detailed analysis of gas chromatograph data usually involve summing either by compound type or by a reactivity scheme, which partially negates the value of the detailed analysis. The system described for the total gas chromatographic analysis of automotive exhaust appears to be one of the most workable systems so far presented.

It results in a single data output which might lead to significant dollar savings in data reduction. The use of plastics at any point, in any sampling procedure, should be evaluated. It is not desirable to use polyethylene or saran for calibration, daily standards, or any other application in which higher-molecular-weight hydrocarbons may be involved. A column of mixture Porapak Q and F separates most of the hydrocarbons, but does not afford a separation of propane and propylene. The use of silica gel for such a column, with or without support modification, might well afford a complete separation. Information on any technique, other than an initial ice trap, for removing the water would be appreciated. Most techniques interfere with detailed analysis by removing many specific hydrocarbons. Differences have been noticed between static and dynamic sampling systems. If one samples dynamically through a system that is maintained at reasonably constant flow, equilibrium is reached rather quickly and there is no apparent increase in response with increased flow time. The only apparent necessity is to allow for complete flushing of all sample lines, for approximately 10 times the volume. Valve leakage may be corrected by lapping both the rotor and the base of two surface valves carefully. Only valves of Teflon and stainless steel should be used. Changes in composition of exhaust have been found in various classes of hydrocarbons. These differences are quantitative rather than qualitative. The overall gas chromatographic pattern of the fuel closely resembles that of the exhaust. Quantitatively, however, variations as large as 20 or 30 per cent from predicted concentrations may occur.##

05136

Sawicki, E. and R. A. Carnes

FLUORIMETRIC ASSAY FOR ALPHA-GLYCOLIC COMPOUNDS AND OTHER ALDEHYDE PRECURSORS . Microchim. Acta, No. 3:602-607, 1968. 2 refs.

Three reagents and a variety of fluorimetric methods are introduced for the assay of alpha-glycolic compounds, polar olefinic compounds, and olefins. The procedures are based on the controlled oxidation of these compounds to aldehydes and analysis of the aldehydes with J-acid, 2,4-pentanedione, or dimedon. Most of the methods show reasonable sensitivity and accuracy and should be capable of use in air pollution studies. Recommendations are made for their use. Results confirm the presence of large amounts of alpha-glycolic compounds in aqueous extracts of urban airborne particulates. (Authors' abstract)##

05170

F. G. Rounds, and H. W. Pearsall

DIESEL EXHAUST ODOR (ITS EVALUATION AND RELATION TO EXHAUST GAS COMPOSITION. Vehicle Emissions (Selected SAE Papers) 6, 45-69, 1964. (Presented at the National Diesel Engine Meeting, Society of Automotive Engineers, Chicago, Ill., Nov. 1-2, 1956, Paper No. 863.)

Techniques, based on panel estimates, were developed for evaluating the odor and irritation intensities of undiluted Diesel engine exhaust gases or of various dilutions of these gases in air. Along with the estimates, chemical analyses were made to determine the concentrations of total aldehydes, formaldehyde, and oxides of nitrogen. Statistically significant correlations were found between odor or irritation intensity estimates and the analytical data, but these correlations were too weak to permit accurate prediction of odor or irritation from chemical analyses. The effects of some engine variables on Diesel odor were studied. Possible means of reducing Diesel odor are discussed. Limited studies indicated that engine load has a pronounced effect on exhaust odor and irritation intensity. Engine make, engine speed, engine condition, fuel type and lubricating oil type had comparatively little effect.##

05191

A. R. Barringer

DEVELOPMENTS TOWARDS THE REMOTE SENSING OF VAPOURS AS AN AIRBORNE AND SPACE EXPLORATION TOOL . Proc. Symp. Remote Sensing Environ., 3rd, Ann Arbor, Mich., 1964. pp. 279-92. Feb. 1965

The remote sensing of geochemical parameters is investigated. The techniques under study and development are concerned with sensing the dispersion of volatile components of orebodies or their oxidation products in the surface soils and in the air above. The elements and compounds of interest include mercury, iodine and sulphur dioxide in connection with metal bearing deposits, and hydrocarbon gases and iodine in association with oil fields. (Author abstract)##

05210

A. A. Belyakov

DETERMINATION OF CARBON TETRACHLORIDE IN AIR. Zavodsk. Lab. (Moscow) 23, (2) 161-2, 1957. Russ. (Tr.)

Determination of carbon tetrachloride and chloroform by colorimetric analysis is discussed. The method involves application of the condensation reaction between 2,4-dinitrochlorobenzene and pyridine to form pyridinium chloride which is converted by hydrolysis to glutaconic aldehyde and 2,4-dinitroaniline. The color reaction depends on the formation of derivative of glutaconic aldehydes and reaction of the latter with aniline. A standard scale of colored solutions was established to evaluate the concentrations. It is possible to determine 1 gm of carbon tetrachloride (CCl₄) in 1 ml of solution with an average error of 4.5%. In the case of chloroform (CHCl₃), 0.5 gm per ml can be analyzed.##

F. E. Saalfeld

MASS SPECTROMETRIC DETERMINATION OF THE ALIPHATIC AND AROMATIC CONTENT OF A HYDROCARBON MIXTURE . Naval Research Lab., Washington, D.C., Chemistry Division. (NRL Rept. No. 6178.) Nov. 12, 1964. 8 pp.

A simplified mass spectrometric technique has been devised for determining the aromatic content in hydrocarbon mixtures of the type that have been recovered from adsorptive carbon samplers exposed in the atmospheres of nuclear submarines. The method is based on the summation of ion currents at mass-to-charge ratios' (m/e) of 27, 28, 29, 41, 43, and 57 for aliphatic hydrocarbons and aromatic hydrocarbons. The mass spectrometric results agree reasonably well with Fluorescence Indicator Adsorption analyses of the same samples. While, due primarily to cost and operational complexity, no available mass spectrometers are suitable for shipboard operation, future developments in the field of mass spectrometry should be carefully observed for advances that make such use possible. (Author abstract)

P. G. Jeffery, and P. J. Kipping

GAS CHROMATOGRAPHY FOR THE ANALYSIS OF EXHAUST GASES. Proc. Inst. Mech. Engrs., London, Engl., 1966. 180 (3G), 95-100 (1966).

The traditional methods for the analysis of vehicle exhaust gases have never been entirely satisfactory. The recent development of gas analysis by gas chromatographic methods offers considerable improvement in accuracy, precision, and also in time required. Difficulties still arise for certain constituents, notably sulphur dioxide and oxides of nitrogen, for which chemical methods of analysis are still preferred. The chromatographic analysis of the hydrocarbon fraction and the remaining inorganic fraction of exhaust gases, where this is required, is now a routine operation, calling for neither expert chromatographic knowledge, nor exceptional skill in manipulation. A typical gas chromatograph may be considered as comprising a number of simple building blocks, including a carrier gas flow system, a sample inlet mechanism, a chromatographic material for component resolution, a detector for those components of interest, and a display mechanism. Some form of electrical control is required; this may amount to little more than a Wheatstone bridge network, or may be a high quality linear amplifier and associated voltage-decade supply for the more sophisticated ionization detectors. Each of these building units is considered in detail, and the errors that can arise in the course of making an analysis of an exhaust gas are noted. The possibility of gross errors arising from defective equipment is also considered.##

05299

M. Katz

STANDARDIZATION OF METHODS OF MEASUREMENT OF AIR QUALITY IN MEMBER COUNTRIES. Preprint. (1963)

Measurement methods for dust fall, suspended particulates, sulfur dioxide, sulfur trioxide, sulfuric acid, nitrogen oxides, ozone or oxidants, and hydrocarbons are reviewed. Standardization of techniques and methods of reporting data is a prerequisite for international exchange of information and for further co-operative research in order to establish a sound basis for the control of air pollution.

05319

Engel, C. R., and E. Sawicki

A SUPERIOR THIN-LAYER CHROMATOGRAPHIC PROCEDURE FOR THE SEPARATION OF AZA ARENES AND ITS APPLICATION TO AIR POLLUTION. J. Chromatog., Vol. 31, p. 109-119, 1967. 8 refs.

A thin-layer-chromatographic method for separation of polynuclear aza heterocyclic compounds with silica gel is presented which is superior to previously reported paper and thin-layer chromatographic methods. Many of the groups of compounds had run together in previous separation methods. This procedure has been applied to the separation of various basic fractions of interest in air pollution studies. Ben(c)acridine, benzo(h)quinoline, acridine, benz(a)acridine, and phenanthridine can be separated and identified in these samples with the help of two-dimensional thin-layer chromatography on silica gel-cellulose (2:1). In addition, a column chromatographic separation of a basic fraction of coal-tar pitch, with silica gel as the adsorbent, was investigated, and the amounts of benz(c)acridine and benz(a)acridine were estimated. Evidence obtained from the absorption spectra indicates the presence of a large number of unknown and previously identified compounds in the fractions. The various silica gel methods are recommended for use in air pollution studies. (Authors' abstract)

05322

MONITORING OF CONTAMINANTS. THE FIRST STEP IN AIR POLLUTION CONTROL. Instrument Development Co., Reston, Va. Feb. 1, 1967. 27 pp.

This paper was prepared in order to contribute to the better understanding of the need for air contaminant monitoring. Included are explanatory remarks on the Clean Air Act of 1963, some historical considerations on air pollution, lists of sources pollutants, and specifications on air pollution monitoring equipment currently offered by the Instrument Development Company.

Stebar, R. F., M. J. Cianciolo, F. M. Ward, and D. A. Brownson

DIGITAL DATA ACQUISITION AND COMPUTER DATA REDUCTION FOR THE CALIFORNIA EXHAUST EMISSION TEST. In: Vehicle Emissions, Part II, SAE Progress in Technology Series, Vol. 12, Society of Automotive Engineers, Inc., N.Y. 1966, p. 342-351. (Presented at the SAE Mid-Year Meeting, Detroit, Mich., June 6-10, 1966.)

The tedious, time consuming task of hand reducing data from the California exhaust emission test has been alleviated through the use of digital data acquisition equipment and a digital computer. Analog signals from exhaust gas analyzers and an engine speed transducer are converted to digital measurements which are recorded on tape and submitted to a digital computer for data analysis and computation of results. In the data analysis, the computer identifies the required driving modes from engine speed changes, taking into account the sample delay time. "Reported" composite emissions determined by the automatic data reduction method agree within 5% with results determined by careful hand analysis of analog strip chart recordings. The results determined by the automatic data reduction system are more consistent and accurate because of human errors prevalent in hand analysis have been eliminated, and because nonlinear analyzer response is accounted for. With the automatic system, data reduction time has been decreased from about 4 hr per test to less than 3 minutes. (Authors' abstract)##

05376

Khrustalev, V. A.

DETECTION OF PHENOL IN THE ATMOSPHERE WITH 4-AMINOANTI-PYRENE. Gigiena i Sanit. 10, 42-5 (1962). Russ. (Tr.)

In the detection of phenol by the use of 4-A.A.P. (4-aminoantipyrène), it was established that dimethyl p-cresol, acetophenone, alpha-methyl-styrene, diethyl ether, isopropyl alcohol, hydroperoxide of isopropyl benzene, benzene, dimethyl phenylcarbonyl; ethyl- and butyl-benzene do not interfere. In the detection of phenol with diazotized p-nitroaniline, presence of dimethyl p-cresol interferes to the extent of 0.7 microgram which attests to the expediency of the use of the 4-A.A.P. and not of the diazotized p-nitroaniline. The absorption of phenol from air can be achieved by liquid media or solid sorbent. The use of 0.05 M solution of sodium borate, of which 3 or 6 ml. should be put into a V-shaped absorber with a No. 1 porous membrane is recommended for liquid media. It is possible to carry out the liquid media absorption of phenol at a speed of 5 L/min. Silica gel in suspension was used as the solid absorbent. Absorption rates for complete absorption here were 5-10 L/min. The use of ethyl alcohol effected complete extraction of the phenol from the silica gel in 15 min. Results of these studies are presented in diagram. The rose color of the sample in the 0.1 percent aqueous 4-A.A.P. solution was compared with the standard curve.

05383

Krilov, N. A.

DETERMINATION OF ETHYLENE OXIDE IN THE ATMOSPHERE. Gigiyena i Sanit. 10, 48, 1961. Russ. (Tr.)

A colorimetric method was developed for the estimation of ethylene oxide in the atmosphere, based on the hydration of ethylene oxide to the ethylene glycol and its subsequent oxidation by periodic acid or potassium periodate to formaldehyde and the determination of the latter with chromotropic acid. The sensitivity of the method is 0.000 5 gm. in 5 ml. It is recommended that ethylene oxide be sampled in 6 ml. of 40 percent H₂SO₄ contained in a U-shaped absorber with a No. 1 porous membrane at a speed of 0.5 l/min. (Author conclusions modified)

05404

E. J. Levy and D. G. Paul

THE APPLICATION OF CONTROLLED PARTIAL GAS PHASE THERMOLYTIC DISSOCIATION TO THE IDENTIFICATION OF GAS CHROMATOGRAPHIC EFFLUENTS. J. Gas Chromatog. 5 (3) 136-45, Mar. 1967.

A technique has been developed for gas chromatographic effluent identification. In the application of this technique, the peak selected for identification is transferred in a continuous flow system, from the primary gas chromatographic unit, through a tubular quartz pyrolysis reactor, and then through a second gas chromatograph for identification of the pyrolysis products. The pyrolysis patterns obtained are characteristic of the parent compound, independent of sample size and constant for the standard pyrolysis condition. Under these standard conditions, the pyrolysis product distribution may be treated in a manner analogous to the mass spectral ion distribution reported as a percentage of total ionization. The pyrolysis product distribution obtained using hexadecane as a test compound agreed very closely with the distribution predicted by the modified Rice free radical mechanism for thermal dissociation. (Authors' abstract, modified)

05456

Roschig, M. and Matschiner, H

INVERSE POLAROGRAPHIC DETERMINATIONS OF TRACES OF LEAD IN MIXTURES OF TECHNICAL HYDROCARBONS. Inverspolarographische Bestimmung von Bleispuren in Technischen Kohlenwasser-Stoffgemischen. Chem. Tech. (Berlin) 19(2):103-104, Feb. 1967. Ger.

A method is described in which lead in benzene in concentrations of 1 to 100 ppb can be determined. After reducing the tetraethyl lead with bromine, the lead is extracted with 0.1N HNO₃ and determined in an inverse polarographic cell. The threshold of detection of 0.8 ppb of lead depends on the purity of the reagents used. The method is fast, requiring about 45 min. with a standard deviation of plus or minus 7 percent.

Y. Suzurki and H. Matsushita

THIN LAYER CHROMATOGRAPHIC SEPARATION OF POLYNUCLEAR HYDROCARBONS ON THE PLATE COMPOSED OF TWO ADSORBENT LAYERS. Ind. Health, (Japan) 4, (3) 109-17, Oct. 1966.

In thin layer chromatography, the band width of a sample applied to a plate is one of the most important factors affecting the efficiency of separation of a sample. A new method is described to narrow and to separate adequately a band of a mixture of polynuclear hydrocarbons applied to a chromatoplate composed of two adsorbent layers by means of a chromatocharger. One layer of the chromatoplate is used to narrow a band of sample applied to a plate and the other is used to separate the narrow band into several bands corresponding to each hydrocarbon. A successful separation of polynuclear hydrocarbons is obtainable by thin layer chromatography using 26% acetylated cellulose-aluminum oxide G plate, silica gel WOELM-cellulose plate, and aluminum oxide G-cellulose plate. By using this method, a mixture of several hydrocarbons in 10 ml of dilute solution can easily be separated into the separate hydrocarbons without further concentration. (Author summary, modified)##

05501

G. J. Cleary

NATURE OF POLYNUCLEAR AROMATIC HYDROCARBONS IN AIR PARTICULATES (A REPORT OF SOME OBSERVATIONS IN THE SYDNEY AREA). Proc. Clean Air Conf., Univ. New South Wales Vol. 1, 14p. 1962, Paper 2.

Procedures are described for the separation and characterisation of polynuclear hydrocarbons in air borne particulates and related samples. The basic method involves chromatographic separation using activated alumina columns considerably longer than usually encountered. This factor, coupled with careful elution, enables quite good separation to be achieved in the column itself. Ultraviolet spectral analysis is then used as a means of characterising the samples whilst mixed fractions and trace quantities, after concentration, may be rechromatographed on acetylated paper. Among the compounds identified or characterised were acenaphthene, phenanthrene, anthracene, pyrene, fluoranthene, 1,2 benzfluorene and 2,3 benzfluorene, chrysene, 9,10 benzphenanthrene, 3,4 benzpyrene and 1,2 benzpyrene, 2,3 benzfluoranthene, 1,12 benzphenylene, anthanthrene and coronene. (Author abstract)##

M. Katz · J. L. Monkman

THE ORGANIC FRACTION OF PARTICULATE POLLUTION, INCLUDING POLYCYCLIC HYDROCARBONS. Proc. Clean Air Conf., Univ. New South Wales, Vol. 1, 25p., 1962, Paper 3.

Seasonal variation in content of organic material in urban atmospheres shows the anticipated high winter low summer trend. The constitution of the extremely complex organic media besides differing with source, depends upon possible photochemical, catalytic oxidation and polymerisation reactions in the atmosphere. Solid fuel burning equipment is the most prolific source of aromatic polycyclic hydrocarbons. Suggestions have been made for utilising the concentration ratios 3,4 benzpyrene/coronene and 3,4 benzpyrene/1, 12 benzperylene as indicative of pollution from coal burning plant or automobile exhaust, however, extensive tunnel tests have shown that the contribution of efficiently operated internal combustion engines is less than expected. It should be stressed that the separation and determination of polycyclic constituents is a complex and delicate investigation and cannot be considered routine research. There is still a need for complete classification of aromatics and other hydrocarbons, phenols, quinones, nitrogen derivatives and other organics. Moreover, new and quicker methods of biological appraisal of potentially cancerous air contaminants are long overdue. (Author abstract)##

05536

Broering, L. C. Jr., Werner, W. J., Rose, A. H. Jr.

AUTOMOTIVE MASS EMISSION ANALYSIS BY A VARIABLE DILUTION TECHNIQUE. Preprint. (Presented at the 60th Annual Meeting, Air Pollution Control Association, Cleveland, Ohio, June 11-16, 1967, Paper 67-200.)

The objective of this study was to develop an improved method for measuring engine exhaust, to be used both for compliance testing and for the design and development of new engine-emission-controls. The variable dilution sampling technique was chosen for the system. The operation of this system includes collection and simultaneous dilution of the total-exhaust volume with a variable volume of dilution air, such that the total mass flow rate of exhaust gas plus diluent air is constant for a given unit of vehicle operation. Measurement of contaminant concentration in the exhaust-diluent air mixture provides direct measurement of the mass of contaminants discharged per unit operation of the vehicle. For continuous mode mass emission measurements, samples are withdrawn continuously after the sample pump. Carbon monoxide, carbon dioxide, hydrocarbons, and oxides of nitrogen are measured by the standard exhaust measurement techniques. The practical capabilities of the variable dilution system to measure auto exhaust emissions during cyclic operation, were evaluated by comparing the mass-emission levels indicated by this system to those obtained with the proportional sampler. To determine the response characteristics of the system under continuous sampling conditions, known

quantities of butane were injected at the inlet of the sampling system, and the response of the hydrocarbon (NDIR) instrument was recorded. The response time of the total system, including that attributable to the analytical instruments, compared favorably to that obtained with the instrument train specified in both the current Federal and the California Exhaust Emission Standard Procedures. In summary, the variable dilution sampling technique possesses 2 distinct advantages over present emission testing procedures: (1) The technique is simple, practical, and accurate for the direct measurement of vehicle-exhaust mass emissions. (2) The rapid and highly sensitive response characteristics of the system to changes in mode mass-emission levels establish its usefulness as a design and development tool.

05561

R. D. Stewart and D. S. Erley

DETECTION OF VOLATILE ORGANIC COMPOUNDS AND TOXIC GASES IN HUMANS BY RAPID INFRARED TECHNIQUES. Progr. Chem. Toxicol. 2, 183-220 (1965).

Advances in infrared analytical techniques and sampling accessories have permitted the development of methods for detecting toxic gases and volatile organic compounds in the expired breath, blood, urine, and tissues. Inherent in these infrared techniques are the desired specificity, sensitivity, speed, and simplicity. Infrared analysis of the expired breath may be used effectively to detect the following groups of compounds: (1) the halogenated hydrocarbons, such as carbon tetrachloride, trichloroethylene, and methylene chloride; (2) the alcohols, such as methanol, ethanol, and isopropanol; (3) the ethers and aldehydes, such as ethyl ether and paraldehyde; (4) the ketones, such as acetone and methylethyl ketone; (5) gases such as carbon monoxide, carbon dioxide, and ammonia. Infrared techniques for the determination of carbon monoxide in the exhaled breath are faster and more sensitive than the standard carboxyhemoglobin determination. Solvent extractions of body fluids may be analyzed by infrared for the following groups of compounds: (1) the halogenated hydrocarbons; (2) the alcohols; (3) the ethers and aldehydes; and (4) the ketones. Infrared analysis of body fluid extracts has proved valuable in the fields of toxicology, industrial and forensic medicine, and pharmacology. The infrared identification of any compound ultimately depends on the comparison of its spectrum with that of a standard of known purity. While it is true that the spectrum itself will often reveal much information about the functional groups present, specific identification and quantitative analysis always require comparison with a standard spectrum. It is essential, therefore, to have a reference file of the spectra of pure materials, and some means for reaching this file efficiently.##

05572

Scott, W. E. and E. R. Stephens

A SCIENTIFIC APPROACH TO THE PROBLEM. Proc. Symp. Cleaner Air Urban Areas, Philadelphia, Pa., pp. 24-35 (1956)

Chemical reactions that take place in a polluted atmosphere produce substances that lend smog its eye-irritating, crop-damaging, visibility-lowering characteristics. The authors relate how, in an effort to identify these reactions and substances, the staff devised the long-path (up to 500 meters) infrared absorption cell. They describe the construction of the cell, and how it is used to detect and "fingerprint" the products of photochemical reactions, both in synthetic and in actual smog. Early work with this new tool was pointed to explaining the characteristic high ozone concentrations of smog, and proceeded from Dr. Haagen-Smit's evidence that nitrogen dioxide reacted with organic compounds in air to produce ozone. They trace the nitrogen dioxide studies that finally led to discovery of Compound X (peroxyacyl nitrite), believed to be the "missing link" in the process of ozone formation in smog. Gasolines and auto exhaust as sources of organic pollutants that take part in NO₂ reactions are discussed. They relate their plans for further studies with the infrared cell, and the possibility of applying Los Angeles smog research to other afflicted cities. It may appear that the work reported here is concerned solely with the Los Angeles problem. This is partly true because there air pollution problems in some cities which involve pollutants and weather conditions entirely different from those of Los Angeles. On the other hand, however, many large cities do have pollution sources of the same kind as Los Angeles: power plants, refineries and other industry, incinerators, automobiles, etc. The results of studies of reactions of pollutants from these sources are valid regardless of the city. Weather conditions and topography in the Los Angeles area are such that the products of reactions in the atmosphere frequently accumulate and result in damage and irritation. While conditions for the accumulation of these products occur less frequently in other cities, nevertheless they do occur and the resulting smog is objectionable and costly. With an inversion and no wind, we have a good trap for pollutants from these sources, and as good a chance of having smog as Los Angeles. Plant damage is reported in areas surrounding most large cities of the world. Los Angeles studies show that there are other pollutants besides coal smoke and SO₂ that may be objectionable, especially in and around large cities.##

05578

R. W. Patton and J. S. Lewis

FRACTIONATION AND ANALYSIS OF A MICRO SCALE BY GAS CHROMATOGRAPHY. Proc. Natl. Air Pollution Symp., 3rd, Pasadena, Calif., 1955 pp. 74-9.

The work reported in this paper concerned a study of the usefulness of gas chromatography for the separation, isolation, and identification of the components of a complex mixture. Automobile exhaust gas was chosen as the source of samples because of its ready availability and its importance in air pollution studies. The objective was not to obtain a complete analysis but to discover some of the potentialities of the method alone and in combination with other methods.##

R. R. Austin

AN EXPERIMENTAL INSTRUMENT FOR THE CONTINUOUS MEASUREMENT OF THE CONCENTRATION OF OLEFINS IN AIR. Proc. Natl. Air Pollution Symp., 3rd Pasadena, Calif., 131-5 (1955).

The principles of electrolytic generation of bromine and reaction of this reagent in the gas phase at high temperature in a contact bed with olefin have been studied and proved practical as the basis for a continuous record of the concentration of olefins in the atmosphere and in such sources of emission as exhaust gases. An experimental model of a recording instrument of this kind has been developed and successfully operated with manual control of sample gas. Work is in progress to complete the instrument development and carry out field tests.##

05605

Boubel, R. W. and L. A. Ripperton

BENZO(A)PYRENE PRODUCTION DURING CONTROLLED COMBUSTION. J. Air Pollution Control Assoc. 13(11):553-557, Nov. 1963. (Presented at the 56th Annual Meeting, Air Pollution Control Association, Detroit, Mich., June 9-13, 1963.)

A statistical experimental design was initiated to determine if the quantitative production of benzo(a)pyrene during combustion could be related to some of the variables of the combustion process. Four fuels of different molecular structure, but the same carbon number, were chosen. These were benzene, cyclohexane, hexene-1, and hexane. Three air-fuel ratios were selected: the richest and leanest practical mixtures plus one intermediate. The combustion was investigated with and without the effects of flame quenching by a cooled surface in the combustion chamber. Choice of these levels of variables led to the establishment of a program containing 72 treatments (4 fuels x 3 energy levels x 3 A/F ratios x 2 cooling levels = 72 runs). The apparatus was constructed around a surplus truck preheater. This heater was a gasoline-burning type equipped with electric ignition, a forced draft combustion air system, and a vaporizing pot-type burner. Sample analysis was carried out spectrophotometrically utilizing the variable reference technique of Jones, Clark and Harrow. The results confirm previous work by others who have shown measurable benzo(a)pyrene production during incomplete combustion. The statistical method of this experimental design was very efficient for indicating the significant differences of the variables and magnitude of these differences. The curvilinear regression equations can be used in any future work with this system to predict the mean value of benzo(a)pyrene produced by any combination of the variables used in this experiment. The fact that the benzo(a)pyrene can be minimized for any one fuel used in the apparatus is highly significant. The procedures used in this study can be applied to any combustion process to determine the effects of the system parameters on the quantity of benzo(a)pyrene produced, and can be adapted for use in field studies and utilized to predict the quantity of this carcinogen emitted by each of the many sources contributing to its atmospheric concentration.##

Morris, R. A. and R. L. Chapman

FLAME IONIZATION HYDROCARBON ANALYZER. J. Air Pollution Control Assoc., 11(10):467-469, Oct. 1961. (Presented at the 54th Annual Meeting, Air Pollution Control Association, New York City, June 11-15, 1961.)

The empirical basis for the flame ionization method is the observation that while the flame of pure hydrogen contains an almost negligible number of ions, the addition of even traces of organic compounds produces a large amount of ionization. In practice, the sample to be analyzed is mixed with a hydrogen fuel and passed through a small jet. Air is supplied in the annular space around the jet to support combustion. Any hydrocarbon carried into the flame results in the formation of ions which are accelerated to a collector electrode by an electric field set up between the jet and electrode. The generated ion current is proportional to the rate the hydrocarbon molecules are introduced into the flame. If flow rates are held constant, the ion current is proportional to hydrocarbon concentration. It has been found empirically that the ion current produced in the hydrogen flame is proportional to the heat of partial combustion of the sample (to CO₂ and H₂O). Therefore, it is possible to construct a table showing the approximate relative contribution which carbon atoms in aliphatic, aromatic, olefinic, acetylenic, and carbonyl molecules will make on the observed signal. Such a table is included. The hydrocarbon analyzer is ideally suited to instrumentation for auto exhaust inspection. In general, it can be used to determine the presence of total hydrocarbons in inert or inorganic gases such as He, A, N₂, H₂, and air. Determinations of carbon content in concentrations from 0.1 ppm to 25% are possible with excellent discrimination against water, CO, CO₂, and other inorganic gases. The instrument gives equivalent sensitivity for various hydrocarbons, thus it is not selective for mixtures of organic compounds.##

05834

M. Feldstein

STUDIES ON THE ANALYSIS OF HYDROCARBONS FROM INCINERATOR EFFLUENTS WITH A FLAME IONIZATION DETECTOR. (J. Air Pollution Control Assoc.) 12, (3) 139-41, Mar. 1962. (Presented at the 54th Annual Meeting, Air Pollution Control Association, New York City, June 11-15, 1961.)

Flame ionization units capable of detecting small concentrations of hydrocarbons make use of the principle that when a hydrocarbon is introduced into a hydrogen flame, electron concentrations are formed and can be measured. The thermionic work function for carbon is 4.35 electron volts which, apparently, is low enough for electron emission at hydrogen flame temperatures. The response of the instrument is proportional to the number of carbon atoms in the compound being burned; that is, hexane will give six times the response of methane. The instrument can thus be considered as a carbon counter. Apparatus and equipment included a Carad flame ionization analyzer and detector,

recorder, a Carad gas sampling unit, and stainless steel collecting tanks. A 30 ml sample of effluent was injected and yielded a reading proportional to the total hydrocarbon content of the sample. A second 30 ml sample was then injected with the silica tube in line. Response due to methane, ethane, ethylene, and acetylene was then noted on the recorder as these gases separated on the silica column. The difference between the total hydrocarbon reading and the methane reading is proportional to the C2-C6 hydrocarbons present in the sample. The same samples were also analyzed by gas chromatography. By converting the results obtained with each method to similar units, direct comparison may be made. For the series of effluents analyzed, agreement between the two methods is excellent. The flame ionization method and adsorption properties of particle and surface. Adhesion of provides a more rapid procedure for the analysis and may be considered as a comparable method for the analysis of C2 and higher hydrocarbons.##

05836

H. F. Clark

EVALUATION OF MICROBIOLOGICAL SYSTEMS FOR ESTIMATING AIR POLLUTING SUBSTANCES. Preprint. (1957).

The procedure used in the evaluation of microbiological systems for estimating air polluting substances consisted of: (1) Placing an indicator organism on a membrane filter strip in a logarithmic increasing concentration; (2) Exposing the bacterial indicator on the surface of the strip to a synthetic aerosol (irradiated automobile exhaust) at a flow rate for the aerosol of 5/min with the strip moving 7.8 mm/mm; (3) cultivation of the remaining viable bacteria on the strip after aerosol exposure by incubation on an appropriate medium at 35C for 18-20 hrs; and (4) Comparison of the bacterial colony density on the exposed strip with suitable control strips to estimate the growth inhibiting property of the aerosol under examination. A recently isolated E. coli. was used as an indicator. The procedure appears to have valuable application in the study and comparison of exhaust before and after irradiation. The concentrations of hydrocarbons in some of the experimental tests were in the range of those which might occur on a street during heavy motor vehicular traffic. The test procedure has sufficient merit to justify further development work on methodology, interpretation and application.##

05837

E. W. Cieplinski and L. S. Ettre

A NEW SIMPLIFIED DETECTOR FOR THE ANALYSIS OF ORGANIC IMPURITIES IN ATMOSPHERE AND EXHAUST GASES. Preprint. (Presented at the Joint Symposium on Air Pollution Instrumentation, Instrument Society of America and Air Pollution Control Association, New York City, June 12-13, 1961.)

The Model 223 Flame Ionization Analyzer is a 117-volt, 60-cps, line-operated instrument. It measures 10 1/4 inches on a side and weighs about 25 pounds. A meter located on the front of the instrument indicates the organic vapor concentration of the sample. Since different classes of organic compounds give a different detector response, the meter indication for a given sample must be interpreted on the bases of instrument calibration with an appropriate test gas. Output connections are provided for using the instrument with a standard 0-5 or 0-10 millivolt, potentiometer recorder. Hydrogen, air, test gas, and zero gas supplies are necessary for operation. Filters containing 5-A Molecular Sieve must be used to remove any small impurities present in the air and hydrogen. The test gas contains a known concentration, in the same order of magnitude as the sample, to permit the proper calibration of the panel meter. The zero gas is the same as the background gas of the sample and is usually only necessary when the higher sensitivity ranges are being used. The gas is used to check and eliminate any effect the background gas may have on the flame detector operating parameters. The instrument will continuously monitor organic impurities in the atmosphere and exhaust gases. The unit is transportable, line-operated, and is very stable. Samples may be introduced in the range of 35-75 millimeters of mercury pressure when external regulation is used and between 0.4-9.5 liters per minute when the instrument's back pressure regulator is used. The linearity of response for the detecting system has been shown to be very good over a wide range of concentrations ##

05848

R. Goldstein and J. H. Elliott

EXPERIMENTAL PROGRAM FOR THE CONTROL OF ORGANIC EMISSIONS FROM PROTECTIVE COATING OPERATIONS (INTERIM REPT. NO. 5. DEVELOPMENT OF SAMPLING AND ANALYTICAL METHODS.) Los Angeles County Air Pollution Control District, Calif. Mar. 1960. 44 pp.

Analytical methods have been developed for the determination of low concentrations of solvent vapors emitted from protective coating operations. Organic compounds are detected and determined as CO₂ in a nondispersive infrared CO₂ analyzer after combustion. A chromatographic apparatus has been constructed to be used in conjunction with the combustion-infrared CO₂ analyzer to determine low concentrations of organic vapors as CO₂ in the presence of background concentrations of CO₂ as high as six %. The development of a chromatographic procedure for the complete separation and quantitative determination of individual compounds in an effluent containing solvent vapors is in progress. (Author abstract) ##

05863

L. S. Ettre

APPLICATION OF GAS CHROMATOGRAPHIC METHODS FOR AIR POLLUTION STUDIES. J. Air Pollution Control Assoc.

11 (1), 34-43 (Jan. 1961). (Presented at the 53rd Annual Meeting, Air Pollution Control Association, Cincinnati, Ohio, May 22-26, 1960.)

The modifications of conventional gas chromatography apparatus are described which allows the use of gas chromatography in air pollution studies. The newest developments of supersensitive chromatography are described with special respect to their importance in trace analysis. The construction, and operation of a new instrument based on the flame ionization principles is detailed. (Author summary)##

05951

Alekseeva, N. V.

METHODS FOR THE DETERMINATION OF ATMOSPHERIC POLLUTANTS. (In: Limits of allowable concentrations of atmospheric pollutants. Book 6.) U.S.S.R. Literature on Air Pollution and Related Occupational Diseases, Vol. 9. pp. 107-33. (1962). Russ. (Tr.)

Development in the synthesis of high molecular compounds resulted in the production and utilization of many new organic substances by the USSR national industries. Plants producing these substances and their intermediate products discharge into the air gases, vapors and by-products as surrounding atmospheric air pollutants the detection and quantitative determination of which require special and highly sensitive analytical methods. Methods are described for the detection of acetic acid esters, acetates, dinityl, isopropylbenzene, furfural, ethylene oxide, monobasic carbonaceous acids, methylmetacrylate, dimethylformamide, and isopropylbenzene hydroperoxide. An index of allowable concentration limits for harmful substances in atmospheric air of inhabited areas is appended.

05952

Ryazanov, V. A.

A SUMMARY OF 1961 STUDIES IN THE FIELD OF LIMITS OF ALLOWABLE CONCENTRATIONS OF ATMOSPHERIC AIR POLLUTANTS. (In: Limits of allowable concentrations of atmospheric pollutants. Book 7.) U.S.S.R. Literature on Air Pollution and Related Occupational Diseases, Vol. 9, pp. 138-41. (1963). Russ. (Tr.)

The Committee for the Sanitary Protection of Atmospheric Air approved limits of allowable concentrations in the air for the following new substances: furfural, dimethylformamide and styrol. Furfural is a heterocyclic aldehyde which is a good solvent for many organic substances used in the preparation of some plastics and a selective solvent for the purification of crude oil lubricants. The threshold of aldehyde odor perception in most sensitive persons was established at 1 mg/cu m. It was determined that 0.05 mg/cu m of furfural constituted the subthreshold concentration in all the tests employed. Therefore, 0.05 mg/cu m of furfural was accepted as the maximal single allowable

concentration. Styrol is a benzene homologue with one double bond at its side chain. The maximal single allowable concentration of styrol in the atmospheric air was suggested as 0.003 mg/cu m. Dimethylformamide is a colorless liquid having a nauseating herring odor; it is used as a polyacrylnitril solvent in the synthetic fiber industry known as orlon and nitron. It was recommended that 0.03 mg/cu m be adopted as the limit of allowable single and 24 hour concentration of dimethylformamide vapor in the air, since it proved to be the subthreshold concentration in relation to all the test indexes. The limit of allowable phenol concentration in atmospheric air was set at 0.01 mg/cu m. Rats were exposed to the inhalation of nitrogen dioxide 6 hours daily for 164 days at different dose levels. No maximum allowable concentration was agreed upon.

05959

Alekseeva, M. V. Tkachev, P. G.

METHODS FOR THE DETERMINATION OF SOME ORGANIC ATMOSPHERIC AIR POLLUTANTS. (In: Limits of allowable concentrations of atmospheric pollutants. Book 7.) U.S.S.R. Literature on Air Pollution and Related Occupational Diseases, Vol. 9. pp. 203-12. (1963). Russ. (Tr.)

Methods are described for the determination of aniline, xylol, n-butyvinyl ester and dimethylterephthalate in the atmosphere. Standard color scales are also included for the quantitative determination of xylol, n-butyvinyl ester and dimethylterephthalate (DMTPH). A method for the determination of phenol with 4-aminoantipyrine is described and standard color scales for the quantitative determinations are included.

05981

Cantuti, V., G. P. Cartoni, A. Liberti, and A. G. Torri

IMPROVED EVALUATION OF POLYNUCLEAR HYDROCARBONS IN ATMOSPHERIC DUST BY GAS CHROMATOGRAPHY. J. Chromatog. 17, (1) 60-5, Jan. 1965.

In the investigation of the application of gas chromatography to the determination of polynuclear hydrocarbons in airborne particles new liquid phases were evaluated and programmed temperature chromatography was used. An electron capture detector was used for the determination of polynuclear hydrocarbons. Its relative response was compared with results obtained with a hydrogen flame ionization detector. It is shown in one of the chromatograms of an atmospheric dust sample that the response of the electron capture is very different from that of the flame and at the same time shows many other unknown compounds as large peaks that are not detected by the flame detector because of being present in too small an amount.

D. J. Morgan and G. Duxbury

THE DETERMINATION OF CHLORINATED HYDROCARBONS IN THE ATMOSPHERE BY ACTIVATION ANALYSIS. Ann. Occupational Hyg. (London) 8(3):253-256, July 1965.

The maximum allowable concentration for continuous exposure to trichlorethylene varies by a factor of ten depending on the country in which it is used; in this country it is variously quoted as 100 ppm or 200 ppm but recent studies (Morgan, 1964) have suggested that these values may be too high. A limited experimental programme using neutron irradiation was undertaken to examine its potentialities and to demonstrate its utility in the field of industrial hygiene. The air samples are drawn through charcoal, which is then irradiated in a thermal neutron flux, where C1-38 is formed; this then decays with a half-life of 37 min, emitting gamma-radiation of energies 1:60 and 2:15 MeV. The amount of C1-38 is then determined by spectrometry. A series of measurements was carried out in a well-ventilated room in which a degreasing tank was situated. Concentrations less than 10 ppm of trichlorethylene were generally found in the room air during the day, a sampler operated at a height of 5 ft above ground level, near the side of the tank, indicated a concentration of about 20 ppm averaged over the whole day.##

06021

W. Stanilewicz and E. Mirowska

(THE USEFULNESS OF THE NEPHELOMETRIC METHOD FOR BENZENE AND OIL DETERMINATION IN THE AIR. (Przydatnosc metody nefelometrycznej do oznaczania benzyny i nafty w powietrzu.) (Med. Pracy (Lodz) 16 (3), 223-9 (1965). Pol.

Nephelometric methods for the determination of benzene and oil concentration in air were investigated. Detection methods, standard scale range, the effect of the addition of water on turbidity, and the durability of oil and benzene solution in glacial acetic acid were studied. The method of Zapolsky and Vorochobina and that of Pieregud are not considered suitable for the determination of benzene concentrations in air because the resultant values are too low.##

06025

A. L. Lynch, R. B. Davis, R. F. Stalzer, and W. F. Anzilotti

STUDIES OF ANALYTICAL METHODS FOR LEAD-IN-AIR DETERMINATION AND USE WITH AN IMPROVED SELF-POWERED PORTABLE SAMPLER. Am. Ind. Hyg. Assoc. J. 25(1):81-93 (Feb. 1964). (Presented at the

Annual Meeting, American Industrial Hygiene Association, Cincinnati, Ohio, May 10, 1963.)

The portable "Uni-Jet" Lead-In Air Analyzer was revised to provide constant rate collection of tetraethyl (TEL) and tetramethyl lead (TML). Reliable results from monitoring leaded gasoline storage tanks, cleaning and decontamination procedures, were obtained by drawing a two-cubic foot sample during twenty minutes through methanolic iodine. The aspirating unit powered by nonflammable "Freon-12" has been used widely in fire and explosion hazard areas. (Authors' abstract)##

06050

D. F. Adams

OZONE ANALYSIS WITH THE MINI-ADAK II. J. Air Pollution Control Assoc. 13, (2) 88-90, Feb. 1963. (Presented at the 55th Annual Meeting, Air Pollution Control Association, Chicago, Ill., May 20-24, 1962.)

The suitability of sodium diphenylaminesulfonate (NaDS), potassium iodide, and phenolphthalein reagents for ozone analysis in a multipurpose, automatic analyzer such as the Mini-Adak II was investigated. The oxidation potential for NaDS is more negative than that for iodine and, therefore, NaDS is believed less susceptible to oxidative interference as a colorimetric reagent. The reagents were prepared along with a mixture of ozone and oxides of nitrogen. The test atmosphere was drawn through a single manifold and thence to two midjet impingers in parallel, one containing 10 ml of the neutral KI reagent and the other 10 ml of either the NaDS or phenolphthalin reagent. A second series of comparisons was made between a midjet impinger containing neutral KI and the Mini-Adak II utilizing the NaDS or phenolphthalin reagent. Based on the literature and the work herein reported, either the phenolphthalin or NaDS reagents can be used in the Mini-Adak for ozone analysis. Selection of the reagent to be used should be based upon an evaluation of the possible interferences which may be present with ozone in the atmosphere and the relative sensitivities (molar absorptancy) of the two reagents. Either reagent shows only one-fourth as much response to NO₂ neutral KI and is therefore superior to KI in this respect. Based on the laboratory study, the phenolphthalin reagent appears somewhat preferable for use in the Mini-Adak. This selection is tentatively made upon the basis of the greater sensitivity (molar absorptancy) of the phenolphthaline which permits the use of a lower Mini-Adak sensitivity range with its attendant reduction in electronic background noise.##

06052

J. L. Jones, E. A. Schuck, R. W. Eldridge, N. Endow, F. W. Cranx

MEASUREMENT OF AUTOMOBILE EXHAUST GAS HYDROCARBONS. J. Air Pollution Control Assoc. 13, (2) 73-7, Feb. 1963. (Presented

at the 140th National Meeting, American Chemical Society, Chicago, Ill., Sept. 3-8, 1961.)

The purpose of the study was to compare hydrocarbon analyses obtained with a non-dispersive infrared analyzer and those obtained by other instruments. Automobile exhaust was examined with a dispersive IR analyzer, with a flame ionization hydrocarbon detector, and gas chromatographs. As a part of this study, the methods of handling automobile exhaust gases were also examined. Dispersive IR analyses were performed using a Perkin-Elmer Model 21 spectrophotometer equipped with 40-meter gas cells and a scale expander. The nondispersive IR hydrocarbon analyzer essentially measures the saturated hydrocarbon fraction of the total hydrocarbon concentration in exhaust. Since the ratio of saturated to unsaturated components in exhaust is not constant, the hydrocarbon concentrations obtained with this instrument are not necessarily proportionate of the total hydrocarbon concentration in the exhaust. Specifically, this instrument is insensitive to certain short-chain unsaturated aliphatic hydrocarbons which are the principal reactants in photochemical smog. Thus, this instrument could indicate that an exhaust was relatively free of hydrocarbons when in reality it contained high concentrations of smog precursors. The flame ionization hydrocarbon detector, the IR spectrophotometer, and the gas chromatograph can measure most of the hydrocarbon components in exhaust. Using the flame ionization hydrocarbon detector in conjunction with the n-hexane-sensitized nondispersive infrared analyzer prevents erroneous conclusions concerning hydrocarbon concentrations. If the flame ionization hydrocarbon detector measures the total hydrocarbon concentration in the exhaust and the nondispersive infrared instrument measures saturated hydrocarbons, then the difference between the concentrations will provide a rough measure of the unsaturated hydrocarbons (plus methane) in an exhaust. In analyses of exhaust gas hydrocarbons, the method of direct 5:1 dilution of the hot exhaust gas with nitrogen gas, followed by parallel analysis with the nondispersive IR and flame ionization instruments, is suggested in preference to the method utilizing condensate traps, or heated exhaust sampling.##

06065

V. Levin, B. W. Nippoldt, and R. L. Rebertus

SPECTROPHOTOMETRIC DETERMINATION OF PRIMARY AROMATIC AMINES WITH THIOTRITHIAZYL CHLORIDE (APPLICATION TO DETERMINATION OF TOLUENE-2, 4-DIISOCYANATE IN AIR). Anal. Chem. (U.S.) 39(6):581-584, May 1967.

Highly colored intermediates form during the reactions of thiotrithiazyl chloride with some primary aromatic amines. The molar absorptivities range from about 21,500 liters/mole cm for the red product from m-phenylenediamine to about 300 liters/mole cm for the green product from aniline. Rapid color development is achieved at room temperature either by direct combination of solid thiotrithiazyl chloride with a solution of the amine in methanol-chloroform, or by percolating the amine solution over a bed of thiotrithiazyl chloride mixed with dry sand. Although the colored species generally decompose within a few minutes, linear

calibration curves are readily obtained by controlling reaction conditions. These observations have been applied to the determination of airborne toluene-2,4-diisocyanate at concentrations as low as 0.01 ppm by volume. (Author abstracts)##

06070

M. M. Rockind

INFRARED ANALYSIS OF MULTICOMPONENT GAS MIXTURES. Anal. Chem. 39, (6) 567-84, May 1967. (Presented at the 153rd National Meeting, American Chemical Society, Miami Beach, Fla., Apr. 9-14, 1967.)

A new method for the infrared analysis of multicomponent gas mixtures which involves a condensed phase sampling technique employing commercially available cryogenic equipment is described. Only a few micromoles of material are required for positive qualitative identification of most chemical species; hence, the method is sensitive and suitable for impurity analysis. The technique is very general in its applicability. Structurally similar molecules are readily differentiated, and molecules differing only in isotopic content may sometimes be distinguished. Molecules are characterized by a small number of well defined frequencies. The method permits analyses to be executed rapidly, and is capable of creditable quantitative results. Herein spectral analyses are demonstrated for a series of 13 C(1) C(4) hydrocarbons. (Author abstracts)##

06112

Tada, O.

MEASUREMENT OF AIR POLLUTANTS. Bunseki Kagaku (Japan Analyst) (Tokyo) pp. 110R-7R. 1966. Jap.

Important papers published in Japan Analyst in 1964 and 1965 are summarized. The subject is limited to measurement methods of air pollutants known to be toxic to health. Pollutants from stacks and automobile exhausts are covered, including many cyclic hydrocarbons, aldehydes, sulfur oxides, nitrogen oxides, ozone, carbon monoxide, carbon dioxide, fluorine compounds, hydrogen sulfide, lead compounds, and offensive odors. Various sampling methods are described, especially using filtering with glass wool filters, electric dust collectors, gas absorbers, and portable samplers containing silica gel. The pollutants can be measured by electroconductivity methods, colorimetric measurement recorder, gas chromatographic analysis, electron capturing detector, and hydrogen ion detector. The papers summarized do not include those dealing with industrial or occupational environment or mining.

06135

Clemon, G. R.

SOME CONSTITUENTS OF CITY SMOKE. Tetrahedron 23, (5) 2389-93, May 1967.

An interest in the complementary action of cigarette smoke and the neutral constituents of city smoke prompted this study of the isolation and identification of the aromatic hydrocarbons collected on cotton filters through which air had been drawn for 10-12 weeks. Chromatography on an alumina column of the neutral portion of the atmospheric soot which had been eluted from the cotton filters with a light petroleum gave a number of nitrogen-free hydrocarbons from which the crystalline 1,3,5-trinitrobenzene complexes were prepared. Identification was based on infrared, ultraviolet, and mass spectrometry as well as on the melting points. Pyrene, 3-methylpyrene, 1,2-benzpyrene, triphenylene, chrysene, 1,12-benzperylene, and picene were isolated and identified. The 3,4-benzpyrene was identified, but not the non-aromatics which formed the bulk of the neutral portion. Mass spectrometry showed that the most volatile fraction of the light petroleum extract contained a series of 10 compounds with molecular weights from which a base, C₁₃H₁₅N, has been isolated.

06200

Stanley, Thomas W. James E. Meeker, and Myrna J. Morgan

EXTRACTION OF ORGANICS FROM AIRBORNE PARTICULATES: EFFECTS OF VARIOUS SOLVENTS AND CONDITIONS ON THE RECOVERY OF BENZO(A)PYRENE, BEN(C)ACRIDINE, AND 7H-BENZ(DE)ANTHRACEN-7-ONE. Environ. Sci. Technol., 1(11):927-931, Nov. 1967. 20 refs. (Presented at the 153rd National American Chemical Society Meeting, Miami, Fla., April 9-14, 1967.)

Recently developed spectrophotometric and spectrophotofluorimetric methods of analysis for several known carcinogens were applied in studies of extraction efficiencies of solvent systems used to obtain the organic fractions of airborne particulates. Some of the solvents investigated were pentane, benzene, cyclohexane, acetone, diethyl ether, methylene chloride, and benzene: diethylamine (4:1, V/V). Weights of organic extracts from known weights of carefully composited air particulates ranged from 20 to 1300 mg. Variations of time, temperature, and method of extraction affect total weights of organic extracts and concentrations. In the analysis of equal weights of air particulates enriched with pure benzo(a)pyrene, benz(c)acridine, and 7H-benz(de)anthracen-7-one the percentages of these compounds extracted ranged from 50 to 100, 15 to 100, and 40 to 80, respectively. On the basis of these data extraction efficiency studies are required for the proper selection of solvents used to define the organic extracts of airborne particulates. (Author's abstract)

06203

K. T. Whitby, and B. Y. H. Liu

GENERATION OF COUNTABLE PULSES BY HIGH CONCENTRATIONS OF SUBCOUNTABLE SIZED PARTICLES IN THE SENSING VOLUME OF OPTICAL PARTICLE COUNTERS. (IN: EVALUATION OF OPTICAL PARTICLE COUNTERS-FINAL REPORT.) Minnesota Univ., Minneapolis, Particle Technology Lab. (Particle Laboratory Publ. No. 110.) 25p., June 1967.

It is shown by analysis and has been confirmed by experiment that large numbers of sub-countable particles in the sensing zone of single particle optical counters generate spurious counts in the counting range of the instrument. A statistical theory has been developed which is capable of predicting the size distribution and number of the spurious pulses from the concentration and particle size of the sub-countable aerosol. The theory has been extended to atmospheric aerosols obeying the distribution law $dN/dDp = 0.41 \phi D^{-4}$ and it is shown that the many sub-countable particles present in atmospheric aerosols can account for the false mode often observed when single particle optical counters are used to size concentrated urban aerosols. It is also shown that the numerous sub-countable residue particles present in the atomized poly-styrene latex aerosols can generate spurious pulses in the lower channels, thereby affecting the accuracy of this calibration method.##

06231

A. Goetz and O. Preining

THE AEROSOL SPECTROMETER AND ITS APPLICATION TO NUCLEAR CONDENSATION STUDIES. ((National Academy of Sciences-National Research Council, Washington, DC)) Publ. 746. (1960) pp. 164-82.

The Aerosol Spectrometer (A.S.) separates quantitatively air-borne particles in the diameter range 3 microns to 0.03 micron from the atmosphere in the form of a size-spectrum, i.e. a continuous band-shaped deposit. The position of a particle thereon is indicative of its "Stokes' diameter" while it was air-borne, and independent of physical etc. changes incurred after its separation from the suspending air. This size classified separation results from the exposure of a laminar, continuous air flow to a large centrifugal field (up to 26,000 g), the flow rates vary between 3.3 and 7.4 lit/min. The size - (and mass-) distribution of the aerosol is derived from the topical variation of the deposit density along the spectrum. A brief description of the instruments and the mathematical basis of the analytical procedure is presented, as well as its application to a "model" aerosol of polystyrene latex. From the size definition in terms of the Stokes diameter a relationship between the locus of deposition of dry and hydrated hygroscopic nuclei is derived and subsequently supported experimentally for NaCl aerosols. The A.S. has been applied to the analysis of natural and artificial aerosols in the submicron range. The artificial generation and conditioning of NaCl aerosols and the so resulting size distribution is described. Traces of organic vapors during hydration and dehydration prevent or delay the equilibrium of the nucleus when the humidity of its gaseous environment is altered. (Author summary)##

06284

R. Buscaglia and S. Wallack

FEASIBILITY STUDY OF A MULTIPURPOSE INFRARED PROPELLANT DETECTOR. (Patterson Moos Research Division, Leesona

This investigation was concerned with determining the feasibility of developing open-path narrow absorption infrared (NAIR) instrumentation capable of detecting and measuring very low atmospheric concentrations of various toxic propellant vapors. In the course of this program a novel measurement system was conceived, and a laboratory prototype of this system was designed and fabricated. Because of the unique spectral response characteristics of the NAIR detector, it was possible to combine in this one instrument the desirable features of both single and double beam instrumentation. The system was applicable to ethylene oxide, unsymmetrical dimethyl-hydrazine, dinitrogen tetroxide and hydrazine. Tests performed with this prototype instrument demonstrated system feasibility. The measurement sensitivity was, in all cases, within one order of magnitude of that required; in most cases it was substantially better than this. Sensitivity to ethylene oxide exceeded the specified requirements. In addition to demonstrating feasibility and determining sensitivity, these tests also indicated several simple modifications which would substantially reduce noise and thereby improve sensitivity. (Authors' abstract)##

06301L

MECHANISMS OF AIR POLLUTION REACTIONS. (Section VIII of Air Pollution Research Progress Report for Quarter Ended December 31, 1966.) Bureau of Mines, Pittsburgh, Pa., Coal Research Center, 1966, pp. BM/69-BM/76.

The NO_x-sensitized photooxidation of 2-methyl-1-butene was investigated. Yields with regard to the reaction production formaldehyde, methyl ethyl ketone, PAN, PPN, nitrates and CO were determined. The study of the NO_x-sensitized photooxidation of tagged ethylene in the presence of other hydrocarbons was terminated. Results indicated that (1) the photochemical reactivity of ethylene in mixture with other hydrocarbons varies with change in the mixture composition, and (2) the variation is unpredictable at the present time. (Author summary)##

06328L

J. D. Hocker

ANALYSIS OF COMBUSTION PRODUCTS WITH GAS CHROMATOGRAPHY APPARATUS (A MASTER'S THESIS). (1963). 63 pp. (For the degree of Master of Science, Arizona Univ., Tucson.)
DDC: AD 410240

The purpose of this study was to develop techniques for applying principles of gas chromatography to the analysis of fuel gases and combustion products. By effective calibration of the gas chromatography apparatus, unknown samples of combustion products

and fuel gases were analyzed both quantitatively and qualitatively. The procedure employed was to use known mixtures of pure gases and to record on an electronic recorder the response of the gas chromatography apparatus. Six different gases were used in the calibrating mixtures: H₂, O₂, N₂, CH₄, CO₂ and CO. Techniques, procedures and methods were established to identify the composition of unknown samples by the application and principles of gas chromatography. (Author abstract)##

06380

Dubois, L., A. Zdrojewski, C. Baker, and J. L. Monkman

SOME IMPROVEMENTS IN THE DETERMINATION OF BENZO(A)PYRENE IN AIR SAMPLES. J. Air Pollution Control Assoc., 17(12):818-821, Dec. 1967. 10 refs. (Presented at the 60th Annual Meeting, Air Pollution Control Assoc., Cleveland, Ohio, June 11-16, 1967.)

As benzo(a)pyrene (BaP) and benzo(k)fluoranthene (Bk) both fluoresce strongly and it is possible to make accurate measurement of BaP in the presence of BkP in an unchromatographed air sample extract using fluorescence, this measuring technique served as the basis of the research discussed here. In this method benzene was first used as the extracting solvent, the columns being processed in a fume hood on account of its well known toxicity. As more experience was gained it was found that toluene could also be used with satisfactory results and benzene was abandoned as an eluting agent. Both benzene and toluene, with their aromatic structure, would be quite unsuitable eluting agents if subsequent measurements were to be made by ultraviolet absorption. Since in this method fluorescence is used, the aromatic structure is irrelevant. The essential condition is that the toluene used be free from fluorescing impurities. The method is simple and direct, and probably demands somewhat less skill and experience than older methods. It is worth mentioning that the calculations of the final values require an appreciable percentage of the total analytical time. The use of a programmed bench top computer reduces this calculation time for 20 samples from 5 hours to 5 minutes.##

06433

Singh, T., R. P. Sawyer, E. S. Starkman, and L. S. Caretto

RAPID CONTINUOUS DETERMINATION OF NITRIC OXIDE CONCENTRATION IN EXHAUST GASES. J. Air Pollution Control Assoc., 18(2):102-105, Feb. 1968. 8 refs. (Presented at the 60th Annual Meeting, Air Pollution Control Association, Cleveland, Ohio, June 11-16, 1967, Paper 67-151.)

A continuous sampling, continuous analysis method for measuring nitric oxide was demonstrated. Rapid oxidation of nitric oxide to nitrogen dioxide is obtained through ozonation. Nitrogen dioxide concentrations are determined by means of an ultra-violet absorption technique. Nitric oxide concentrations between 100 and 5000 ppm have been measured and response times of about 20 sec

obtained. The presence of unburned hydrocarbons in the exhaust sample has an adverse effect on the results of this technique which requires either the removal of hydrocarbons or adjustment of ozone concentration. (Authors' abstract, modified)##

06435

Smith, D. S., R. F. Sawyer, and E. S. Starkman

OXIDES OF NITROGEN FROM GAS TURBINES. J. Air Pollution Control Assoc., 18(1):30-35, Jan. 1968. 6 refs. (Presented at the 60th Annual Meeting, Air Pollution Control Association, Cleveland, Ohio, June 11-16, 1967.)

Experimental and theoretical studies were made to provide information on nitrogen oxide concentrations produced by gas turbine engines. Nitric oxide concentrations of from 100 to 350 ppm, adjusted to stoichiometric conditions, were measured in aircraft turbojet engines. Concentrations of less than 50 ppm, similarly adjusted, were measured in a 60 hp industrial gas turbine. Concentrations of about 100 ppm, also adjusted, were measured in a laboratory combustor of a design similar to gas turbine combustors. Carbon monoxide and unburned hydrocarbon concentrations also were determined. Comparison with predicted equilibrium concentrations shows strong departures from equilibrium. (Authors' abstract)##

06445

K. T. Whitby

RECENT AEROSOL RESEARCH - UNIVERSITY OF MINNESOTA. Preprint. (Presented at the 60th Annual Meeting, Air Pollution Control Association, Cleveland, Ohio, June 11-16, 1967, Paper No. 67-103.)

Polystyrene aerosols produced by an improved generator (described in study) have been studied with respect to the electrostatic charge on the polystyrene particles and the size distribution and charge on the residue aerosols resulting from the evaporation of the non polystyrene containing droplets. The median number of unit charges and standard deviation σ of the charge distribution found on the plus and (-) particle is summarized. The PSL charges found are great enough to have a serious effect in many experimental applications. Diffusion and field charging studies of micron and submicron aerosols at pressure from atmospheric to 1 torr have been made. A new diffusion charging theory based on an improved kinetic model has been developed. The final equation which is identical in form to the White diffusion charging equation has been shown by experiment to be satisfactory for Knudsen numbers from 0 to 1 and by calculation to be satisfactory for larger Knudsen numbers. Work on an improved field charging theory for Knudsen numbers on the order of 1 is in progress. Considerable data has been obtained and an improved theory has been developed. A two stage electrostatic aerosol sampler of accurate sampling of micron and submicron size aerosols

onto any flat collecting surface of an area up to 50 sq. cm has been developed. The concentration and size distribution of particles from 0.001 to 3 microns in radius dispersed in the urban atmosphere was measured with a continuous-sampling sizing system composed of a nuclei counter, an electrical particle counter, and an optical counter. Atmospheric aerosol size distribution measurements made by previous investigators were reviewed and compared with the new information.##

06471

H. W. G. Wyeth and G. W. Timmins

DETECTION AND MEASUREMENT OF INFLAMMABLE VAPOURS IN AIRCRAFT. Ministry of Aviation, Farnborough Hants, England, Royal Aircraft Establishment. (Rept. No. 65191.) (Sept. 1965). 74 PP.

DDC: AD477 232

A study is made of the feasibility of detecting and measuring concentrations of inflammable vapour within compartments of aircraft in flight. The basic requirements are outlined. A review is made of properties of inflammable vapours that might be exploited. Mention is made of some existing instruments and techniques, and their limitations for the present purpose are discussed. Especial emphasis is given to techniques of catalytic combustion and ionization which with further development are thought likely to be suitable. (Author summary)

06504L

J. M. Beebe and E. L. Dorsey

A FLUORESCENT DYE TRACER AS A MEANS FOR DETERMINING PHYSICAL DECAY RATES OF AEROSOLS. Army Biological Warfare Labs., Fort Detrick, Frederick, Md. (Aug. 1958). 21 pp. (BWL Technical Memorandum 8-4.)

The use of fluorescein as a dye tracer for the determination of the physical decay rates of aerosols was investigated. Two types of chambers were used for most of the preliminary experiments: a 20-liter horizontal irradiation chamber, and a 1500-liter, 6 foot diameter toroid which can be revolved at speeds of from 0.27 rpm on up, for periods up to 24 hrs or more. Small chamber clouds were generated by a Vaponefrin Nebulizer Clouds in the toroid were generated by a modified UCTL atomizer. The spray medium in all cases was beef heart infusion. Two methods of sampling were employed. The small chamber samples were collected on Millipore Filters. Samples from the toroid were collected in standard 2.5 l/min impingers, containing 10 ml of glass-distilled water. Fluorometric analyses of the above dye solutions were made with a Light Scattering Microphotometer. A standard curve, showing the relationship between a known dye concentration and photomultiplier reading, was established with the particular dye lot to be used. A separate curve must be developed for each dye, or dye lot, and/or for each solvent in which samples are to be collected, since some impinger fluids contain materials that will

fluoresce. Whenever possible samples were collected in glass-distilled water, or on MF filters and then dissolved out established for a particular dye lot and solvent it was but a matter of a few minutes to determine the dye content of a series of samples. The method is simple and can be performed rapidly with a high degree of precision, sensitivity and reproducibility.##

06624

R. A. Saunders

ANALYSIS OF THE SPACECRAFT ATMOSPHERE. Naval Research Lab., Washington, D. C., Chemistry Div. (NRL Rept. No. 5816.) (Oct. 23, 1962). 21 pp.

DDC: AD 288 255

A study has been made of the nature of the contaminants introduced into the cabin atmosphere of a Project Mercury space capsule, external to the pressure suit, by the deliberately induced malfunction and overheating of certain parts of the capsule equipment during simulated flight. The contaminants were collected and concentrated by an adsorption-desorption cycle employing activated charcoal as the adsorbing medium. An analytical gas chromatograph was used to resolve the components of the contaminant mixture, which were then recovered individually from the effluent stream of the chromatograph and identified by means of their infrared spectra. Thirty-five components were detected in this atmosphere, 26 of which were identified. Approximate minimum concentrations have been indicated for the latter. The contaminant mixture comprised aliphatic and aromatic hydrocarbons, chlorinated hydrocarbons, and aliphatic alcohols, esters, and ketones. Some of the contaminants were present in sufficient concentration that they could possibly reduce the effectiveness or efficiency of an exposed pilot. (Author abstract)##

06634

K. Wettig

ESSAY ON THE PROBLEMATICS CONCERNING THE DETERMINATION OF BENZOPYRENE IN ATMOSPHERIC AIR. Neoplasma 14 (2), 181-4 (1967).

A proposal of method of hydrocarbon determination, which takes into consideration the problems of interpretation, is discussed. The majority of toxic substances in atmospheric air is present in the same form in which they take effect in vivo. The degree of concentration of a given, injurious substance, is in most cases a measure for the endangerment of the health of human beings. Quite different, however, is the cancerogenic effect of polycyclic hydrocarbons in the air. The conclusions drawn from the atmospheric content of cancerogenic hydrocarbons with regard to the endangerment of health of human beings depends solely in the assumption, that the total content of hydrocarbons stands in correlation with the active hydrocarbons. Owing to the diversities of the possibilities which govern the formation of "active" hydrocarbons, such a correlation is naturally very questionable. A better approximation may be attained by using a

method consisting of the following steps in succession: The splitting-up of an aspirated sample of dust into its components according to the diameter of the separate particles; The portional extraction of the particles having a diameter of 100 to 5000 micrograms with a simulated body-liquor for a period of time corresponding to the time of retention of the dust particles in the human lung; and Review of the cancerogenic activity of the extract. The usual determination of the content of hydrocarbons in atmospheric air cannot be replaced but merely supplemented by procedures for the determination of their active components, as the knowledge of the total amount of the various hydrocarbons permits conclusions to be drawn with regard to their origin, this being of great importance for the removal or abatement of emissions.##

06661

E. G. Kachmar

DETERMINATION OF BENZENE TOLUENE AND XYLENE SIMULTANEOUSLY PRESENT IN THE AIR . U.S.S.R. Literature on Air Pollution and Related Occupational Diseases, Vol. 7, 143-7, 1962. (Gigiena i Sanit.) 258 (5) 58-62, 1960. Translated from Russian.

CFSTI: 62-11103

The new methods in this presentation were based on the formation of azo-compounds. Benzene was nitrified with a 10% nitration mixture to the dinitro form, which was then reduced with metallic zinc, diazotized in the presence of concentrated hydrochloric acid by a 1% solution of sodium nitrate, and combined with m-phenylenediamine. The resulting azo-compound is of a yellow-brown color. The sensitivity of this reaction is 0.005 mg in the volume used for colorimetry. A series of experiments were performed with known amounts of benzene determined on a parallel basis by the azo-compound formation and the Yanovskii reactions. Control tests showed that the presence of an equal amount of toluene and of an equivalent 60% amount of xylene, did not interfere with the determination. The toluene determination method consisted in the reduction of trinitrotoluene and the combination of the reduced products with diazotized sulfanilic acid. The sensitivity of the reaction was 0.01 mg of toluene in the colorimetric volume. Additional control tests showed that the presence of an equal concentration of xylene and of half the equivalent volume of benzene did not interfere with the determination. No suitable basis found for the development of a method for xylene determination in the presence of toluene; for this reason xylene was separated from benzene and toluene. The following studies were made; 1) conditions of benzene, toluene and xylene absorption on silicagel; 2) conditions of desorption such as effects of temperature and air volume passed through the silicagel in order to displace the benzene, toluene and xylene. On the basis of results obtained conditions for the separation of xylene from benzene and toluene are recommended.##

P. P. Dikun

QUANTITATIVE DETERMINATION OF LOW 3, 4-BENZOPYRENE CONCENTRATIONS WITH FINE STRUCTURE FLUORESCENT SPECTRUM . U.S.S.R. Literature on Air Pollution and Related Occupational Diseases, Vol. 7, 153-69, 1962. (Vopr. Onkol.) 7, (7) 42-53, 1961. Translated from Russian.

CFSTI: 62-11103

A new method is described for the determination of lower 3, 4-benzopyrene concentration than with any previous tests. This method combines the principle of spectrofluorometry with the fine structure spectral fluorescence phenomenon described by E. V. Shpol'skii. Quantitative determination is based on ratio between 3,4-benzopyrene and 1,12-benzoperilene absorption intensity lines. By the fine structure spectral fluorescent method, determinations can be made of 0.05 - 0.10 gamma or less of 3, 4-benzopyrene per sample with a high degree of accuracy. Average deviation of 15 control tests was only + or - 8%. Deviations exceeding 10% occurred in 3 of the 15 control tests, and none ex-

06682

D. N. Sunderman, J. E. Howes, and H. S. Tosenberg

THE DEVELOPMENT OF AN IMPROVED METHOD OF SAMPLING AND ANALYSIS FOR ATMOSPHERIC IODINE . (Battelle Memorial Inst., Columbus, Ohio.) (July 22, 1965). 20 pp. (Rept. No. BMI-X-10137.)

The feasibility was studied of an iodine sampler which will be somewhat analogous to a gas-liquid chromatographic column although the separation of the iodine species will not employ the chromatographic principle. The system will consist of a column of sodium bisulfite particles or sodium bisulfite on a solid matrix such as Chromasorb, coated with a viscous organic solvent. A glass-fiber filter will precede the column to remove particulate iodine from the sample stream. In operation, the elemental iodine and organic iodine compound will be absorbed and retained by dissolution in the organic film on the particles. The elemental iodine will diffuse to the interface between the liquid and solid phase, react with the solid phase to form the iodide, and thus be separated from the organic iodide. Gaseous inorganic iodine compounds are expected to be absorbed on the surface of the organic film or pass through the column unaffected. Following the sampling period, water would be passed through the column to elute any water soluble iodine compounds, organic iodides would be recovered by dissolution of the organic phase with a solvent, and the sodium bisulfite particles would be recovered to obtain the reacted, elemental iodine. Reaction studies between the various forms of iodine, dodecane, and NaHSO₃ indicate that the proposed iodine sampling technique is feasible. Elemental iodine and methyl iodide will dissolve in the stationary liquid phase. Methyl iodide will remain in stationary liquid, while the elemental iodine will be reduced to the iodide by solid NaHSO₃, the solid support material. The experiments show that both at 24 C and 100 C the extraction efficiencies for elemental iodine are better than 94 per cent after 15 minutes contact times. The

extraction of iodine in the solid NaHSO₃ should occur rapidly, therefore, reaction with the organic phase will not be significant. The experiments also show that no apparent reactions occur between the methyl iodide and the reducing phase. When iodine was extracted from a mixture of methyl iodide, iodine, and dodecane, isotopic exchange occurred between the iodine and methyl iodide. When NaI and HI solutions were contacted with dodecane, I- in solution did not react with dodecane.##

06699

C. F. Ellis, R. F. Kendall, and B. H. Eccleston

IDENTIFICATION OF SOME OXYGENATES IN AUTOMOBILE EXHAUSTS BY COMBINED GAS LIQUID CHROMATOGRAPHY AND INFRARED TECHNIQUES. Anal. Chem. 37 (4) 511-6 (Apr. 1965).

A method for identifying certain oxygenates in automobile exhausts by gas liquid chromatography with confirmation by infrared spectra is described. The oxygenates were separated from exhaust gases by scrubbing with a 1% solution of NaHSO₃. Then, oxygenates which eluted ahead of water were separated from the solution in a preparatory column. The carbonyls indicated in the chromatograms were derived from the thermal decomposition of the bisulfite complexes of these compounds in the chromatographic column. The eluted oxygenates were collected in a cold trapping needle and charged to an analytical GLC unit employing thermal conductivity detection. A chromatogram was thus obtained, and the individual components indicated in the sample were collected in separate plastic bags and transferred to a 10-meter infrared cell for confirmation of the GLC IDENTIFICATIONS. Acetaldehyde, propionaldehyde, isobutyraldehyde, n-butyraldehyde, acetone, methyl ethyl ketone, methanol, and ethanol were present. Acrolein cannot be detected by this method. After identification of the oxygenates present, GLC analyses employing flame detection were made directly upon the scrubber solutions and also on preparatory column effluents.##

06702

Pagnotto, L. D. and L. M. Lieberman

URINARY HIPPURIC ACID EXCRETION AS AN INDEX OF TOLUENE EXPOSURE. Am. Ind. Hyg. Assoc. J., 28(2):129-134, March-April 1967. 20 refs. (Presented at the 27th Annual Meeting, American Industrial Hygiene Assoc., Pittsburgh, Pa., May 1966.)

A simple procedure is described for the analysis of hippuric acid in urine. The sample is extracted with an isopropyl, alcohol-diethyl ether mixture, and the hippuric acid is measured in the extractant by ultraviolet spectrophotometry. The excretion of hippuric acid in urine as a metabolic product of toluene was studied in relation to its usefulness in industrial exposures to toluene. Good correlation of hippuric acid content of end-of-shift samples and toluene exposure was found in studies performed in leather-finishing and rubber-coating plants. The

hippuric acid test was also found to be useful in measuring the adequacy of cartridge-type respirators in tank painting work. Air-urine correlation, although not complete, suggests that exposures to 200 ppm (MAC) of toluene would produce a urinary hippuric acid content of about 7.0 gm/liter or 5.0 gm/gm of creatinine in samples collected at the end of the work shift.##

06858

A. Richardson, J. Robinson, E. Bush, and J. M. Davies

DETERMINATION OF DIELDRIN (HEOD) IN BLOOD. Arch. Environ. Health 14 (5), 703-8 (May 1967).

Two methods for the determination of HEOD (1,2,3,4,10,10, hexachloro-6, 7 epoxy-1,4,4a,5,6,7,8,8a-octahydro-1, 4 endo, exo-5, 8-dimethanonaphthalene (Dieldrin) in blood were assessed. The procedure using acetone as an extraction solvent gives reproducible results and is rapid. The precision of the extraction procedure, as reassured by the coefficient of variation, is of the order of 6%. The accuracy, assessed by comparison with the destructive hydrolysis technique, does not appear to differ significantly from 100%. Evidence has been obtained that the concentration of HEOD in the blood of the same person can vary in random manner from time to time, and the coefficient of variation for samples of blood collected at different times from the same person is about 25%. The acetone extraction procedure is nondestructive and should therefore be applicable to the determination of the organochlorine insecticides, particularly those which are unstable to alkalis and their metabolites.##

06876

R. M. Lagoshnaya and N. A. Zhuravleva

DETERMINATION OF FREON-22 IN AIR. (Kolichestvennoe opredelenie freona-22 v vozdukh.) Hyg. Sanit. (Gigiena i Sanit.) 30 (6), 366-71 (June 1965). Russ. (Tr.)

The colorimetric and manometric methods for the determination of Freon-22 in the air were described. The colorimetric method is applicable for freon-22 concentrations in the air ranging from 0.5 to 0.00006% and the analytical time is approximately five minutes. The manometric method makes possible the determination of freon-22 in the air for concentrations ranging from 0.5 to 15 vol. % and the analytical time is 10 to 15 minutes.##

06893

Belyakov, A. A., and V. G. Smirnova

DETERMINATION OF FURFUROL IN THE AIR. ((Opredelenie furfurola v

vozdrukhe.)) Hyg. Sanit. (Gigiena i Sanit.) 30(3):390-391, Mar. 1965. Translated from Russian.

CFSTI: TT 66-51033

Methods based on color reaction with aniline have been proposed for determining furfural vapors in the air of industrial premises. The reaction results in the formation of dianilide of oxyglutaconic aldehyde, belonging to the class of polymethine dyes. A common defect of these methods is the instability of dyed solutions, which is reflected in the reproducibility of the results. Using the above-mentioned reaction, the authors were able to find the conditions for a more reliable determination of furfural in the air. They used 98% of icy acetic acid as the absorbent solution and solvent. An aniline concentration within the limits of 50-70 mg per ml of acetic acid is preferable. In this case the dyeing of the solutions reaches the maximum in 15 minutes and is preserved unchanged for the next 45 minutes. Furfural vapors are well absorbed by acetic acid. To determine, for instance, the maximum permissible concentration of furfural (0.01 mg/l), it suffices to pass not more than 25 ml of air through an absorbing instrument with 2 ml of acetic acid. The air humidity is apparently little detained by the icy acetic acid. Thus, the sucking of up to 10 l of air through the absorbing instrument with 2 ml of acetic acid containing 0.5-5 μ g of furfural is not reflected in the results of the determination.##

06894

Razumov, V. A., and T. K. Aidarov

A FAST METHOD FOR DETERMINING LEAD IN THE AIR. ((Uskorenniy metod opredeleniya svintsya v vozdukh.)) Hyg. Sanit. (Gigiena i Sanit.), 30(3):392-394, Mar. 1965. Translated from Russian. CFSTI: 66-51033

In a number of cases there is a need for rapid and accurate determination of the lead aerosol content in the air. The usual chemical and physicochemical methods applied for this purpose are rather lengthy and labor-consuming. The most advantageous is color reaction on paper without any previous working of the ground. The fullest response to all requirements is afforded by the color reaction with tetrahydroxy-p-benzoquinone. Here a legible scale is obtained for microgram parts of lead on paper, the pink coloring lasts for up to six months, and the reagent solution itself is stable for up to 4 months. Antimony, bismuth, zinc, copper, iron, arsenic, chromium and calcium, also cadmium (in equal concentrations with lead) do not interfere with determination. The air sample was taken out with an aspirator plant at a rate of 3 l/min onto filter paper (blue band). When the lead content is within the normal limits, 10-15 l of air have to be taken. A disk of paper 17 mm in diameter was placed in a plexiglas holder of the proper dimensions, and a drop (0.05 ml) of reagent was applied to the filter in the holder; after it had dried, samples were taken, and then a drop (0.05 ml) of buffer solution was applied. The pink coloring appeared at once. Then the filter was taken out of the holder and was placed on clean filter paper (with the coloring upward) to dry. After a few seconds, the coloring was compared with the scale on the paper obtained by the analogous method for certain lead concentrations. The sensitivity of the

method was 0.015 ug in the drop (0.05 ml). For more reliable results, it is better to make two parallel (in the worst case, successive) determinations. The duration of one determination is not more than seven minutes, if the air contains lead in more than the normal amount.##

06902

R. V. Gorskaya

A NEW PHOTOCOLORIMETRIC METHOD FOR THE DETERMINATION OF NAPHTHALENE IN AIR. (Novyi fotokolorimetriceskii metod opredeleniya maftalina v vozdukh.) (Hyg. Sanit). (Gigiena i Sanit.) 30 (11), 243-4 (Nov. 1965 Russ. (Tr.)

A photocalorimetric method for routine analysis of naphthalene is described. The method was tested under industrial conditions by determining the naphthalene in the air of the naphthalene shop of the Rutchenskivskii coke-chemical plant. Interference by phenols was prevented by trapping them first in an absorber containing 0.1 N alkali which was placed in front of the absorber for the naphthalene. The determination was carried out by two methods, with a nitrating mixture and with alloxantin. There was good agreement between the results.##

06903

I. A. Pinigina

THE SEPARATION AND DETERMINATION OF ALIPHATIC ALCOHOLS IN AIR BY PAPER CHROMATOGRAPHY. (Razdelenie i kolichestvennoe opredelenie alifaticeskikh spirtov v vozdukh s pomoshch'yu khromatografii na bumage.) Hyg. Sanit. (Gigiena i Sanit.) 30 (11), 244-9 (Nov. 1965). Russ. (Tr.)

Separate determination of aliphatic alcohols (C1-C10) that simultaneously pollute the air in factories manufacturing synthetic alcohols was accomplished by paper chromatography. Volatile compounds can be determined by paper chromatography after their conversion to nonvolatile compounds. The alcohols are converted to the benzoates. The derivatives of alcohols C1-C6 arranged themselves on the chromatogram in the order of increasing number of carbon atoms. The derivatives of alcohols C7-C10 arranged themselves on the chromatogram in the descending order of the number of their carbon atoms. The alcohols can be quantitatively determined by chromatographic separation, by means of the intensity of the color of the spots formed by their eluates. In the case of alcohols C1-C6, the color is eluted and the optical density of the elute measured with an SF-4 spectrophotometer or a photocalorimeter. Quantitative determination of the alcohols C7-C10 was performed visually by comparing the color intensities of the sample spots with those of reference spots made with standard solutions.##

M. N. Inscoc

PHOTOCHEMICAL CHANGES IN THIN LAYER CHROMATOGRAMS OF POLYCYCLIC, AROMATIC HYDROCARBONS. Anal. Chem. 36, 2505-6 (Dec. 1964).

The change in spot color due to photochemical changes of thin layer chromatograms in the identification of polycyclic aromatic hydrocarbons was discussed. The changes were observed on spots of 15 representative hydrocarbons following exposure to ultraviolet light. The absorbents used were silica gel G, aluminum oxide G, cellulose powder, and acetylated cellulose (21%). After the initial exposure to ultraviolet light, the changes take place even when the plates are kept in the dark. Similar, but slower, changes also occur on plates kept in ordinary roomlight, without exposure to other ultraviolet illumination. The changes are accelerated by continuous irradiation, either by long-wavelength ultraviolet light or by light of 253.7 millimicron. The nature of the developing solvent appears to have little effect on the colors observed. The presence of solvent often accelerates the changes in the spots. This effect is particularly noticeable with chlorinated solvents.##

07061

M. E. Whitman and A. E. Johnston

SAMPLING AND ANALYSIS OF AROMATIC HYDROCARBON VAPORS IN AIR: A GAS-LIQUID CHROMATOGRAPHIC METHOD. Am. Ind. Hyg. Assoc. J. 25 (5), 464-9 (Oct. 1964).

The sampling and analysis of air for mixtures of benzene, toluene and xylene vapors are described. The application of a molecular sieve prefilter to remove water vapor and a silica gel adsorption tube for the collection of the hydrocarbon was investigated. The development of a method for the extraction of aromatic hydrocarbons from silica gel and their subsequent estimation by gas chromatography is reported. The method is sufficiently sensitive to permit accurate measurement at 10% of the MAC level. (Authors' abstract)##

07097

L. H. Piette, J. H. Sharp, T. Kuwana, and J. N. Pitts, Jr.

PARAMAGNETIC RESONANCE OF SOME BENZOPHENONE DERIVATIVES IN THEIR PHOSPHORESCENT STATE. J. Chem. Phys., 36(11), 3094-5 (June 1, 1962).

Paramagnetic resonance absorption of the triplet or phosphorescent state in several para-substituted derivatives of benzophenone was observed. The phosphorescent states are formed during uv irradiation of the compounds in rigid solutions at liquid-nitrogen temperatures. Solutions of 4-aminobenzophenone,

4-dimethylaminobenzophenone, 4,4', bis-(dimethylamino)benzophenone, and 4-phenylbenzophenone were irradiated at 77 deg K. Paramagnetic resonance absorption was observed for all the above compounds at a magnetic field of about 1500 gauss, (g equals 4). In addition to paramagnetic resonance absorption at g equals 4, the irradiated solid solutions show strong phosphorescence. This phosphorescence decays exponentially with a mean lifetime of 0.41 plus or minus 0.04 sec and agrees favorably with the decay of the paramagnetic resonance absorption signal when the light is cut off. Mean phosphorescent lifetimes of the other compounds range from 0.2 to 0.4 sec and are being correlated with the decay of their EPR signals at g equals 4.##

07104

McEwen, D. J.

IMPROVED SAMPLING VALVE FOR GAS CHROMATOGRAPHY. J. Chromatog., Vol. 9, p. 266-269, Oct. 1962.

For the gas chromatographic analysis of engine exhaust and air for trace amounts of hydrocarbons, a gas sampling valve with the following features was required: (1) no detectable gas leaks, (2) no contamination or adsorption of the sample, (3) fast switching speed for instantaneous sample injection, (4) interchangeable sample volumes with the smallest about 0.1 ml, and (5) good sampling precision. A four-way solenoid valve for use with industrial gas chromatographs leaked seriously, but otherwise showed promise of meeting the above requirements. A method for making the valve gastight and an example of the use of the valve in the analysis of highly diluted hydrocarbon mixtures are discussed. In the disassembled valve the stainless steel part is separated from the brass base by a Teflon diaphragm, which opens and closes the valve ports by means of air pressure. The surfaces separated by the diaphragm bore the marks (mainly long scratches) of the grinding operation in the manufacture of the valve. It was found that the valve could be made gastight with Teflon diaphragms by polishing both surfaces to a mirror-like finish. The smallest sample that has been measured with the valve is 86 ul. The precision of the valve has not been extensively investigated; however, the average deviation of peak heights for repeat analyses of dilute hydrocarbon mixtures is usually better than plus or minus 0.5%.##

07146

Gronsborg, E. Sh.

DETERMINATION OF VINYL CHLORIDE IN THE AIR. U.S.S.R. Literature on Air Pollution and Related Occupational Diseases, Vol. 1:148-150, Jan. 1960. (Also published in *Gigiena i Sanit.*, No. 11:43-44, 1954.) Translated from Russian.

CFSTI: TT 60-21049

The procedure described is based on bromination in chloroform solution with a bromine solution in a 1:1 mixture of glacial acetic

acid and chloroform. The method is sensitive to 0.10 mg of vinyl chloride per test. The absorption of vinyl chloride from air is accomplished by aspirating the tested air through chloroform kept at -10 to -15 deg., at the rate of 10 - 12 liters per hour. This method is specific in the presence of methanol and dichlorethane. Observing the additional steps and precautions indicated obviates the interference of ethylene and of chlorine.##

07150

Dzedzichuk, V. P. and A. V. Demidov

APPARATUS FOR THE DETERMINATION OF CARBON MONOXIDE AND CARBON DIOXIDE IN THE AIR AND OF GASEOUS COMPONENTS OF LIQUID FUEL. U.S.S.R. Literature on Air Pollution and Related Occupational Diseases, Vol. 1:168-177, Jan. 1960. (Also published in Lab. Delo 3(4):46-51, 1957.) Translated from Russian.

CPSTI: TT 60-21049

The principle of the method described is the same as of the combustion methods currently in use. The carbon monoxide or the hydrocarbons contained in the air are oxidized to carbon dioxide in a combustion chamber with the aid of an electrically heated coil. The carbon dioxide is then passed through a coil condenser (absorber) which contains a known volume of a known solution of barium hydroxide, and the excess of the latter determined by titration with a standardized solution of HCl, and the results expressed in mg of CO or of hydrocarbons, as the case may be, per liter of air. The apparatus consists of four main sections: the purifying section, the distributor, the combustion chamber and the absorber. The apparatus and technic are described in detail.##

07153

Bronsberg, E. Sh.

CHROMATOGRAPHIC SEPARATION OF BENZENE AND ISOPROPYLBENZENE AND OF BENZENE AND CHLOROBENZYL IN AIR ANALYSIS. U.S.S.R. Literature on Air Pollution and Related Occupational Diseases, Vol. 1:187-191, Jan. 1960 (Also published in Gigiena i Sanit., 23(1):77-81, 1958.) Translated from Russian.

The method studied consisted of a combination of thermal desorption and chromatographic analysis. Sets of conditions developed for the chromatographic partitioning of vapors of benzene, isopropylbenzene and chlorobenzyl present in the air of industrial manufacturing premises. The partitioning was accomplished at the time of the sample taking when the air was aspirated through the system which consisted of a V-shaped tube containing grade ASK silicagel and of two absorbers containing 2 ml of a nitro-mixture. The benzene is absorbed by the nitro-mixture, the second component remaining adsorbed by the silicagel. Colorimetric methods are described for the determination of the isopropylbenzene and the chlorobenzyl in the presence of benzene.##

Senderikhina, D. P.

DETERMINATION OF PARAFFIN AND CERESIN AEROSOLS IN THE AIR OF INDUSTRIAL PLANTS. U.S.S.R. Literature on Air Pollution and Related Occupational Diseases, Vol. 1:206-207, Jan. 1960. (Also published in Gigiena i Sanit., 23(8):77-78, 1958.)
Translated from Russian
CFSTI: TT 60-21049

For quantitative determination of petroleum paraffin vapor its differential characteristics of dissolving readily in ether and with difficulty in ethanol were utilized. The ethanol is added to the ether-dissolved petroleum paraffin and cooled to 0 deg which causes the paraffin to separate from solution as an emulsion whose turbidity varies directly with the quantity of the dissolved paraffin. The standard solution to be used in the turbidimetric comparator is prepared from a weighed amount of petroleum paraffins in ethyl ether, usually 1 mg per ml. Quantitative analysis of synthetic cerecin is done gravimetrically by aspirating through a glass filter No. 2 at the rate of 0.2 lit./min. using ether as the absorber. The absorbed cerecin is removed from the glass filter plate by dissolving it in hot gasoline; the latter is driven off by evaporation in a preweighed porcelain dish over a waterbath. After the gasoline has been evaporated the dish is cooled for 20 - 30 minutes in a desiccator and weighed on an analytical balance.##

07285

Khrustaleva, V. A.

DIFFERENTIAL DETERMINATION OF ORGANIC AND INORGANIC LEAD IN THE AIR OF GARAGES. Text in Russian. Gigiena i Sanit. No. 9:48-49, 1952. Engl. transl. by B. S. Levine, U.S.S.R. Lit. on Air Pollut. & Relat. Occup. Dis., Vol. 2, p. 8-10, March 1960.

CFSTI TT60-21188

Air samples for the determination of inorganic compounds should be collected by aspirating 300 - 500 li of air through absorbent cotton at a rate of 10 li/min. With reference to tetraethyl lead it may be stated that, owing to the presence of carbon monoxide and vapors of hydrocarbons in the air, and the nonspecificity of the method, its determination in the form of intact molecules is not feasible. It is necessary first to destroy the molecules and to proceed with the determination of free lead. For this purpose tetraethyl lead is absorbed from the air into alcohol at a rate not exceeding 1 li/min, i.e., 60 li per hour; at a higher rate evaporation of the alcohol-dissolved tetraethyl lead will take place. By the method used in this study metallic lead determinations could be made reliably with 0.002 - 0.005 mg as the lower limit. For the collection of tetraethyl lead air samples the use of conventional equipment is proposed, such as a suction dust collector, a high velocity flowmeter, corrugated tubes as adapters for cotton filters to retain metallic lead, and Petri

tubes containing 10 ml of alcohol for the absorption of the tetraethyl lead. By the proposed method of air sampling it was possible to aspirate within one hour and a half up to 1 cu. m. of air and to accumulate a quantity of tetraethyl lead sufficient for a precise determination.##

07298

Dikun, P. P.

THE DETERMINATION OF 3,4-BENZOPYRENE IN PRODUCTS OCCURRING IN THE MANUFACTURE OF SYNTHETIC LIQUID FUEL. Text in Russian. Vopr. Onkol., Vol. 4, p. 289-291, 1958. 4 refs. Engl. transl. by B. S. Levine, U.S.S.R. Lit. on Air Pollut. & Relat. Occup. Dis., Vol. 2, p. 122-125, March 1960.

CFSTI TT60-21188

The results of fluorescent-spectral analyses of a series of the primary, intermediate, and final products in the U.S.S.R. manufacture of synthetic liquid fuels by the hydrogenation method are presented. The analytical procedure was as follows: One gram of the test material was dissolved in 15 - 20 ml of petrolic ether. Highly viscous products, such as coal paste, petroleum residue, etc., not easily soluble in petrolic ether were first dissolved in 2 - 3 ml of benzene, and then diluted with a specified volume of petrolic ether, which was accompanied by the formation of a heavy precipitate, the latter was removed with the aid of a Buchner funnel filter. The filtrate was passed through a column of aluminum oxide; the adsorbed substances were eluted with a mixture of petrolic ether and benzene. The passing of the substances through the column was followed with the aid of a luminescent light. The fluorescent spectra of the chromatographically partitioned fractions were photographed for permanent recording of the presence of carcinogenic substances. From the concentration of 3,4-benzopyrene found in the partitioned fraction the total content of 3,4-benzopyrene in the product was calculated. The method employed was designed for the detection of 3,4-benzopyrene as the representative carcinogenic factor of polynuclear aromatic hydrocarbons. Results of investigations by this method fully agree with theoretical assumptions that 3,4-benzopyrene and probably the other carcinogenic substances of this type were not newly formed during the production of synthetic liquid fuel, but were destroyed, if originally contained in the primary material. It must be borne in mind that these conclusions apply only to the 3,4-benzopyrene types of carcinogenic substances; the results of this investigation do not exclude the possibility of the formation of carcinogenic substances of different chemical structures.##

07335

H. Tanimura

AN APPLICATION OF GAS CHROMATOGRAPHY TO THE ANALYSIS OF SOLVENT VAPOURS IN THE INDUSTRIAL AIR. REPT. 1. Text in Japanese. Japan J. Ind. Health (Tokyo), 7(9):7-16, Sept. 1965. 7 refs.

The determination of solvent vapours by means of gas chromatography is discussed. Industrial air is sampled and a survey is made on the method of quantitative determination of aromatic hydrocarbons and others in the solvent. The best result is obtained with gas chromatography under the following conditions. Stationary phase: 2% squalane/diasolid M (40-60 mesh) 2 m packed column. Column temperature: 80 degrees C-100 degrees C. Sample inlet temperature: 80 degrees C-100 degrees C. Carrier gas: Nitrogen. Gas flow rate: 20-30 ml/min. Detector: Hydrogen flame ionization detector. After performing gas chromatography with gas, the detector response peak is measured. An then the concentration of the sampled gas is determined by reading the value of the response peak against the standard calibration curve of its equivalent gas.##

07373

Hettche, O. and H. Von Becker

METHOD FOR THE GRAVIMETRIC TRACE ANALYSIS OF HYDROCARBON VAPORS. ((Verfahren zur gravimetrischen Spurenanalyse der Dämpfe von Kohlenwasserstoffen.)) Text in German. Stadtehygiene (Uelzen/Hamburg), 16(3):64-68, Mar. 1965. 10 refs.

A survey of maximum allowable concentrations for various hydrocarbons suggests that it is desirable to develop a simple non-selective analytical method to determine quantitatively hydrocarbons down to concentrations of the order of magnitude of 1 ppm. The method described in detail is based on the adsorption of hydrocarbons on activated carbon. A 500-liter plastic sack is used to sample the air. The fabrication of the sack is described. With a membrane pump the gas is taken from the bag, metered, and passed through two drying bottles filled with sulfuric acid. For aromatic compounds, the sulfuric acid must be replaced by CaCl_2 , P_2O_5 or $\text{Mg}(\text{ClO}_4)_2$. Then the gas passes through two U-shaped tubes with activated carbon. The tubes are weighed before and after the air passage. Weight differences of the second tube are used to correct the weighing of the first tube. The method was tested with n-hexane, benzene, carbon tetrachloride, ethyl acetate, trichloroethylene, diethyl ether, chloroform, tetrachloroethane, and butane. On the average, about 65% of the theoretical amount could be detected. Butane and carbon disulfide give large errors. Results from tests performed in the laboratory and in an underground garage are presented in four tables. Typical concentrations of the test substances were 10 to 70 mg/cu. m.

07375

S. Horiguchi, K. Shinagawa, T. Utsunomiya, K. Iyoda, N. Tanaka

ATMOSPHERIC DETERMINATIONS OF CHLORINATED HYDROCARBONS, ESPECIALLY THE DETERMINATION OF 1,1,1-TRICHLOROETHANE. Text in Japanese. Japan J. Ind. Health (Tokyo), 7(5):25-28, May 1965. 5 refs.

The determination of chlorinated hydrocarbons in air, particularly that of 1,1,1-trichloroethane in air was examined. Vapor of 1,1,1-trichloroethane is collected by adsorption on silica gel in U-tubes. Extraction of the vapor from silica gel is made by isopropyl alcohol at 52 C, followed by filtration. Hydrolysis of the filtrate is made at 52 C by dissolving some pellets of potassium hydroxide. The solution is then neutralized with 5% acetic acid and 1 ml of 5% potassium chromate is added as an indicator, determination is made for hydrolyzed chlorine ion by titration with 0.1N silver nitrate.##

07386

H. Konosu

DETERMINATION OF ORGANIC SOLVENT VAPOR-AIR MIXTURES BY A NON-DISPERSIVE ULTRAVIOLET GAS ANALYZER AND EXAMINATION OF PRECISION. Text in Japanese. Tokyo Kogyo Shikensho Hokoku (Rept. Govt. Chem. Ind. Res. Inst. Tokyo) (Tokyo), 62(7): 257-265, July 1967, 11 refs.

A convenient and rapid procedure for determining the organic solvent vapors in air has been studied which permits determination by direct ultraviolet photometric absorbance measurements. The higher boiling point samples were vaporized in a newly designed, electrically heated evaporator. The organic solvent vapor can then be admitted to the sample gas cell until its pressure equals atmospheric pressure. Precision and accuracy of the determination by the analyzer were examined statistically. Toluene ethylbenzene, chlorobenzene, aniline, cyclohexanone, pyridine, nitromethane, nitroethane, tetrachloroethylene, and furfuryl alcohol were detected in the following minimum concentrations: 4, 3, 13, 1, 65, 44, 47, 1 and 1 ppm, respectively. There was a linear relationship between the absorbance and the concentration in the chlorobenzene, aniline, cyclohexanone, pyridine, nitromethane, and nitroethane. Maximum allowable concentration value (75 ppm) of chlorobenzene can be determined, whereby a 95% confidence interval extends from 60 ppm to 90 ppm. Considerably less than the maximum allowable concentration of many organic solvents can be detected by the analyzer. (Author's summary, modified)##

07400

Shabad, L. M.

STUDIES IN THE U.S.S.R. ON THE DISTRIBUTION, CIRCULATION AND FATE OF CARCINOGENIC HYDROCARBONS IN THE HUMAN ENVIRONMENT AND THE ROLE OF THEIR DEPOSITION IN TISSUES IN CARCINOGENESIS: A REVIEW. Cancer Res. 27(6):1132-1137, June 1967. 40 refs. (Presented in part at the 9th Int. Cancer Congr., Tokyo, Japan, Oct. 1966.)

By the use of quantitative spectrofluorescent assay of such carcinogenic hydrocarbons as benzo(a)pyrene (BP), it is possible to follow the carcinogenic hydrocarbons at different stages of their distribution and circulation in animal organisms and in human environment. The carcinogens circulate from one product to

another, and from industrial and transport exhausts into the air. The exhausts from factories, heating systems, and combustion engines fall on soil, appear in water, accumulate or disappear, pass from nutrient medium into microorganisms, and contaminate fodder and even human food. The action of some soil bacteria in transforming and destroying BP not only throws light on the fate of this material in the soil, but indicates the possibility of biological purification of the human environment from carcinogenic hydrocarbons. Modern accurate methods of hydrocarbon determination (for BP the limit is 0.000001 mg/ml) show new ways to cancer prevention.##

07403

Syczewska, K., Z. Martyniak, and B Glowiak

INTERFEROMETRIC MEASUREMENT METHODS OF AIR POLLUTION.
((Interferometryczna Zanieczyszczen.)) Text in Polish.
Ochrona Pracy (Warsaw), 22(2):16-19, Feb. 1967. 4 refs.

Experiments confirming the suitability of the interferometric method for analyzing all known and unknown gaseous substances of atmospheric air were made. The basis of the method is the refraction of light by gases measured in an interferometer. This consists of two enclosed parallel tubes with the following arrangement: monochromatic light source, slit, collimator, lens, diaphragm, cuvette, movable compensator, telescopic lens arrangement for observing the field of view, and a rotating drum for manual adjustment of the compensator. By this method, a wide range of concentrations of all chemical substances can be measured in several seconds. A schematic of the instrument, a discussion of the calculations, and a report of an experiment to determine the cyclohexane concentration in air are given. At present, the method is still limited to the analysis of binary mixtures.##

07427

G. E. Moore, R. S. Thomas, J. L. Monkman

THE ROUTINE DETERMINATION OF POLYCYCLIC HYDROCARBONS IN AIRBORNE POLLUTANTS. J. Chromatog., 26(2):456-464, 1968. 9 refs.

A method for the analysis of polycyclic hydrocarbons found in polluted air and tobacco tars is described in detail. The chromatography of polycyclic hydrocarbons involves compromises including the activity of the alumina, the depth of the adsorbent, and the amount of the ether, or other polar solvent used. Ultraviolet spectroscopy as a monitoring technique is not sufficiently sensitive. This lack of sensitivity may be the reason that column losses have been reported. Fluorescence as a monitoring technique is much more sensitive and must be used when benzo(a)pyrene is being measured, since the benzo(k)fluoranthene present in the benzo(a)pyrene fractions causes serious interference with measurements made at the characteristic benzo(a)pyrene peak at ca. 402nm.##

M. Selucky, J. Novak, J. Janak

THE USE OF THE CHROMATOGRAPHIC EQUILIBRATION PROCEDURE FOR AIR POLLUTION STUDIES. DETERMINATION OF MINUTE AMOUNTS OF BENZENE, CHLOROBENZENE, AND NITROBENZENE IN AIR. J. Chromatog., 28(2): 285-292, 1967. 13 refs.

The equilibration technique was used for the determination of benzene in the presence of nitrobenzene and chlorobenzene. The applicability of the chromatographic equilibration technique for air pollution control was verified for the systems benzene-chlorobenzene, benzene-nitrobenzene, and for a ternary mixture of the three compounds. For field assays, invaluable advantages of the method used are: (1) Water does not interfere with the determinations when non-polar phase is used for the concentration-tube packing. (2) The extent to which individual components are trapped is proportional to their partition coefficients, i.e. usually inversely proportional to their volatility. Thus, the least volatile compounds that are present in the atmosphere usually at lowest concentrations, are most efficiently accumulated. (3) During sampling, care need not be taken of the exact volume drawn through the concentration tube, thus eliminating the use of clumsy-to-operate sampling devices. (4) The sampling procedure is very versatile and extremely simple, thus rendering the method suitable for field practice. Also the transport of the pocket-size tubular samples is convenient. (5) The overall time necessary to prepare and analyze samples of benzene in the presence of chloro- or nitrobenzene is about 30 to 40 min. as compared with standard procedures, where a complete analysis takes several hours. The equilibration method is therefore of considerable advantage in studying micro-climatic conditions and momentary surges of exhalates.##

07435

A. Zdrojewski, A. L. DuBois, G. E. Moore, R. S. Thomas, J. L. Monkman

COLUMN CHROMATOGRAPHY AND SPECTROSCOPY IN THE ANALYSIS OF AIRBORNE POLYCYCLICS. J.Chromatog., 28(2):317-325. 1967. 16 refs

Analytical difficulties encountered during the separation (column chromatography) and measurement (spectrophotometric and fluorimetric) of polynuclear compounds are discussed. A glass tube 1.0 cm I.D. and 40.0 cm long is fitted with a teflon plug stopcock. The column is filled to a depth of 12 cm with a slurry of the deactivated alumina in cyclohexane. For ultraviolet absorption a Bausch & Lomb spectrophotometer and a Cary 14 recording spectrophotometer were used. For fluorimetric measurements a modified Aminco-Bowman spectrophotometer was used. The use of fluorescence is mandatory in the measurement of polycyclic hydrocarbons in air samples. Without its use, the analyst would be seriously handicapped with regard to sensitivity. There seems to be no evidence for losses on the chromatographic column and

accordingly no need to correct for such losses. It is possible that apparent losses may be due to interference from the background. The background may be due to overloading of the column or to incomplete separation of a mixture of hydrocarbons having a common structure. These hydrocarbons are likely to be of the two to three ring type. Overloading of the column and incomplete separation are different affects, but the influence on the chromatogram will be the same.##

07564

Jacobs, Morris B., M. M. Braverman, and Seymour Hochheiser

CONTINUOUS DETERMINATION OF CARBON MONOXIDE AND HYDROCARBONS IN AIR BY A MODIFIED INFRARED ANALYZER. J. Air Pollution Control Assoc., 9(2):110-114, Aug. 1959. 5 refs.

The estimation of hydrocarbons and carbon monoxide in small amounts in the ambient air was achieved by modification of the nondispersive type of infrared gas analyzer. Essentially the analyzer consists of an infrared source, a sample and comparison cell, a beam combiner and filter cell, a detector cell, an amplifier and a recorder. The sensitivity of the instrument can be increased by increasing the length of the sample and comparison cells, and by increasing the pressure of the sample gas. Water vapor has an absorption throughout the infrared region and is therefore an interference in the analysis of carbon monoxide and hydrocarbons. By saturating the incoming air stream with water vapor and adjustment of the controls the concentration of water vapor is constant and can be eliminated as a source of error. The daily variation of hexane and carbon monoxide during a typical day of high pollution in New York City is illustrated. The sensitivity of this instrument was increased sufficiently so that it could be used for the direct measurement of carbon monoxide in the ranges of 0 to 20 ppm and 0 to 50 ppm and of hydrocarbons such as hexane in the ranges of 0 to 5 ppm and 0 to 10 ppm.##

07575

Manita, M. D. and G. Kh. Ripp

SPECTROPHOTOMETRIC DETERMINATION OF LOW ATMOSPHERIC CONCENTRATIONS IN THE PRESENCE OF OTHER PRODUCTS LIBERATED DURING THE MANUFACTURE OF SYNTHETIC RUBBER. (Spektrofotometricheskii metod opredeleniya malykh kontsentratsii divinila v atmosfernom vozdukh v prisutstvii drugikh produktov proizvodstva sinteticheskogo kauchuka.) Text in Russian. Gigiena i Sanit., 30(8), Aug. 1965. 1 ref. Engl. transl. by Israel Program for Scientific Translations, Hyg. Sanit., 30(8):231-234, Aug. 1965.

CPSTI: TT66-51033/3

The spectrophotometric method for the determination of DV (1,3 butadiene) was tested under field conditions in the atmosphere around the factory manufacturing synthetic rubber SK. The maximum DV concentrations were 6.12 to 0.5 mg/cu. m. at

distances of 50 to 2000 m, respectively, from the source of pollution in the summer season, and 3.8 to 0.1 mg/cu. m. at the same distances in the autumn-winter season. Thus, the spectrophotometric determination of DV in the atmosphere in the presence of alpha-methylstyrene, isopropylbenzene, butane, and butylenes is based on measurements of the optical density of the isooctane solution of the mixture of wavelengths 224 and 245 millimicron in quartz cell with 1 equal 1 cm with an SP4 spectrophotometer. DV concentration in the solution is calculated from the provided formula. The sensitivity is 0.125 microgram/ml, the accuracy is within plus or minus 2.6%.**

07578

Krylova, N. A.

THE SPECTROPHOTOMETRIC DETERMINATION OF DIMETHYLPHENYL-CARBINOL AND DIMETHYL-PHENYL-P-CRESOL IN AIR. (Spektrofotometricheskoe opredelenie dimetilfenilkarbinola i dimetilfenilparakrezola v vozdukh.) Text in Russian. Gigiena i Sanit., 30(9), Sept. 1965. 2 refs. Engl. transl. by Israel Program for Scientific Translations, Hyg. Sanit., 30(9):375-379, Sept. 1965.

CPSTI: TT66-51033/3

The spectral characteristic of DMPC (dimethylphenylcarbinol) in the ultraviolet region was studied. The solvent was ethanol. The instrument was an FE-4 spectrophotometer. The calibration graph was checked against several synthetic samples prepared in the laboratory. The mean error lay within plus or minus 3.6%. Consequently, the calibration graph can be used for the determination of DMPPC (dimethylphenyl-p-cresol) in solutions. The sensitivity is 0.5 microgram/ml. The degree of conformity of DMPPC solutions to Beer's Law was studied and a calibration graph in the region of 279-280 millimicrons was constructed. The sensitivity at lambda equaling 279 millimicrons was 2 micrograms/ml. DMPC and DMPPC can best be absorbed by drawing air, at a rate of 0.5 l/min, through three Zaitsev absorption vessels connected in series, each of which is filled with 5 ml ethyl alcohol and cooled with ice. Up to 90% DMPC and Dmp pC is retained by the first absorber, and up to 10% in the second. The next step was concerned with the possibility of determining DMPC and DMPPC separately when present together. This mixture was analyzed by means of a modification of Vierordt's method, in which one component absorbs light at a wavelength at which the other is not detected. At lambda equaling 225 millimicrons, DMPPC solutions have an intense absorption whereas DMPC solutions have an insignificant absorption up to a concentration of 10 micrograms/ml, without producing any appreciable deviations. At lambda equaling 210 millimicrons both substances absorb intensely. The effects of phenol and acetone on the determination of DMPC and DMPPC were verified. Phenol interferes with the determination of the substances in question because of its considerable light absorption in the region 210-225 millimicrons. Acetone hardly interferes with the determination because even solutions containing 10 micrograms/ml of acetone cause only a slight degree of deviation (of the order of 0.015 to 0.02) in the regions used in the determination.**

Sturgis, B. M., W. F. Biller, J. W. Bozek, and S. B. Smith

THE APPLICATION OF CONTINUOUS INFRARED INSTRUMENTS TO THE ANALYSIS OF EXHAUST GAS. In: Vehicle Emissions, SAE Tech, Progress Series, Vol. 6, Society of Automotive Engineers, New York, 1964, 81-93. (Presented at the Annual Meeting, Society of Automotive Engineers, Jan. 1958.)

The Infrared Analyzer, applicable to analysis of the hydrocarbon component of exhaust gases, and the Exhaust Gas Analyzer which analyzes exhaust gas simultaneously are described for hydrocarbons, carbon monoxide, and carbon dioxide. The installation, calibration, and operation of these instruments and their use for the analysis of exhaust gases are discussed. Extensive use of continuous methods of analysis outlined here has made possible large scale field surveys of vehicle exhaust gases as well as studies of the effect of engine variables on exhaust gas composition. (Authors' abstract, modified) ##

Hurn, R. W., K. J. Hughes, and J. O. Chase

APPLICATION OF GAS CHROMATOGRAPHY TO ANALYSIS OF EXHAUST GAS. In: Vehicle Emissions, SAE Tech. Progress Series, Vol. 6, Society of Automotive Engineers, New York, 1964, 94-101, (Presented at the Annual Meeting, Society of Automotive Engineers, Jan. 1958.)

Information providing historical reference to work and findings in the early stages of development of gas-liquid chromatography (GLC) techniques for separation of the hydrocarbons emitted in auto exhaust gas are reported. Both equipment and techniques are suitable for separation of the major portion of the hydrocarbon component of exhaust gas condensate into separate fractions with identification and quantitative measurement of each fraction. In general, however, determinations are limited to C7 or lighter hydrocarbons and do not include, or where included do not differentiate, the oxygenated products of combustion. In the procedure described, about 500 ml of raw exhaust gas are required for the determinations to be made. Information is given on the technique of analysis, exhaust gas sampling and transfer procedures, and on the identification of fractions separated by the GLC technique.

Ixfeld, H. and M. Buck

A METHOD FOR DETERMINING THE TOTAL AMOUNT OF COMBUSTIBLE ORGANIC SUBSTANCES IN WASTE GASES. ((Eine Methode zur Bestimmung der Gesamtmenge verbrennbarer organischer Substanzen in Abgasen.)) Text in German. Brennstoff-Chem. (Essen), 47(3):79-83, March 1966. 2 refs.

The gas sample is passed through a small tube filled with silica gel on which organic compounds from the gas are absorbed, with the exception of CO₂. These compounds are then desorbed by heating and oxidizing on platinum wool. In order to remove sulfur oxides and halogen compounds which are also absorbed, the gas is passed through silver wool which by chemo-sorption eliminates these compounds. Subsequently the gas passes through a gas washing bottle with Ba(OH)₂ solution where the CO₂ formed by combustion is absorbed. Its amount is determined by titration with oxalic acid. The applicable range of concentrations suitable for this method is 20 to 400 mg C/cu Nm, with 3% relative standard deviation. The laboratory procedure is described in detail, and calibration values are listed. The results of tests on 17 substances are also reported.

07706

Feldstein, M., S. Balestrieri, and D. A. Levaggi

THE USE OF SILICA GEL IN SOURCE TESTING. Am. Ind. Hyg. Assoc. J., 28(4):381-385, July-Aug. 1967. 9 refs.

This is a study of the adsorption of a large group of solvent vapors upon silica gel and their subsequent quantitative desorption. Esters, ketones, aromatic and aliphatic hydrocarbons, and halogenated hydrocarbons were among those studied. Except for certain low-molecular-weight hydrocarbons, the silica gel was extremely efficient for adsorbing organic solvents. In general, dimethylsulfoxide proved ideal for elution of adsorbed materials and for subsequent analysis by gas chromatography. It could not be used for hydrocarbon solvent mixtures or for higher boiling solvents. In these cases, carbon disulfide, alone or with water, was used for desorption. (Authors' summary)

07743

Bender, D. F.

THIN-LAYER CHROMATOGRAPHIC SEPARATION AND SPECTROPHOTOFUOROMETRIC IDENTIFICATION AND ESTIMATION OF DIBENZO(A,E)PYRENE. Environ. Sci. Technol., 2(6):204-206, March 1968. 10 refs.

Only two hexacyclic aromatic hydrocarbons containing the pyrene nucleus have been found in urban airborne particulate matter. An investigation of the application of thin-layer chromatography and spectrophotofluorometry to the identification of additional hexacyclic aromatic hydrocarbons containing the pyrene nucleus was undertaken to determine whether these compounds are indeed present in urban atmospheres before proceeding to quantitative analysis for them. Further experiments were conducted to produce a method of estimating the amount of dibenzo(a,e)pyrene in urban airborne particulate matter. Two-dimensional thin-layer chromatography was used in exploratory research to find out whether any dibenzopyrenes could be found in the air. The general patterns were not very reproducible. Dibenzo(a,e)pyrene, placed on the plate and

developed one-dimensionally, gave a higher Rf value than was obtained with the same system in the two-dimensional procedure. The identity of the components of each fluorescent area was investigated by collecting the fluorescent area and extracting. The fluorescence spectra obtained for the various fluorescent areas in a composite particulate sample taken in Birmingham, Alabama provide evidence for the presence of dibenzo(a,e)pyrene in urban airborne particulate matter. With a method using two one-dimensional separations and fluorescence spectra, the amount of dibenzo(a,e)pyrene in the Alabama composite was found to be approximately 100 micrograms per gram of benzene-soluble. The concentration of benzo(a)pyrene in Birmingham was approximately 1900 micrograms per gram of benzene-soluble and in Atlanta, approximately 730 micrograms per gram of benzene-soluble.##

07749

Ives, N. F. and Laura Giuffrida

INVESTIGATION OF THERMIONIC DETECTOR RESPONSE FOR THE GAS CHROMATOGRAPHY OF P, N, AS, AND C1 ORGANIC COMPOUNDS. J. Assoc. Offic. Anal. Chemists, 50(1):1-4, Feb. 1967. 8 refs. (Presented at the 8th Annual Meeting, Association of Official Analytical Chemists, Washington, D.C., Oct. 10-13, 1966.)

Investigations were conducted to determine the degree of specificity and enhanced response of the thermionic detector (TD), using alkali metal salts. The test compounds included the triphenyl derivatives of group V (a) elements. Because of special interest in nitrogen response, several types of nitrogen compounds were included. The effects of varying jet diameter, carrier gas, and other operating parameters were also studied. Thermionic response to group V(a) elements in organic compounds was found to depend on the salt cation used in the TD. The magnitude of response was similar for different salts of the same cation. Increased response for phosphorus was 10,000 fold or better, for nitrogen about 100 fold, and for arsenic about 30 fold. With an unknown response, phosphorus can be distinguished from nitrogen or arsenic by comparing the thermionic and conventional flame responses. The detection of nitrogen in organic compounds was not affected adversely by using nitrogen as a carrier gas. With certain size flame jets, a significant increase in thermionic response can be obtained by substituting helium for nitrogen as the carrier gas. Detector stability was best with potassium salts and was better with rubidium than with cesium salts; KCl was preferred for phosphorus compounds and RbCl for nitrogen compounds.

07807

Altshuller, A. P.

APPLICATION OF REACTIVITY CONCEPTS TO EMISSIONS FROM DEVICE EQUIPPED AND UNEQUIPPED AUTOMOBILES. Preprint, Public Health Service, Cincinnati, Ohio, National Center for Air Pollution Control, ((18))p., ((1967)). 12 refs.

Various manifestations of atmospheric photochemical reactions can be associated with the relative ability of various hydrocarbons to participate in these reactions. The ratings derived from such manifestations have been used to develop a number of hydrocarbon reactivity scales. These scales are utilized in evaluating the effectiveness of automotive exhaust control devices. The effectiveness of the devices as computed from reactivity scales is compared with total hydrocarbon measurements.

07830

Popov, V. A.

THE PRESENCE OF OXIDANTS IN THE ATMOSPHERE OF CERTAIN TOWNS IN THE U.S.S.R. ((Prisultstvie oksidantov v atmosfernom vozdukhe nekotorykh gorodov SSSR.)) Text in Russian. Engl. transl. Hyg. Sanit., 31(1-3): 3-8, Jan.-March 1966.

Oxidants in the air of certain towns of the Soviet Union were measured by the phenolphthalein method. The standard color scale was a mixture of an alcoholic-aqueous solution (3:2) of phenolphthalein and 1% borax solution. The maximum concentration of oxidants on the highways of Moscow and Baku on sunny days was as high as 0.1 mg/cu m, and on cloudy days did not exceed 0.03 mg/cu m. A study of this type of pollutants in Baku revealed their presence in the area of oil refineries at concentrations within 0.15 mg/cu m. On the other hand, the maximum value of oxidants in the vicinity of Batumi oil refinery was considerably lower (0.04 mg/cu m).##

07838

Dimitriades, Basil

METHODOLOGY IN AIR POLLUTION STUDIES USING IRRADIATION CHAMBERS. J. Air Pollution Control Assoc., 17(7):460-466, July 1967. 12 refs.

Experimentation in large irradiation chambers has been useful in providing insight into the chemistry of the photochemical smog formation problem. Initial efforts to reproduce the atmospheric phenomena artificially at controllable scale were successful in that gross atmospheric smog symptoms were observed in irradiation chambers. However, as the experimentation and evidence produced were becoming more elaborate, the question arose as to how much one could rely on chemical data in understanding and interpreting atmospheric phenomena. The question becomes highly pertinent in view of the difference in concentration levels between atmosphere and chamber work. This issue was discussed during recent American Chemical Society meetings, and the conclusions from presentations and discussions were as follows: (1) There is qualitative agreement between chamber data and atmospheric data wherever comparison is feasible. (2) There is need for more precise chamber work at concentration levels more nearly equal to those in the atmosphere. Experimentation in chambers under typical atmospheric conditions presents some special problems associated with the chamber design and chemical analysis. Chamber methodology has been the focus of considerable research effort, and it appears to be an important factor affecting further progress in air pollution research. This paper describes methods and techniques used at the Bartlesville Petroleum Research Center. (Author's abstract)

Walsh, J. T. and D. M. Rosie

STUDIES OF THE GAS DENSITY CELL. J. Gas Chromatog.,
5(5):232-240, May 1967. 9 refs.

The gas density cell as a gas chromatographic detector possesses the unique possibility of providing both quantitative and molecular weight information. Studies are reported in regard to optimum operational parameters for maximum cell response and upon the accuracy of quantitative and molecular weight measurements. The magnitude of cell response was found to be a function of (1) the value of reference and measuring gas flow rates, (2) the physical properties of the reference gas, and (3) the density change produced in the reference gas by sample vapor. Accuracies of 1-2% for per cent weight and 3-4% for molecular weights were obtained on a large variety of compound types over reasonably wide concentration and molecular weight ranges. An equation was developed which accounts for the variables upon which cell response is dependent and which permits comparison to other type detectors. (Authors' abstract)##

Engel, C. R. and E. Sawicki

AZULENE PROCEDURE FOR CHROMATOGRAPHIC ANALYSIS OF AROMATIC AND HETEROCYCLIC ALDEHYDES, CARBOHYDRATES, AND OTHER ALDEHYDE PRECURSORS. Preprint, Public Health Service, Cincinnati, Ohio, National Center for Air Pollution Control, ((27))p., ((1967)). 9 refs.

A new location method for many types of conjugated aldehydes and their precursors is introduced. Because the compounds of interest are neither fluorescent nor colored, they are difficult to locate once they are separated. This method, with azulene as the reagent, is compared with a number of other location methods. Evidence is presented for the location of aromatic aldehydes, furfural derivatives, sugars, dinitrophenylhydrazones, and azines on paper and silica gel plates with azulene. This location procedure was applied to the identification of 5-hydroxymethylfurfural in extracts of effluents from a coffee-roasting plant. Techniques described in this paper have been developed for eventual application to analyses of airborne particulate. (Authors' abstract, modified)##

R. J. Lewis, R. Smith, P. Baker

AN ANALYSIS OF INSTRUMENT DOWNTIME FOR A LARGE AIR MONITORING NETWORK. Preprint. Public Health Service, Cincinnati, Ohio, National Center for Air Pollution Control, (12)p., 1967. (Presented at the 60th Annual Meeting, Air Pollution Control Association., Cleveland, Ohio, June 12-16, 1967.)

There is a prevalence of opinion encouraged by company sales representatives that currently available continuous air monitoring equipment is truly continuous and automatic. The word automatic as applied to present air monitoring instruments is defined by a detailed analysis of the type of instrument failures which can be expected. The experience is drawn from the operating reports and records of the Continuous Air Monitoring Project (CAMP). Failure of the instrument system can come about for many reasons, and is defined by the loss of anticipated valid data output. Three major causes for loss of data are instrument failure, personnel failure, and supply support failure. It is concluded that successful network operation of continuous air monitoring equipment demands careful design of support functions and personnel selection. A continual reanalysis of operating efficiency and upgrading of personnel training is mandatory. (Authors' abstract, modified)##

07887L

McCabe, J. R.

A TRACE CONTAMINANT ANALYSIS TEST ON AIR SAMPLES - PHASE II Arnold Engineering Development Center, Aro, Inc. Arnold Air Force Station, Tenn., Contract-AF 40 (600)-1200, -AEDC-TR-67-19, 93p., Feb.: 1967.
DDC: AD 807485

Details of transferring and concentrating contaminants from 150-cc stainless steel cryogenic traps to small volume glass traps more suitable to trace analysis are given. A description of the gas chromatographic equipment used in the analysis are given. A description of the gas chromatographic equipment used in the analysis, and the analysis procedures used, are presented. The chromatographic instrumentation, calibrations, and data assimilation procedures are described. Basic test results and observations concerning the utility of procedures used, along with comparative discussions of various aspects of Phase 2 compared with Phase 1, are noted. (Author's abstract, modified)

07898

Wyant, R. E., M. K. Scott, A. F. Fentiman, and R. H. Poirier

IMPROVED DETECTION AND IDENTIFICATION OF INCAPACITATING AND LETHAL AGENTS. Battelle Memorial Inst., Columbus, Ohio, Contract DA-18-035-AMC-379(A), Proj. IC622401A102, BM1-6, 17p., Jan. 1967. 13 refs. DDC: AD 814888

The search for specific, sensitive, and direct methods for functional groups or moieties was continued. The synthesis of reagents for the detection of lethal agents (organophosphorus-type agent) was emphasized. Materials that are capable of undergoing the second-order Beckman reactions that lead to detectable fragments were emphasized. Particular attention was directed to oximes that would produce triaryl methane dyes or aliphatic

mercaptans. Thus, through the high tinctorial strength of triaryl methane dyes, or the highly odoriferous nature of certain mercaptans, detection systems with enhanced sensitivity might be realized.##

07908

Zdrojewski, A., L. Dubois, G. E. Moore, R. Thomas, and J. L. Monkman

FLUORESCENCE SPECTROSCOPY IN THE ANALYSIS OF AIR SAMPLES. Am. Chem. Soc., Div. Water, Air, Waste Chem., Preprint, 6(1):40-44, 1966. (Presented at the American Chemical Society, Division of Water, Air, and Waste Chemistry, Pittsburgh, Pa., March 1966.)

Column separations and ultraviolet measurements are accepted as almost the only procedure available for the analytical determination of polycyclic aromatic hydrocarbons in air samples. The air sample extract is passed through an alumina column and each fraction is scanned in the ultraviolet. All the fractions containing a compound detected by ultraviolet measurements are combined and a quantitative determination is made on the composite. Two analytical difficulties encountered in the use of this technique are one, low recoveries of some of the polycyclic hydrocarbons and two, the "background". To elucidate these two problems, ultraviolet absorption and fluorescence techniques were used separately and in conjunction. Each of the following possibilities for low recovery of polycyclics was investigated. 1. Lack of sensitivity of the technique. 2. Irreversible adsorption. 3. Tailing. 4. Incomplete separation. The minimum of limiting concentration required to get a measurable response was determined and is shown in a table. From results of column chromatography combined with ultraviolet and fluorescent measurements it was concluded that: the adsorption is reversible, and that tailing, for all practical purposes, is negligible. When working with standards only, recovery is not a problem. The results obtained by fluorescence measurements on air samples indicate that the spectrum of the so called background is identical to the spectrum of an air sample extract. Moreover, a curve of background fluorescence against the elution volume has the shape of a typical decay curve. It seems therefore that overloading of the column by a high concentration of unknowns is a possible explanation of the background.##

07981

Green, A. E. S., D. T. Williams, R. S. Sholtes, and J. Dowling, Jr.

THE MIDDLE ULTRAVIOLET AND AIR POLLUTION. In: A. E. S. Green, ed., The Middle Ultraviolet: Its Science and Technology, New York, John Wiley & Sons, 1966, Chapt. 8, p. 158-164. 32 refs.

Currently in the air pollution field a great effort is underway to find and develop more specific methods of measuring contaminants.

It appears that ultraviolet spectroscopy would be an important tool in measuring these trace species. The important pollutants such as nitrogen dioxide, sulfur dioxide, and ozone all have strong absorption coefficients in the ultraviolet, as do many of the other lesser pollutants and the products of the photochemical reactions which play such a large role in smog formation. Both chemical and spectroscopic methods have their advantages and disadvantages. Perhaps the greatest importance in utilizing ultraviolet spectroscopy is that a program which complements the chemical program could be obtained. The two programs working together should indeed contribute significantly to the body of knowledge which is necessary to solve the air pollution problem.

08066

Wohlers, Henry C.

RECOMMENDED PROCEDURES FOR MEASURING ODOROUS CONTAMINANTS IN THE FIELD. J. Air Pollution Control Assoc., 17(9):609-613, Sept. 1967. 15 refs.

Although the perception of odorous contaminants cannot be precisely described, certain basic facts about human olfaction are known. With known facts or principles, it is possible to investigate odorous contaminants for air pollution control purposes. Odor remains, however, a very intangible commodity. Odorous contaminant investigations must be tailored to the individual problem or locality. Consequently, the methods described were designed for individuals who have working knowledge of either odor or air pollution problems. Background references are available for workers who are not familiar with either field. Generalized facts concerning odors as well as subjective and objective methods for measuring odorous contaminants in the field are described. The use of specific portions of the method depends upon each individual investigation. (Author's summary, modified)

08077

Johnson, F. A.

DETECTION OF LOW LEVELS OF TETRAFLUOROHYDRAZINE IN AIR. Rohm and Haas Co., Huntsville, Ala., Redstone Research Labs., Contract DAAHOI-67-C-0655, S-137, 19p., June 1967.
DDC: AD 815940

Tetrafluorohydrazine was converted to fluoride ion by nitrogen dioxide and water. The fluoride ion was detected continuously by a commercial fluoride ion electrode. A 30-mV change in electrode potential was obtained for one part per million of N2F4 in the air. Various factors affecting sensitivity, stability, and speed of the detection system were considered. (Author's abstract)

Keenan, Robert G.

CHEMICAL ASPECTS OF ENVIRONMENTAL HEALTH. Occupational Health Rev. Ottawa, 18(1):3-8, 1966. 39 refs.

Modern methods of physical and chemical analysis, as applied to biological materials, atmospheric samples containing gaseous or particulate contaminants, industrial process materials, intermediates, and finished products are discussed briefly. A discussion of the uses to be made of such analytical data includes: (1) the "normal" concentrations of certain metallic elements in body tissues and fluids; (2) the need to compare these concentrations with those developed analytically on samples from exposed subjects; (3) the comparison of atmospheric concentrations of contaminating substances found in the working environment with the A.C.G.I.H. Threshold Limit Values; (4) the analysis of industrial process materials, settled dusts, and finished products to help in assessing the total exposure of the worker to chemical elements. (Author's abstract, modified)

08083

Mercer, W. B.

CALIBRATION OF COULTER COUNTERS FOR PARTICLES ABOUT 1 MICRON IN DIAMETER. Rev. Sci. Instr., 37(11):1515-1520, Nov. 1966.

A linear relationship between particle volume and instrument response is confirmed for particles between 0.75 and 2.5 cubic microns, but this relationship may not hold for smaller particles. The implicit assumption of negligible surface conductance in derivations of this relationship is found acceptable for polystyrene spheres about 1 micron in diameter. A potential source of error in calibration is identical and allowed for. A relationship is developed between observed count and true count which allows coincident passage correction to be based on all available experimental points. The critical volume is found experimentally to be a function of particle volume. (Author's abstract)

08132

M. I. Poletayev

COLORIMETRIC DETERMINATION OF SMALL QUANTITIES OF STYRENE IN THE AIR. In: Survey of U.S.S.R. Literature on Air Pollution and Related Occupational Diseases. Translated from Russian by B. S. Levine. National Bureau of Standards, Washington, D. C., Inst. for Applied Tech., Vol. 3, p. 14-16, May 1960.
CFSTI: TT 60-21475

The determination of small quantities of styrene is based on its nitration property and is made photocolorimetrically.

An experimental attempt was made to absorb styrene directly into the nitrating mixture. Absorption was made from a special bottle, the air of which was saturated with styrene vapor, by aspirating the test air through two absorbers connected in succession. Nitrated styrene vapor acquired a yellow color; the nitrated product was completely retained in the first absorber even when the air was aspirated at a rate of 1 l/min. To prevent the yellow color from fading it was necessary to change the medium as follows: after styrene vapors were absorbed from the air the content of the absorber was diluted with 3 ml of distilled water and neutralized by a 25% ammonia solution until litmus paper showed an alkaline reaction. Final colors were compared with colors yielded by standard styrene solutions in carbon tetrachloride.##

08136

Senderkhina, D. F.

DETERMINATION OF CHLORINATED HYDROCARBONS IN THE AIR BY THE METHOD OF MICRO-COMBUSTION. In: Survey of U.S.S.R. Literature on Air Pollution and Related Occupational Diseases. Translated from Russian by B. S. Levine. National Bureau of Standards, Washington, D. C., Inst. for Applied Tech., Vol. 3, p. 23-27, May 1960. CFSTI: TT 60-21485

The method described is based on the quantitative oxidation of chlorinated hydrocarbon vapor in a combustion chamber equipped with a platinum coil heated to redness. The combustion products are then passed through an absorber solution and the ionic chlorine determined nephelometrically. With an appropriately prepared standard scale accurate determinations can be made in solutions containing 0.001 mg of chlorine in 1 ml. Control tests were made with ethylene chloride, chloroform, carbon tetrachloride and trichlorethylene. A portable apparatus for the determination of chlorinated hydrocarbons in the air by the micro-combustion method was constructed. The micro-combustion method described proved to be accurate for the determination of thousandths of a milligram of chlorine within 30 to 40 minutes. A new micro-absorber is described which assures complete absorption of products of hydrocarbon combustion. Air samples are aspirated into gas pipettes filled with a saturated solution of sodium sulfate or into vacuum gas pipettes.##

08171

Formicheva, N. I. and P. A. Mel'nikova

RAPID DETERMINATION OF SMALL QUANTITIES OF DIMETHYLANILINE IN THE AIR. Gigiena i Sanit., No. 5:49-52, 1952. Translated from Russian by B. S. Levine, U.S.S.R. Literature on Air Pollution and Related Occupational Diseases, Vol. 4, p. 1-5, Aug. 1960. CFSTI: TT 60-21913
CFSTI: TT 60-21913

A rapid colorimetric method is described for the determination of small quantities of dimethylaniline in the air, based on the formation of a yellow colored paranitrosobasic salt. The air aspiration and the colorimetric estimation with the aid of an artificial scale requires approximately 15 to 20 minutes; the dimethylaniline content per 1 ml of the air must be within 0.001 0.01 mg. The method is simple, requires no complex equipment and is suitable for dimethylaniline determination in the air of industrial premises at concentrations in the order of hundredths and thousandths of a milligram per liter. ACM##

08226

Likina, M. T. and G. L. Barodina

LINEAR-COLORIMETRIC METHOD FOR THE DETERMINATION OF CARBON DIOXIDE IN AIR. *Gigiena i Sanit.*, 24(8):30-32, 1959. 4 refs. Translated from Russian by B. S. Levine, U.S.S.R. Literature on Air Pollution and Related Occupational Diseases, Vol. 5, p. 212-215, Jan. 1961. CFSTI: TT 61-11149

A linear-colorimetric method for the determination of carbon dioxide in sewage system air is described. The advantages of this method over those used by the sanitary chemists are speed of the analysis and the ease with which it can be used under field conditions even at low air temperature, since the determining chemical reactions depends upon a solid absorber. Hydrazine-hydrate-N₂H₄. H₂O is a good carbon dioxide absorber and it combines with basic fuchsin in solution to form an unstable colorless solution, the original fuchsin color is restored in proportion to the carbon dioxide concentration in the air. Best results are obtained with 125 ml of the CO₂-containing air. This volume of air can be passed through the indicator tube for the determination of CO₂ concentrations ranging between 0.5 and 9.0 percent. Results of experiments indicate that unsaturated hydrocarbons, gasoline vapor and small amounts of hydrogen sulfide affected neither the height nor the color in the indicators; however, when the concentration of hydrogen sulfide was 0.3 mg/li or more the color of the column faded almost completely. However, the maximum content on the hydrogen sulfide in the air of the sewage system never exceeded 0.007 mg/li.

08257

Baum, Fritz, Inge Reichardt, and Wolfgang Steinbach

SIMPLE MEASURING ARRANGEMENT FOR RECORDING HYDROCARBON CONTENT. Staub (English translation), 27(6):16-19, June 1967. 11 refs. CFSTI: TT 67-51408/6 (HC\$2.00)

A method for using a batch-sampling gas-chromatograph with flameionization detector to record continuously the presence of hydrocarbons is described. Use of this measuring device is illustrated by several examples. Hydrocarbons are thermally ionized in a hydrogen flame in the flame-ionization detector. Flue gases of an oil stove with vaporization burner, flue gases of a medium-size waste incinerator, and automobile exhaust were

measured. The hydrocarbon content of the flue gas of an oil stove only exceeded that of the air in the laboratory above a combustion rate of 0.5 kg of oil per hour. With decreasing chimney draft the hydrocarbon content of the flue gases rose sharply, being accompanied by an increase of the Bacharach soot number. When the chimney draft was throttled to 0.1 mm W.G. at the maximum combustion rate, the concentration of hydrocarbons rose to 350 times the value of normal operation. The combustion phases in a medium size waste incinerator can be directly observed with the measuring device. Total hydrocarbon concentration in the exhaust of an automobile at various operating conditions is presented. In neutral, a slight increase in hydrocarbon concentration was recorded. During acceleration in neutral the concentration dropped immediately. The concentration varied when the position of the accelerator was changed. On a 14% grade, finally, the concentration dropped briefly and then rose considerably.##

08270

M. F. Fracchia, F. J. Schuette, P. K. Mueller

A METHOD FOR SAMPLING AND DETERMINATION OF ORGANIC CARBONYL COMPOUNDS IN AUTOMOBILE EXHAUST. Environ. Sci. Technol., 1(11):915-922, Nov. 1967. 24 refs. (Presented at the Division of Water, Air, and Waste Chemistry, 152nd Meeting, ACS, New York, N.Y., Sept. 1966.)

Automobile exhaust was sampled at 1 liter per minute through a water trap and two bubblers in series. The bubblers contained aqueous acidified 2,4-dinitrophenylhydrazine. The carbonyl compounds in the water trap were precipitated with the hydrazine reagent. The hydrazones in the trap and in the bubblers were collected by filtration and extraction, dissolved in carbon disulfide, and analyzed by gas chromatography using a flame ionization detector. The water trap contained mostly formaldehyde. All aldehydes were quantitatively trapped in the first bubbler, and the ketones were determined from the hydrazones in the second bubbler. The role of potential interferences has been evaluated. Sampling efficiencies and analytical errors have been established for several compounds. Alkyl and aromatic carbonyl compounds obtained from selected automobiles under several operating modes are compared. More sensitive methods are needed for analyzing carbonyl compounds in air, but a methodology is now available for studying combustion sources. (Authors' abstract)##

08285

W. Briegleb

GASCHROMATOGRAPH COLUMN CIRCUIT FOR ANALYSIS OF GASES IN CLOSED SYSTEMS FOR BIOLOGICAL AND BIOMEDICAL INVESTIGATIONS. ((Gaschromatographische Kolonnenschaltung für die Analyse der Gase in geschlossenen Systemen für biologische und biomedizinische Untersuchungen.)) Text in German. Deutsche

A variable gaschromatographic column circuit is described for measuring oxygen, nitrogen, carbon dioxide, carbon monoxide, helium, and argon gases as well as the lower hydrocarbons in a single run. Diagrams of the circuit in a specially developed Beckman gaschromatograph column and a chromatogram of an analysis are provided.##

08290

Vander Kolk, Alvin L.

SAMPLING AND ANALYSIS OF ORGANIC SOLVENT EMISSIONS. Am. Ind. Hyg. Assoc. J., p. 588-589, Nov.-Dec. 1967.

Stack emissions were evaluated for air pollution purposes by using both Mylar bag sampling and gas washing bottles containing normal hexane and orthoxylene. Analysis was done by gas chromatography. Agreement between the two sampling techniques was good, and each method has its advantages and disadvantages. (Author's abstract)

08294

Boettner, E. A. and Benjamin Weiss

AN ANALYTICAL SYSTEM FOR IDENTIFYING THE VOLATILE PYROLYSIS PRODUCTS OF PLASTICS.

Am. Ind. Hyg. Assoc. J., p. 535-540, Nov.-Dec. 1967. 1 ref. (Presented at the American Industrial Hygiene Association Meeting, Houston, Texas, 1965.)

Techniques are described for determining the identity and toxicity of the pyrolysis products of plastics. Differential thermal analysis (DTA) and thermogravimetric analysis (TGA) determine the temperature at which the plastic melts, the temperature at which it goes through physical and/or chemical change (oxidation or reduction), and the temperature at which it undergoes weight losses. The identity and quantity of the combustion products are determined with a controlled combustion furnace, utilizing the temperature information obtained by DTA and TGA. The combustion products emitted by the furnace are separated by gas chromatographic techniques and analyzed by infrared absorption, ultraviolet absorption, other gas chromatographic techniques, and mass spectroscopy. The results obtained utilizing polyvinyl chloride are described. (Authors' abstract)

08296

Valori, P. C. Melchiorri, A. Grella, and G. Alimenti

VOLATIZATION AND DECOMPOSITION OF AROMATIC POLYCYCLIC HYDROCARBONS DURING THE USUAL PROCEDURE FOR THE CONCENTRATIONS OF EXTRACTS OF

ATMOSPHERIC DUST. ((Sulla volatilizzazione e la decomposizione degli idrocarburi policiclici aromatici nel corso degli abituali procedimenti per la concentrazione degli estratti di pulviscolo atmosferico.)) Text in Italian. Nuovi Ann. Igine Microbiol. (Rome), 17(4):311-324, 1966. 37 refs.

Research is described on a series of commercially available hydrocarbons which are found in polluted air (naphthalene, acenaphthalene, fluorene, phenanthrene, anthracene, 9,10-dihydroanthracene, pyrene, fluoranthene, chrysene, 1,2-benzanthracene, naphthacene, perylene, 3,4-benzopyrene, 1,12-benzoperylene, anthanthrene, 1,2,5,6-benzanthracene, and coronene). The sample hydrocarbons were evaporated at medium heat (hot water bath at 90-95 deg Co.), or dried with a jet of filtered air, or with a jet of nitrogen; samples were either evaporated to dryness or to a liquid volume of 2 ml. The per cent loss for all three techniques is tabulated. The highest proportion of sample loss (up to 100 percent) is generally encountered when dry heat is used to evaporate to dryness. The per cent loss varies with the individual hydrocarbon, and is generally correlated with volatility. Other modes of sample loss are discussed: decomposition, reaction with other chemicals, oxidation, and ultraviolet photodecomposition. The data are discussed with reference to experimentation with air-borne carcinogens. These data were to be used in the development of a procedure for the analysis of polluted air.

08316

Louis, Rudolf

PROTON MAGNETIC RESONANCE ANALYSIS OF GASOLINES. ((Protonenresonanzanalyse von Motorenbenzinen.)) Text in German. Erdoel Kohle (Hamburg), 19(4):281-287, April 1966. 4 refs.

Gasolines exhibit typical proton magnetic resonance spectra. Their qualitative and quantitative interpretation is discussed in detail for 19 super and regular gasolines, covering characteristic hydrocarbon groups as well as single components and additives. Thus, far-reaching conclusions about composition and quality of gasolines are possible with a minimal expenditure of time. The range of application of this method is shown by a comparison with CH-, FIA-, infrared- and gas chromatographic analyses.

08321

Stefanescu, A. and L. Stefanescu

THE DEGREE OF DANGER CAUSED BY THE INFLUENCE OF AROMATIC POLYNUCLEAR HYDROCARBONS DURING THE MANUFACTURING PROCESS OF CARBON BLACK. I. THE DANGER OF ANTHRACENE AND THE DETERMINATION OF THE ANTHRACENE CONTENT OF THE AIR. ((Der Gefährungsgrad unter Einwirkung der aromatischen polynuklearen Kohlenwasserstoffe beim Fabrikationsprozess von Russ. I. Die Gefährdung durch Anthrazen und die Bestimmung des Anthrazengehaltes der Luft.)) Text in German. Z. Ges. Hyg. Ihre Grenzgebiete (Berlin), 12(3):182-189, 1966.

The toxic effect of anthracene was strongest in workers who handle crude anthracene, while the ones who worked with refined anthracene showed very few detrimental effects. The skin cancer noted in anthracene workers is most likely caused through contact of the skin with the polynuclear hydrocarbons which are impurities in anthracene oil. The maximum allowable concentration of anthracene recommended by the American Conference of Governmental Industrial Hygienists is 0.1 mg./cu m of air. A new method for the determination of anthracene in air during the production of carbon black is described. The hydrocarbons were absorbed on active carbon and desorbed using benzene vapor and oxygen-free nitrogen. The desorption apparatus is illustrated. The amount of anthracene obtained was determined by gas-fluid repartitioning chromatography. The chromatograms illustrated show that besides anthracene, several lighter and heavier unidentified components were obtained, most likely higher condensed polynuclear hydrocarbons. The degree of danger caused by anthracene to workers in the manufacture of carbon black is tabulated, showing the variations caused by different work places, work time, and concentrations of the toxic substance.##

08354

Brink, D. L., and J. F. Thomas, and D. L. Feuerstein

MALODOROUS PRODUCTS FROM THE COMBUSTION OF KRAFT BLACK LIQUOR.
II. ANALYTICAL ASPECTS. TAPPI, 50(6):276-285, June 1967.
25 refs. (Presented at the 51st Annual Meeting of the Technical Association of the Pulp and Paper Industry, New York, N. Y., Feb. 21-24, 1966.)

Gaseous and liquid products isolated by pyrolysis of kraft black liquor, were analyzed qualitatively and quantitatively using gas-liquid chromatography with detection by flame ionization. More than 60 compounds were detected in the pyrolysis liquid and at least 32 of these were present in the pyrolysis gas. Using the microcoulometric titration system, hydrogen sulfide, methyl mercaptan, dimethyl sulfide, dimethyl disulfide, and at least 19 unidentified sulfur-containing components were detected in the pyrolysis products; 7 of the major components were determined quantitatively. Using cochromatography and the methods of detection noted, the identities of methyl mercaptan, dimethyl sulfide, and dimethyl disulfide were verified and tentative identifications of several other sulfur-containing products were also made. Hydrogen, oxygen, nitrogen, methane, carbon monoxide, ethane, carbon dioxide, and acetylene were resolved and determined quantitatively. Hydrogen sulfide, methyl mercaptan, and five unidentified components were also qualitatively detected. Sulfur present in pyrolysis residues was determined using a wet oxidation procedure. A powerful analytical method has been developed for detailed study of the effects of recovery furnace operation on such emissions and it should prove to be a valuable aid to industry. With adequate development, pyrolysis carried out independently of gaseous, liquid, and solid products could provide an answer to complete odor control; in addition, isolation of organic by-products may be feasible. AAM##

Cave, G. C. B.

THE COLLECTION AND ANALYSIS OF ODOROUS GASES FROM KRAFT PULP MILLS. PART II: A LABORATORY STUDY OF THE COLLECTION OF POLLUTANTS FOR ANALYSIS. TAPPI, 46(1):5-11, Jan. 1963. 5 refs.

An experimental study was made of the performance of traps, in collecting kraft-mill pollutants from an air stream. The traps were in a mixture of dry-ice and acetone. Some traps in the train were empty; others contained ethylbenzene as a solvent. A convenient experimental method is described for artificially producing a polluted air stream, and for evaluating the performances of traps. The distribution was found of hydrogen sulfide, sulfur dioxide, methyl mercaptan, dimethyl sulfide, and dimethyl disulfide among the traps of the train. The effect of flow-rate, volume of solvent, and trap design on trap performance was measured. The effect of varying the degree of air turbulence in an empty cold trap was studied. It was confirmed that cold ethylbenzene is a satisfactory solvent for all the pollutants except hydrogen sulfide. For this latter pollutant, an aqueous solution of cadmium was used to trap it. A study was included on the losses of the pollutants that might occur on extended storage of their ethylbenzene solutions. Apparatus and a procedure are described for the concentration of the original ethylbenzene solution of pollutants, to improve the sensitivity of the method. (Author's abstract)##

Cave, G. C. B.

THE COLLECTION AND ANALYSIS OF ODOROUS GASES FROM KRAFT PULP MILLS. PART III: THE ANALYSIS OF COLLECTED POLLUTANTS BY GAS CHROMATOGRAPHY. TAPPI, 46(1):11-14, Jan. 1963. 4 refs.

The qualitative and quantitative analysis of kraft-mill pollutants in ethylbenzene by using gas chromatography is discussed. Columns of tri-m-cresyl phosphate and of Carbowax 1540 are proposed for use at 35 and 85 C. These columns permit the resolution of all known kraft-mill pollutants. Techniques are described for qualitative analysis. They include the two-column method, and graphs prepared by this method are presented for homologous series of mercaptans, ketones, esters, and normal alcohols. It is emphasized that the unequivocal identification of an unknown pollutant is rarely possible by gas chromatography alone. Quantitative analysis is also described, including the preparation of standard solutions and the presentation of prepared calibration curves. These curves were straight lines. The use of an ultrasensitive detector, the ionization chamber, is briefly discussed. (Author's abstract)##

R. B. Tupeeva

THE DETERMINATION OF METHOXONE IN AIR. ((Metody opredeleniya metoksona v vozdukh.) Hyg. Sanit. (English translation of: Gigiena i Sanit.), 32(4-6):72-76, April-June 1967. 4 refs. CPSTI: TT 67-51409/2

The optimum conditions were established for the determination of methoxone by the method of wet combustion with a mixture of sulfuric acid and potassium dichromate, followed by iodometric determination of the liberated chlorine. The sensitivity was found to be 0.080 mg methoxone in the analytical volume. A sensitive method was devised for the determination of methoxone based on its hydrolysis with concentrated sulfuric acid, with the liberation of formaldehyde, followed by the photometric determination of the latter with chromotropic acid. The sensitivity was found to be 0.010 mg in the analytical volume. The hydrolysis of methoxone with concentrated sulfuric acid in the presence of chromotropic acid provides a more sensitive and accurate method for the determination of this substance.##

08446

L. I. Gavrilova

METHODS FOR THE DETERMINATION OF SODIUM AND BUTYL 2,4-DICHLOROPHEN-OXYACETATES IN AIR. (Metody opredeleniya natrievoi soli i buty-lovogo efira 2,4-dikhlorfenoksiuksusnoi kisloty v vozdukh.) Hyg. Sanit. (English translation of: Gigiena i Sanit.), 32(4-6):394-396, April-June, 1967. 4 refs. CPSTI: TT 67-51409/2

Different colorimetric methods for the determination of different preparations of 2,4-D in air were tested in order to determine which was most suitable for routine sanitary work. The 2,4-D herbicides are used in agriculture in the form of liquid aerosols and dust, while under actual working conditions they are present as dust. They should therefore be sampled on FFP-15 filters placed in metal cartridges, by means of electrical aspirators. It is recommended that the air for sampling 2,4-D herbicides be drawn up at a rate of 10 l/min. This was tested under working conditions and found to be the optimum rate.##

08471

Yuhi, Kennosuke

STUDIES ON THE CHEMICAL ESTIMATION METHOD OF INDUSTRIAL ENVIRONMENT. II. DETERMINATION OF TRICHLOROETHYLENE, CHLOROFORM AND BENZYLCHLORIDE BY THE PYRIDINE-FORMALIN METHOD. Text in Japanese. Japan. J. Hyg. (Tokyo), Vol. 21, p. 407-409, Feb. 1967. 12 refs.

A simple method for the determination of trichloroethylene, chloroform and benzyl chloride was developed, utilizing formaldehyde to stabilize the color developed by the reaction of pyridine and halogen compounds (Fujiwara reaction). An air sample was passed through 5 ml. of pyridine-formaldehyde solution (9:1 ratio), and the solution mixed with 1 ml. of sodium hydroxide solution; amounts of halogen compound were determined spectrophotometrically. The method is both sensitive and specific. 1.5 gamma of trichloroethylene, 2.5 gamma of chloroform and 1.0 gamma of benzyl chloride were measured in 5 ml. of sampling solution.##

08490

Kol'kovski, Peter

A NEW COLOR REACTION FOR VAPORS OF CERTAIN AROMATIC HYDROCARBONS. ((O novoi tsvetnoi reaktsii parov nekotorykh aromaticheskikh uglevodorodov.)) Text in Russian. Zh. Analit. Khim. (Moscow), Vol. 22, p. 456-458, 1967. 9 refs.

A new color reaction has been found for benzene, toluene and xylene vapors using a solution of cesium disulfate in fuming sulfuric acid supported on silica gel. Linear-colorimetric methods have been developed on the basis of this reaction for determining benzene, toluene and xylene vapors in the air of industrial establishments.##

08519

Smith, Walter D.

THE NRL TOTAL HYDROCARBON ANALYZER. In: A.L. Alexander and V.R. Piatt, Status of Chemical Research in Atmosphere Purification and Control on Nuclear-Powered Submarines (Fifth Annual Progress Report), Naval Research Lab., Washington, D.C., NRL-6491, p. 18-22, Jan. 11, 1967. 7 refs.

CFSTI, DDC: AD 648505

Sampling of atmospheric gases on submarines for later analysis in the laboratory has always been a problem. The judicious choice of equipment and techniques is paramount in obtaining a representative sample that will not change during storage and transit. The NRL Total Hydrocarbon Analyzer fulfills a need for a method of analysis which can be used aboard ship to determine the total hydrocarbon concentration. The instrumentation and procedure of operation for this analyzer are described. The use of the instrument has been made more practical by devising a scheme for purifying the ship's air to make it suitable for use as an air supply for the detector. Other applications of this analyzer are mentioned.

08589

Kunte, Helga

CARCINOGENIC SUBSTANCES IN WATER AND SOIL. XVIII. THE DETERMINATION OF POLYCYCLIC, AROMATIC HYDROCARBONS USING COMBINED

THIN-LAYER CHROMATOGRAPHY AND FLUORESCENCE MEASUREMENT. (Kanzero anzerogene Substanzen in Wasser und Boden. XVIII. Die gene Substanzen in Wasser und Boden. XVIII. Die mittels Misch Dunnschichtchromatographie und Fluoreszenzmessung.) Text in German. Arch Hyg. Bakteriol. (Munich), 151(3-4):193-201, Aug 1967. 25 refs.

A method is described for the separation of polycyclic, aromatic hydrocarbons from extracts of water, soil, and dust by two-dimensional mixed thin-layer chromatography and their quantitative determination by fluorescence measurement. The behavior of these compounds is described: pyrene, fluoranthene, 1,2-benzanthracene, 3,4-benzpyrene, 3,4-benzfluoranthrene, 10, 11-benzfluoranthrene, 11,12-benzfluoranthrene, perylene, indeno(1,2,3-cd) pyrene, and 1,12-benzperylene. These hydrocarbons are detected at concentrations of 0.05-1.0 micro./ml. at wavelengths from 400 to 650 milli microns. This study was limited by the use of 365 milli microns as the standard wavelength. Limitations, such as reduced intensity, possible errors, and correction factors are discussed. The simplicity, speed, and sensitivity of the method recommend it.

08592

Luft, K. F., G. Kesseler, and K. H. Zoner

NON-DISPERSIVE INFRARED GAS ANALYSIS WITH THE UNOR APPARATUS. (Nichtdispersive Ultrarot-Gasanalyse mit dem UNOR.) Text in German. Chem. Ingr. Tech. (Weinheim), 39(16):937-945, Aug. 1967. 7 refs.

A single or double ray appartus can be used for nondispersive infrared gas analysis. The new one-ray apparatus is schematically illustrated and its measurement principles and technical performance are described. Measurement sensitivity and interference effects are discussed, taking into consideration the underlying physical principles. The UNOR apparatus is illustrated and its technical applications are outlines. This method permits sensitive, continuous readings of pollutants in the atmosphere, the determination of single components in stack, exhaust and waste gases, as well as the determination of synthetic gas components.

08643

Dubois, L., A. Zdrojewski, and J. L. Monkman.

MEASUREMENT OF BENZO(a)PYRENE, BENZO(k)FLUORANTHENE AND BENZO(g,h,i)PERYLENE BY ULTRAVIOLET SPECTROSCOPY. Mikrochim. Acta, No. 5:834-842, 1967. 8 refs. (Presented at the Congress on Occupational Medicine, Budapest, Hungary, Sept. 1966.)

Published ultraviolet data for BaP in air may be grossly in error, particularly those published before 1960. It is not possible to measure BaP in air samples with accuracy, using the 401 nm peak, unless BaP is present alone (no BkF). The BaP detection limit measurable at 401 nm by ultraviolet is too high. The horizontal measurement technique produces results of greater accuracy than the base line technique. Better analytical values for BaP are obtained

if, instead of using the peak at 401 nm, the 388 nm peak is used. BkF can be precisely measured using the 307 nm peak and a horizontal drawn at 314 nm. The technique for determining benzo((a))pyrene, benzo((k))fluoranthene, and benzo((g,h,i))perylene respectively in microgram amounts by UV absorption measurements is described. The feasibility of using this technique to analyze air samples has been investigated.

08644

Dubois, L., A. Zdrojewski, and J. L. Monkman.

COMPARISON OF THREE METHODS FOR TRACE ANALYSIS OF POLYCYCLICS. Mikrochim. Acta (Vienna), No. 5:903-911, 1967. 16 refs. (Presented at the Anachem Conference, Detroit, Mich., Oct. 11, 1966.)

Several analytical techniques for the determination of polycyclic aromatic hydrocarbons in air have been evaluated. Two solvents, benzene and cyclohexane, were compared for effectiveness in the preliminary preparation of the air sample. To identify and measure the polycyclics, the techniques of ultraviolet absorption and fluorescence were used. Air sample extracts were analyzed with and without prior chromatographic separation. A rapid chromatographic procedure using benzene as elutant was employed for the first time. The extract aliquot or eluate fraction was chromatographed on fully activated alumina using benzene as the eluting solvent. BaP and BkF are eluted from such a column in 30 minutes or less in a total eluate volume of perhaps 50 ml and the two hydrocarbons are determined by fluorescence emission. Work in progress suggests that benzene may be replaced in this application by the less toxic toluene. By any method used the BkF values found were in good agreement. The agreement between the various BaP values was poor, suggesting not all were of equal validity. The highest, and also least accurate, BaP values seem to be associated with the use of benzene as extractant, or ultraviolet absorption as a measuring technique. (Authors' abstract)

08681

Chapman, Robert L.

AN INSPECTION METHOD FOR AUTOMOBILE HYDROCARBON EMISSION. J. Air Pollution Control Assoc., 10(6):463-464, Dec. 1960. 5 refs. (Presented at the 53rd Annual Meeting, Air Pollution Control Assoc., Cincinnati, Ohio, May 22-26, 1960.)

There has been a need for a simple, inexpensive and extremely sensitive method for the discriminate detection of hydrocarbons in auto exhaust, that may be used by the law enforcing agencies. The use of the flame ionization detection method to fill this need, is discussed. The operation possibilities and limitations of this method are discussed.

Katz, Morris

GUIDE TO THE SELECTION OF METHODS FOR MEASURING AIR POLLUTANTS. Preprint. World Health Organization, Geneva (Switzerland), WHO/AP/67.29, 115p., 1963. 2 refs.

The contents of this review are: main purposes of air pollution investigations, units for expression of results, atmospheric sampling, selection of sampling procedure and apparatus, gas analysis methods, automatic sampling and monitoring instruments, recent advances in instrumentation for gas analysis, analysis of polycyclic aromatic hydrocarbons and carcinogenic air pollution, and indicators and other rapid methods for identification or measurement of air pollutants.##

08838

Hoover, Gary M., Charles E. Hathaway, and Dudley Williams

INFRARED ABSORPTION BY OVERLAPPING BANDS OF ATMOSPHERIC GASES. Appl. Opt., 6(3):481-487, March 1967. 9 refs.

The spectral transmission of carbon monoxide, nitrous oxide, and mixtures of the two has been studied in the 2200 per cm region, where overlapping absorption bands occur. With spectral slit widths sufficiently large to include several absorption lines, it was found that the observed spectral transmittance of a mixture is equal to the product of the transmittances of the components measured separately, provided that sufficient nitrogen is added to give the same total pressure for all samples. This result was also obtained for overlapping bands of nitrous oxide and methane in the 1300 per cm region. The present work confirms earlier studies of overlapping bands of CO₂ and water vapor. An investigation of the possible breakdown of the multiplicative property of transmission for narrow spectral slit widths was inconclusive. (Authors' abstract, modified)##

08848

Vander Kolk, Alvin L.

SAMPLING AND ANALYSIS OF ORGANIC SOLVENT EMISSIONS. Am. Ind. Hyg. Assoc. J., 28(6):588-589, Nov.-Dec. 1967.

Stack emissions were evaluated for air pollution purposes by using both Mylar bag sampling and gas washing bottles containing normal hexane and orthoxylene. Analysis was done by gas chromatography. Agreement between the two sampling techniques was good, and each method has its advantages and disadvantages.##

Dubois, L. and J. L. Monkman

THE ANALYSIS OF AIRBORNE POLLUTANTS. In: Pollution and Our Environment: Conference Background Papers. Vol. 3, Montreal, Canadian Council of Resource Ministers, Paper D25-3, p. 1-20, 1967. 23 refs. (Presented at the National Conference, Canadian Council of Resource Ministers, Montreal, Oct. 31-Nov. 4, 1966.) Available from the Canadian Council of Resource Ministers, 620 Dorchester Boulevard West, Montreal, Canada, \$10.00 per volume.

Some specific problems in the sampling and analysis of pollutants are discussed illustrating some discrepancies in data already obtained. The analysis of H₂S and BaP are emphasized to indicate that some data may be unreliable. Conclusions drawn from the discussion indicate that measuring techniques and sampling methods should be considered as an integrated whole. To avoid possible conflict, the use of direct reading recording instruments is preferred to batch sampling devices and methods. If the instrument or batch sampling method does not produce accurate results, efforts to measure a particular pollutant should be abandoned until a satisfactory method has been developed. Much is being said about the setting of standards and criteria. If methods do not exist which can determine with accuracy the limit chosen, it is better to avoid, at least temporarily, the setting of a limit. All factors must be considered, including current data on toxicity and current ability to measure before deciding on a standard or limit. Data are not an end in itself but merely an intermediate from which conclusions and correlations may be drawn. It is better to spend some effort and money in the development of a better measurement technique than to continue to use methods which are known to be unsatisfactory.

09111

Chapman, Robert L.

THE ROLE OF OPTICS IN AIR POLLUTION MONITORING. Opt. Spectra, 1(3):15-18, 1967.

Optical instrumentation and analysis techniques commonly used in air pollution monitoring are described. Beginning with a definitive description of major air pollutants and their causes, the article traces the development and use of optical instruments for this purpose from the "beginning" more than two decades ago to present. Comprehensive descriptions of instruments and techniques currently in use and a brief discussion of developments that would still further enhance the value of optical instrumentation in this application are presented.**

09223

Kohler, M. and H. J. Eichhoff

A RAPID METHOD FOR THE DETERMINATION IN ATMOSPHERIC DUST. ((EINE Schnellmethode zur Bestimmung von mehrkernigen, aromatischen

Kohlenwasserstoffen in Luftstaub.)) Text in German Z. Anal. Chem. (Berlin), 232(6):401-409, Nov. 24, 1967 5 refs.

The dust is sampled onto a cellulose asbestos filter and is extracted with benzene in a Soxhlet apparatus. The polycyclic hydrocarbons are then isolated from the extract, using 2-dimensional thin-layer chromatography on aluminum oxide-cellulose acetate. The eluted spots are analyzed by fluorospectroscopy, usually at normal temperature in solution or, in special cases, at lower temperatures in a solid state. About 70 percent of the polycyclic aromatic hydrocarbons originally contained in the dust are detected, as determined by a test with labelled 3,4-benzpyrene. The apparatus used is diagramed. (Authors summary, modified)

09234

Martinelli, Giorgio

THE CONTINUOUS CONTROL OF AIR POLLUTION WITH INDUSTRIAL ANALYSERS. ((Il controllo continuo dell'inquinamento atmosferico con analizzatori industriali.)) Text in Italian. Termotecnica (Milan), 21(10):558-565, Oct. 1967.

For protection against air pollution from increased vehicular traffic, urbanization, and industry, Italy established a law on air pollution control in August 1966. Some provisions of the law are cited. A monitoring system for continuous measurements of air samples involves wind direction, registration of concentrations, determination of pollutants, and the emitter. Better results could be obtained from a network of monitoring stations at various cities, and a plan is proposed for their establishment and operation, where continuous measurement would also be made of air temperature and humidity, concentrations of SO₂, H₂S, NO₂, CO₂, CO, and hydrocarbons. Photographs showing equipment and apparatus for the stations are reproduced. A schematic diagram depicts the picoflux apparatus for SO₂ measurements; an electrical cell for measuring H₂S is also shown. The URAS infrared analyzer is used to measure CO₂. Analyses for CO, hydrocarbons and dust are discussed, along with the equipment for air pollution monitoring in Frankfurt, Germany.

09333

Lial W. Brewer, (ed.)

ANALYTICAL PROCEDURES FOR THE ENVIRONMENTAL HEALTH LABORATORY. Sandia Corp., Albuquerque, N. Mex., Industrial Hygiene Lab., SC-M-3044, 147 p., Feb. 1968. 13 refs.

This is a manual compiled of thirty-nine analytical procedures used by an industrial hygiene laboratory. The procedures for the following substances in air are included: The Determination of Acetone, Acid and Alkali Contaminants; Benzene, Toluene, and Other Aromatics; Beryllium (Spectrographic Method); Beryllium (Morin Method); Cadmium; Chromic Acid, Chromates, and Dichromates; Formaldehyde; Lead; Methanol;

Nitrogen Dioxide; Oil Mist; Ozone (Colorimetric Method); Ozone (Titration Method; Phosgene; Silica (Colorimetric Method); Sulfur Dioxide; Thallium; and Zinc.##

09342

Papa, Louis J.

GAS CHROMATOGRAPHY-MEASURING EXHAUST HYDROCARBONS DOWN TO PARTS PER BILLION. Preprint, Society of Automotive Engineers, 20p., 1967. 26 refs. (Presented at the Mid-Year Meeting, Chicago, Ill., May 15-19, 1967, Paper 670494.)

Several methods for determining hydrocarbons in automotive exhaust are presented and discussed. These include: nondispersive infrared, ultraviolet, flame-ionization detection, and gas chromatography. A gas chromatographic method is presented for determining individual hydrocarbon components in automotive exhaust. The minimum detectable concentration of each hydrocarbon is one part per billion (ppb) volume/volume. The method has thus far detected over two hundred hydrocarbons of all classes, i.e., paraffins, olefins, and aromatics, in exhaust. The total analysis time is 25 to 30 minutes. A technique for collecting the exhaust sample in small plastic bags is described along with a brief study on the selection of suitable bag material. Technique for sampling, calibration, and standardization are also discussed. Applications of the method are presented along with a discussion of the results. (Author's abstract)##

09343

Pearsall, H. W.

MEASURING THE TOTAL HYDROCARBONS IN DIESEL EXHAUST. Preprint, Society of Automotive Engineers, 11p., 1967. 19 refs. (Presented at the Automotive Engineering Congress, Detroit, Mich., Jan. 9-13, 1967, Paper 670089.)

In order to simulate diesel exhaust of known composition, weighed amounts of various high-boiling hydrocarbons were evaporated into a stream of heated air. These mixtures were sampled continuously and the hydrocarbon contents measured with a heated flame ionization detector (FID). The evaporator unit and FID were operated at various temperatures and 375 F was optimum as regards percentage of input material accounted for (85-100%, for paraffins through C16), fast response, and repeatability. The FID was then used at various temperature total hydrocarbons in exhaust from a 1-cyl diesel engine. Again 375 F was optimum for obtaining maximum apparent hydrocarbon concentration, fast response, and repeatability. Finally, FID measurements were obtained at 375 F on exhaust from the engine at various operating conditions, to assess the effects of operating variables on hydrocarbons. Increasing compression ratio and temperatures of the inlet air and crankcase oil were effective ways of lowering hydrocarbons. Some principles for valid sampling and measurement of diesel exhaust hydrocarbons are discussed. (Author's abstract)##

Westveer, J. A.

CORRELATION OF EXHAUST EMISSION TEST FACILITIES. Preprint, Society of Automotive Engineers, 8p., 1967. 4 refs. (Presented at the Automotive Engineering Congress, Detroit, Mich., Jan. 9-13, 1967, Paper 670165.)

Current legally specified test procedures for measuring hydrocarbon and carbon monoxide concentrations in vehicle exhaust gases contain intrinsic test variables which significantly affect test results. These variables constantly hamper efforts to correlate test data generated at one or more exhaust emission test facilities. Some of the more prominent test variables such as vehicle repeatability, test driver repeatability, instability of calibrating gases and changing ambient test conditions and the success of various measures which were undertaken to reduce or eliminate the influence of some of the variables on test repeatability and facility correlation are described. It is recommended that one of the facilities be designated as a control facility which would be responsible for establishing and maintaining a set of primary gas concentrations. Particular attention should be placed on the driving patterns of the test drivers, as deviations from the prescribed patterns alter test results. Standardization of the analytical instruments improved correlation. Particular emphasis should be placed on matching and reducing the sizes of the internal cavities, such as water traps, filters, and common manifolds, etc. The size of sample cells should be standardized especially in the hydrocarbon sample train as the hexane to propane response varies with the sample cell length. The infrared analytical instruments should be located in an area relatively free of harsh drafts as the abrupt temperature changes may cause the instrument calibrations to change momentarily. The analyzers should be mounted in a console or cabinet type enclosure to reduce the possibility of rapid temperature changes within the analyzer case. Vehicle exhaust emissions are affected by barometric pressure changes. The existing ambient barometric pressure should be recorded for each test and appropriate correction factors applied to the test results to compensate for barometric pressure differences. Circulating a test vehicle among facilities for correlation purposes has remained a standard practice within the industry because it is presently the best known method for obtaining comparative emission data. The development of devices and of procedures which will eliminate the major variables will significantly simplify the present correlation problems.

09365

Hill, R. L. and J. M. Sonley

A FOUR CHANNEL CHROMATOGRAPH FOR RAPID GAS ANALYSES. Lab. Pract., 17(1):55-59, Jan. 1968.

A multiple column chromatograph is described which quickly and accurately analyzes gas samples for hydrogen, oxygen, nitrogen, carbon monoxide, carbon dioxide and hydrocarbons. The total time for an analysis is just under six minutes. Operator fatigue is reduced to a minimum and electronic integrators enhance the

accuracy. The cost of the equipment (3,250 pounds) is justified by the large number of samples. Apparatus specifically described include; the sampling system, detectors, the electrical system, and oven units. The operation and calibration of the equipment are briefly discussed.##

09369

Wilson, H. N. and G. M. Duff

INDUSTRIAL GAS ANALYSIS: A LITERATURE REVIEW. Analyst, 92(1101):723-758, Dec. 1967. 712 refs.

Analytical methods are reviewed for: permanent and inorganic gases; analysis of liquefied or pure gases; fuel gases; flue gases; motor exhaust gases; analysis of micro samples; and atmospheric pollutants. The years from 1958 to about mid-1966 were covered. In no branch of analysis is the swing towards physical methods more marked than in gas analysis. There have been no important developments of the conventional methods during the last ten years; the chief advances have been the application of galvanic methods to "trace" of certain gases, and gas chromatography. The rapid spread of the electrogalvanic methods for the "on-stream" determination of traces is also most significant. The other most noticeable feature is the vast and increasing attention being paid to atmospheric pollutants of all kinds, particularly sulphur dioxide, sulphuric acid and hydrocarbons.##

09388

Valori, P. and A. Grella

CHROMATOGRAPHIC SEPARATION OF POLYCYCLIC AROMATIC HYDROCARBONS. A METHOD FOR CONCENTRATION AND PRELIMINARY PURIFICATION OF EXTRACTS FROM SAMPLES OF ATMOSPHERIC DUST. (Separazione cromatografica degli idrocarburi policiclici aromatici. Metodo per la concentrazione e la preliminare purificazione degli estratti di campioni di pulviscola atmosferico.) Text in Italian. Nuovi Ann. 'Igiene Microbiol. (Rome), 17(5):351-382, Sept.-Oct. 1966. 35 refs.

Different techniques in chromatographic separation are discussed; they generally yield different results. Another method is described which involves: a) the concentration of polycyclic constituents by absorption on alumina; b) the purification of extracts from tars and colored materials; and c) a preliminary separation of polycyclic aromatic hydrocarbons into two large fractions. The differences between levels of hydrocarbons determined by classical method and by this new one are considerable, for example, 0.98 and 3.72 micrograms/100 cu m air for phenanthrene respectively, and 5.40 and 13.56 for 1,12-benzperylene. This method can be easily adapted for analyses of more complex materials and represents a "small preparative analysis" in the gas chromatography of polynuclear compounds.

Dubois, L., T. Teichman, R. S. Thomas, and J. L. Monkman

SULPHUR COMPOUNDS IN URBAN AIR. In: Air Pollution. Proceedings of the Symposium on the Physico-chemical Transformation of Sulphur Compounds in the Atmosphere and the Formation of Acid Smogs. Organisation for Economic Co-operation and Development, Paris, Directorate for Scientific Affairs, Paper 8, Dec. 1967, p. 63-73. 6 refs.

Three sampling stations were set up using glass fiber filters. All filters were carefully washed to reduce the relevant blank levels as much as possible. Measurements were made of dust loading, lead, polycyclics and sulphate. Using hot aqueous extraction, sulphate blank values were determined on a larger group of glass fiber filters. Sulphate blanks on organic filter media are much lower than for the glass fiber type. Suitably low blanks have only been achieved for polycyclic, lead and sulphate blanks. Results currently being obtained for sulphate in air are shown in histograms. The effect of wind direction has been applied to the results. There seems to be a rough correlation between the three stations. Peaks tend to occur on weekends. Dust and sulphate air loadings are given in tables. Values are summarized for three months, with some average values for the same months obtained 10 years previously in the same city at another location one mile distant. Glass fiber sheet appears to be quite unsuitable for the measurement of sulphate or sulphuric acid in air since it is analytically unsound to try to measure sulphate if the total sulphate blank is as large, or larger, than the quantity being measured.**

09515

California State Dept. of Public Health, Berkeley, Air and Industrial Hygiene Lab.

A GUIDE TO OPERATION OF ATMOSPHERIC ANALYZERS. SDPH-2-40, 14p., May 1966.

Methods for both manual and continuous automatic sampling and analysis of the common air pollutants are described. Experiments are described for the measurement of sulfur dioxide using the West method. Total oxidant content of the atmosphere is analyzed using the Neutral Buffered Potassium Iodide Method, C1 through C5 atmospheric hydrocarbons are monitored and analyzed. Guides to the operation of atmospheric analyzers are reviewed.**

09574

Sanders, W. N. and J. B. Maynard

CAPILLARY GAS CHROMATOGRAPHIC METHOD FOR DETERMINING THE C3-C12 HYDROCARBONS IN FULL-RANGE MOTOR GASOLINES. Anal. Chem. (U. S.), 40(3):527-535, March 1968. 13 refs.

A capillary gas-liquid chromatographic method has been developed to determine the individual C3 - C12 hydrocarbons in full-range motor gasolines. The analyses are conducted on a 200-foot squalane capillary column in less than 2 hours. Approximately 240 chromatographic peaks are observed in the analysis of an average gasoline; 180 of them (amounting to 96-99 percent wt of the sample) have been specifically identified. The column temperature and column inlet pressure are both programmed to obtain resolution of close-boiling hydrocarbons. Standard deviations and the 95 percent confidence limits are given for the quantitative repeatability and reproducibility of the method. Chromatographic peak identifications and the detailed quantitative composition of typical premium and regular-grade gasolines are presented, as well as the detailed composition of the American Petroleum Institute Prototype Fuel No. 1 -Premium Leaded Reference. Changes that can be made in the temperature and pressure programs to obtain resolution of specific groups of hydrocarbons are discussed. With modifications of present sampling procedures, the method could easily be applied to analysis of the individual hydrocarbons found in automotive exhaust gases. (Authors' abstract, modified)

09597

Engle, Carole and Eugene Sawicki

RAPID ITLC FLUORIMETRIC METHODS FOR THE ASSAY OF PHENALEN-1-ONE AND 7H-BENZ(DE)ANTHRACEN-7-ONE IN POLLUTED URBAN ATMOSPHERES. Preprint. Public Health Service, Cincinnati, Ohio, National Center for Air Pollution Control, ((23))p., Feb. 1968. 4 refs.

Through the use of glass-fiber paper impregnated with silica gel (called instant thin-layer chromatography, or ITLC), the rapid determination of phenalen-1-one (PO) and 7H-benz(de)anthracen-7-one (BO) is facilitated. One method is introduced for the specific determination of PO, and one method for the determination of both PO and BO at the same time. Both methods are superior to previous sensitivity. In addition, they give reasonable accuracy and precision. Samples from urban atmospheres and air pollution source effluents can be analyzed rapidly for PO and BO by these methods. Analysis of one sample of organic extracts would take less than 1/2 hour; analysis of a dozen samples would take less than 2 hours. For those laboratories without instrumentation the amount of PO and BO can be estimated by eye after separation; eight analyses for either compound can be accomplished in about 20 minutes. (Authors' abstract)

09734

De Schwertzing, Hannibal, Sol S. Nelson, and Harold G. Eaton

CRYOGENICALLY TRAPPED TRACE CONTAMINANTS ANALYZED BY IONIZING GAS CHROMATOGRAPHY. Melpar, Inc., Inc., Falls Church, Va., Contract AF 41(609)-2958, Task 793002, SAM-TR-64-68, 15p., Aug. 1967.

CFSTI, DDC: AD 662330

The concentrations of microcontaminants in a sealed environmental system were determined quantitatively. The separation and identification of the cryogenically trapped trace contaminants were accomplished with liquid gas chromatography using a flame ionization detector. Thirty-nine sets of samples were taken during a manned simulator run; 29 sets from a similar run; one sample set from a trapping efficiency run. The compounds contained in the sample cylinders were identified by their time of elution from a column and the amount measured with the aid of peak areas. The response characteristics of the chromatograph were calculated from responses obtained with standard mixtures. (Authors' abstract) modified)

09738

Berner, Axel and Hemma Reichelt

THE ROTATING-SLIT AEROSOL SPECTROMETER (ROSL-SPECTROMETER): PROTOTYPE. In: Aerosol Research at the First Physics Institute. Vienna Univ., Austria, p. 1-18, Jan. 1968. 3 refs.

A new aerosol centrifuge is described. Particle-size spectra resembling those of the confuge are produced; their selectivity, however, is considerably better. Aerosols produced by nebulizing monodispersed Latex suspensions are analyzed by the centrifuge. The different locations and are completely separated. (Authors' abstract)

09888

Flesch, Jerome P.

CALIBRATION STUDIES OF A NEW SUB-MICRON AEROSOL SIZE CLASSIFIER. Preprint, Public Health Service, Cincinnati, Ohio, National Center for Air Pollution Control, 17p., 1967. 12 refs. (Presented at the 153rd Meeting, American Chemical Society, Miami Beach, Florida, April 10-14, 1967.)

The size-fractionating characteristics of a new aerosol classifier operating in the size range 0.015 to 0.5 micron were investigated with homogenous aerosols of zinc ammonium sulfate, polystyrene latex spheres, and sodium chloride cubes. Size analyses were carried out by electron microscopy. Characteristic deposition curves were nearly identical in the small-particle collection zone and agreed with data for methylene blue spheres. For the zone above 0.2 micron the curves differed significantly, probably because of charging differences of the various aerosols. Preliminary application of the classifier to ambient air sampling has yielded size distribution data for lead in urban Cincinnati. (Author's abstract, modified)

10034

Meyer, R. T.

FLASH PHOTOLYZED REACTIONS MONITORED BY TIME-OF-FLIGHT MASS SPECTROMETRY. Sandia Corp., Albuquerque, N. Mex.,

Aerospace Sciences Div., SC-RR-68-162, 20p., April 1968.
28 refs. (Presented at the "Symposium on Applications of Mass Spectrometry to Gas Phase Reactions," 155th National Meeting of the American Chemical Society, Division of Water, Air, and Waste Chemistry, San Francisco, Calif., April 4, 1968, Paper 55).

CFSTI: TID 4500 (51ST ED.)

The techniques of flash photolysis and time-resolved mass spectrometry have been combined for the study of fast gas phase reactions. The apparatus provides an incident ultraviolet light flux of 1.0×10 to the 18th power quanta per cm^2 per flash and a spectrometer sensitivity of 5×10 to the minus 8 power mole per liter. Time resolution is 1.4 micron sec. at successive 50 microns sec intervals. The following chemical systems have been investigated: 1) nitrogen dioxide sensitized reaction between hydrogen and oxygen; 2) decomposition of nitromethane; 3) termolecular recombination of iodine atoms in the presence of nitric oxide; and 4) reaction of excited iodine ($2P_{1/2}$) atoms with methyl iodide. The most promising development for pollution studies seems to be the use of nitrogen dioxide as a sensitizer and primary reactant. It should be possible to explore the reaction kinetics of nitrogen dioxide as a sensitizer and primary reactant. It should be possible to explore the reaction kinetics of nitrogen dioxide and various hydrocarbons with this technique. The mass spectrometer sensitivity limit of 1 part per 100,000 will not permit, however, reproducing the dilution factor normally experienced in the actual atmospheric environment (approximate range 0.01 to 1 part per 10 to the 6th power).##

10089

Kol'kovski, P.

INDICATOR METHOD FOR DETERMINATION OF XYLENE VAPOR IN THE AIR.
(Indikatornen metod za opredelyane na ksilolovi pari v'v v'zdukh.)
Text in Bulgarian. Khim. Ind. (Sofia), 39(2): 76-78, 1967. 11 ref

An indicator method based on a color reaction was developed for determining the xylene concentration in the atmosphere. The indicator is prepared by treating 0.3-0.4 mm. silicate with 0.5 l./g of a 25 solution of $\text{Ce}(\text{SO}_4)_2 \cdot 4\text{H}_2\text{O}$ in concentrated sulfuric acid. A mm. long glass tube 0.4 mm. in diameter is filled with the indicator and is then standardized for xylene concentrations of 0 to 0.5 mg./l. by passing 500 l. air through the tube, or for concentrations from 0 to 25 mg./l. by passing 100 l. air through the tube. The distance over which the color change from orange to blue occurs is then recorded as a function of xylene concentration. The method has a sensitivity of 0.01 mg./l. and an accuracy of 205. It can be used in the presence of aliphatic hydrocarbons but not in the presence of toluene, benzene, or benzene derivatives.

10238

Arutyunov, Yu. I. and Z. I. Geller

THE ACCURACY OF CHROMATOGRAPHIC ANALYSIS OF FLUE GASES WHEN USING THERMOCATALYTIC DETECTORS. Thermal Eng. (English

translation of: Teploenergetika) 14(10):94-97, April 1968 7 refs.

Thermocatalytic detectors, used to analyze flue gases, operate on the principle of measuring the heat of combustion of the eluted components in the carrier gas flow. Platinum wires, incorporated into an unbalanced Wheatstone bridge, are measured for their changed resistances during catalytic combustion with the eluted gases. The theoretical basis for the relationship between input voltage and measured resistances is explored. On combustion of the eluted component by the wire, an additional amount of heat is liberated, raising the temperature of the wire's surface a discrete amount. In experimental verification of the derived relationships, a KHT-4 chromatograph was used for automatic analysis of minute constituent of combustibles in boiler stack gases. A low-temperature detector of catalytic combustion was employed. Theoretical and experimental values for temperature of the heated wire and for internal current, depending on the variations in supply voltage, differ by not more than plus or minus 10-15%.##

10242

Dimitriadis, B.

METHODS FOR DETERMINING NITROGEN OXIDES IN AUTOMOTIVE EXHAUSTS. Bureau of Mines, Washington, D. C., RI 7133, 29pp., May 1968. 10 refs.

Five direct and indirect methods for determining nitrogen oxides in automotive exhausts have been evaluated from the standpoint of accuracy and applicability in current exhaust studies. These methods are: static oxidation in tank, Bureau of Mines method, Chevron Research method, phenoldisulfonic acid method, and direct measurement of NO. Results showed that methods requiring conversion of nitric oxide to nitrogen dioxide as a part of the analytical procedure are subject to errors introduced by the instability of NO₂. The extent of some of these errors has been determined, and procedures have been developed to minimize undesirable influences. On the basis of the results obtained from this study, recommendations are made regarding procedures for batch type or continuous measurement of nitrogen oxides in exhaust streams.##

10489

Bufalini, J. J.

GAS PHASE TITRATION OF ATMOSPHERIC OZONE. Preprint, Public Health Service, Cincinnati, Ohio, National Center for Air Pollution Control (8)p., April 1968. 9 refs.

Ozone can be selectively removed from a gas stream containing a variety of oxidants. Oxidant analysers can be made specific for ozone by incorporating a small gas reaction chamber on the instrument. Possible interferences from hydrogen peroxide, n-butyl hydroperoxide, peroxyacetyl nitrate, nitrogen dioxide, and peracetic acid are discussed. (Author's abstract)

Dubois, K., C. J. Baker, A. Zdrojewski, and J. L. Monkman

CORRELATION OF THE BLACKNESS INDEX OF HI-VOL AIR SAMPLES WITH THE POLYCYCLIC HYDROCARBON CONCENTRATIONS. Preprint, Department of National Health and Welfare, Ottawa, (Ontario), Occupational Health Div., ((24))p., 1968. (Presented at the 61st Annual Meeting of the Air Pollution Control Association, St. Paul, Minn., June 23-27, 1968, Paper 68-124.)

The darkness of a soiling index sample being due to products of combustion it would be interesting to find out if a relation could be established the blackness index or the dark colored fraction of the sample, and the polycyclic hydrocarbon concentration. Having deduced such a relation one could use this blackness index to indirectly measure the polycyclics in air samples. The time involved in measuring the blackness (a few seconds for a sample) is insignificant as compared to two days required for a complete determination of polycyclics in an air sample. The relation between the blackness index and the concentration of benzo((k))fluoranthene (BkF) and consequently of polycyclics, vary from one station to the other. Each relation is characteristic of a given station. Preliminary results indicate that the curve are different from one city to the other although the difference from one station to the next or from one month to the next is more important in some cases. The relationship between the blackness index and the concentration of BkF or polycyclic is different from one month to the next. For a given blackness index, the concentration of BkF is lower in summer than in winter, and for a given amount of particulate matter, the concentration of BkF is also lower in summer. It then follows that the dark material is different, from summer to winter. The blackness index seems to be a poor indicator of the polycyclic concentration in air samples and it would be unwise to use it to make such measurement unless a standard curve for a given city has been prepared.##

10672

Hersch, Paul A.

CONTROLLED ADDITION OF EXPERIMENTAL POLLUTANTS TO AIR. Gould-National Batteries, Inc., Minneapolis, Minn., 24p., 1968. 21 refs. (Presented at the 61st Annual Meeting of the Air Pollution Control Association, St. Paul, Minn., June 1968, Paper 68-153.)

Experience with, and extensions of less known techniques of providing an air stream with a steady and adjustable level of a gaseous impurity are described. Leaving aside those means that employ moving solid parts, the paper discusses devices using liquid pistons, mikro-flow through channels, diffusion across channels and barriers, stream splitters for attenuation, and methods based on evaporation, electrolysis, chemical conversion, and irradiation. (Author s abstract, modified)

Jager, J.

UTILIZATION OF QUASILINEAR FLUORESCENCE SPECTRA IN ANALYSIS OF POLYNUCLEAR AROMATIC HYDROCARBON. Atmos. Environ., 2(3):293-294, May 1968.

The utilization of quasilinear fluorescence spectra in the analysis of polynuclear aromatic hydrocarbons is proposed. Quasilinear fluorescence spectra of many polynuclear hydrocarbons, but also enable them to be determined directly in mixtures with satisfactory accuracy, provided some specific conditions are strictly adhered to. The method of obtaining the quasilinear fluorescence spectra is briefly described. (Author's abstract)##

10767

Smith, Charles G., Carl A. Nau, and Charles H. Lawrence

SEPARATION AND IDENTIFICATION OF POLYCYCLIC HYDROCARBONS IN RUBBER DUST. Am. Ind. Hyg. Assoc., J. 29(3):242-247, May-June 1968.

A spectrophotometric technique is described for determining the presence of polycyclic aromatic hydrocarbons in furnace black, vehicular tire rubber, and lung tissue, utilizing benzene and immiscible solvent system extraction followed by thin-layer chromatography on cellulose with N,N-dimethylformamide as developer. By use of this procedure, furnace black and new and aged vehicular tire rubber are found to contain 3,4-benzpyrene, 1,2-benzpyrene, fluoranthene, and pyrene in quantities which are not diminished by processing, aging, or wear. In a further application of the procedure it was established that commercial furnace black and furnace black deposited in the lungs of monkeys are similar in that both contain adsorbed 1,2-benzpyrene, pyrene, and possibly fluoranthene, and two unidentified fluorescent compounds. They are dissimilar in that the furnace black from monkey lungs contains no coronene or 3,4-benzpyrene. (Authors' abstract)

10772

Yamamoto, Robert K., and Warren A. Cook

DETERMINATION OF ETHYL BENZENE AND STYRENE IN AIR BY ULTRAVIOLET SPECTROPHOTOMETRY. Am. Ind. Hyg. Assoc. J., 29(3):238-241, May-June 1968.

In the production of styrene, it is important to be able to determine ethyl benzene and styrene in the presence of each other as an indication of sources of dispersion of vapors from the closed reaction system. The air is drawn at a fixed rate through a fritted glass bubbler containing spectro-grade isooctane. The absorption of ultraviolet light at wavelengths of 268 mμ for the ethyl benzene and 291 mμ for the styrene is used as a measure for the amounts of these compounds collected from the air. This method has the advantages of sampling over a wide range of concentrations, of specificity, and of facility in both field and laboratory phases. (Authors abstract)

10946

Arito, H., R. Soda, and H. Matsushita

GAS CHROMATOGRAPHIC DETERMINATION OF POLYNUCLEAR HYDROCARBONS IN PARTICULATE AIR POLLUTANTS. Ind. Health, 5(3-4):243-259, Dec. 1967.

An attempt to simplify procedure for analysis of polynuclear hydrocarbons in particulates in town air was carried out. Vacuum sublimation method was employed to extract organic materials from the particulates instead of the method with a Soxhlet apparatus. The sublimate was dissolved in small amount of benzene and the solution was submitted to direct gas chromatographic analysis by utilizing a flame ionization detector or an electron capture detector. It was proved that further purification of the sublimate by partition was unnecessary in this method. Seven polynuclear hydrocarbons including benzo(a)pyrene were determined on the collected particulates from the air by this method. (Author's abstract)##

10960

Chapman, R. L.

AIR POLLUTION CONTROL SYSTEMS. Instr. Control Systems, 41(8):79-82, Aug. 1968.

The methods for measuring the major air pollutants are reviewed briefly. Some of the problems involved in calibration of instruments are discussed.##

10964

H. J. Davis

GAS CHROMATOGRAPHIC DETERMINATION OF BENZO(A)PYRENE IN CIGARETTE SMOKE. Anal. Chem., 40(10):1583-1585, August 1968.

An analytical method which is shorter and more versatile than the fluorometric method for the determination of benzo(a)pyrene in cigarette smoke is described. Gas chromatography with an electron capture detector is found to measure as little as 1 mg of BaP with satisfactory precision. The electron capture detector is basically an ionization detector utilizing a helium glow discharge as the electron source capable of operation at temperatures up to 400 degrees C.##

11030

Hanst, Philip L. and John A. Morreal

DETECTION AND MEASUREMENT OF AIR POLLUTANTS BY ABSORPTION OF INFRARED LASER RADIATION. Preprint, 27p., 1968. (Presented

at the 61st Annual Meeting, Air Pollution Control Association, St. Paul, Minn., June 23-27, 1968, Paper 68-91.)

A technique of detecting gaseous air pollutants by means of absorption of laser radiation is under development at the NASA Electronics Research Center. The iodine infrared laser and the carbon dioxide infrared laser are forced to emit spectral lines which fall on the infrared absorption bands of atmospheric pollutants. The attenuation of a laser line when passed through an air sample is the measure of the pollutant concentration. The narrow spectral width of the laser emission permits sensitive detection, minimizes interference between pollutants, and allows penetration of atmospheric water bands. The collimation and high power outputs available from lasers permit transmission of the radiation over long straight paths through the atmosphere and over long folded paths in multiple-pass absorption cells. A sample of absorbing gas placed within the laser cavity forces the emission of the selected wavelengths. With a one-half kilometer path to a retro-reflector and back, it is predicted that the following concentrations of air pollutants will be detected by means of the indicated laser lines: carbon monoxide at 2 parts per million in air (ppm), using the 10.53 micron carbon dioxide line; sulfur dioxide at 1.5 ppm, using the 9.08 micron carbon dioxide line; and ozone at 0.15 ppm, using the 9.52 micron carbon dioxide line. It seems feasible to extend the technique to other pollutants such as nitrogen dioxide, methane, butane, and peroxy acetyl nitrate. Continuing effort is being devoted to development and construction of the laser transmitting and receiving equipment. Field testing is planned for the near future.##

11061

H. W. Theones, W. Guse

LATEST STATE OF DEVELOPMENT OF INSTRUMENTS FOR THE CONTINUOUS MONITORING OF GAS EMISSIONS. Staub (English translation), 28(3):53-63, March 1968. 17 refs.
CFSTI: TT 68-50448/3

For the measurement of gaseous emissions, testing methods using chemical analysis are used for emission control based on random sampling while automatic gas analyzers are employed for continuous concentration control. The different types of measuring instruments, their possibilities and limitations are explained, and difficulties occurring during gas cleaning are considered. Practical experience is available which has been gained in many years during the operation of gas cleaning installations and of analysers for continuous measurement of sulphur dioxide present in flue gas. (Authors' summary)##

11068

C. R. Engel

DIRECT SPECTROPHOTOFUORIMETRIC ANALYSIS OF COMPOUNDS ON PAPER AND THIN-LAYER CHROMATOGRAMS AND PHEROGRAMS. Preprint, Public Service, Cincinnati, Ohio

National Air Pollution Control Administration, ((1))p.,
((1968)) 12 refs.

Direct spectrophotofluorimetric analyses can be coupled with paper or thin-layer electrophoresis, and paper or thin-layer chromatography. It is simple and offers many advantages. Neither time nor compound is lost in extraction or elution. A thin-layer or paper chromatographic or electrophoretic spot can be examined immediately after separation. Since no expensive cells are needed, there are no breakage costs. Characterization is enhanced through the use of quenchofluorimetric techniques. Thus, direct spectrophotofluorimetric techniques. Thus direct spectrophotofluorimetric analysis has great potential in trace characterization and trace quantitative analysis of complex mixtures. It approaches colorimetric analysis in simplicity and speed and surpasses it in sensitivity, and the amount of information that can be obtained from one analysis. (Author's abstract, modified)##

11091

Sawicki, E.

MICROESTIMATION OF BENZO(a)PYRENE IN AIRBORNE PARTICULATES AND AIR POLLUTION SOURCE EFFLUENTS. Preprint, Public Health Service, Cincinnati, Ohio, National Center for Air Pollution Control, ((8))p., ((1967?)) 4 refs.

The particulate collected from the urban atmosphere is extracted with an organic solvent and then separated alongside pure benzo(a)pyrene (BaP) with alumina thin-layer chromatography. The unknown and standard spots are eluted, their solutions are evaporated, and the residues are dissolved in concentrated sulfuric acid. Readings of standard and test spot solutions are taken at F 470/540 with the spectrophotofluorimeter or with a filter fluorimeter containing a primary filter peaking at 460 millimicrons and a secondary filter peaking at 565 millimicrons.##

11093

Stanley, Thomas W.

SPECTROPHOTOMETRIC DETERMINATION OF BENZO(a)PYRENE IN AIRBORNE PARTICULATES. Preprint, Public Health Service, Cincinnati, Ohio, National Center for Air Pollution Control, ((8))p., 1968. 5 refs.

Airborne particulates collected from polluted atmospheres on glass-fiber filters are extracted exhaustively with an organic solvent. These extracts are carefully reduced to tarry residues through evaporation and then separated on thin-layers of activated alumina. The fluorescent area of pure benzo(a)pyrene and a corresponding area of the sample are removed from the TLC plate and eluted. Solutions of the pure compound and the unknown are spectrophotometrically measured between 4000 and 2400 angstroms. Wavelengths 3900, 3820, and 3750 angstroms are used to determine the amount of benzo(a)pyrene present in the sample.##

Reid, Frank H. and Walter R. Halpin

DETERMINATION OF HALOGENATED AND AROMATIC HYDROCARBONS IN AIR BY CHARCOAL TUBE AND GAS CHROMATOGRAPHY. Am. Ind. Hyg. Assoc. J., 29(4):390-396, July-Aug. 1968.

The preparation and use of a simple charcoal tube is described for the collection of air samples for the determination of several commonly encountered halogenated and aromatic hydrocarbons of industrial hygiene significance. A rapid and efficient desorption procedure is employed. Specific parameters are presented for quantitative determination by gas chromatography. The method provides an easily applicable technique with the advantages of minimum field sampling equipment; and rapid, specific, accurate and economical determinations at atmospheric concentrations ranging from a few ppm to several times the Threshold Limit Value. (Authors' abstract)

11165

Rossano, August T. and Hal B. H. Cooper

SAMPLING AND ANALYSIS. Chem. Eng., 75(22):142-146, Oct. 14, 1968.

Knowledge of the types and rates of emissions from a source or group of sources is fundamental to appraising an air pollution problem. Three factors are critical in source testing and analysis: measuring gas properties; in the duct, withdrawing representative samples, and accurate analysis.

11218

Stanley, Thomas W., Myrna J. Morgan, and James E. Meeker

APPLICATION OF ITLC AND FLUOROMETRY TO THE ESTIMATION OF 7H-BENZ(de)ANTHRACEN-7-ONE AND PHENALEN-1-ONE IN ORGANIC EXTRACTS OF AIRBORNE PARTICULATES FROM 3-HOUR SEQUENTIAL AIR SAMPLES. Preprint, Public Health Service, Cincinnati, Ohio, National Air Pollution Control Administration, ((14))p., Aug. 1968. ((5)) refs. (Presented at the 156th Annual Meeting, American Chemical Society, Division of Water, Air, and Waste Chemistry, Atlantic City, N.J., Sept. 1968.)

Instant thin-layer chromatography (ITLC) was performed by use of glass-fiber paper impregnated with silica gel to separate 7H-benz(de)anthracen-7-one and phenalen-1-one found in acetone extracts of airborne particulates from 3-hour sequential air samples. Only 15 minutes was required to separate 0.2 to 1.25 mg. of the crude extract with pentane:ether, 19:1 v/v. Compounds to be assayed were located on the chromatogram by use of relative R_f values and changes in fluorescence colors in an acidic environment under long-wavelength ultraviolet light. Direct fluorometric measurement and scanning at F 418/550 and F 409/490

indicated concentrations ranging from 2 to 47 microgram/1000 cu m of air for 7H-benz(de)anthracen-7-one and from 0.3 to 17 microgram/1000 cu m for phenalen-1-one. For 7H-benz(de)anthracen-7-one the precision of the method calculated as relative standard deviation was plus or minus 3.6% with a detection limit at 5 nanograms. For phenalen-1-one, precision was plus or minus 1.6% with a detection limit at 2 nanograms. The method was applied in analysis of 3-hour sequential air samples taken with Hi-Vol samplers over two 24-hours periods during January 1968. (Authors' abstract)##

11237

J. C. Chipman, A. J. Hocker, and John chao

MEASURING AND EVALUATING AUTOMOBILE EXHAUST HYDROCARBON EMISSIONS BY INTERRELATED TECHNIQUES. Preprint, California Air Resources Lab., Los Angeles, ((19)) p., 1968. 10 refs. (Presented at the 61st Annual Meeting, American Institute of Chemical Engineers, Symposium on Research and Development in Automotive Air Pollution Control, Los Angeles, Calif., Dec. 1-5, 1968, Paper 53-E.)

The smog forming potential of exhaust gas from a 216 car survey was determined. This potential is defined in terms of reactivity units. Exhaust hydrocarbon emissions were measured by nondispersive infrared, ultraviolet and flame ionization analyzers. The measurements of these analyzers were correlated with the reactivity of the exhaust gas. The results show that each analyzer is capable of delineating the smog potential of gasoline powered vehicles. Hydrocarbon emissions were also correlated with engine classes. The emission level differences for concentration are larger than those obtained on a reactivity or mass rate basis. (Authors' summary)##

11270

O'Keefe, Andrew E.

PROGRESS REPORT: PERMEATION STANDARDS FOR TRACE GAS ANALYSIS. Preprint, Public Health Service, Cincinnati, Ohio, National Center for Air Pollution Control, ((6))p., ((1966)). 1 ref. (Presented at the 152nd Meeting, ACS, Division of Water, Air and Waste Chemistry, New York, N. Y., Sept. 14, 1966.)

A microbottle for dispensing liquefiable gases at rates lower than can be attained by an original method has proved useful. The several steps of its construction and filling, are largely self-explanatory. The glass envelope is drawn down to a size that will not permit passage of the spherical bead; the coefficients of expansion of bead and envelope should not differ widely. For dispensing liquefiable gases incompatible with FEP Teflon a similar microbottle having a tetrafluoroethylene (TFE Teflon) barrier has proved suitable. For dispensing fixed gases a microbottle similar to that described above, but made of metal, is connected directly to a cylinder of gas. A Bourdon gauge assures that this "infinite" gas source has not been

accidentally exhausted. This version is incapable of providing a gravimetrically calibrated primary standard; indirect calibration will usually be necessary. Substitution of thin-wall TFE Teflon tubing for the FEP tube of the original device adapts it for dispensing substances whose properties are such as to limit their permeation rates at undesirably low values. This modification has extended the range of usefulness of permeation tubes, operating at room temperature, to include compounds as large as cumene.##

11476

Andreeshcheva, N. G.

THE EFFECTS OF CERTAIN AROMATIC HYDROCARBONS IN THE AIR.
((O sanitarno-toksikologicheskoi otsenke nekotorykh aromaticheskikh uglevodorodov v atmosfernom vozdukh)) Hyg. Sanit. (English translation of: Gigiena i Sanit.), 33(4-6):13-17, April-June 1968. ((10)) refs.
CFSTI: TT 68-50449/2

A spectrophotometric method of determining meta-nitrochlorbenzol (MNCB), and 3,4-dichloraniline (3,4-DCA) in the air is elaborated. The findings point to a definite relation of the threshold values of smell to the changes in the chemical structure of the substance due to introduction of nitro-amino- and chlorine groups into the benzol ring. The action of chlorine products on the light sensitivity of eyes becomes stronger as additional chlorine groups, besides the nitro- and amino- groups, are being introduced into the benzol ring.##

11485

Kaznina, N. I.

DETERMINATION OF STYRENE IN AIR BY PAPER CHROMATOGRAPHY.
((Opredelenie stirola v vozdukh s pomoshch'yu bumazhnoi khromatografii.)) Hyg. Sanit. (English translation of: Gigiena i Sanit.), 33(4-6):215-217, April-June 1968. ((2)) refs.
CFSTI: TT 68-50449/2

A chromatographic method was developed for the determination of styrene in air, based on the reaction of styrene with mercury acetate in an ethanol medium. The minimum amount of styrene which can be so determined is 0.5 microgram. Quantitative determination of styrene is based on the color intensity of spots developed on the paper by reaction with diphenylcarbazide.##

11486

Petrova, M. S. and O. N. Shevkun

HYGIENIC ASSESSMENT OF ODOR OF NONMETALLIC BUILDING MATERIALS.
((K voprosu o gigenicheskoi otsenke nemetallicheskih stroitel'nykh materialov po ikh zapakhu.)) Hyg. Sanit.

(English translation of: Gigiena i Sanit.), 33(4-6):218-220, April-June 1968. ((2)) refs.

CFSTI: TT 68-50449/2

Testers were first studied to ensure that they have a normal olfactory threshold (as described below). The testers then evaluated the odor of the building material under test (Vozhzhova and Denisenko). The odor of several coatings and other materials was tested. A varnish coating based on styrene with epoxy ester was tested for its odor 8 months after its application to the substrate. In the testing of a special adhesive with a phenolformaldehyde base, an olfactory sensation was produced by 0.6-0.8 ml air; i.e., it produced a "moderate odor". Every material tested by this method (taking into account the specified conditions of its envisaged use) may be categorized in terms of its odor. The method makes it possible to appraise the odor of new articles and materials at moderate cost and with simple equipment.*

11496

Dmitriev, M. T., N. A. Kitrosskii, and V. A. Popov

FLAME-IONIZATION CHROMATOGRAPHY FOR DETERMINATION OF ORGANIC MATTER IN AIR. ((O termoionizatsionnom khromatograficheskom veshchestv v atmosfernom vozdukh)) Hyg. Sanit. (English translation of: Gigiena i Sanit.), 33(4-6):350-356, April-June 1968. ((4)) refs.

CFSTI: TT 68-50449/2

Flame-ionization chromatography performed with serially manufactured gas chromatographs is discussed in detail. This method is useful where large ranges of substances manufactured by the chemical industry makes it very difficult to devise and apply specific colorimetric techniques for the determination of organic atmospheric pollutants. A technique for the determination of tetrahydrofuran in air on a chromatograph, according to the standard methods is presented. Flame-ionization chromatography possesses important operational advantages. The normal air components, including water vapor, do not produce background noise, so that all the peaks are formed by organic pollutants. The chromatographs are insensitive to vibrations, temperature variations, changes in air pressure and wind velocity, and are practically free from inertia. Small variations in the flow rates of hydrogen and nitrogen are likewise immaterial. Flame-ionization instruments may be used in mobile units and in expeditions. Flame-ionization chromatography may be recommended as a universal method for the determination of atmospheric pollutants of organic origin.**

11498

Aigina, E. P., G. S. Lopukhova, and S. S. Khikmatullaeva

SPECTROPHOTOMETRIC DETERMINATION OF THIOPHENE IN AIR. ((Opredelenie tiofena v vozdukh spektrofotometricheskim metodom.)) Hyg. Sanit. (English translation of: Gigiena i Sanit.), 33(4-6):409-411, April-June 1968. ((1)) refs.

CFSTI: TT 68-50449/2

The spectral characteristic of thiophene in the wavelength range 220 - 250 millimicron, using ethanol, methanol, heptane, hexane and octane as the solvents was studied. Measurements of the optical densities of methanol solutions of thiophene with concentrations up to 15 micrograms/ml at $\lambda = 231$ millimicrons showed these solutions to obey the Lambert-Beer law. Therefore the concentration of thiophene in the solution can be determined from the optical density using a calibration graph, or calculating from an equation. For determinations of thiophene in air in the presence of benzene, another variant was elaborated making use of Vierordt's method. This method makes it possible to determine concentrations of each of the components of a binary mixture from the optical density of solution. The spectral characteristics of methanol solutions of benzene and thiophene are shown. Thus, two variants of the spectrophotometric method are proposed for the determination of thiophene in air. The first variant, proposed for hygienic experiments, is based on measuring the absorption of UV radiation by the methanol solution of thiophene at $\lambda = 231$ millimicrons. Its sensitivity is 0.5 micrograms per 1 ml solution. Benzene in concentrations of up to 20 micrograms/ml does not interfere with the determination. The second variant, proposed for determination of thiophene in air in the presence of benzene, is based on measurements of absorption of UV radiation by a thiophene -- benzene mixture in methanol at 231 and 254.6 millimicrons. The thiophene concentration in the solution is calculated from an equation. This variant is used in the presence of benzene concentrations exceeding 20 micrograms in 1 ml methanol.

11540

Yeich, R. A.

A METHOD FOR DETECTING LOW CONCENTRATIONS OF AIRBORNE GASEOUS CONTAMINANTS. Western Electric Co., Reading, Pa., p. 219-229, ((1968)).
CFSTI: N68-29342

A condensation nuclei counter, with suitable converters, may be used to monitor concentrations of sulfur dioxide and certain hydrocarbons. Problems encountered and items of value discovered in using this equipment are discussed. The counter is not actually a counter, but a photometer which measures the forward scattered light in a dark-field optical system. The instrument is unique because it enables monitoring of particles in the submicroscopic range of 0.001 micron to 0.1 micron. The intensity of the scattered light is read by a photomultiplier tube. The meter is divided into linear steps of 300, 1,000, 3,000, 10,000 and 100,000 nuclei per cc exponential steps of 1,000,000 and 10,000,000 and, thereby permitting a response time of only two seconds from intake to readout of a sample. The nuclei counter and sulfur dioxide converter are extremely useful for detecting minute quantities of sulfur dioxide in the ambient air. They are sensitive and reliable, as can be verified by our two years of almost constant monitoring. The value as a quantitative instrument is limited because of a lack of ease in checking operation and the narrow range of contamination measured on the linear scales and the limitations of readout and sensitivity on the exponential scales. The simplicity of operation far outweighs the faults of readout in the investigative area.##

Brictaux, J., W. Fasotte, and P. Ledent

A METHOD FOR SAMPLING AND DETERMINING HEAVY HYDROCARBONS IN COMBUSTION FUMES. (Mise au point d'une methode de prelevement et de dosage des hydrocarbures lourds dans les fumees de combustion.) Text in French. Ann. Mines Belg. n(3):309-331, March, 1968. 16 refs.

A method has been devised for sampling and measuring heavy hydrocarbons in combustion smokes. The sampling technique is based on the adsorption of the hydrocarbons on a short adsorbent column placed within the chimney itself. The smokes can be drawn up through the sampling tube in less than one minute with the help of a rubber syringe. In order to measure the hydrocarbons collected, the sampling tube is inserted in a carrier gas circuit which also includes a flame ionization detector. The tube is brought up to a high temperature in a mobile oven. The hydrocarbons are desorbed and carried by the carrier gas towards the detector; there is no separation of the hydrocarbons and the response appears in the form of a single peak on the recording paper. It is possible to desorb hydrocarbons having a boiling point above 500 degrees C without inducing cracking phenomena. The output, which depends on the boiling temperatures of the sampled hydrocarbons, is excellent and can be still further improved if, prior to the sampling, the tube is refrigerated. A quantity of 10-6g anthracene produces a peak allowing accurate quantitative determination of the compound. The method also makes possible to perform a detailed analysis of the sample and determine the individual concentrations of the various components. For this purpose, a chromatographic column must be inserted into the carrier gas, between the sampling tube and the detector. Several examples of the determination of total and individual concentrations in various synthetic gas mixtures, combustion smokes, cigarette smoke, automobile exhaust, are presented. The possibility of applying the method to the measurement of benzo(a)pyrene is being considered. Another method for assessing the sample by methanol elution followed by a spectrophotometric examination is also described.##

11558

Delaunois, C.

ANALYSIS OF SMALL GAS SAMPLES BY MEANS OF GAS CHROMATOGRAPHY. (Analyse par chromatographie en phase gazeuse, de faibles volumes de gaz.) Text in French. Ann. Mines Belg. n(5):644-648, 1968. 7 refs.

In various fields of research, it frequently occurs that quantitative analyses of gas cannot be made by chromatography, if the gas is present in small quantities, as the standard methods of injection cannot be used. This problem was solved during research concerning the cracking of phenols in a micro-autoclave, when less than one milliliter of gas is produced. A gas-drainage device, under mercury, was devised, whereby the volume of gas could be measured under atmospheric pressure. An original system for the circulation of mercury, and a method for analysing H₂, CH₄, N₂, CO₂, C₂H₄, C₂H₆, on a column of activated charcoal kept permanently at a temperature of 150 degrees C, were developed.##

Delaunois, C. and B. Bettens

ANALYSIS BY GAS CHROMATOGRAPHY OF PHENOLIC AND AROMATIC COMPOUNDS OBTAINED FROM THERMAL CRACKING OF PHENOLS. (Analyse par chromatographie gazeuse des constituants phenoliques et aromatiques issus du craquage thermique des phenols.) Text in French. Ann. Mines Belg., n(5):633-641, May 1968. 7 refs.

A capillary column of 100 m loaded with propylene glycol was used to separate thirty-six components obtained during the thermal cracking of phenols. In addition to the separation of several aromatic hydrocarbons, it was possible, following previous etherification with hexamethyl disilazane, to separate the isomers of cresols and xylenols. A flame ionization detector was used to determine quantitatively the various components studied to approx. 0.1% in weight. The use of a Perkin Elmer D 24 integrator, contributed greatly to the reproducibility of the results, and reduced the time of analysis.##

11567

Hood, L. V. S., and J. D. Wineforder

THIN-LAYER SEPARATION AND LOW-TEMPERATURE LUMINESCENCE MEASUREMENT OF MIXTURES OF CARCINOGENS. Text in English. Anal. Chim. Acta, 42(2):199-205, Aug. 1968. 16 refs.

Low-temperature fluorescence and phosphorescence characteristics of a number of polynuclear aromatic hydrocarbons are reported. Complex mixtures of hydrocarbons were studied to determine the selectivity of low-temperature luminescence measurement. Low-temperature fluorimetry is applied to measure several hydrocarbon carcinogens after ethanolic extraction from thin-layer chromatograms. The method described permits determination of 0.1 micrograms of most of the potent carcinogens (such as pyrenes, anthracenes, perylenes, triphenylenes, etc.). The results suggest that the method may be well suited for environmental studies of hydrocarbon pollution.##

11574

Lahmann, Erdwin

STUDIES ON AIR POLLUTANTS. I. ANALYTICAL METHODS. ((Die Untersuchung von Luftverunreinigungen. I. Analysenmethoden.)) Text in German. Bundesgesundheitsblatt, (10):145-150, May 12, 1967. 71 refs.

This detailed review of the apparatus and techniques used for air pollution measurements deals with both sampling and analytical methods. A distinction is made between empirical or discontinuous and continuous methods of sampling and it is pointed out that only the latter can yield readily interpretable results. In connection with gas sampling techniques, the value of an impinger for increasing the rate of dissolution of gaseous pollutants is discussed. Methods are then described for the quantitative

determination of SO₂, SO₃, NO₂, NO, CO, H₂S, HF, and NH₃, and brief mention is made of the techniques of gas chromatography and flame ionization detection for traces of organic compounds. The two principal techniques for estimating the total particulate content of the air are dust-fall and dust-concentration determinations. The latter which depends on photoelectric measurement of the particle density after filtration is more difficult to perform, but more interesting from the health point of view.##

12001

Jacobs, E. S.

GAS CHROMATOGRAPHIC DETERMINATION OF HYDROCARBONS IN AUTOMOBILE EXHAUST. In: Report on CRC Symposium on Exhaust Gas Analysis. Coordinating Research Council, Inc., New York, N.Y., Group on Composition of Exhaust Gas, CRC-RN-404, pp. 34-38, Sept. 21-22, 1965.

The principle proposed for gas chromatographic determination of hydrocarbons in automobile exhaust and gasoline is based on the use of a wide range temperature program with an open tubular column and a flame ionization detector. Automatic integration of the flame detector signal provides peak area values for determining the concentration of each component. All exhaust gas samples for gas chromatographic analysis are collected in 3 cubic feet coated Mylar plastic bags. The hydrocarbon concentration of exhaust samples decreased 3-5% after standing for one hour in these bags. Typically, gas chromatographic analysis showed that the decrease was due primarily to the loss of the more reactive components. The use of the 0.01 in. ID column provides the separation and determination for as little as 1 ppm carbon of each component from C₁ through C₁₀ within 13 minutes. At present, an 0.02 in. ID open tubular column is being used to provide analysis for as little as 0.1 ppm carbon for each component. The conditions for use of the 0.02 in. ID column are the same as for the 0.01 in. ID column except for the final column temperature. The separation of hydrocarbons on the larger bore column is quite adequate for quantitative as well as qualitative analysis. The C₁ and C₂ hydrocarbons are determined on a short packed column of silica gel with a flame ionization unit. The chromatographic conditions are given. An average exhaust chromatogram contains 80-100 measurable peaks while a fuel chromatogram may contain 120-160 measurable peaks. At present, all components are identified by comparison to retention times obtained with standards. This technique was found to yield fast and efficient information for the individual hydrocarbon components found in exhaust and gasoline. Determination of the individual components allows application of specific reactivity factors to the individual components, so that a smog potential for fuel as well as exhaust may be ascertained.##

12002

Harkins, John

BROMOCOULOMETRIC OLEFIN ANALYSIS. In: Report on CRC Symposium on Exhaust Gas Analysis. Coordinating Research

Council, Inc., New York, N. Y., Group on Composition of Exhaust Gases, CRC-RN-404, pp. 41-43, Sept. 21-22, 1965.

The bromocoulometric method is based on the observation that olefins, excluding ethylene, can be quantitatively brominated by passing a gas sample through a solution of appropriate composition. Briefly, the sample is passed through the sensing solution and the time to generate the bromine absorbed by the sample is measured amperometrically, that is, by noting the current flowing through the solution when a constant potential of 220 or 230 mv is applied to the electrodes. With the exception of ethylene the bromocoulometric method appears to do an excellent job in measuring olefins in exhaust gases. Work completed several years ago indicated that ethylene could be obtained by changing the solvent in the cell.**

12072

Grupinski, Leonhard

MEASURING THE CONCENTRATIONS OF ORGANIC SUBSTANCE IN WASTE GASES BY ABSORPTION AND INFRARED SPECTROMETRY. Staub (English translation), 28(8):28030, Aug. 1968. 4 refs.
CFSTI: TT 68-50448/8

A method is described for determination of organic substances in waste gases. 10 liters of waste gas, passed through three was bottles connected in series, are sufficient for detecting 25mg of organic substances in 1 cu m of waste gas by means of an infrared spectroscope. Perchloroethylene is suitable to be used as the absorbent. The efficiency of washing may be determined with sufficient accuracy by separate determinations carried out in the three gas washing bottles. The method permits direct samples to be taken from waste gas lines at intervals of 10 - 15 minutes. (Author's summary, modified)**

12086

Chakraborty, B. B. and R. Long

THE FORMATION OF SOOT AND POLYCYCLIC AROMATIC HYDROCARBONS IN DIFFUSION FLAMES. PART THREE. EFFECT OF ADDITIONS OF OXYGEN TO ETHYLENE AND ETHANE RESPECTIVELY AS FUELS. Combustion Flame, 12(5):469-476, Oct. 1968. 15 refs.

The amounts of chloroform-soluble material, polycyclic aromatic hydrocarbons (PCHAH), and carbonaceous residue in the dry soot recovered from ethylene-air and ethane-air diffusion flames, respectively, have been determined and the effects on these of increasing additions of oxygen to the fuel have been investigated. With ethylene, the amounts of dry soot, chloroform-soluble material, PCHAH and carbonaceous residue (CR) all increase to maxima and then decrease. With ethane, the amounts of dry soot and CR increase to maxima and then decline whereas the chloroform-soluble material and PCHAH decrease steadily with increase in oxygen/ethane molar ratio in the fuel stream. The PCHAH adsorbed on the soot particles leaving the flame have been analysed by programmed temperature gas chromatography. Pyrene predominates in the mixture but the carcinogen 3,4-benzopyrene is

present in smaller amounts. Increasing the addition of oxygen to the fuel stream is shown to lead to higher temperatures in the pyrolysis zone and an attempt has been made to account qualitatively for the above results on the basis of the effects on pyrolysis of the fuel and on the oxidation of the products leaving the tip of a diffusion flame. A "qualitative model" for the formation of PCAH and "carbon" has been proposed tentatively on the basis of recent results from this laboratory and elsewhere. (Author's Abstract)##

12663

N. G. McTaggart, C. A. Miller, B. Pearce

QUANTITATIVE HYDROCARBON GAS ANALYSES USING ALUMINA-PACKED GLASS CAPILLARY COLUMNS. J. Inst. Petrol., 54 (538):265-277, Oct. 1968. 11 Refs.

The experimental conditions necessary to obtain quantitative hydrocarbon gas analysis by gas chromatography using alumina-packed glass capillary columns (0.01 inch id) and flame ionization detection are described. These conditions include the method of reducing the activity of the alumina and the procedure for maintaining a high and constant column performance. The deviation of detector response from true weight proportionality and the need to apply determined correction factors are shown. The quantitative results of a number of analyses of blends of saturated and unsaturated hydrocarbon gases are presented and statistically assessed repeatability figures are given. Analysis times are about a half of that required when using the conventional (3/16 inch id) columns. Inorganic gases, if present, must, however, be determined by other means. Chromatograms are shown to illustrate the application of these columns to the quantitative analysis of saturated and unsaturated hydrocarbon refinery gas streams, and also to natural gas samples. (Author's Summary)##

12579

Bovee, H. H. and P. A. Breysse

STUDY OF AIR QUALITY AND CONTAMINANT ANALYSIS FOR WORK UNDER COMPRESSED AIR. Am. Ind. Hyg. Assoc. J. 29(5):432-438, Sept.-Oct. 1968. 6 refs.

The quality of air in a tunnel being constructed under pressures varying from 0 to 30 psig was monitored for a period of 24 months. Except for an electrical fire and an oxygen deficiency incident, the tunneling was completed without hazardous levels of air contaminants being encountered. The compressor facilities and sampling and analytical procedures are described. (Authors' abstract)##

12668

R. R. Forsey

A DUAL-COLUMN GAS CHROMATOGRAPHIC METHOD FOR THE ANALYSIS OF LIGHT GASES. J. Gas Chromatog., 6 (11):555-556, Nov. 1968

Although many separation methods for H₂, N₂, O₂, CO₂, CO, CH₄, C₂H₆, and H₂O mixtures using gas chromatography have been described in the literature, all have had certain limitations. A system which combines a molecular sieve and a polyaromatic polymer-bead column has the advantage of eluting O₂ before N₂ and resolving CO₂ and J₂O, all at ambient or higher temperatures. The column temperature was programmed at 12 degrees C/min. from 30 degrees to 150 degrees C after the CO emerged from the molecular sieve column to speed the elution of water and higher molecular weight hydrocarbons from the polyaromatic polymer-bead column. Higher molecular weight hydrocarbons, amines, chlorinated and nitrated hydrocarbons may be analyzed by this method because the column can be programmed as high in temperature as 290 degrees C to speed the elution of these compounds.##

12887

Ludwig, C. B., R. Bartle, and M. Griggs

STUDY OF AIR POLLUTANT DETECTION BY REMOTE SENSORS. General Dynamics Corp., San Diego, Calif., (122)p., July 1969. 124 refs.

The feasibility of detecting the major air pollutants by earth-oriented, satellite-borne sensors is investigated. The major pollutants considered are carbon monoxide, sulfur dioxide, ozone, ammonia, nitrogen dioxide, typical hydrocarbons, and peroxyacetyl nitrate (PAN). The spectral region considered extends from the ultraviolet to the microwave region. Considerations of the number of species accessible to optical detection, the matter of day and night detection, and of specificity indicate that the infrared region extending from 3.5 microns to 13 microns is the most useful one. A discussion of the pollutant species, their occurrence, formation, chemistry, concentration levels, and distribution profiles through the atmosphere is given. The problems of detection in the UV and visible regions, in relation to aerosol and molecular scattering, are discussed. Calculations of signal changes expected for an ideal Rayleigh atmosphere are presented. Some considerations of aerosol (particulate) pollution detection are discussed. Then, the radiative transfer of the thermal emission of the earth and atmosphere under the influence of meteorological conditions is investigated. Signal changes arising from the difference in radiation levels due to clean and polluted atmospheres are calculated and found to be usually more than 1%. A performance evaluation of eight different spectroscopic instruments for the remote detection of pollutants is made. These include radiometers, grating spectrometers, Fourier-transform interferometer-spectrometers, three instruments based on optical correlation methods, microwave radiometers, and one active system--a satellite-based laser. Two instruments, which are based on optical correlation methods (matched filter and selective chopper), have the greatest potential for near-future application. (Authors' abstract modified)

13028

Bernert, Jurgen

A METHOD FOR DETERMINATION OF THE TOTAL AMOUNT OF COMBUSTIBLE ORGANIC SUBSTANCES IN WASTE GASES WITH HIGH WATER VAPOR

CONTENT. (Eine Methode zur Bestimmung der Gesamtmenge verbrennbarer organischer Substanzen in Abgasen mit hohem Wasserdampfgehalt). Text in German. Wasser Luft Betrieb, 13(6):215-216, June 1969. 5 refs.

The method for determination of the total amount of combustible organic substances in waste gases described in two previous papers by J. Bernert and R. Engelsfeld becomes inaccurate in cases when the waste gases have a high moisture content or are even saturated with water vapor. This drawback is corrected by a new sampling aspirator in which the waste-gas sample is cooled to remove the moisture by condensation. In this manner, the sample is separated into an aqueous phase and a gaseous phase. The determination of the total C concentration in the latter can now be carried out with high precision by the original method, while the composition of the condensate can be determined in several different ways. The method of Egli-Shar, which involves the determination of dissolved organically bound carbon in waste water, is believed to be best suited for this type of investigation.

13050

Budzak, Paul M.

SAFETY AND VENTILATION. Mining Engineering, 21(2):110-111, Feb. 1969.

Coal mine gas explosions may be due to an accumulation of undetected methane, a flammable gaseous hydrocarbon. A new methane monitoring system is being developed and tested by industrial and government agencies. This system is designed as an integral part of permissible face equipment and would automatically cut off power to the mining machines when the percentage of methane reached a concentration of 2% or more for a period of 3 sec. The monitor's electrical system is completely isolated from the mine's power circuit, and the warning lights of the monitor are visible to everyone in the vicinity of the unit. The monitor offers greater protection from methane gas liberated from the coal seam.

13154

Tada, Osamu

ON THE METHODS OF EVALUATING THE EXPOSURE TO TOXIC SUBSTANCES BY ANALYZING THE METABOLITES IN THE BODY. (Tainai taisha sanbutsu ni yoru yugaibutsu bakuro hyokaho). Text in Japanese. Rodo Kagaku (J. Sci. Labour, Tokyo), 45(4):171-183, 1969. 177 refs.

Under certain conditions, the amount of toxic substance absorbed by workers exposed to toxic air contaminants cannot be predicted from air analysis data. If the concentration of metabolites in tissue or excreta is proportional to that of the toxic substance in the air, the degree of adverse exposure may be evaluated by analyzing samples of expired air, blood, urine, or hair, with reference to atmospheric threshold limit values. Tests for assessing the level of exposure to carbon monoxide, mercuric vapor, inorganic lead, and chlorinated hydrocarbons are

discussed. Of the various methods developed for determining the carboxyhemoglobin level in the blood of workers exposed to carbon monoxide, the 20-second breath holding method is the most practical and convenient. If the determination is carefully made, the urinary excretion of mercury can be used as an indicator of exposure to mercuric vapor. The absorption of lead varies according to whether it is absorbed as fume or dust. Therefore, the degree of exposure should be evaluated by analyses of lead in urine or blood during repeated exposure. The storage of lead in the body can be determined by the increase in urinary excretion of lead following the administration of calcium ethylenediaminetetraacetate. The determination of urinary excretion of alkaline-pyridine reactants is tentatively suggested as an indicator of exposure to chlorinated hydrocarbons. (Author abstract modified)

13543

Brunauer, Stephen and Paul H. Emmett

THE USE OF LOW TEMPERATURE VAN DER WAALS ADSORPTION ISOTHERMS IN DETERMINING THE SURFACE AREAS OF VARIOUS ADSORBENTS. J. Am. Chem. Soc., Vol. 59, p. 2682-2689, Dec. 1937. 12 refs.

Low temperature van der Waals adsorption isotherms of various gases have been determined on a variety of adsorbents. Argon and nitrogen were determined at -195.8 C; argon, nitrogen, carbon monoxide and oxygen at -183 C; carbon dioxide at -78 C; and butane and sulfur dioxide at 0 C. A number of different adsorbents were used, including copper catalysts, nickel, silica gel samples, and activated carbon. All the adsorbents except carbon gave S-shaped isotherms. The values for the surface area evaluated from the different isotherms for the same adsorbent were consistent with each other.

13779

Thompson, C. J., H. J. Coleman, C. C. Ward, and H. T. Rall

DESULFURIZATION AS METHOD OF IDENTIFYING SULFUR COMPOUNDS. Anal. Chem., 32(3):424-430, March 1960. 11 refs.

A desulfurization technique is described for pure sulfur compounds and gas-liquid chromatography fractions of less than 0.0002 ml of sulfur compound concentrates from crude oils. The apparatus consists of an aluminum reaction tube packed with catalyst, a furnace for heating the reaction tube to the desired temperature, a motor-driven syringe for charging relatively large quantities of pure compounds, and the necessary adapters, valves, and connectors for handling very small trapped samples from the GLC column. Samples are passed through the apparatus at a temperature of 150 to 200 C, and the hydrocarbons produced upon desulfurization are collected and identified by gas-liquid chromatography. By analyzing the hydrocarbons produced, it is possible to determine the exact sulfur compounds found in the crude oil fractions. Data are presented showing the desulfurization of typical members of the sulfur compound classes: alkane and cycloalkane thiols, alkane and cyclic sulfides, thiophenes, and benzothiophenes.

13805

Chaigneau, M., L. Giry, and L. P. Ricard

ANALYTICAL INVESTIGATION OF SOME TYPES OF SOOT, USING MASS SPECTROMETRY. (Etude analytique de quelques suies par spectrometrie de masse). Text in French. Chim. Anal. (Paris), 51(4):187-195, April 1969. 9 refs.

Application of mass spectrometry to soot obtained from the combustion of fuel in a boiler furnace, from the combustion of motor fuel, and from chimney deposits caused by the burning of firewood revealed that carbonaceous deposits comprise complex mixtures containing numerous organic substances. Of the 74 organic bodies identified, 34 were hydrocarbons and these included a number of condensed-nucleus polycyclic compounds and aromatic hydrocarbons. Among the main compounds were derivatives of naphthalene, pyrene, perylene, acenaphthalene, and diphenyl. Other compounds identified were acridines, phenols, and quinones. The data obtained show that the composition of soot varies according to the origin of the fuel and the method of combustion. Soot from wood contains more hydrocarbons than soot from fuel oils or even motor fuels, but soot from fuel oil contains only hydrocarbons. Quinones, phenols and their ethers, acetic acid, and benzaldehyde are found only in soot from wood.

13974

Mrose, H.

DETERMINATION OF HYDROCARBON CONTENT OF THE AIR BY GAS CHROMATOGRAPHY. (Bestimmung des Kohlenwasserstoffgehaltes der Luft mit Hilfe der Gaschromatographie). Text in German. Z. Meteorol., 20(1-6):60-67, 1968. 9 refs.

A flame ionization detector installed at the outlet of an appropriate gas chromatographic column permits direct measurements for quantitative and qualitative analysis of atmospheric hydrocarbons up to 0.1 ppm. Traces two orders of magnitude smaller must be analyzed in concentrated form. The physical-chemical fundamentals of gas chromatography are briefly summarized, as is the function of the detector. An experimental apparatus which shows the stated sensitivities is described. (Author abstract modified)

13989

Oblaender, K. and D. Kraeft

DETOXICATION OF AUTOMOTIVE EXHAUST GASES - MEASURING METHODS AND TEST CYCLES. (Abgasreinigung an Kraftfahrzeugen - Messverfahren und Testzyklen). Text in German. ATZ (Automobiltechnische Zeitschrift) (Stuttgart), 71(4):117-124, 1969. 24 refs.

Detoxification of automotive exhaust gases raises not only motor engineering problems but also measurement engineering problems. The various methods for measurement of CO based on heat conductivity, on heat evolution and an infrared absorption are discussed and compared. The disadvantages of hydrocarbon measurements in the hexane range and of the flame ionization method are pointed out. Also discussed are the measurement of nitric oxide and the existing and planned multi-stage test cycles. A brief discussion of the possibilities of lowering the exhaust gas emission by motor modifications, the effects of traffic, and the fuel composition is included.

14109

Leonardos, Gregory, David A. Kendall, and Nancy J. Barnard

ODOR THRESHOLD DETERMINATIONS OF 53 ODORANT CHEMICALS. Preprint, Air Pollution Control Assoc., Pittsburgh, 23p., 1968. 4 refs. (Presented at the 61st Annual Meeting of the Air Pollution Control Assoc., St. Paul, Minn., June 23-27, 1968, Paper 68-13.)

Recognition odor thresholds for 53 commercially important chemicals were determined in the laboratory by an expert panel of four members. By standardizing the method of sample presentation and minimizing extraneous sensory interference, the concentrations determined as producing the minimum identifiable odor response provided consistent and internally comparable data for one parameter of odor. The odorants were presented to the panel in a static air system utilizing a low-odor background air as the dilution medium. The odor threshold was defined as the first concentration at which all panel members were able to recognize the odor. Aspects of human odor detection and of the concept of the odor threshold are discussed. The thresholds determined for each odorant in terms of parts per million by volume are presented. The minimum threshold observed was with trimethyl amine at 0.00021 ppm. As a group, compounds with sulfur had the lowest thresholds of the compounds tested. It was noted that carbon disulfide, sulfur dichloride, and sulfur dioxide affect the other chemical senses (taste and feel) as well. The presence of unsaturation in an odorant chemical was not found to be associated with low threshold concentrations, and it is observed that extended generalizations pertaining to the odor threshold based on similar chemical structures cannot easily be made. With reference to benzenoid-type materials, substitution on the benzene ring reduced the odor threshold by as much as a thousandfold depending on the nature of the group added, and in general produced a wide variation in thresholds. Three chemicals, toluene, styrene, and tolylene diisocyanate were purified by a gas-liquid chromatography to note the effect of chemical purity on the odor threshold; differences from thresholds determined from starting materials seemed slight, if any.

14125

Matsushita, Hidetsuru, Yasutomo Suzuki, and Hiroyuki Sakabe

A SPECTROFLUOROMETRICAL METHOD FOR DETERMINATION OF 3,4-BENZOPYRENE IN BENZENE SOLUTION CONTAMINATED WITH 3,4-

BENZFLUORANTHENE OR 3,4-BENZFLUORANTHENE AND 1,2-BENZOPYRENE.
Ind. Health, (Japan), vol. 3:107-120, 1965. 11 refs.

A spectrofluorometric method is proposed which consists of removing oxygen dissolved in a test solution, measurement of fluorescence, and determination by a narrow base line method as outlined by Commins. By this method, 3,4-benzopyrene can be determined accurately even in a solution containing 3,4-benzopyrene, 3,4-benzofluoranthene and 1,2-benzopyrene in a concentration ratio of 1:100:100. This method has an advantage over the ordinary peak method in that it eliminates interference of the contaminants which may be attributed to the following facts. Fluorescence intensities of the contaminants change in an approximately linear manner over the narrow range of wavelength near 405 millimicrons and removing the oxygen makes the characteristic peak of 3,4-benzopyrene distinct at 405 millimicrons. However, the narrowing of wavelength range has some limit, as it results in a decrease in peak height and drop in sensitivity. The base line which connects the two points 25-30A distant from the 405 millimicron peak on either side is assumed to be most suitable for the determination of 3,4-benzopyrene in the benzene solutions contaminated with impurities. Selection of an excitation source seems to be an important factor to minimize interference of contaminants, although in this case only 366 millimicron mercury light was used. If the exciting light is so selected that it is absorbed strongly by 3,4-benzopyrene and weakly by contaminants, the present method will be also useful for the determination of 3,4-benzopyrene in a solution contaminated with various other polynuclear hydrocarbons.

14173

Sharkey, A. G., Jr., J. L. Shultz, T. Kessler, and R. A. Friedel

DETERMINING ORGANIC CONTAMINANTS IN AIR AND WATER. Res./Dev.,
20(9):30-32, Sept. 1969. 14 refs.

In this limited investigation of organic contaminants in airborne particulate matter and treated sewage, the potential of the high-resolution mass spectrometer for expanding the knowledge of pollutants in air and water supplies is demonstrated. A major advantage of this type of instrumentation is that the elemental compositions of a wide variety of components can be determined on essentially total samples. Information concerning alkyl derivatives, such as carbon number distribution data obtainable by mass spectrometry, could be of prime importance in studies of carcinogenic pollutants. A limitation is that particular isomers cannot be determined. Combined gas chromatographic-mass spectrometric techniques, particularly with the use of high-resolution mass spectrometry in this combination, will increase the usefulness of the method for studies of organic pollutants. Data are presented on ten typical airborne pollutants to illustrate the applicability of the high-resolution technique to detect and determine the elemental composition of polynuclear species in atmospheric particulate matter. Additional data are given to illustrate the ability of the instrument to detect organic compounds having the same nominal molecular weight but different precise mass resulting from the presence of heteroatoms. (Author conclusions modified)

14301

Wallcave, Lawrence

GAS CHROMATOGRAPHIC ANALYSIS OF POLYCYCLIC AROMATIC HYDROCARBONS IN SOOT SAMPLES. Environ. Sci. Technol., 3(10): 948, Oct. 1969. 3 refs.

An unknown pyrene derivative was isolated from soot by Long and Chakraborty in 1967. An apparently identical compound isolated by this author from a coal tar pitch is presumed to be cyclopenta(c,d)pyrene (or acepyrene). The absorption spectrum of this substance has the seemingly characteristic peaks found by Long and Chakraborty at 378 and 358 millimicrons. Its molecular weight is 228, and its mass spectrum possesses peaks at m/e values greater than 228. Cyclopenta(c,d)pyrene is the only compound of reasonable structure that can have a molecular weight of 228 as well as the absorption spectrum and chromatographic behavior of an alkyl pyrene derivative. It is by no means a trace element. Five to 10 micrograms were isolated from 5 mg of coal tar pitch, indicating a concentration of 0.1%.

14428

Hadzija, Olga

ABSORBENTS IN MICROANALYSIS. IV. ADSORPTION PROPERTIES OF SILICA GEL IN SIMULTANEOUS DETERMINATION OF CARBON, HYDROGEN, AND IODINE OR CARBON, HYDROGEN AND SULPHUR. Mikrochim. Acta (Vienna), no. 5:1114-1116, 1969. 2 refs.

A simple gravimetric method is described for simultaneous microanalytical determination of carbon and hydrogen together with sulfur, bromine, or iodine, in non-nitrogenous compounds. Commercial silica gel is used as the external absorbent for sulfur dioxide and halogens at room temperature. Under these conditions, sulfur dioxide does not oxidize to sulfur trioxide. The increase in weight of the silica gel tube corresponds to sulfur dioxide formed from which the percentage of sulfur can be calculated. One silica gel layer can be used for 4-5 analyses, provided that the first analysis is that of a sulfur-containing compound. The method does not work for nitrogen-containing compounds.

14430

Benes, Milos, Milada Malechova, Jiri Malecha, and Jaroslav Myslivecek

ANALYSIS OF GASEOUS MIXTURES CONTAINING CARBON MONOXIDE, CARBON DIOXIDE, HYDROGEN, METHANE, NITROGEN AND OXYGEN. (Deleni smesi kyslicniku uhelnateho, kyslicniku uhliciteho, vodiku, methanu, dusiku a kysliku plynovou chromatografii). Text in Czech. Chem. listy, 63(6):703-709, 1969. 13 refs.

The title compounds are found in combustion products, in chemical plants, and in all cases where the burning of fuel is not fully

accomplished. The use of gas chromatography for measurement gives more precise and rapid results than all other known methods. Analysis of incompletely burned methane uses helium as carrier gas and thermal conductivity and combustion detectors are used for determinations. Gases are separated on a molecular sieve 5A and Synachrome. Individual gaseous mixtures are recorded at maximal sensitivity, in accordance with possible percentage content of individual components in the sample. From empirical results it is evident that the greatest accuracy is achieved for carbon dioxide and methane and the least for nitrogen.

14470

Steger, Eberhard and Hermann Kahl

THE ANALYSIS OF GASEOUS AIR CONTAMINATIONS BY INFRARED SPECTROSCOPY. (Die ultrarotspektroskopische Analyse gasfoermiger Luftverunreinigungen). Text in German. Chem. Tech. (Berlin), 21(8):483-488, Aug. 1969. 43 refs.

The detection thresholds of infrared spectrometry were determined for diethylether, carbon tetrachloride, benzene, acetone, methanol, carbon dioxide, sulfur dioxide, hydrogen sulfide, propane, and acetylene in the gaseous state. The recorded spectra were analyzed by the method of Wright. In all analyses of the gases, such influences as pressure and interference by other compounds must be taken into account. It is important to use the same pressure for the measurement and the calibration. Interfering substances, particularly H₂O, were eliminated by use of the drying agent calcium chloride. Study of mutual interference showed that only methanol was slightly influenced by diethylether. The error calculation method for evaluation was used when the average value was determined from at least five measurements. The detection thresholds found for the substances measured are listed. It is concluded that infrared spectrometry can be used for gas analyses in the concentration range of the threshold limit value for eight hours (with the exception of H₂S). It is not good enough, however, for concentrations in the range of maximum allowable values in the atmosphere.

14476

Ixfeld, H.

METHOD FOR DETERMINING ORGANIC SUBSTANCES IN WASTE GASES. (Verfahren zur Erfassung organischer Substanzen in Abgasen). Text in German. Brennstoff-Chem. (Essen), 50(6):186-189, June 1969. 4 refs.

The method of Ixfeld and Buck for quantitative determination of organic substances in waste gases (with the exception of the hydrocarbons C₁-C₄) can be improved if the samples are carefully taken and prepared. This improvement is illustrated by the example of waste gases from a lacquer-drying stove. The waste gases from these stoves are usually cleaned in catalytic after-burners. The partially clean gases contain much higher fractions of CO₂ (50 to 100 g/cu m) and water vapor (20 to 50 g/cu m) than the uncleaned waste gases. These high concentrations may have a

considerable influence on hydrocarbon analysis by the Ixfeld and Buck method. To determine the magnitude of this influence, CO₂ and synthetic air were mixed in a 1:1 ratio and freed of combustible organic substances. The gas mixture, cooled to room temperature and saturated with water vapor, was passed for 10 min through a silica gel tube. The tube was tightly sealed afterwards and left to rest for periods of up to 24 hrs. After that it was flushed for 5 min with nitrogen and desorbed. The desorbed CO₂ quantity was proportional to the length of time the silica gel tube rested. The optimum resting period between the two flushings was 4 hrs. After this period, further reduction of the remaining CO₂ content was found to be negligible. The nitrogen flushings did not influence analysis of the adsorbed organic substances. Similar experiments were conducted to determine the influence of H₂O. So-called MN silica gel was used as the adsorbent and hexane as the organic component with synthetic air. The measurement errors increased with water content. Lowering of the gas throughput in the same sampling time brought no improvement. Aerosols can be better sampled if glass fiber filters are inserted ahead of the silica gel tube.

14525

Innes, W. B.

SELECTIVE COMBUSTION ANALYSIS AND APPLICATION TO AUTO EXHAUST. Franklin Inst. Research Labs., Philadelphia, Pa., Materials Science and Engineering Dept. and Public Health Service, Durham, N. C., National Air Pollution Control Administration, Proc. First Natl. Symp. on Heterogeneous Catalysis for Control of Air Pollution, Philadelphia, Pa., Nov. 1968, p. 363-382. 4 refs.

The application of a vanadia catalyst to hydrocarbon analysis is discussed. The combination of hydrocarbon-carbon monoxide analysis involves a second parallel reactor with a Hopcalite catalyst. Air with constant moisture content passes through a temperature-controlled preheater and catalyst bed at a constant flow rate, and the gas sample is added to the air stream in a small quantity. A review of California data indicated that the idle mode was reasonably good for predicting pass/fail hydrocarbon emission levels and that it could be correlated with cyclic values on a statistical basis. About 300 cars were tested at local service stations, car washes, and dealerships which were believed to be representative of the Los Angeles basin car population. About 200 cars were also tested in car clinics. The results suggested that over half the emissions can be attributed to the high emitters (greater than 1000 ppm), most of which are believed to have defective ignition systems. The effect of routine tuneup by tuneup specialists on emissions was also studied. The results, in line with other studies, suggest that cars with reasonably low emissions are not helped and emissions may even increase, and that the average degree of improvement from a professional tuneup is proportional to how much the levels exceed that of a car in good shape. Together with the distribution data, they suggest that an effective check and correct program could lower emissions by as much as 50%.

Skala, H., F. G. Padrta, and P. C. Samson

DIESEL ENGINE POLLUTANTS. PART I. IDENTIFICATION. Franklin Inst. Research Labs., Philadelphia, Pa., Materials Science and Engineering Dept. and Public Health Service, Durham, N. C., National Air Pollution Control Administration, Proc. First Natl. Symp. on Heterogeneous Catalysis for Control of Air Pollution, Philadelphia, Pa., Nov. 1968, p. 209-220.

High molecular weight organic constituents of diesel exhaust other than unburned diesel fuel were identified. Samples were collected by the use of a thermal gradient trap from a slip stream off the total exhaust effluent. The organic pollutants were partitioned out with n-hexane. A portion of the diesel odor concentrate was subjected to additional separation over silica gel. Identification of the components was made by mass spectrometry. The pollutants were found to be partially oxidized components of the diesel fuel over its full molecular weight range. Five different classes of oxygenated hydrocarbons were found: aldehydes and ketones, carboxylic acids, alcohols, phenols, and nitrophenols. These yielded a total of over 400 observable species. Aldehydes and ketone derivatives of paraffins, cycloparaffins, olefins, and aromatics were observed. In the aromatic series, benzaldehyde, indanone, cinnamaldehyde, indenone, naphthaldehyde, acenaphthenone, and fluorenone and their higher homologues were found. The aromatic carbonyl compounds were the predominant species. The vital role of the aromatic oxygenates in the diesel odor picture was further substantiated by the absence of diesel odor in the exhaust when a fuel consisting of only n-paraffins was used. The precursors of diesel odor are therefore considered to be primarily the aromatics present in diesel fuel. Their observed relative enrichment is reasonable when one considers the relative rates for oxidation of a paraffin versus an aromatic. For aromatics, oxidation to intermediate compounds is faster than for paraffins, and complete oxidation is slower.

Jaeger, J. and O. Lugrova

DETERMINATION OF 3,4-BENZOPYRENE IN A MIXTURE BY FLUORESCENCE SPECTROGRAPHY AT THE TEMPERATURE -197 C. (Stanoveni 3,4-benzopyrenu ve smesi pomoci fluorescencni spektrografie za teploty -197 C). Text in Czech. Chem. Zvesti, 19(10):774-782, 1965. 18 refs.

Analysis of aromatic polycyclic compounds is made possible using fluorescence spectrography at very low temperatures. Suitable solvents are chosen from the normal paraffin series. Under this condition, the spectrum has very sharp peaks, comparable to atomic absorption spectra. The presence of the substances can be detected even if they exist as traces in concentrations of 10 to the minus 11th power to 10 to the minus 9th power g/ml. 3,4-Benzpyrene gives a sharp maximum at 4030 Å at a concentration of 10 to the minus 11th power in 1 ml of octane. The test is carried out on a thin sheet of aluminum

oxide. A standard solution of pure 3,4-benzpyrene is added to the specimen so that after the dilution, the limit of 0.15 micrograms/ml is not exceeded. To keep error lower than 8%, absorption of the solution should never be higher than 0.017 for 1 cc of solution at 3650 Å. The other sources of measurement error are high concentration, unsteady current in the source of radiation, error in freezing the dilution, and error of dilution.

14662

Dikun, P. P.

DETECTION OF POLYCYCLIC AROMATIC HYDROCARBONS IN POLLUTED ATMOSPHERE AND OF OTHER POLLUTANTS BY MEANS OF QUASILINEAR FLUORESCENCE SPECTRA. (Obnaruzheniye polititsiklicheskikh aromaticheskikh uglevodorodov v zagryazneniyakh atmosfernogo vozdukh a drugikh ob'yektakh s pomosh'yu kvazilineychnykh spektrov fluorestsentsii). Text in Russian. Zh. Prikl. Spektroi, 6(2):202-209, Feb. 1967. 19 refs.

Contaminants present in urban atmospheres were investigated by column and thin-layer chromatography and by spectral analysis of quasilinear fluorescence spectra. Nine substances, including three compounds possessing very high carcinogenic activity, were detected in contaminated atmospheres. Polycyclic aromatic hydrocarbon data obtained from the present investigation were compared with earlier data. Structural formulae of the compounds found in the polluted atmosphere are given. Tables give numerical information extrapolated from data obtained by means of fluorescence spectroscopy.

14722

STUDY OF THE CONTINUOUS DETERMINATION OF ORGANIC SUBSTANCES WITH FLAME IONIZATION DETECTORS. (Beitrag zur kontinuierlichen Summenbestimmung organischer Substanzen mit Flammenionisationsdetektoren). Text in German. Wasser Luft Betrieb, 12(2):68-69, 1968. 8 refs.

Two hydrocarbon analyzers were used for continuous determination of gaseous organic substances in the air. They were set up in a busy street of Berlin and calibrated with 4.6 and 16.5 ppm methane in synthetic air. The recordings were evaluated by planimetry and half-hourly averages were computed. From these, the daily averages were computed for a total of 20 measurement days. From the daily averages for a concentration range of 2.0 to 7.3 ppm methane, a standard deviation of 0.46 ppm was obtained. The results showed that the flame ionization detector can be used for such measurements if it is carefully calibrated and serviced.

14773

Starshov, I. M. and G. Ya. Ivanova

DETECTION OF TRACE QUANTITIES OF DICHLOROETHANE IN AIR. (Opredeleniye mikrokolichestva dikhloretana v vozdukh e). Text

in Russian. Gigiena i Sanit., no. 7:54-55, 1969. 4 refs.

Chromatographic detection of dichloroethane using a DIP-1 chromatograph is described. Analysis takes four minutes and is sensitive to a concentration of 0.005 g dichloroethane per liter of air. This equipment is suitable for single determination or for continuous monitoring. Preparation and calibration of the column is described.

14839

Freedman, R. W., H. W. Lang, and M. Jacobson

GAS CHROMATOGRAPHIC ANALYSES OF THE PRINCIPAL CONSTITUENTS OF MINE ATMOSPHERES. Bureau of Mines, Washington, D. C., RI 7180, 13p., Sept. 1968. 7 refs.
CFSTI: PB 183 373

A gas chromatographic method for the rapid and accurate determination of oxygen, nitrogen, carbon dioxide, and if present, carbon monoxide, in mine air was developed. This method replaces presently used gas-reaction types such as the Haldane or Orsat analysis, offering advantages of precision, accuracy, speed, and convenience. The gas chromatographic system can detect O₂, N₂, CH₄, and CO₂ in a sample of air in concentrations ranging from 0.01 to 100%. Precision and accuracy are attainable over most of the range with a coefficient of variation of plus or minus 1%. Chromatographic analysis is complete within about 7 minutes of sample injection. If carbon monoxide is present in excess of 0.01%, it can be determined as a peak separating about 3 minutes later. The sample is introduced by a gas sampling valve and is split into two analytical columns. Column 1 separates oxygen, nitrogen, and methane, and, if indicated, carbon monoxide. The methane peak appears in about 6 minutes, and the carbon monoxide peak appears in about 10 minutes. Column 2 effects the separation of carbon dioxide from composite gases in about 2 minutes. Concentrations of the gases are quantitatively determined by comparing the integrated peak areas with the areas of standard gas peaks under similar conditions.

15171

Yamate, Noburu

MANUAL METHODS AND AUTOMATIC CONTINUOUS INSTRUMENTS FOR MEASUREMENT OF GASEOUS AIR POLLUTANTS. (Gasujo taiki osenshitsu no sokutei to sono sokuteikiki). Text in Japanese. Kogai to Taisaku (J. Pollution Control), 5(10):785-796, Oct. 1969. 36 refs.

In order to prevent air pollution, measurement of pollutant concentrations must be continuously performed. In this report, both continuous monitoring and manual analyses of typical air pollutants are reviewed. Numerous methods are tabulated and most of them are explained, with particular attention to continuous methods and apparatus. Sulfides are measured manually by colorimetric analysis with rosaniline or barium molybdate, by the

lead per oxide method, or by test paper methods. Sulfides are also measured continuously by means of solution conductance (Thomas autometer) or by optical absorption with rosaniline or with iodine-starch. Carbon monoxide is measured manually with palladium sulfate and ammonium molybdate, by gas chromatography, or by the hopcalite method. It is measured continuously by infrared or ultraviolet absorption of reduced mercuric oxide. Nitrides are measured manually by the Saltzman or the Jacobs method, or with ortho-tolidine sulfate. Hydrogen sulfide is measured manually by methylene blue and continuously by a colorimetric filter paper method. Hydrocarbons are measured manually by gas chromatography and continuously by flame ionization detectors. Formaldehyde is measured manually by colorimetric analysis with a chromotropic acid or with acetylacetone, or by the MBTH method. Ozone is measured manually by the phenolphthalein or the potassium iodide method and continuously by coulometric titration or by optical absorption with potassium iodide. Fluorides are measured manually by colorimetric analysis with thorium neothron(?) or lanthanum alizarin complex and continuously by filter paper fluorescence. Actual Tokyo data on changes in the concentrations of carbon monoxide, nitric oxide, and nitrogen dioxide are tabulated.

15200

King, W. H., Jr.

THE CONTINUOUS MEASUREMENT OF HYDROGEN, METHANE, AND HYDROCARBONS IN THE ATMOSPHERE. Preprint, American Chemical Society, Washington, D. C., 20p., 1969. 3 refs. Presented at the American Chemical Society, 158th National Meeting, New York, Sept. 8-12, 1969.

Photochemically inert methane accounts for 90% of atmospheric hydrocarbons, and its large signal interferes with the flame ionization detection of active smog-producing hydrocarbons. To overcome this problem in hydrocarbon monitoring, automatic systems were developed which use a flame ionization detector or water sorption detector in conjunction with a selective catalytic combustor. The programmed combustor unit, consisting of a quartz tube containing a platinum wire coil, takes advantage of methane's inertness to analyze for it in the presence of hydrocarbons. The combustor can be utilized in three ways, each of which was evaluated for several months in the laboratory and in the field. One method involves the selective combustor and a flame ionization detector. An automatic zero level, methane, and total hydrocarbons are recorded by this method. In the second method, hydrocarbons are dried, combusted, and converted to water and carbon dioxide. The water is detected by a sorption detector. Hydrogen, olefins, paraffins, and methane are recorded. The third method is analogous to the second, except that carbon dioxide is determined, rather than water. The second method is preferred since no extra gases are required, calibration is simple, and equipment is portable and battery-operated. With this technique, 1.6 ppm methane, 1.5 ppm paraffins, and 1.9 ppm olefins and other reactive hydrocarbons have been recorded. However, it is expected that air monitoring stations with flame units will prefer the first method. The water sorption technique should gain acceptance if hydrocarbon monitoring becomes important.

Institut National de l'Industrie Charbonniere, Liege, Belgium

DESIGN OF A METHOD OF SAMPLING AND MEASURING HEAVY HYDROCARBON CONCENTRATIONS IN COMBUSTION FUMES. (Mise au point d'une methode de prelevement et de dosage des hydrocarbures lourds dans les fumees de combustion). Text in French. Bull. Tech. Houille et Derives, no. 36, 15p., March 1968.

A method was devised for sampling and measuring heavy hydrocarbons in combustion smokes. The sampling technique is based on the adsorption of the hydrocarbons on a short adsorbent column placed within the chimney itself. The smokes can be drawn up through the sampling tube in less than one minute with the help of a rubber syringe of the 'Propipette' type. To measure the hydrocarbons collected, the sampling tube is inserted in a carrier gas circuit which also includes a flame ionization detector. The tube is brought to a high temperature in a mobile oven. The hydrocarbons are desorbed and carried by the carrier gas towards the detector; there is no separation of the hydrocarbons, and the response appears in the form of a single peak on the recording paper. It is possible to desorb hydrocarbons with a boiling point above 500 C, and it has been demonstrated that no cracking occurs. The drainage output, which depends on the boiling temperatures of the sampled hydrocarbons, is excellent and can be still further improved if, prior to the sampling, the tube is cooled to the temperature of the dry ice. With regard to sensitivity, it was demonstrated that, in the case of anthracene, quantities equal to 0.000001 g produced a peak the area of which allowed a precise measurement to be made. The method also makes it possible to carry out a detailed analysis of the sample and determine the individual concentrations of the various components. For this purpose, a chromatographic column must be inserted into the carrier gas between the sampling tube and the detector. Several examples of the determination of total and individual concentrations are given in various fields: synthetic mixtures, combustion smokes, cigarette smokes, and automobile exhaust gas. The possibility of applying the method to the measurement of benzo(a)pyrene is being considered. In variation, a second method of assessing the sample by methanol elution followed by a spectrophotometric examination is described.

15337

Stanley, Thomas W., Myrna J. Morgan, and James E. Meeker

RAPID ESTIMATION OF 7H-BENZ(DE)ANTHRACEN-7-ONE AND PHENALEN-1-ONE IN ORGANIC EXTRACTS OF AIRBORNE PARTICULATES FROM 3-HOUR SEQUENTIAL AIR SAMPLES. Environ. Sci. Technol., 3(11):1198-1200, Nov. 1969. 5 refs. (Presented at the Div. of Water, Air, and Waste Chemistry, American Chemical Society, 156th Annual Meeting, Atlantic City, N. J., Sept. 1968.)

Thin-layer chromatography using glass-fiber paper impregnated with silica gel was used to separate 7H-benz(de)anthracen-7-one and phenalen-1-one found in acetone extracts of airborne particulates from 3-hr sequential air samples. Only 15 min was required to separate 0.2-1.25 mg of the crude extract with 19:1 pentane-ether.

Direct fluoremetric measurement and scanning at F 418/550 and F 409/490 indicated concentrations ranging from 2 to 48 micrograms/1000 cu m of air for 7H-benz(de)anthracen-7-one and from 0.3 to 17 for phenalen-1-one. For 7H-benz(de)anthracen-7-one, the precision of the method calculated as relative standard deviation was approximately 3.2%, with a detection limit at 5 nanograms. For phenalen-1-one, the precision was approximately 1.0%, with a detection limit at 2 nanograms. The method was applied in analysis of 3-hr sequential air samples taken with Hi-Vol samplers over two 24-hr periods during January 1968 in polluted urban atmospheres. In the absence of detailed meteorological and land-use data, no meaningful conclusions can be drawn to explain changes in concentrations of these compounds during the 24-hr periods investigated. At the same site used for this investigation, a different diurnal distribution pattern was observed for four polynuclear aromatic hydrocarbons. However, the distribution patterns were consistent with peak concentrations occurring from 6-9 a.m. and from 3-6 p.m. The direct spectrophotofluorometric procedure reported in this paper and similar procedures show potential for application to more comprehensive air pollution studies.

15354

Wilson, K. W., G. J. Doyle, D. A. Hansen, and R. D. Englert

PHOTOCHEMICAL REACTIVITY OF TRICHLOROETHYLENE AND OTHER SOLVENTS. Am. Chem. Soc. Div. Org. Coatings Plastics Chem. Preprints, 29(2):445-449, 1969. 6 refs. (Presented at the 158th Meeting of the Am. Chem. Soc., Div. Organic Coatings and Plastics Chemistry, New York, Sept. 1969.)

A special smog chamber was built to study the slowly reacting solvents which, in the presence of nitrogen oxides, form smog much more slowly than do automobile exhausts. The chamber has Pyrex panels with an access wall of cast aluminum. The aluminum wall incorporates eye ports for measurement of eye irritation, an access hole for the optics of a multireflection infrared cell, and sampling ports through which gas is removed for wet chemical analysis. An air purification system for the chamber removes contaminants by catalytic combustion over platinum at 5-8 atm and 500 to 600 C and cools the purified air to below 327 C and about 1 atm. Performance of the chamber was validated by charging it with test hydrocarbons, e.g., ethylene, cyclohexane, trichloroethylene, xylenes, and paraffins at 1, 4, or 8 ppm and nitric oxide at 0.25, 1, or 2 ppm. The photooxidation experiments show that the rate of photochemical smog formation decreases as the hydrocarbon:nitric oxide ratio decreases and that eye irritation is caused primarily by formaldehyde. As judged by its rate of disappearance, trichloroethylene is less reactive than ethylene. Trends observed with changing concentrations of trichloroethylene also suggest that average atmospheric concentrations of trichloroethylene would produce no eye irritation or other measurable smog symptoms.

15355

Luis, P., C. N. Carducci, and A. Sa

DETECTION OF FLUORINE ON THE NANOGRAM SCALE; INORGANIC AND ORGANIC

FLUORINE COMPOUNDS. Mikrochim. Acta (Vienna), no. 4:870-881, 1969. 6 refs.

Simple techniques are described for detecting fluorine on the nanogram scale. They are based on the evolution of hydrofluoric acid as revealed by an alizarin-3-methylamine-N,N'-diacetic acid-cerium(III) complex reagent and the use of a Pyrex capillary siliconized to prevent the glass from retaining hydrofluoric acid at ordinary temperatures. The methods are suitable for the detection of fluoride in waters, minerals, salts, and organic compounds including complex pharmaceutical preparations and plastics. Even 150 pg of fluorine can be revealed in a 1:500,000 solution of the reagent.

15400

EXTENDED TESTING OF THE METHANE IONIZATION DETECTOR. (FINAL REPORT). Contract AT(30-1)-3717, Melpar, Inc., Falls Church, Va. Rept. NYO-3717-1, 21p., Dec. 1968.

A sensitive automatic detector was developed for monitoring the building of methane in coal mines and detecting the gas before it reaches the lower explosive limit. The detector uses a cross-section ionization detector as the basic transducer. Each transducer cell contains two foil electrodes and each electrode contains titanium tritide. A preliminary series of mine tests resulted in improved electronic-circuitry waterproofing, conversion to a single-point ground system to prevent ground loop problems, addition of a heater to prevent condensation of moisture within the detector, and pneumatic balancing of the gas transport system. A reference air system was added to improve the unit's response to small or slow changes in methane concentration. Cross-talk and pickup problems were eliminated when retested and operated continuously for 48 hours, the unit gave no false positive indications of methane concentration. Unfortunately, the probe or the probe line could be damaged by large chunks of falling coal. It is thought that this difficulties can be ameliorated by using flexible armored hose instead of stainless steel tubing in the sampling line. The detector has good sensitivity and high selectivity, low noise level and drift rate, and simple maintenance requirements.

15484

Lang, Helen W., W. E. O'Neill, B. A. Coulehan, and R. W. Freedman

CONTINUOUS MONITORING OF DIESEL EXHAUST GAS FOR CARBON DIOXIDE, CARBON MONOXIDE, OXYGEN, METHANE, AND NITROGEN OXIDES. Bureau of Mines, Washington, D. C., RI 7241, 14p., March 1969. 9 refs.
CFSTI: PB 183386

A monitoring system was applied to provide rapid, continuous analyses of diesel exhaust gas. Commercially available continuous analyzers with strip chart readout were employed for nitric oxide, carbon dioxide, methane, carbon monoxide, and oxygen. All five continuous analyzers performed satisfactorily during the preliminary testing and were used successfully during

several actual diesel approval tests. The results were checked by two independent analytical methods: gas volumetric and gas chromatographic analyses. It was shown that the use of nondispersive infrared analyzers is a generally accepted technique for on-stream analysis of carbon dioxide, carbon monoxide, and methane gases. Polarographic analyzers worked well for on-stream analysis of oxygen. Mass spectrometry was used to determine the nitric oxide content. Strip chart recorders provided permanent records of all concentration changes during the course of the approval tests. It was believed that the use of analyzers would speed up the diesel approval testing procedure.

15529

Johnson, J. E., M. E. Umstead, and W. D. Smith

NUCLEAR SUBMARINE ATMOSPHERES. PART 2. DEVELOPMENT OF A TOTAL HYDROCARBON ANALYZER. (Interim Report). Naval Research Lab., Washington, D. C., Chemistry Div., NRL Problems C08-30, R05-24B, C08-33, Projects SF-013-08-03-4092-4095, WW-041, SP-89422, NRL 6064, Sp., Jan. 30, 1964. 12 refs.
CFSTI: AD 431141

An instrument was developed for the shipboard monitoring of total hydrocarbons in nuclear submarine atmospheres. In addition to total hydrocarbons, the instrument also measures methane and Freon-12 and, with a slight modification in operating procedure, Freon-11. The system is based on a chromatograph technique coupled with a highly sensitive flame ionization detector. An air sample is injected into a chromatographic column and chromatographed in the usual manner until the methane and Freon-12 peaks emerge. At this point, the flow of carrier gas is reversed and the higher hydrocarbons are backflushed from the column through the detector as a single peak. The area under the backflushed peak provides a measure of the total atmospheric hydrocarbon content. The instrument was successfully tested at sea, with hydrocarbons detected within a few minutes. The analyzer is relatively insensitive to interference by water, CO₂, and other organic gases.

15541

Turk, Amos, Jack I. Morrow, Stephen H. Stoldt, and Warren Baecht

ENHANCED DESORPTION OF ATMOSPHERIC SAMPLES FROM ACTIVATED CARBON. Preprint, City Coll., New York, Dept. of Chemistry, 13p., (1963?), 7 refs.

Enhanced desorption techniques as compared with normal desorption provide significantly more information on the presence of contaminants in air, especially hydrocarbon materials, thus enabling sufficiently specific descriptions of individual atmospheres to afford valuable characterizations. The feasibility of enhanced desorption was first tested on butane and CCl₂F₂ using carbon tetrachloride as the displacing vapor. The enhancement of butane desorption ranged between 35% and 41%. The CCl₂F₂ desorption was also enhanced but to a lesser degree, possible due to the lesser difference in molecular weights between CCl₄

and CCl₂F₂ than between CCl₄ and butane. The percentage desorption of CCl₂F₂, with or without CCl₄, decreased in successive runs, accompanied by the formation of an insoluble white polymer that probably caused some pore blockage on the carbon surface. Preliminary tests on atmospheric samples using activated carbon (wherein carbon tetrachloride was allowed to adsorb into the carbon in vacuo and was then chromatographed) showed an increased response. Infrared spectra obtained from carbon samples exposed to air at gas sampling stations showed the following: 2360 and 2310 reciprocal cm peaks were probably CO₂; the broad 2080 reciprocal cm peak was indicative of CO; the 2940, 2920, and 2860 reciprocal cm bands were due to CH₂ and CH₃ group absorptions. Carbons of greater surface area per unit weight have a greater adsorption capacity and will adsorb more rapidly than carbons of more limited area. Charcoal with the smaller pore diameter has adsorbate molecules with a lower vapor pressure; diffusion through the narrower pores is more difficult.

15708

Hoffmann, Dietrich, Yoshito Masuda, and Ernest L. Wynder

A-NAPHTHYLAMINE AND B-NAPHTHYLAMINE IN CIGARETTE SMOKE. *Nature*, 221(5177):254-256, Jan 18, 1969. 8 refs.

Epidemiological data suggest an association between cigarette smoking and urinary bladder cancer in men. Identification in cigarette smoke was made of A-naphthylamine and B-naphthylamine, which are known experimental bladder carcinogens. For the quantitative analysis, A and B-naphthylamines labelled with ¹⁴C were used as internal standards. Samples isolated chromatographically were subsequently identified by mass spectrometry.

15730

Tubina, A. Ya. and L. V. Mel'nikova

METHODS OF DETERMINATION OF NITROMETHANE AND NITROETHANE IN THE AIR PRODUCTION INSTALLATIONS. (Metody opredeleniya nitrometana i nitroetana v vozdukhie proizvodstvennykh pomeshcheniy). Text in Russian. *Gigiena Truda i Prof. Zabolevaniya*, vol. 6:49-50, 1969.

A polarographic method for detecting nitromethane and nitroethane and a colorimetric method for detecting nitromethane in air are described. The polarographic method adequately detects 0.2 micrograms of nitromethane and 0.25 micrograms of nitroethane per milliliter of water. The colorimetric method is capable of detecting 0.2 micrograms of nitromethane in 2 milliliters of solution. A 0.2 liter air sample is thus adequate for detecting concentrations of these components at levels 3-15 times below permissible values.

15749

Ludwicka, Antonina

THE PROJECT OF NORMALIZED METHOD FOR DETERMINATION OF VAPORS OF

BENZYL CHLORIDE IN AIR. (Projekt znormalizowanej metody oznaczania par chlorku benzylu w powietrzu). Text in Polish. Med. Pracy (Warsaw), 20(4):425-429, 1969.

Two standardized methods for the determination of benzyl chloride vapor in air were discussed which use nitration or pyridine. The nitration process consisted of nitrating benzyl chloride to form 2,4-dinitrobenzyl chloride. Methyl ethyl ketone was added to extract 2,4-dinitrobenzyl chloride. Potassium hydroxide was then added and the resulting violet color determined the concentration. The reaction of warmed pyridine and sodium hydroxide or benzyl chloride resulted in a yellow-orange solution which also determined the concentration. The analysis for both methods was 1 mg/cu m or 5 mg/cu m, depending upon the amount of air sampled.

15763

Candeli, A. and G. Morozzi

THE PROBLEM OF THE CARCINOGENICITY OF ATMOSPHERIC POLLUTANTS. III. THE RADIOACTIVE TRACER TECHNIQUE FOR THE QUANTITATIVE DETERMINATION OF AROMATIC POLYCYCLIC HYDROCARBONS. (Il problema della cancerogenicit  dell'aria inquinata: III. Tecnica dei traccianti radioattivi per la determinazione quantitativa degli idrocarburi aromatici policiclici). Text in Italian. Giorn. Igiene Med. Prevent. (Genoa), 10(1):3-15, 1969. 20 refs.

A tracer technique using H 3- labeled 3,4-benzopyrene was employed to determine the extent of 3,4-benzopyrene loss during analytical procedures such as column chromatography followed by paper chromatography. The H 3-labeled benzopyrene was added to a solution of pure aromatic polynuclear hydrocarbons as an internal standard. The amount of H 3-labeled benzopyrene was determined at the beginning and end of the analysis by a liquid scintillation counting technique. The experimental results showed that the recovery percentage of tritiated 3,4-benzopyrene corresponds to the recovery percentage of the non-tritiated 3,4-benzopyrene. The tracer technique was also satisfactory with other polynuclear compounds. The loss of the polynuclear compounds was about 30% after column chromatography and 50% after paper chromatography. The analysis of the particulate matter of gasoline engine exhaust gases showed a loss of the tritiated compound which was similar to that revealed on mixtures of pure aromatic polynuclear compounds. (Author summary modified)

15802

Hollis, O. L.

SEPARATION OF GASEOUS MIXTURES USING POROUS POLYAROMATIC POLYMER BEADS. Anal. Chem. (U. S.), 38(2):309-316, Feb. 1966. 5 refs. (Presented at Advances in Gas Chromatography, Third International Symposium, Houston, Texas, Oct. 1965.)

Outstanding separations of volatile compounds were achieved with columns of polyaromatic polymer beads synthesized by suspension with a diluent to give a highly porous structure. Notable sharp, symmetrical peaks, and low retention volumes were found for water, alcohols, and glycols. These polymer packings have

partition properties of a highly extended liquid surface without the problems of support polarity, liquid-phase volatility, or freezing point which hamper gas-liquid chromatography. The porous polymers can be synthesized from monomers such as styrene, tertiary-butylstyrene, and ethylvinylbenzene with divinylbenzene as crosslinker. Applications of porous gel polymer columns range from the analysis of oxides of nitrogen to the determination of diethylene glycol in dipropylene glycol. The analysis of trace quantities of water in a variety of materials is greatly facilitated because water is eluted very rapidly with good peak shape from the columns. The columns are also useful where the adsorptive properties of the stationary phase contributes to tailing or skewing of the peak from materials such as carbon dioxide and acetylene on gas-solid chromatographic systems and water on most gas-liquid chromatographic systems. (Author abstract modified)

15898

Friedrichs, Karl-Heinz and Arthur Brockhaus

MEASUREMENTS OF PARTICULATE AIR POLLUTANTS WITH TWO FILTER APPARATUS OF DIFFERENT UPPER SEPARATION LIMITS. (Messung partikelfoermiger Luftverunreinigungen mitzwei Filtergeraeten unterschiedlicher oberer Abscheidegrenze). Text in German. Staub, Reinhaltung Luft, 29(11):467-470, Nov. 1969. 3 refs.

Filters for the preliminary separation of coarse particles by the forces of gravity and inertia were used in the atmosphere. The separation of the aerosol into two portions permitted aerosol size to be compared at different measuring points. Chemical analysis showed a considerable difference between the composition of the fine and coarse particles. Hydrocarbons and 3,4-benzopyrene were found in the fine aerosol. (Author summary modified)

15904

Braman, Robert S.

EMISSION-TYPE DISCHARGE STUDY OF SOME AIR POLLUTANT COMPOUNDS. Preprint, American Chemical Society, Washington, D. C., Div. of Water and Waste Chemistry, 16p., 1969. 3 refs. (Presented at the American Chemical Society, 158th National Meeting, Division of Water, Air, Waste Chemistry, New York, Sept. 8-12, 1969.)

The applicability of a four-channel DC discharge system to gas chromatographic analysis of air pollutants was investigated in laboratory analyses of automobile exhaust and other gas mixtures. Air pollutants studied included carbon monoxide, sulfur dioxide, nitrogen oxides, and carbonyl sulfide. Alkanes, alcohols, and other compounds were also investigated for comparison purposes. The four major wavelengths observed were 5165 C₂; 4312 CH; 4216 CN; and 6562 H. The detector gave good response patterns suitable for qualitative identification of gases and pollutants and was particularly useful in confirming the identity of air peaks, hydrogen, CO, hydrocarbons, and CO₂. Limits of detection air in the ppm range. The limits need improvement if sub-ppm

concentrations are to be directly analyzed and detected in air. Data presented in the form of tables include wavelength and band/line spectra of analyzed compounds, response data, and emission ratios for a series of alcohols.

15909

Tsuda, Mitsushige, Shigekazu Hatano, and Ikuji Mizuta

CONTINUOUS SAMPLING OF AUTOMOBILE EXHAUST GAS AND ADJUSTMENT OF STANDARD GASES. Mitsubishi Heavy Industries, Ltd., Tech. Rev., 6(3):40-46, Sept. 1969. 4 refs.

Among the problems involved in analyzing automobile exhaust are the techniques to be used in continuous exhaust gas sampling and in handling the standard gas to be used for calibration of the analytical equipment. Cooling and dehumidifying of exhaust gas is of particular importance in continuous sampling. The cooling temperature must be maintained below 41 F. Selection of materials for the gas channel of an analyzer and the prevention of hydrocarbon adhesion to filter surfaces are of particular importance in minimizing measurement errors. To increase the responsiveness of the analyzer, the volume of gas passage inside the channel must be as small as possible and the flow of sampled gas as large as possible. Continuous measurement of total hydrocarbons in exhaust gas is possible by combining a continuous sampling channel with a flame ionization detector. The measuring range of such an analyzer is 100 to about 42,000 ppm methane and 15 to about 7000 ppm n-hexane. Required concentrations of the standard gas can be correctly determined by combustion methods for hydrocarbons and by the Orsat method for CO-CO₂-O₂ mixed gas. Standard gas whose concentration is guaranteed by the above methods should be used in calibrating an analyzer. (Author conclusions modified)

15969

Mukherii, Anil K., T. Erdman, N. M. Trieff, and K. L. Gabriel

EVALUATION OF THE ADSORPTION PROPERTIES OF MOLECULAR SIEVE 569 COATED WITH 10% WT/WT TRITON X100. Preprint, Drexel Inst. of Technology, Philadelphia, Pa., Dept. of Chemistry and Drexel Inst. of Technology, Philadelphia, Pa., Environmental Engineering and Science Program, llp., 1968. 1 ref.

The usefulness of molecular sieve 569 coated with 10% Triton x-100 as a dessicant for removing moisture from a gas stream was established in experiments which showed that water had no effect on the elution of benzaldehyde, pentyl acetate, n-butyl alcohol, or hexane at 50 C in a gas chromatographic column. In experiments with an uncoated sieve, hexane was retained by the column at 50 C. At 100 and 200 C no desorption was observed. When the coated sieve system is run for 30 min at 2.5 l/min flow rate, quantitative recovery for hexane and butanol is about 100%; for petyl acetate, 85%; for benzaldehyde, 70%. When the system is run longer than 30 min, all recoveries approach 100%. Recommended procedures for regenerating the coated sieve are given. Use of the coated molecular sieve for collection of organic components present in air are discussed.

Heszina, A. J.

QUANTITATIVE DETERMINATION OF CARCINOGENIC HYDROCARBONS THROUGH FLUORESCENT SPECTROPHOTOMETRY. (Carcinogen szénhidrogenek mennyiségi meghatározása fluoreszcens színkepelemzéssel). Text in Hungarian. *Egészségtudomány*, 11(2):131-135, 1967. 4 refs.

The aromatic hydrocarbon content of air samples amounts to 1-100 ppm of the solutions prepared for spectrophotometric analysis. If the solutions are not purified by chromatography, the results of the spectrophotometry will be rather uncertain. The method reported here combines chromatographic purification of the solution at room temperature with spectrophotometry at -196 C. Liquid nitrogen is used for cooling because of this low temperature the spectrograph shows very sharp lines. The low temperature measurement is very fast and provides advance information on whether time-consuming deep-cooling is warranted. The chromatographic purification process uses an aluminum trioxide column.

16016

Marsh, K. J.

THE MEASUREMENT OF AIR POLLUTATION AROUND OIL REFINERIES. British Petroleum Co., Middlesex, England, Rept. of the Working Group 'Stack Height and Atmospheric Dispersion', Concave, The Hague, Netherlands, 15p., Jan. 1968. 13 refs.

Principles of air pollution measurements are summarized to guide oil refineries in planning emission measurements and analyzing emission data. Pollutants considered are sulfur dioxide, hydrogen sulfide, mercaptans, smoke, solids such as grit and acid smuts, nitrogen oxides, hydrocarbons, ozone, and other oxidants. The advantages of using new commercial instruments for continuous or consecutive measurements at fixed sites are contrasted with discontinuous methods using discrete samples. To determine the long-term pollution pattern around a refinery, data must be accumulated for a number of years and cumulative frequency curves derived for various concentrations of a pollutant at each measuring point. Such a curve can be used to determine the 'dosage' at each point and the damage caused by pollution. The effect of wind direction on pollution measurements must also be determined. To do this, measurements at each point are grouped according to the principle wind directions, a cumulative frequency curve is derived for each group, and concentrations obtained from the curve are plotted on vector diagrams similar to wind roses. These vector diagrams will tell whether changes in frequency distribution of pollutants are due to refinery operations or variations in weather.

16132

Saitoh, Takeshi, Takamichi Hiramatsu, Tatsuyuki Takahashi, Yasunori Takemoto, and Akira Ochiai

INFLUENCE OF ENGINE VARIABLES ON EXHAUST EMISSIONS FROM AUTOMOBILE

A method was developed to test transient performance of automobile engines on an engine test bench equipped with an inertia wheel and a dynamometer controlled by an analogue computer. The air-controlled disc brake and the clutch actuator were incorporated in this acceleration equipment to simulate the start of the vehicle. Accuracy and reproducibility of the equipment and method were satisfactory. The influence of engine variables on the concentrations of CO and hydrocarbon in the engine exhaust was studied with this acceleration simulator. The CO and HC concentrations during acceleration were the same as the exhaust composition of the steady running engine. As a consequence, exhaust compositions during acceleration could be estimated from those in the steady state.

16170

Scherber, F. I. and J. H. Stoudenmire

A MOBILE TEST STATION FOR MOTOR VEHICLE EXHAUST. Bendix Tech. J., 2(3):94-100, Autumn 1969. 4 refs.

The design of a fully integrated mobile test station was described with emphasis on test-cycle criteria and instrumentation techniques. Key components and functions performed in the test facility include nondispersive infrared spectrometers for carbon monoxide, carbon dioxide, and hydrocarbon analyses, variable-flow, fixed-dilution, or variable-dilution sampling, a chassis dynamometer for engine loading, and integrated circuits on printed-circuit cards for sensor signal conditioning. Also included are reed switches driven by the program clock for sensor scanning, a keyboard for manual inputs, and the best available diagnostic sensors for engine diagnosis. One of the most important factors governing selection of a suitable testing cycle is the time restriction imposed; no more than five minutes may elapse between drive-on and drive-off with hard copy test data. A procedure under consideration is a high-speed conditioning cycle followed by a medium speed surveillance cycle, the total test time being 155 seconds. Exhaust emission levels must be capable of direct correlation with Federal standards in order that a meaningful pass or fail status can be readily assigned to each vehicle tested. A number of approaches to the automation of vehicle-exhaust gas analysis were proposed which call on a variety of techniques, among them analog, digital, and hybrid schemes which vary in complexity with the intended application. Visual aids in the test vehicle and on the mobile laboratory control panel will permit both the vehicle driver and the dynamometer operator to monitor the test-cycle modes. The gas levels measured for each mode of the test cycle will be automatically recorded on punched cards for immediate computation of concentration and mass-per-mile values. The Friez Data Center will be used to interface the analog outputs of the analyzers with the punched card terminal equipment. The modular concept utilized in the design of the Friez Data Center permits its adaptation to a wide variety of systems configurations. All functional circuits are contained on plug-in printed-circuit cards which can be selected on the basis of the characteristics required to provide any specified over-all system performance.

Bernert, Juergen and Reiner Engsfeld

EXPERIENCES WITH A MODIFIED METHOD FOR DETERMINATION OF THE TOTAL AMOUNT OF COMBUSTIBLE ORGANIC SUBSTANCES IN WASTE GASES.

(Erfahrungen mit einer modifizierten Methode zur Bestimmung der Gesamtmenge verbrennbarer organischer Substanzen in Abgasen). Text in German. Wasser, Luft Betrieb, 12(7):422-425, July 1968. 6 refs.

A plant manufacturing glass fiber insulating panels, a brake lining manufacturing plant, a wire manufacturing plant, and two chicken manure drying stations are discussed with respect to how they determine organic substances in waste gas. In the first three plants, vapors from solvents and phenols and their cracking products were analyzed. In the first case, 3 silica gel probes were used since it was not known how the method would respond to mineral oils. However, hydrocarbons could be detected at all measurements. With larger volumes drawn through the probes within an equal period of time, a higher loading of probe 2 was observed. This may be explained by the fact that of the water vapor/oil mixture, the former shows greater affinity to the silica gel than the latter, which impairs the oil mist adsorption. The result of 30 measurements in the second plant showed that the carbon concentration in the uncleaned gas experienced a maximum at each temperature increase which subsided until the next temperature increase. The carbon concentration of the cleaned gas is almost independent of time, which indicates that the afterburning system has an efficiency of more than 90%. Generally it can be said for all measurements in all three types of plants that no major difficulties were encountered. Quantitative adsorption was achieved in almost all cases in the first section of the first silica gel probe. The result of measurements in the chicken manure drying plants showed that the initially present mercaptans appeared in none of the analyses, which indicates that they are oxidized to sulfates. It was further found that these gases contain further organic emission components which can presently not yet be identified (presumably fatty acids and their derivatives).

Hill, D. W. and H. A. Newell

THE VARIATION WITH POLARIZING VOLTAGE OF THE RESPONSE TO METHANE, CARBON DIOXIDE AND NITROUS OXIDE, OF A MACRO-ARGON IONIZATION DETECTOR FOR GAS CHROMATOGRAPHY. J. Chromatog., vol. 32:737-739, 1968. 15 refs.

Response curves with unexpected characteristics were obtained for methane, carbon dioxide, and nitrous oxide during an investigation of the physical processes governing the operation of a macro-argon ionization detector. A previously recorded response vs polarizing voltage for an argon detector to various concentrations of propane is contrasted with the obtained response vs polarizing voltage of an argon detector to various concentrations of methane. The former is the commonly recorded response to organic vapors with ionization potentials less than the energy of the argon metastable atom. The methane curve illustrates a reversal of sign with

voltage increase. This variation could explain previous, contradictory observations at unquoted field strengths. At low applied voltages, the positive responses for methane, carbon dioxide, and nitrous oxide are reported to have similar form, with carbon dioxide having nearly twice the response of methane and nitrous oxide. The negative response observed at the high voltage region was approximately identical for all three vapors. At 30 V, when the response of each gas was at a maximum, the response of carbon dioxide coincided with that of propane. The results are in contrast to predictions that responses to methane, carbon dioxide, and nitrous oxide would not occur, since the ionization potentials of the substances are higher than the argon metastable level. It is suggested that the positive responses are due to lower recombination coefficients resulting from a lowering of primary electron temperature by inelastic collisions with added gas molecules.

16361

Kessler, R. L.

QUALITY CONTROL ASPECTS OF CHRYSLER'S CLEANER AIR SYSTEM. Preprint, American Society for Quality Control, Milwaukee, Wis., 11p., 1968. (Presented at the Conference American Society of Quality Control, 22nd Annual Technical, Philadelphia, Pa., 1968.) (Also: Automotive Industries, 141(7):74-97, Oct. 1, 1969.)

The quality control procedures of Chrysler's program to comply with Federal limits on allowable concentrations of certain automobile emissions is described. The basic equipment for the testing comprises tanks of purging and calibration gas, a non-dispersive infrared analyzer with recorders, dynamometer instruments and driver's aid, a sunk test console, and digital computer and typewriter. Personnel required to operate the test facility are two driver-mechanics, a quality control engineer, and an analyzer-operator. A complete test consists of three cycles, the first being a 'dummy' run to ensure proper engine conditioning; each cycle in turn consists of ten operating conditions, or modes, which require 137 seconds to complete. A vehicle fails the test if the emission level exceeds 275 ppm hydrocarbons and/or 1.5% carbon monoxide content; or if spark timing, idle rpm, distributor vacuum and/or idle CO content exceed the specified limits. Rechecks and adjustments are made on any vehicle which fails; if it does not then pass re-testing, the carburetor and/or distributor are replaced. An important aspect of the quality control program is the series of controls exercised at the plants that supply auto components; these controls are particularly carefully applied to suppliers of carburetors and distributors and at engine-building plants.

16363

Vizioz, J. -P. and W. Leuckel

METHODS AND INSTRUMENTS UTILIZED AT THE F.R.I.F. EXPERIMENTAL STATION FOR THE MEASUREMENT OF DIFFUSION FLAMES. (Methodes et instruments utilises a la Station Experimentale de la F. R. I. F. pour des mesures dans les flammes de diffusion). Text in French. Riv. Combust., 23(9):427-437, Sept. 1969. 4 refs. (Presented at

the Conference 'I Problemi della Combustione - Bruciatori' de l'Associazione Termotecnica Italiana, Milan, June 18-19, 1969.)

The investigation of turbulent diffusion flames is a highly complicated field of work, calling for a large number of experimental data. For this purpose, two square section experimental furnaces were built: one 6.5 m long and 2 m wide; the other, 10 m long and 1.5 m wide. The instruments used offered extremely quick measurement readings, were compact, and highly heat and corrosion resistant. Temperature was measured along the furnace walls and on the gases of combustion. To measure velocities, a Prandtl tube, parallel with the flame axis, was employed. To analyze the combustion products sampled at various points of the flame, the expedient was adopted of cooling them quickly to arrest the chemical combustion reactions. Chromatography was used to analyze H_2 , CO_2 , O_2 , N_2 , CH_4 , CO . Hydrocarbon levels were also assayed considered as C_2 , C_3 , and C_4 . To determine unburned solids, a sample of gas was filtered under isokinetic conditions. (Author summary modified)

16398

Noyes, Claudia Margaret

STUDIES OF THE DETERMINATION AND REACTIONS OF SULFUR DIOXIDE AS AN AIR CONTAMINANT. Colorado Univ., Boulder, Thesis (Ph. D.), Ann Arbor, Mich., Univ. Microfilms, Inc., 1966, 56p. 38 refs.

Analytical methods for sulfur dioxide determination, including colorimetric and conductometric methods, were evaluated, and the reactions of sulfur dioxide with hydrocarbons and nitrogen oxides at high dilution in air were studied. Radioactive $S(35)O_2$ was used as a tracer to follow SO_2 in the gas phase and after its absorption in the sampling solution. The West-Gaeke colorimetric method gave slightly less color but better reproducibility and sample stability than the Helwig-Gordon method. Liquid scintillation counting showed that the dilute hydrogen peroxide-sulfuric acid solution used for absorbing SO_2 in the Thomas conductometric method was also less sensitive and less reproducible than the West-Gaeke colorimetric method. It was emphasized that the use of bubblers in series is not necessarily a reliable method for measuring absorbing efficiencies of solutions for gases. None of the mixtures showed any measurable amount of reaction of SO_2 in dry or moist air in the dark during residence times as long as three weeks. Since there was a reaction of SO_2 in an irradiated mixture containing both NO_2 and hexene in dry air but none with either NO_2 or hexene alone, it seemed probable that SO_2 reacts with a product of the hexene- NO_2 photolysis. There was no appreciable SO_2 reaction in an irradiated mixture with benzene alone or in the presence of NO_2 . All products of the SO_2 reactions were absorbed, since both color and counts were low in the gaseous aliquots taken from flasks immediately after irradiation. Whether the SO_2 is oxidized or held in some form not detectable by colorimetric analysis is not known. It is definite that those reaction products which do not react as SO_2 in the colorimetric determination do not remain in the gaseous phase. (Author abstract modified)

Wolstenholme, E. F.

METHANE DETECTION. Colliery Guardian (London), 217(1):47-54, Jan. 1969. 5 refs.

A recording methanometer and a specially designed recording air-flowmeter were used to obtain continuous measurements of the total quantity of firedamp emitted from a longwall coalface. The sources and variations in total firedamp emission from a production longwall unit were also analyzed. Results showed it was possible to split the readings of firedamp emission into different trends and to correlate the results to coalface activities. Firedamp emissions from coal cutting operations were shown to be reasonably constant, whereas emissions from adjacent strata were found to be cumulative with time. The complex nature of the variations measured emphasize the inadequacies of spot measuring techniques. The results indicated numerous ways in which research into firedamp emission could be extended utilizing continuously measuring instruments. It was shown possible to continuously record the variations in air quantity circulating a unit and the variations in firedamp content of that air. By recording the variations in a number of units in a mine district and also recording the variations in pressure across the units, it would be possible to relate changes in firedamp emission to absolute values of coalface resistance. A set of instruments on the main return from the district could be used as a check on the total variations. The recording airflow meters were found to be reliable research instruments although requiring regular maintenance. The main hazard to their performance was the presence of dust which resulted in a loss of sensitivity. Regular laboratory checks, however, indicated that this did not affect the calibration. Definition of the normal sources variations, and magnitude of firedamp emission by the methods described, could prove an invaluable aid in increasing the confidence with which abnormal trends can be identified and analyzed.

16616

Hiam, Leon and Saul Chaikin

DEVELOPMENT OF A SIMPLE AUTO EXHAUST ANALYZER. (FINAL REPORT.) Stanford Research Inst., Menlo Park, Calif., Contract PH 86-66-60, SRI Proj. FMU-5859, 18p., Aug. 1966. 23 refs.

The feasibility of applying a heated filament combustible gas detector for separately analyzing the total hydrocarbons and carbon monoxide in auto exhaust gases was determined. The first phase was a detailed study of the filament temperatures required for oxidation of selected hydrocarbons and CO on a platinum filament. Additional work was conducted on the effect of O₂ and hydrocarbon concentration on the oxidation initiation temperature; the interacting effects in simple gas mixtures were studied. The data showed that the required analyses could not be made on the basis of the platinum filament temperature. Rhodium, iridium, palladium, palladium-silver, and palladium-gold alloys, oxidized nickel, gold, and oxidized cobalt were tested in a search for materials which might show greater selectivity in catalyzing oxidation of hydrocarbons and CO. None of these materials were

found to make the required analyses feasible on the basis of filament operating temperature. Two procedures were evaluated for making a preliminary separation before analysis with a heated filament. Hopcalite catalyst was used to remove the CO from the gas sample by selective oxidation. Problems associated with the adsorption of hydrocarbons on Hopcalite made the procedure of doubtful use. Silica gel was used to selectively remove hydrocarbons from the gas sample so that an analysis for CO could be made on the heated filament. The complications it introduced were such that the basic simplicity of the combustible gas detector was lost. Since the separate analyses for hydrocarbons and carbon monoxide did not seem feasible, an effort was made to construct a detector that would measure total combustibles minus hydrogen and the lower aliphatic hydrocarbons. The procedure utilized a platinum wire 'preburner' whose function was to selectively combust hydrogen. This procedure did not succeed because carbon monoxide was found to inhibit the selective combustion of hydrogen over platinum at low temperatures. It was concluded that the combustible gas detector does not show any great potential for auto exhaust analysis. (Author summary modified)

16620

Freedman, R. W. and H. W. Lang

A COMPARISON OF INFRARED AND GAS CHROMATOGRAPHIC METHODS FOR DETERMINATION OF METHANE IN MINE AIR. Bureau of Mines, Washington, D. C., RI-7179, 4p., Sept. 1968.

CPSTI: PB 182672

The gas chromatographic method was compared with the infrared method used for confirmatory determination of methane in mine air. In terms of speed, convenience, and precision, the gas chromatographic method was far superior to the infrared method. The comparable infrared analysis required almost a full day per sample; the gas chromatographic analysis could be performed in 10 min, including sample injection and calculation. Replicate analyses were unnecessary. Only one or two standards had to be run per day because of the lack of drift and the high degree of precision. A coefficient of variation of less than 1% was attainable. Separation of methane from other hydrocarbons was complete with the use of molecular sieve columns under proper experimental conditions. This provided the specificity for methane that is essential. The amount of sample required for the chromatograph was only 10 ml compared with 100 ml or more for the infrared cell. The need for such a small quantity indicated the possibility of taking mine-air samples in syringes. This would save space, weight, time of sampling, and time of injection into the instrument, and would avoid the use of mercury for gas transfer. (Author conclusions modified)

16701

Bell, J. H., Sue Ireland, and A. W. Spears

IDENTIFICATION OF AROMATIC KETONES IN CIGARETTE SMOKE CONDENSATE. Anal. Chem., 41(2):310-313, Feb. 1969. 12 refs.

Because of the complexity of cigarette smoke, extensive fractionation was necessary to isolate and identify minor components. The separation techniques involved solvent partition, column, paper, and gas chromatography. The gas chromatographic system allowed the collection of smoke constituents for subsequent analysis by ultraviolet and infrared spectroscopy and mass spectrometry. From the study of one subfraction which represents 0.08% of the original weight of the condensate, fluoren-9-one, the four methylfluoren-9-ones and seven other alkylated fluoren-9-ones were identified. (Author's Abstract)

E. CONTROL METHODS

00003

HEARINGS S 306. A Bill to Amend the Clean Air Act to Require Standards for Controlling the Emission of Pollutants from Gasoline-Powered or Diesel-Powered Vehicles, to Establish a Federal Air Pollution Control Laboratory and for Other Purposes. 89th Congress (1st Session) Senate Committee on Public Works. Special Subcommittee on Air and Water Pollution. April 9, 1965. 308 pp.

This document contains Government reports, statements made by Government officials and industrial representatives, and communications to Senator Muskie. The following topics are discussed: (1) photochemical smog; (2) effects of air pollution; (3) vehicle use trends; (4) recognition by state governments; (5) exhaust and crankcase emission control; (6) fuel evaporator loss control; (7) fuels; and (8) diesels. Also included are reports on causes and control of automotive emissions, by J.D. Caplan; and descriptions of visits to General Motors Research Laboratories, Ford Motor Co. Vehicle Emissions Testing Laboratory, American Motors Corp. (Air-guard system for exhaust control), and to Chrysler Corp. Laboratories (Clean air package components).##

00015

L. J. E. Hofer, J. F. Shultz, and J. J. Feenan

EFFECT OF LEAD DEPOSITS ON ACTIVITY OF AUTOMOTIVE EXHAUST CATALYSTS. Bureau of Mines, Washington, D.C. (Report of Investigations 6243.) 1963, 26p.

This study, part of a broad program of research in air pollution related to minerals, was conducted to determine the nature and extent of the poisoning of catalysts when used to remove certain air pollutants from exhaust gases. The poisoning examined in this investigation occurs when leaded gasoline is used as a fuel for automotive engines. The smog in the Los Angeles area is attributed to the effect of radiant energy on the mixture of hydrocarbons and nitrogen oxides found in the atmosphere there. To prevent the escape of these hydrocarbons into the atmosphere catalytic mufflers have been proposed. In principle, these are simple and nonmechanical, consisting of a vessel charged with a catalyst capable of destroying the exhaust hydrocarbons by catalyzing their oxidation. However, these catalysts are severely affected by the particulate matter, mainly in the form of lead sulfate, lead oxysulfate, and lead chlorobromide, contained in the exhaust gas. Deposition of lead on the catalyst restricts catalytic activity. After 20,000 miles of operation, the temperature necessary to achieve 50% conversion of isopentane in a mixture of 0.2% isopentane, 2% CO and 4% oxygen, and the

balance N at 10,000 hourly space velocity has risen from 400 to 500 C. even with a catalyst taken from the exit portion of the catalyst bed. The rest of the catalyst was more severely affected. It would appear that operation for 20,000 miles is near the limit for a catalyst.##

00057

R.D. Kopa

PNEUMATIC FUEL ATOMIZATION AS APPLIED TO AUTOMOBILE AIR POLLUTION CONTROL. California Univ., Los Angeles, Dept. of Engineering. (Rept. No. 63-61.) Dec. 1963. 19p.
CFSTI, DDC: AD 601025

The principle of pneumatic fuel atomization as applied to internal combustion engine carburetion was conceived during research activity concerned with exhaust gas recycling and its effects on engine performance. The goal was to find a solution to thre engine "power surging" problem, a phenomenon resulting from exhaust gas recycling as a method of nitrogen oxide control. The test results were obtained during the operation of an engine equipped alternatively with a factory standard carburetor or with a fuel atomization device. The earlier developed exhaust gas recycling devices installed on engines equipped with standard carburetors were extensively road tested. They proved to operate trouble-free for test periods extended over 30,000 miles of driving. Nitrogen oxides reduction averaged 80% and the specific fuel consumption remained substantially unchanged. The fuel atomization device eliminates the "power surging" noticeable with the earlier recycling device, and since it combines the exhaust gas recycling with fuel-air mixture homogeneity, an additional benefit, namely, substantial reduction of unburned hydrocarbons and of carbon monoxide is obtainable. More research work, however, is needed in order to gain a conclusive picture about the full potential of pneumatic fuel atomization as a method of automotive air pollution control.##

00087

A.F. Bush, R.A. Glater, J. Dyer, G. Richards

THE EFFECTS OF ENGINE EXHAUST ON THE ATMOSPHERE WHEN AUTOMOBILES ARE EQUIPPED WITH AFTERBURNERS. California Univ., Los Angeles; Dept. of Engineering. (Rept. No. 62-63.) Dec. 1962.. 38 pp.
CFSTI, DDC: AD 297976

In order to determine the probable composition of the atmosphere aftrr automobile exhausts are controlled, tests were conducted using the air pollution test facility on the campus at UCLA. Automotive vehicles were studied with and without afterburners using various concentrations of auto exhaust during simulated driving cycles. The objective of the experimentation was to simulate ambient atmosphere and to trst this atmosphere for contamination by exposing known sensitized plants to it and testing its ability to produce human eye irritation. Indications are that atypical plant damage reported is due to oxides of nitrogen: Fumigations showed that, in all instances of elevated formaldehyde measurements, eye irritation resulted.##

L.L. Winkstrom K Nobe

CATALYTIC DECOMPOSITION OF NITROGEN DIOXIDE. California Univ., Los Angeles, Dept. of Engineering. (Report 63-19.) Apr. 1963. 40 pp.
CFSTI, DDC: AD 406834

Reactions of the oxides of nitrogen are of considerable interest in current air pollution research. The investigation reported in this paper is the study of the complete dissociation of NO₂ in nitrogen and in air with CuO-Alumina (1:1) and CeO₂-Alumina (1:1) catalysts. The initial concentration of the NO₂ was varied within the range 720-2200 ppm. The reaction was studied in a steady-state isothermal flow reactor with the temperature varied in the range 304 - 520 C at gas space velocities (STP) ranging from 1,400 to 11,200/hr. It was observed that the kinetic data were best represented by the rate expression, $r = ap / (1 + bp)$. At low temperatures and high flow rates the rate reduced to a zero order reaction. Below 480 C the CuO had a higher catalytic activity than the CeO₂. Above 480 C, however, the CeO₂ had a higher activity. It was observed that there was considerable decomposition of NO₂ even in excess air with CuO catalysts. Since it had been reported previously that CuO catalysts were quite satisfactory for hydrocarbon oxidation, the results of this investigation indicate that both hydrocarbons and oxides of nitrogen may be simultaneously eliminated to a considerable degree with CuO catalysts. (Author)**

00103

P. Gustafson and S. H. Smith, Jr.

REMOVAL OF ORGANIC CONTAMINANTS FROM AIR BY TYPE 13X MOLECULAR SIEVE. Naval Research Lab, Washington, D.C. (NRL Rept. 5560.) Dec. 6, 1960. 20 pp
CFSTI: AD 248512

The adsorption of low concentrations of n-decane, methane, benzene, toluene, xylene, pyridine, aniline, and nitrobenzene on type 13X Linde molecular sieve has been studied at influent concentrations of from 5 to over 100 ppm and superficial linear velocities (velocities if no sieve were present to reduce the cross section) of up to 3000 cm/minute. The breakthrough weight capacity at a flow rate of 2500 cm/minute for a representative aliphatic compound (n-decane) was 10 wt-% of the sieve and for a mononuclear aromatic (benzene) was 0.35 wt-% at 25C. Decreasing the flow rate of the aromatic to 500 cm/minute increased the breakthrough capacity to 2.1%. Regeneration conditions were also studied. Water vapor readily displaces organic adsorbates (except high boiling polar compounds) at room temperature. Therefore, molecular sieve with coadsorbed water may be reactivated by passing dry air at 200 to 325C in the same direction of gas flow as that used during the adsorption cycle. The coadsorbed water will displace the sorbed organic compounds as it moves down the column, whereas the organic materials would be pyrolyzed in place if the water were not there. (Authors' abstract)**

00257

A. G. Sandomirsky, D. M. Benforado, L. D. Grames, and
C. E. Pauletta

FUME CONTROL IN RUBBER PROCESSING BY DIRECT-FLAME INCINERATION.
J. Air Pollution Control Assoc., 16(12):673-676, Dec. 1966
(Presented at the 59th Annual Meeting, Air Pollution Control
Association, San Francisco, Calif., Paper 66-55, June 24,
1966.)

The application of direct-flame incineration to successfully
eliminate a smoke-oil-mist and odor problem in the manufacture of
rubber-base rug underlay is presented. The investigation of
various air pollution control processes leading to the development
and adoption of the direct flame incineration system is covered.
The rug underlay curing process incorporating the direct-flame
incineration system with primary heat recovery is described.
Results and discussion of a source test to determine the
effectiveness of direct-flame incineration in this application are
included. (Authors' abstract)##

00269

V. H. Luther, K. Lohner, H. Muller, and W. Zander

POSSIBILITIES OF DECONTAMINATING EXHAUST GASES OF OTTO ENGINES.
Möglichkeiten einer Entgiftung der Abgase von Ottomotoren.
Erdoel Kohle (Hamburg) 18(12):964-972, Dec. 1965. Text in
German.

The composition of motor exhaust gases is discussed.
Measuring methods and the possibility of decontamination before,
in, and behind the combustion chamber are described in detail.
Fundamental principles of the Cleaner Air Package, crankcase
blowby control devices, after-burner with spark ignition, and the
Man-Air-Ox system are given. The state of the art of catalytic
combustion is summarized and it is shown that the combination of
other after-burner systems with small catalyst units are worthy of
further development.##

00373

SUBMARINE ATMOSPHERE HABITABILITY DATA BOOK (REVISION-1).
Navy Dept., Washington, D. C., Bureau of Ships
(NAVSHIPS 250-649-1). Sept. 1962. 198 pp.

This publication brings together scattered information and
references to more detailed information on chemical principles,
experimental results, and operating experience concerned with
maintenance of atmospheric habitability in nuclear-powered
submarines. Habitability is defined as control of chemical
aspects of the atmosphere to meet the requirements of equipment
and personnel. Recommended methods for removal of carbon
dioxide, carbon monoxide, hydrocarbons, aerosols, and odors
are discussed. Basic operation of an electrostatic precipitator
is described. Details are given on the continuous air monitoring
system required to insure safe operation of the submarine.##

00538

J. Schulte

SEALED ENVIRONMENTS IN RELATION TO HEALTH AND DISEASE. J. Inst. Heating Ventilating Engrs. (London), Vol. 24:79-87, June 1966.

The general health aspects of life in a sealed environment are related primarily to habitability and atmospheric control. The control of the atmosphere involves : (a) some means to provide the continual addition of oxygen in sufficient quantity to support life and preserve health, and (b) methods to effect the continuous removal of carbon dioxide, carbon monoxide, and other atmospheric contaminants to prevent them from gradually increasing to concentrations which could produce illness. A number of the atmospheric constituents are discussed in detail in regard to their source, effects upon health, and methods of control. The need for control of temperature and humidity and for protection from radiation has also been included in the discussion. These needs and methods for controlling the atmospheric constituents, temperature, humidity, and radiation exposure in a sealed environment have been projected to the future space vehicle.##

00562

E. Hunigen and W. Prietsch

THE ELIMINATION OF NOXIOUS SUBSTANCES FROM INTERNAL COMBUSTION ENGINES. Probleme und Lösungswege der Schadstoffbeseitigung bei Verbrennungsmotoren. Technik (Berlin), 21(6):377-383, June 1966.

Control of air pollution from internal combustion engine is reviewed. A table is given of maximum permissible concentrations of various components of exhaust gases for both Germanies, the USSR, and USA. The review emphasizes methods of measurement of various pollutants.##

00583

D.E. Cooper, H.E. Griswold, R.M. Lewis, R. W. Stokeld

IMPROVED DESORPTION ROUTE TO NORMAL PARAFFINS. Chem. Eng. Prog. 62(4):69-74, April 1966.

In the over-all process economics, desorption of the n-paraffins from the molecular sieve is the most important step of the Tecaco selective finishing process. There are basically five vapor phase techniques for desorbing n-paraffins from molecular sieves: (1) thermal swing, (2) pressure swing, (3) sweeping with a nonadsorbable material, (4) desorbing with a material which is more strongly absorbed than the product n-paraffins, and (5) desorbing with an adsorbable material which is less strongly absorbed than the product n-paraffins. The desorption procedure used in the TSF process combines most of the better features of several of these desorption techniques and avoids most of

the disadvantageous aspects of each. The process basically employs vapor phase, displacement desorption using an adsorbable desorbing medium which is less strongly adsorbed by the sieve than the product n-paraffins. The advantages of the TSF desorption procedure over other methods of n-paraffin desorption are numerous, especially when processing kerosine or gas oil range materials. The most significant advantage is that n-paraffin desorption rates are maximized within economically feasible operating limits. Desorption rates are maximized by optimization of key operating variables including temperature, pressure, desorbing medium material, degree of desorption per cycle, and desorbing medium flow rate. Integration of this desorption technique with the other steps of the cycle results in a process which is relatively simple from an operational standpoint and which is capable of efficiently producing high purity n-paraffins from a variety of feedstocks.##

00587

J.A. Brink, Jr., W.F. Burggrabe, L.E. Greenwell

MIST REMOVAL FROM COMPRESSED GASES. Chem. Eng. Progr., 62(4):60-66, April 1966.

Fiber mist eliminators have been successfully used to purify gases and solve difficult air pollution problems involving: methanol synthesis gas, sulfonation and chlorination process gases, nitric acid process gases, chlorine, and compressed air. Extensive research and development work resulted in the development of fiber mist eliminators for the collection of submicron mist particles. The first plant-scale installations were made for the control of air pollution from sulfuric and phosphoric acid plants. After full-scale units had been proven highly efficient on stack gases containing submicron particles, further research was undertaken to develop fiber mist eliminators which would be most economical for the collection of particles which are predominantly 1 to 20 microns in diameter. The installation of fiber mist eliminators within various processes to purify gases was started after several difficult air pollution problems had been solved. The widespread application of fiber units to chlorine plants was reported in detail, but the applications to many other processes has not been reported previously. It should be noted that mists are present in many chemical processes at pressures ranging up to 5,500 lb./sq. in. gauge. The temperatures at which mists are present are usually moderate since many mists vaporize at higher temperatures.##

00936

Freeman, J. H., Jr. and R. C. Stahman

VEHICLE PERFORMANCE AND EXHAUST EMISSION, CARBURETION VERSUS TIMED FUEL INJECTION. In: Vehicle Emissions, Part II, SAE Progress in Technology Series, Vol. 12, Society of Automotive Engineers, Inc., New York, 1966, p. 32-59. 5 refs. (Presented at the SAE National Fuels and Lubricants Meeting, Tulsa, Okla., Nov. 2-4, 1965.)

Vehicle performance and engine efficiency are evaluated from the point of view of carburetion versus gasoline injection. The author discusses measurement of combustion efficiency; maldistribution and fuel precipitation effects; how to determine maldistribution, heat rejection mixture strength and timing effects; exhaust gas composition and vehicle performance in road service; and octane requirement effects. (Authors' abstract)##

01197

L. Ruhnke, E. Will, and P. Pederson

ELECTROHYDRODYNAMIC REMOVAL OF MICROORGANISMS FROM HYDROCARBON FUELS (FINAL REPT. JUNE 25, 1963 - NOV. 20, 1965). Litton Systems, Inc., Minneapolis, Minn., Applied Science Div (ASD 2905). Nov. 20, 1965. 139 pp.
CFSTI,DDC: AD 630 889

The feasibility of removing microorganisms and other particulates from hydrocarbon fuels by electrostatic precipitation was studied. Theoretic investigations describe the physics of electrohydrodynamic precipitation and essential parameters influencing collection efficiency. Measurements of fuel characteristics and filter parameters have been made which led to the development of an electrohydrodynamic filter. Particulates and a liquid are unipolarly charged in a corona edge ionizer and then are flushed into a precipitation tube in which particulates are moved by Coulomb forces into porous non-conducting walls. A 10-gpm model showed filter efficiencies of at least 85 percent by number of particles larger than 1 micron diameter. The basic advantages of the method investigated are the low pressure drop over the filter element and the small size of the unit. (Author abstract)##

01351

H.O. Engel C.D. Calnan

RESIN DERMATITIS IN A CAR FACTORY. Brit. J. Ind. Med. (London), Vol. 23:62-66, Jan. 1966.

An outbreak of dermatitis in a car assembly factory is described; it affected 50 workers who handled rubber weatherstrips coated with an adhesive. The adhesive was found to contain para-tertiary butyl phenol (P.T.B.P.) formaldehyde resin. Of those patch gested 70% gave positive reactions to the adhesive and 65% to the resin. Improved methods of handling and personal protection succeeded in arresting the occurrence of dermatitis. Barrier creams gave no protection in these circumstances. The episode illustrates the different preventive control methods which have to be tried when dealing with a simple skin hazard which cannot be abolished. (Author abstract)##

01411

R. C. Stahman and A. H. Rose, Jr.

EMISSIONS FROM CARBURETED AND TIMED PORT FUEL INJECTED ENGINES. J. Air Pollution Control Assoc. 16(1):15-18, Jan. 1966.

A popular make car was tested. Spark timing and fuel flow optimization was briefly studied. Performance and economy were compared between the fuel injected and carbureted versions. Emission measurements of CO, CO₂, and hydrocarbon were made in road tests by proportional sampling and through the California Cycle by continuous nondispersive infrared instrumentation. (Author abstract modified)##

01497

J. L. Blumenthal and K. Nobe

CATALYTIC COMBUSTION AND ADSORPTION KINETICS OF CARBON MONOXIDE ON CUPRIC OXIDE. Ind. Eng. Chem. Process Design Develop., 5(2):177-183, April 1966.

Studies have shown that cupric oxide-alumina is an effective catalyst for the complete oxidation of low concentrations of hydrocarbons and carbon monoxide. The catalytic combustion of hydrocarbons and CO is of interest in the control of the quality of automobile exhaust emission. The adsorption and oxidation of CO on 4 unsupported cupric oxide catalysts were studied. The adsorption of CO₂ was also studied. The objective of the work was to determine the effect of different catalyst preparation methods on the adsorption and oxidation kinetics.##

01550

P. L. Collinson, C. Jones, and D. E. R. Lloyd

VENTILATION PROBLEMS ON RAPIDLY ADVANCING FACES, WITH SPECIAL REFERENCE TO THIN SEAMS. Mining Engr. (London), 125(71):746-762, Aug. 1966.

An assessment of ventilation problems in coal mining is presented. It is of particular interest today in view of increasing rates of production and the trend towards thinner seam sections. There is need to discover the relation between methane emission and coal output in varying circumstances. The assumption often made that gas emission is directly proportional to coal output may be a sufficient approximation for minor increases in output, but may be wide of the truth where output is doubled or trebled. The reasons for these variations are not known, but they must be related to the origin of the gas, particularly to the proportions coming from strata and from the solid and broken coal. Variations in air velocity over the cross-sectional area of the face affect the scouring of gas and the dispersal of dust. This is the type of information that must be obtained before it is possible to plan with any degree of accuracy the ventilation requirements of rapidly advancing faces and the means of providing such ventilation that the highest levels of output may be attained.##

01623

D.A. Jensen

STATUS REPORT ON COST FACTORS IN EXHAUST CONTROL (INFORMATIVE REPT. NO. 5). J. Air Pollution Control Assoc. 14, (10) 427-9, Oct. 1964.

The costs of devices for automotive exhaust control are estimated. The total costs paid by the customer are estimated based on factory installation. These systems include: (1) exhaust afterburners - flame type; (2) exhaust afterburners - catalytic type; (3) exhaust afterbutrners - limited mode type; (4) exhaust afterburners - non-flame type (manifold air); (5) deceleration devices; (6) engine modification.##

01645

A. J. Haagen-Smit

THE CONTROL OF AIR POLLUTION. Sci. Am. 210, (1)-25-31, Jan. 1964.

Using the development of Los Angeles' control program as an example, smog, dust, fumes, photochemical reactions, automotive emissions, control methods, emissions standards, and control devices are reviewed.##

01850

J.A. Bolt M. Boerma

THE INFLUENCE OF INLET AIR CONDITIONS ON CARBURETOR METERING. Society of Automotive Engineers, Inc., New York, 1966. 13 pp. (Presented at the Congress of the Society of Automotive Engineers, Detroit, Mich., Jan. 10-14, 1966, Paper 660119.)

This paper provides data concerning the enrichment of automotive carburetors with variation of inlet air pressure and temperature. These changes occur with weather and the season, with altitude, and because of underhood heating. The early opening of the conventional carburetor enrichment valve at altitude can add greatly to the "normal" carburetor enrichment. Means for compensating the mixture ratio for these changes in inlet air conditions are known, but will almost certainly add to the complexity and cost of the engine induction system. The cost of improved devices must be compromised with the possible reduction in exhaust emissions and improvement in fuel economy. (Author abstract)##

01851

C.R. Begeman

CARCINOGENIC AROMATIC HYDROCARBONS IN AUTOMOBILE EFFLUENTS. Society of Automotive Engineers, Inc., New York also published in Vehicle Emissions (Selected SAE Papers) 6, 163-74, 1964. (Presented at Congress of the Society of Automotive Engineers, Detroit, Mich., Jan 8-12, 1962, Paper 440C.)

This paper is part of the joint effort by the General Motor Research Laboratories and the Sloan-Kettering Institute to evaluate the contribution by automobiles to the trace amounts of carcinogenic hydrocarbons in the atmosphere. Benzene-soluble "tar", containing carcinogenic polynuclear aromatic hydrocarbons, is recovered from the total volume of exhaust and blowby gases

of an engine operated on a simulated city driving schedule. Fuel composition was found to influence both the pyrene, a carcinogen. Iso-octane and diisobutylene fuels gave only 20% as much "tar" as did a typical commercial gasoline, and a fuel comprised of equal volumes of ortho-xylene and benzene gave 70% as much "tar" as did gasoline. The emission rate of benzo(a)pyrene with diisobutylene fuel was only 7% of the rate with gasoline. Benzo(a)pyrene emission in blowby gas was less than 4% of the total benzo(a)pyrene emitted from the engine. On the assumption that benzo(a)pyrene from automobiles settles out of the air in the same manner as the lead from exhaust gas, automobiles may contribute, on the average, about 2% of the total benzo(a)pyrene in the air over cities. On the other hand, if benzo(a)pyrene is dispersed with little or no settling, as is the case for carbon monoxide from exhaust gas, the contribution of benzo(a)pyrene by automobiles may average about 10%. (Author abstract)**

01854

R.S. Reid, J.G. Mingle, W.H. Paul

OXIDES OF NITROGEN FROM AIR ADDED IN EXHAUST PORTS. In: Vehicle Emissions, Part II, SAE Progress in Technology Series, Vol. 12, Society of Automotive Engineers, Inc., New York, 1966, p. 230-240. 6 refs. (Presented at the SAE Automotive Engineering Congress, Detroit, Mich., Jan. 10-14, 1966. Paper 660115)

This paper presents the results of a study made to examine quantitatively the oxides of nitrogen in the exhaust of an internal combustion engine installed in a passenger car. The effects of adding secondary air in exhaust ports, with both a rich and lean carburetor, and for steady-state conditions, are reported. Experimental setup and procedures are explained. (Authors' abstract)**

01867

K.J. Springer, P. Lepisto, C. Wood

INVESTIGATION OF DIESEL POWERED VEHICLE ODOR AND SMOKE. Southwest Research Inst. San Antonio, Tex., Div. of Engines, Fuels, and Lubricants. (SwRI Proposal 10-4336A) Nov. 19, 1965. 46 pp.

This is a proposal from the Southwest Institute to assist the U.S. Public Health Service in setting reasonable, practical, and realistic smoke and odor standards for diesel powered vehicles. This assistance will involve obtaining additional basic data in the form of dilution ratios and operating conditions most conducive to the production of odor and smoke. A usable panel technique for measurement of odor will be developed as will chassis dynamometer procedures for evaluation and test of smoke and/or odor control devices. Various control devices will be evaluated using these chassis dynamometer methods and finally, fleet evaluation of the most promising control device(s) will be conducted.***

E. Bartholomew

POTENTIALITIES OF EMISSION REDUCTION BY DESIGN OF INDUCTION SYSTEMS. In: Vehicle Emissions, Part II, SAE Progress in Technology Series, Vol. 12, Society of Automotive Engineers, Inc., New York, 1966, p. 192-211. (Presented at the SAE Automotive Engineering Congress, Detroit, Mich., Jan. 10-14, 1966.) Also published as 90th Congress ("Air Pollution--1967, Part II (Air Quality Act)" Hearings before the Subcommittee on Air and Water Pollution of the Committee on Public Works, U. S. Senate Feb. 8, Apr. 3-4, 1967, pp. 917-36.

As an alternative to oxidation of hydrocarbons and carbon monoxide in the exhaust system, a research program indicates that the volume of the combustibles discharged from the cylinders can be minimized by redesign of fuel-induction systems. The objective is achievable without lowering of the level of acceleration performance or increase of fuel consumption. A tw/-stage carburetion system is employed in combination with a dual or single manifold. The single-barrel primary stage of the carburetor, which is used alone in cruising up to about 70 miles per hour, provides good mixture preparation and close to uniform fuel distribution to the cylinders. The one or two barrels of the second stage are brought into operation when maximum performance is desired. Other features of carburetors and manifolds are described that contribute to emission reduction. (Author's abstract, modified)**

02112

J. Westchester.

PREVENTION OF AIR POLLUTION BY FUMES FROM BAKING FINISHES. Metal Finishing 64, (10) 702-77, Oct. 1966.

After reviewing regulations, particularly in Los Angeles County, for regulation of emission of organic solvents into the ambient air, the author lists critical solvents and their maximum permissible concentrations as established by the American Congress of Governmental Industrial Hygienists. He then goes on to review methods for disposing of waste solvents when finishes are baked on or cured at higher than room temperature. The most effective method is catalytic burning of the solvents; this method is employed in 2500 installations in the US and 1500 installations elsewhere. The disposal of chlorinated hydrocarbons and sulfur containing compounds is more complex and requires additional methods and equipment. Silicone coatings give SiO₂ on combustion and coat the catalyst with a fine powder. The equipment for catalytic burning may be designed in several arrangements, but aerosol formation and condensation must be prevented before the vapors reach the exhaust fan, otherwise the efficiency of the catalyst may be impaired. Some installations recirculate the hot clean air resulting from solvent combustion to help bake the finish.**

T. Tomioka

(POLICIES ON THE PREVENTION OF AIR POLLUTION DUE TO AUTOMOBILE EXHAUST GAS.) Kuki Seijo (Clean Air-J. Japan Air Cleaning Assoc., Tokyo) 4, (1) 31-5, 1966.

The toxic effects of exhaust gas components from internal combustion engines and possible means of control are reviewed. Types of engines mentioned are those fueled with gasoline, liquid petroleum gas and diesel fuel. Periodic inspection of vehicles for proper engine performance, improvement of roads and fuels, and equipping vehicles with supplementary devices for decreasing exhaust emissions are proposed as control methods. The filtering system required on 1966 model cars in California is explained. The principle of the infrared spectrophotometric analyzer for carbon monoxide and hydrocarbons is discussed, and the apparatus described.##

02373

D.E. Rounds

A BIOLOGICAL ASSAY METHOD FOR MIXTURES OF HYDROCARBONS USING HUMAN CELLS IN TISSUE CULTURE. Preprint. (Presented at the Fifth Conference of Methods in Air Pollution Studies, California State Dept. of Public Health, Los Angeles, Calif., Jan. 31, and Feb. 1, 1963.)

It was observed that serial dilutions of hydrocarbons altered the growth rate of human fetal lung cells and an established line conjunctival elements. Growth reached a maximum rate when a chloroform extract of exhaust from an idling automobile was diluted to 0.005 of the stock concentration. The exhaust from the same automobile, after passing through a catalytic filter, showed a peak growth effect with a dilution of 0.025. From these data it was estimated that the exhaust device removed approximately 80% of biologically active hydrocarbons. Applications of the bioassay method to other problems are discussed. (Author summary)## +

02405

AIR-GUARD SYSTEM FOR CONTROL OF EXHAUST EMISSION. American Motors Corp., Detroit, Mich. 1965. 13 pp.

American Motors' Air-Guard System for exhaust emission control was designed specifically to meet the State of California requirements which are based on its photochemical-type smog. In 1959, the California legislature enacted an addition to the Health and Safety Code called "Standards for Ambient Air and Motor Vehicle Exhaust." This legal requirement was adopted December 4, 1959. To meet the State's standards for exhaust emissions, the Air-Guard System was developed and designed to reduce the emission of hydrocarbons and carbon monoxide from the engine exhaust. All of American Motors' Six and V-8 engines are equipped

with the system. According to California law, 1966 model cars registered in the State must be equipped with an exhaust emission control system approved by the California Motor Vehicle Pollution Board. On July 14, 1965 the Board approved American Motors' Air-Guard System after determining that it meets all requirements under the California law. The purpose of this publication is to assist service operators to properly service and maintain the Air-Guard System in order to assure its optimum performance for controlling exhaust emission. (Author abstract)##

02411

EVAPORATIVE LOSS CONTROL DEVICE. Esso Research and Engineering Co., Linden, N.J. 1966. 31 pp.

The ELCD (an acronym for evaporative loss control device) is a development of the Esso Research and Engineering Company, Linden, New Jersey. Its function is to prevent the evaporative emissions of hydrocarbon fuel from automotive vehicles, an air pollution problem of growing significance. Based on a conventional vehicles, an air pollution problem of growing significance. Based on a controlled adsorption-desorption cycle the ELCD traps those hydrocarbon vapors which would normally be lost to the atmosphere and later feeds them into the engine under controlled conditions such that they neither alter engine operation nor increase exhaust emissions of unburned hydrocarbons. A comprehensive treatment of the ELCD system and its components, the principles on which it operates, performance data on equipped cars (including evaporative control and exhaust emission analysis), the most current available information on life of this system and a design section which treats the flexibility inherent of the controlling parameters of this system, are described. (Author introduction)##

02442

G. R. Frysinger

A HYDROCARBON-AIR FUEL CELL USING AN ACID ELECTROLYTE. Army Engineer Research and Development Labs., Fort Belvoir, Va., Electrical Power Division. 11 pp., June 1966
CFSTI, DDC AD 634677

The utilization of liquid hydrocarbon fuels in a fuel cell to produce electrical power is of high practical interest. The ability to utilize the liquid hydrocarbon fractions available from conventional petroleum refineries at energy conversion efficiencies of 40-60% has the effect of greatly increasing the usable energy content of our proven petroleum resources. A new fuel cell concept which utilizes a phosphoric acid electrolyte offers a highly compact fuel cell assembly which can be used in a very highly simplified system for the generation of d. c. electrical power from hydrocarbon fuels. Either the hydrocarbon can be reached directly at the electrodes in an anodic oxidation reaction or the active hydrogen of the hydrocarbon molecules can be liberated by a hydrocarbon-steam reforming reaction and the hydrogen subsequently reacted at the fuel cell anode. The objective of this paper is to describe the electrode processes involved in each of these alternatives and to discuss the

hydrocarbon-air fuel cell system which is now possible, based on the recent achievements from U.S. Army research investigations. (Author abstract)##

02474

G. Bergshoeff

IMPROVED ABSORBERS FOR SAMPLING AIR CONTAMINANTS. Intern. J. Air Water Pollution 10, (9) 62931, Sept. 1966.

In a discussion on the Technical Note of SKARE (1965a) and the Letters to the Editor of NASH (1965) and MARTIN (1965) attention is drawn to a six-fold absorber with special pump-case, published by the author in the DUTCH CHEMISCH WEEKBLAD in 1961. The advantages of this absorber over that of SKARE (1965a) are discussed, and some suggestions for further improvement are given. (Author abstract)##

02541

(SCIENTIFIC METHODS AND TECHNIQUES TO DECREASE THE POLLUTION OF THE ENVIRONMENT, THROUGH INHALATION OR INGESTION, AND OF ACOUSTICAL "NUISANCES.") Moyens scientifiques et techniques de diminuer la pollution des milieux inhalés ou ingérés et des "nuisances" acoustiques. (Chapter 3: Les pollutions et "nuisances" d'origine industrielle et urbaine. Tome 1. Leur prévention et les problèmes scientifiques et techniques qu'elle pose en France.). Premier Ministre, Delegation generale a la recherche scientifique et technique. June 1966. pp. 47-59.

The functioning of chlorophyll in the course of photosynthesis in leaves of plants serves as a method of air purification of sufficient importance to consider its use in control. Vegetation, like men and animals, can sustain a considerable amount of damage to the point where the threshold limit of absorption of toxic substances is exceeded. The three gases causing the most damage to vegetation are carbon monoxide, the sulfur oxides, and those containing fluorine. Also to be considered are acid "smog", toxic "smog", ozone, and nitrogen oxides. Other industrial pollutants which have a toxic influence, but less severe and localized, are dusts, hydrogen sulfides, hydrochloric acid, etc. Ethylene and carbon monoxide cause great damage to the growth hormones, particularly auxin. The effects of SO₂, SO₃, and H₂SO₄ are related to the quantity of gas emitted, the degree of resistance of the species, their state of development, and the various environmental conditions. The sensitivity of vegetation to the action of sulfur gases varies essentially as a function of the speed of absorption of the gas by the leaves. Through experimentation it has been found that the plant species which are most sensitive to SO₂ are chickweed, alfalfa, barley, oats, wheat, rhubarb, lettuce, endive, spinach, cabbage, and tobacco. Apples, apricots, peaches, grapes, corn, and beans are less sensitive, whereas the floral species such as gladiolus, rose, and lilac offer considerable resistance. Aquatic vegetation is often used as purifying means for polluted streams. Subsoils purify themselves of pollutant materials in various ways, including uptake by vegetation and dispersion in the soil with rain water, etc. In a section on means of decreasing the inhaled pollutants

the following are mentioned: dust collectors, normal methods of dispersion in the atmosphere, fumes from domestic fires, auto exhaust fumes, fuel additives, improvement of combustion in engines, recycling of crankcase gases, post-combustion appliances, and redesigning of motors. Also given in this section (Chapter 3) is some similar information on ingested pollutants and on problems of noise ##

02600

N. Y. Yansheva, I. S. Kireeva, and N. N. Serzhantova

THE PROBLEM OF REMOVING THE CARCINOGENIC PROPERTIES OF BRICK COAL. (K voprosu o dekantserogenizatsii ugol'nykh briketov.) Hyg. Sanit. 29, (10) 13-6, Oct. 1964.

CPSTI: TT65-50023/10

3,4 benzpyrene was found to be present in coal pitch from various byproduct coke plants of the Ukraine, and in coal briquets in the production of which pitch was used a binding material. It was shown that the use of a smaller amount of pitch in briquet pressing did not markedly reduce the 3,4-benzpyrene content in briquets. 3,4-benzpyrene was likewise detected in the bitumen produced by Kherson oil refinery, however, its content in briquets made with addition of petroleum bitumen was several-fold lower than in briquets with pitch. Thermic treatment of briquets proved to be highly effective for decreasing benzpyrene content in the product. (Author abstract) ##

02637

C. L. Goodacre

BRIEF SURVEY OF THE LITERATURE RELATING TO EXHAUST GAS CONTROL BY MEANS OF ENGINE MODIFICATION (PART III OF ATMOSPHERIC POLLUTION: A SURVEY OF SOME ASPECTS OF THE EMISSIONS FROM PETROL-ENGINED VEHICLES AND THEIR TREATMENT). British Technical Council of the Motor and Petroleum Industries, England. Sept. 1965. pp. 65-74.

An appraisal is presented of published work on: air-fuel ratio; ignition timing; power output and speed; valve overlap; combustion chamber deposits; manifold vacuum; carburetion; combustion chamber shape; engine cycle variations; spark plugs and electrical equipment; and pressure fuel systems. ##

02638

R. A. C. Fosberry

EXHAUST SYSTEM DEVICES FOR PETROL-ENGINED VEHICLES (PART IV OF ATMOSPHERIC POLLUTION: A SURVEY OF SOME ASPECTS OF THE EMISSIONS FROM PETROL-ENGINED VEHICLES AND THEIR TREATMENT). British Technical Council of the Motor and Petroleum Industries, England. Sept. 1965. pp. 75-92.

The major work on devices in exhaust systems has been on their use for the oxidation of hydrocarbons and carbon monoxide. A common feature of all these devices is that air is added to the

exhaust stream in order to allow combustion to take place; 3 methods of combustion are used, leading to 3 types of devices: Catalytic converters, Direct flame afterburners, and Manifold air oxidation systems. Devices on which results have been published have almost exclusively been related to the requirements of the Californian legislation for the control of exhaust emissions; thus it is convenient to discuss performance where possible in relation to the requirements laid down by California. These requirements are broadly that in 12,000 miles of normal driving the average emissions (as measured during a specified driving cycle carried out at intervals in the 12,000 mile test) should not exceed 275 ppm hydrocarbon (measured as hexane on a nondispersive infra-red gas analyser) and 1.5% carbon monoxide; certain criteria including ones on reliability, noise, odour and safety are also stipulated. Five devices (4 catalytic and one direct flame) have been approved by the Californian M.V.P.C.B. as meeting their requirements; brief details of these devices and of their performance in the California tests are given. A lesser amount of work has been published on the reduction of oxides of N in exhaust gases. The present relative status of the different devices is discussed.##

02648

M. Kuhn and R. Tomingas

ATTEMPTS TO PREVENT THE FORMATION OF POLLUTANTS IN THE EXHAUST GASES OF TWO-STROKE ENGINES AND DIESEL ENGINES BY ACTIVATING COMBUSTION WITHIN THE ENGINE. Staub (English Translation)
25 (3) 2-17, MAR. 1965.
CFSTI TT66-51044/3

Combustion in two-stroke Otto engines and the diesel engine can be influenced by chemical fuel additives in such a way that oxidation is catalyzed and the side reactions of dehydrogenation and cyclization are suppressed. In the two-stroke engine it was possible largely to reduce the formation of benzpyrene by using salts and chelates of polyvalent metals, in particular manganese, and to prevent it completely by means of ether and ether-like additives. For precipitation of the oil mists and soot particles the "adhesive oil method" was employed. In the experiments the two-stroke engine was selected first; checking of the results by experiments on four-stroke engines is in preparation. In the case of the diesel engine it has been possible to achieve a reduction in soot formation with overloading by 10 to 15%. (Author summary)##

02725

A. P. Banner and E. M. Ilgenfritz

DISPOSAL OF COAL TAR PITCH DISTILLATE OBTAINED FROM CARBON BAKING FURNACE BY CATALYTIC COMBUSTION. Preprint. J. Air Pollution Control Assoc. 13, (12) 610-2, Dec. 1963. (Presented at the 56th Annual Meeting, Air Pollution Control Association, Detroit, Mich., June 9-13, 1963, Paper No. 63-34.)

The air pollution problems associated with coal tar pitch fumes evolved in the manufacture of baked carbon cannot be tolerated due

to odor of fumes which contain pyrene, phenanthrene, fluorene, chrysene and related aromatic compounds. Elimination of coal tar fumes was obtained by catalytic destruction at a temperature of 550 C. Complete destruction of aromatic compounds is realized with some unburnt free carbon discharged to the atmosphere. Choice of installation was based upon economics and ability to eliminate fumes. Preliminary data were obtained from work on a pilot unit. (Author abstract)**

02737

J. J. Feenan, R. B. Anderson, H. W. Swan, and L. J. E. Hofer

CHROMIUM CATALYSTS FOR OXIDIZING AUTOMOTIVE EXHAUST. J. Air Pollution Control Assoc. 14, (4) 113-7, Apr. 1964. (Presented at the 56th Annual Meeting, Air Pollution Control Association, Detroit, Mich., June 9-13, 1963.)

The Bureau of Mines, in cooperation with the Public Health Service, Dept. of Health, Education and Welfare, has investigated the feasibility of using various metals and metal oxides as catalysts for the removal of the noxious components of automotive exhaust gases. The phase of this program reported here is the study of chromia-on-alumina catalysts for the oxidation of Co and hydrocarbons as represented by isopentane in a continuous flow system. Aqueous solutions of four compounds of Cr were tried as impregnating media for an alumina support to study their effect on physical and catalytic properties of the finished supported catalyst. Catalysts prepared from ammonium dichromate were considered to be superior to the other preparations on the basis of uniform dispersion of Cr within the support and on activity. Preparations containing 0,1,2,4, and 8 percent Cr were prepared and tested. The activity increased up to 4 percent with little or no improvement at 8 percent. Three-component catalysts containing in addition to chromia and alumina, small amounts of Co, Ag, Mn, Co, and Fe were prepared and tested. Chromia-alumina catalysts containing Ag or Cu were more active than catalysts containing chromia-alumina alone in oxidizing Co at temperatures from 200 to 500 C; chromia-alumina catalysts containing Ag were more active in oxidizing isopentane. (Author abstract)**

02753

R. Lawrence, III, E. Elsevier, L. A. Ripperton

THE EFFECT OF OPERATING VARIABLES ON AUTOMOTIVE HYDROCARBONS EMISSIONS. J. Air Pollution Control Assoc. 14, (4) 126-9, Apr. 1964.

The effect of varying engine load, air-fuel ratio, spark timing, and compression ratio on a blocked, single cylinder, gasoline engine was investigated with relationship to the production of unburned hydrocarbons in the exhaust gas. The study was conducted on a fully instrumented CFR engine. An increase in engine load caused no significant change in hydrocarbon emission. At the theoretical optimum air-fuel ratio the unburned hydrocarbons were at a minimum. Advancing the spark timing caused a decrease in the

hydrocarbon content. An increase in the compression ratio caused an increase in the exhaust gas hydrocarbon content. (Author abstract) **

02764

N.R. Rowe

RECOVERY OF ORGANIC SOLVENT FROM POLLUTED AIR. Preprint. (Presented at the 56th Annual Meeting, Air Pollution Control Association, Detroit, Mich., June 9-13, 1963, Paper No. 63-33.)

Many volatile organic solvents can be recovered profitably from the air in and exhausted from industrial plants by activated charcoal solvent recovery equipment. In some cases, the recovered solvents are of better quality than the original purchased material. Proper use of solvent recovery equipment can prevent air pollution, eliminate fire and health hazards, and reduce manufacturing costs. (Author abstract) **

02973

G. Schiemann

REDUCING THE EMISSION OF SMALL OIL-FIRING UNITS WITH SPECIAL EMPHASIS ON CONTROL METHODS. Staub (English Transl.) 25, (11) 2-10, NOV. 1965.
CFSTI TT 66-51040/11

In the case of small oil firing installations the type and concentration of emissions depend on the combustion process. Noxious effects are mainly caused by soot and aromatic hydrocarbons. Investigations into the possibility of reducing these emissions show that the most convenient solution of the problem is as complete a combustion of all combustible emission components as possible. Practical experience indicates that the present technical methods permit improvements to be achieved. Control methods used in heating operations are here of particular importance because of their effects on combustion. (Author summary) **

03145

W. R. Calvert

AN ABSORBENT FOR PROVIDING CLEAN AIR IN SUBMARINES. Navy Marine Engineering Lab., Annapolis, Md. (MEL Rept. No. 340/66). AUG. 1966. 18 PP.
CFSTI AD 639 583

The components to be removed from the foul air of a submarine atmosphere include moisture, CO₂ and H₂, each in a range up to about 3% by volume, and lesser quantities of contaminations which are off-gases from men and materials. These latter include the halogenated hydrocarbons, other hydrocarbons, CO, sulfur gases, nitrogen compounds, etc, which are in high concentration at their originating sources but may average to only a few parts per

million in the total atmosphere. Occasional situations may occur when much larger quantities of these components enter a submarine's atmosphere. In addition it is necessary to remove certain airborne solids and liquids (i.e., dusts, smokes, aerosols, haze, bacteria, viruses, etc). Since adsorbents separate gases and vapors and filter airborne solid and liquid particles from a foul air stream, their capabilities are broadly inclusive. Coconut shell carbon is the adsorbent now widely used by the U. S. Navy for vents, filters, gas masks, etc. MS 544 is a sodium aluminosilicate adsorbent which, recently, became a commercial product. It is able to withstand thermal treatment in air during repeated activation to desired adsorbency status. It flows easily. An air purification process may need easy flowing adsorbent. This material is an example of the inorganic adsorbents presently available. Investigation of adsorbents included comparison of active carbon with an active inorganic adsorbent (MS 544) for the removal of Freon-11, Freon-12, CO₂, H₂, moisture, and background gases and vapors from prepared streams of "foul air." Adsorption, various desorptions, and heat activation were programmed in tests to compare the two adsorbents. Pressure decrease and clean air purge effects are included. It was concluded that (1) MS 544 is a safer adsorbent than carbon in a regenerative process and will remove more unwanted components from foul air, (2) termination of throughput in an air-purification adsorbent process is dependent upon the nature of the gaseous components which are to be removed from foul air; (3) moisture is a principal adsorbate in an airpurification adsorption process; (4) heating is necessary for rapid desorption and for complete activation prior to subsequent adsorption in a regenerative air-purification adsorption process.##

03266

G. C. Hass, D. R. Olson, J. N. Pattison, M. P. Sweeney, and M. Brubacher

THE EFFECT OF COMMERCIAL TUNEUPS ON AUTOMOTIVE EXHAUST EMISSIONS (PRELIMINARY REPT.). Proc. Tech. Meeting West Coast Section, Air Pollution Control Assoc., 3rd, Monterey, Calif., 1963. 63-75 pp.

An exhaust test was conducted on the car as received. The car was sent out for tuneup and returned for the "after tuneup" exhaust test. The cars were then returned to the owners with specific instructions for them to observe their normal maintenance habits during the year. The cars are then to be brought back at intervals of 3, 6 and 12 months for exhaust testing only. The owners were also asked to keep a record of maintenance costs for a period of one year. One hundred vehicle owners not involved in the test program are also keeping a record of maintenance costs for one year to provide a comparison. Little, if any, improvement in average exhaust emissions can be accomplished by a conventional tuneup. Little, if any, improvement in average exhaust emissions can be accomplished by ordinary dealer tuneups with specific attention to items affecting emissions. If significant reductions in exhaust emissions are to be accomplished by engine maintenance, techniques and skills must be upgraded over current levels.##

S. Calvert.

BASIC STUDY OF AIR POLLUTION CONTROL WET SCRUBBERS. (INTERIM PROGRESS REPT.) Pennsylvania State Univ., University Park, Center for Air Environment Studies. 268 pp. Sept. 1, 1966

The specific aims, method of procedure, and significance of the research are reviewed. Reprints of work reported since January 1964 are appended; their titles are: "Design of Baffled Conduit Particle Collectors" "Entrained Particle Collection in Packed Beds" "Particle Collection in Packed Beds" "A Technique for Determining Particle Penetration - Diameter Relationships" "Removal of Small Particles from Air by Foam" "Gas Sorption by Suspensions of Activated Carbon in Water" "Absorption by Bubbles in Series" "Sorption by Suspensions in a Sieve Plate Column" "Deposition of Particles from a Turbulent Stream by Thermal Force" "Deposition of Particles from a Turbulent Stream by means of Thermal Force" "Particle Collection in Secondary Flows" "Aerosol Sampling with a Wide Port Probe" Reprints of work reported before but published since 1964: "Gas Absorption in a Ribbon-Grid Column" "Mass Transfer in Horizontally Moving Stable Aqueous Foams" "Gas Absorption in a Fin-Wall Conduit" and "Experimental and Analytical Study of Plate-Type Gas Absorber Dynamics"##

03365

E. Kanz

DUST AS A GERM CARRIER IN WORKING ROOMS. STAUB (English Transl.) (Duesseldorf) 26, (8) 10-5, Aug. 1966.
CFSTI, TT 66-51159/8

The importance of dust containing germs in working places is discussed. In addition to sales rooms and other types of public places, various industrial establishments have dust problems. In particular, they are found in chemical plants where large-scale microbiological processing takes place, as in the production of citric and lactic acids; also this problem occurs in pharmaceutical plants producing antibiotics, and in packing and food plants. Hospitals also have to be concerned with controlling dusts. Four methods of air sterilization are discussed. These include UV heating ventilation, UV ceiling radiation, triethylene glycol evaporation and triethylene cold aerosol generation.##

03456

M. W. Jackson W. M. Wiese and J. T. Wentworth

THE INFLUENCE OF AIR-FUEL RATIO, SPARK TIMING AND COMBUSTION CHAMBER DEPOSITS ON EXHAUST HYDROCARBON EMISSIONS. General Motors Corp., Research Labs. 29 pp. (Presented during National Automobile Week, Detroit, Mich., Mar. 12-16, 1962.)

Investigations of air-fuel ratio and spark timing were carried out using: (1) a laboratory single-cylinder engine, (2) a passenger car operated at 30 mph road load (cruise) and (3) passenger cars operated in accordance with the conditions specified in the

California Standards for Motor Vehicle Exhaust Emissions. The study of combustion chamber deposits was limited to tests in a single-cylinder engine and in a passenger car operated according to the California Standards. Air-fuel ratio was found to have a significant effect on exhaust hydrocarbon emission. However, the problem of vehicle "surge," associated with leaner air-fuel ratios, may present a practical limitation to reductions that otherwise might be obtainable. Retarding the spark timing was generally found to reduce exhaust hydrocarbon emission in both a single-cylinder engine and in passenger cars. Reductions achieved by this method, however, will be accompanied by losses in fuel economy. The effects of leaning the air-fuel ratio and retarding the spark timing were additive when used in combination and consequently produced large reductions in exhaust hydrocarbon content. The fuel economy effects tend to offset each other when both methods of hydrocarbon reduction are used. The accumulation of combustion chamber deposits in both a single-cylinder engine and in a passenger car caused a significant increase in exhaust hydrocarbon content. The hydrocarbon emission measured by means of a nondispersive infrared analyzer sensitized to n-hexane was always less than the total emission measured with a flame-ionization analyzer. The ratios of the values obtained with the flame-ionization analyzer to those obtained with the infrared analyzer ranged from 1.5 to 5.5. Variations in air-fuel ratio had little effect on this ratio but retarding the spark timing caused it to increase markedly. This suggests that spark timing has a significant influence upon the type of hydrocarbons in exhaust.##

03536

AUTOMOTIVE AIR POLLUTION III. (A REPORT TO THE U.S. CONGRESS IN COMPLIANCE WITH PUBLIC LAW 88-206, THE CLEAN AIR ACT.)
Preprint. 1965.

Reduced exhaust emissions of hydrocarbons and CO have become a reality in California with the introduction of the 1966-model passenger cars and light commercial vehicles. Recognition of the need for still further control measures is evidenced by the adoption of nitrogen oxide standards by the California Board of Health. The Department of Health, Education, and Welfare is implementing the new responsibilities and authorities conferred by the Motor Vehicle Air Pollution Control Act. Standards for the control of emissions from gasoline-fuelled vehicles are being developed accordingly, to become effective with the 1968 models. Some additional technical information has become available. Further studies of the effect of ambient temperature on exhaust emissions indicate that low temperatures tend to increase hydrocarbons and CO, particularly following cold-engine starts. Preliminary results obtained from a study of the effect of leaded fuels indicate that combustion chamber deposits may not significantly affect the quantities of hydrocarbons and CO emitted in exhaust gases. A survey being conducted to measure CO levels in urban communities suggests that human exposure to CO may be greater than routine atmospheric monitoring data had indicated. A number of new projects are being initiated by the Government to study the performance characteristics of production-type exhaust emission controls in varied environments, to develop more definitive data on exhaust emissions from small cars and diesel-powered vehicles, to learn more about human tolerance of lead and CO, and to effect control of oxides of nitrogen. An expansion of industry research in automotive air pollution

and its control is indicated by the recent activities of technical associations. (Author summary)##

03645

S. J. Leach

VENTILATION OF ADVANCE HEADINGS. Colliery Eng. (London) 43(514):510-516, Dec. 1966.

Ventilation to remove methane from advance headings of mines is discussed; ventilation must dilute the methane to below 5%, its lower inflammable limit. The following points are discussed: (1) the "general body concentration" (concentration obtained when methane and air are completely mixed) given by other ventilating systems, (2) the systems giving the best mixing of methane emitted in and near the heading, (3) the means of restarting the fans if accidentally stopped and methane was accumulated, (4) the interaction of the advance heading ventilation with the main ventilation, and (5) the control of respirable dust. A discussion is also given on ventilation of roof layers where the volume of inflammable gas is greater than on walls or floor.##

03762

Spencer, E. F., Jr. N. Kayne, M. F. LeDue and J. H. Elliott

EXPERIMENTAL PROGRAM FOR THE CONTROL OF ORGANIC EMISSIONS FROM PROTECTIVE COATING OPERATIONS (INTERIM REPT. NO. 2). Los Angeles County Air Pollution Control District, Calif. Jan. 1959. 40 pp.

This report discusses the equipment and procedures used in the evaluation of control equipment for solvent vapors from surface coating processes. A pilot plant which was used to recover organic solvents by means of activated carbon is described. Of the control methods evaluated, adsorption with activated carbon offers the greatest promise. The advantages of the activated carbon system are: (1) recovers solvent vapors in all concentrations below the flammable range; (2) recovers all types of volatile solvents; (3) recovers solvents efficiently in the presence of water vapor; (4) recovers solvent vapors with high overall efficiency; (5) operation of the equipment is simple; (6) the equipment is sufficiently flexible for all types of surface coating operations. Five complete adsorption-desorption cycles were completed. The adsorption efficiency before reaching saturation averaged 92 percent, while the desorption efficiency, based on solvent recovery vs. solvent adsorbed during the individual run, averaged 57 percent. Poor steam distribution is believed responsible for the incomplete desorption and the equipment is being modified to improve the stripping of the carbon. It is planned to investigate another fixed bed unit and one moving bed unit.##

03763

E. F. Spencer, Jr., N. Kayne, M. F. LeDuc, and J. H. Elliott

EXPERIMENTAL PROGRAM FOR THE CONTROL OF ORGANIC EMISSIONS FROM PROTECTIVE COATING OPERATIONS. Los Angeles County Air Pollution Control District, Calif. July 1959. 37 pp.

This report discusses the progress made in an experimental program designed to determine the degree to which the emission of solvent vapors from surface coating spraying operations can be controlled by adsorption with activated carbon. Twenty-two runs have been made to date with single solvents and multi-component solvent mixtures, representative of industrial formulations. The experimental work has shown that the control of organic emissions from surface coating operations by adsorption with activated carbon is technically feasible. Single solvents or combinations of solvents in low concentrations are adsorbed with high overall efficiency. Solvents immiscible with water are recovered with high efficiency. The desorption of mineral spirits appears to be the most formidable economic factor as the required desorption temperature is high and the value of the recovered solvent is low. A small experimental test oven to investigate surface coating oven emissions has been installed. Various surface coatings and resin products will be processed.##

03796

K. C. Stein, J. J. Feenan, G. P. Thompson, J. F. Shultz, L. J. E. Hofer, and R. B. Anderson

CATALYTIC OXIDATION OF HYDROCARBONS (AN APPROACH TO AIR POLLUTION CONTROL). Ind. Chem. Eng. 52, (8) 671-4, Aug. 1960. (Presented at the Division of Petroleum Chemistry, 135th Meeting Chemical Society, Boston, Mass., Apr. 1959.)

The hydrocarbons in the exhaust gases from automobile engines are a major source of the eye irritating smog occurring in urban areas. Catalytic oxidation applied where the pollutants originate in the individual vehicle is one of the methods of control. In a search for suitable catalyst components, a large number of metal oxides in granular form, unpromoted and unsupported, have been investigated by a new microcatalytic technique based on gas chromatography. The most active of the catalysts were, arranged in order of decreasing effectiveness, the oxides of cobalt, nickel, manganese, chromium, and iron. It is probable that different forms or preparations of the same oxide would have different activities. In general, the higher molecular weight hydrocarbons were more easily oxidized than the lower. Hydrocarbons of a given carbon number increased in reactivity according to the series: aromatic, branched paraffin, alicyclic, normal paraffin, olefinic acetylenic. Fortunately, the olefinic hydrocarbons generally considered the most undesirable are relatively easy to remove.##

03797

K. C. Stein, J. J. Feenan, L. J. E. Hofer, and R. B. Anderson

CATALYTIC OXIDATION OF HYDROCARBONS (TESTS OF SINGLE OXIDES AND SUPPORTED CATALYSTS IN A MICROCATALYTIC REACTOR). Bureau of Mines, Washington, D.C. (Bulletin 608.) 1963. 22 pp.

Pure oxides and catalysts supported on alumina were tested for activity in the oxidation of hydrocarbons in a microcatalytic reactor. The active components, oxides or metals, for oxidation of hydrocarbons were found in the transition series and in the lanthanide and actinide series. Partly completed d- or f-electron shells seem to be a criteria for high activity. The 10 most active elements in the 2 series of catalysts, in decreasing order of activity, were: (I) Single Oxides (Co,Mn,Ni,Cr,Fe,Ce, Ti,Th,Al,Cu); and (II) Supported Catalysts (Cr,Pd,Ru, Ag,Mn,V,Pt,Fe,U,Cu). The average reactivity of hydrocarbons in catalytic oxidation was found to decrease in the following order: 1-pentyne, n-hexane, 2-pentene, cyclohexane, n-pentane, 2,3-dimethylbutane, benzene, isopentane, and methane. Some catalysts were unusually effective in oxidizing particular hydrocarbons. The appendix presents data obtained by the same method for the catalytic oxidation of methane. The same general order of activity of catalysts was found in the oxidation of methane and C(5) and C(6) hydrocarbons. (Author summary modified)##

03851

L. Raymond

AIR POLLUTION AND THE AUTOMOBILE. L'Inquinamento Atmosferico e l'Automobile. Fumi Polveri (Milan) 6, (9) 235-45, Sept. 1966. Text in It.

The differences in air pollution between London (or New York) and Los Angeles are tabulated. The type of smog in London is due mainly to particulate matter in the atmosphere and is usually denser at night, while that of Los Angeles is due mainly to photosynthesis and photochemical reactions and is more frequent in the day time. The Department of Public Health of the state of California decided that a reduction of 80% of hydrocarbons and 60% of carbon oxides is necessary. The following rules to limit vehicular gas emissions are: hydrocarbons - 275 parts/million in volume (0.165 moles/100 atoms of carbon); carbon oxides - 1.5% in volume. The requirements of gas purification equipment should be the following: The equipment must be inexpensive and must function properly under diverse climatic conditions for at least 12,000 miles. It must be safe and well built and must not cause damage to the people. Gas must not be allowed to leak to the passengers. The noise level and the amount of gas consumed should not be higher than in similar cars that do not use such equipment. Various equipment of positive ventilation is illustrated, and methods to reduce gas emissions are described.##

03864

E. K. Daniels, J. R. Lutz, L. A. Castler

POLLUTION CONTROL AT FERNDAL, WASHINGTON. Proc. Am. Petrol. Midyear Meeting, American Petroleum Inst. Division of

Midyear Meeting, American Petroleum Inst. Division of Refining, Los Angeles, Calif., May 14, 1958.)

Pollution control at the Ferndale, Wash., refinery of the General Petroleum Corporation involves the design and operation of the various processes used to control liquid and air-borne wastes. Every opportunity is taken to regenerate alkaline solutions used in treating petroleum products, thus enabling reuse of these solutions and providing a further reduction in the load to the biological-oxidation units. When strong spent caustic and potassium cresylate treating solutions are no longer effective, they are enriched with the addition of excess hydrogen sulfide or cresylic acid, respectively, prior to sale. The use of stripped hydrogen sulfide gases in the spent caustic sulfiding tower has helped to reduce the quantity of this gas that has to be burned and, consequently, has reduced the emission of sulfur dioxide to the atmosphere. Floating-roof tanks are used extensively at the refinery to conserve hydrocarbons and reduce emissions to the atmosphere. The incineration and flare systems are discussed.##

03872

E. P. Kropp R. N. Simonsen

SCRUBBING DEVICES FOR AIR POLLUTION CONTROL.

Paint Oil Chem. Rev. 115,, (14) 11, 14, 16, July 3, 1952.
(Presented at the 45th Annual Meeting, Air Pollution and Smoke Prevention Association of America, Cleveland, Ohio, June 10, 1952.)

In cooperation with the municipal program, potential sources of air pollution from refinery operations were investigated. These investigations showed that, in the Sohio operations, there were three major sources of possible air pollution, as follows: 1. Acid Treating of Lubricating Oil Stocks; 2. Grease Manufacture; 3. Asphalt Manufacture. Experimental work with a pilot-model fog-filter type scrubber has established the utility of this type unit for absorption of fatty-acid odors, and sulfur dioxide and hydrogen sulfide from air streams containing these contaminants. Further work with units of this general type may reveal other applications. As a result of this program, commercial units are being installed for the control of sulfur dioxide, hydrogen sulfide, and fatty-acid odors. Reducing the steam concentration of asphalt-oxidizer fumes by means of water sprays can increase the effective capacity of a fume system to dispose of asphalt fumes by combustion.##

03983

H. F. Hartmann, G. M. Brown, B. R. Kean

USE OF CHLORINE DIOXIDE TO REDUCE VAPOUR PHASE GUM IN TOWN GAS. J. Inst. Fuel (London) 39, (307) 325-35, Aug. 1966.

Vapour phase gum, caused by the condensation of trace amounts of nitric oxide, oxygen, and diolefins has caused troublesome blockages of pilots and automatic control devices of gas appliances. This paper deals with the prevention of

minimizing of gum in the gas by oxidation of the nitric oxide by chlorine dioxide. It is shown that chlorine dioxide will oxidize 95% or more of the nitric oxide, in concentrations of up to at least 24 p.p.m. in less than two seconds, and that in favourable circumstances, gum formation will consequently be reduced to quantities too small to cause appliance complaints even though the reaction products are not removed. A considerable amount of control is necessary to make the process operate efficiently and successful application in any particular case will depend on the proper assessment of individual conditions. The protective measures outlined in the paper were instrumental in eliminating corrosion from the chlorine dioxide. (Author abstract modified)##

04013

K. H. Rhodes

PROJECT STRATOFIRE. S.A.E. (Soc. Automotive Engr.), Preprint. (Presented at the Automotive Engineering Congress, Detroit, Mich., Jan. 10-14, 1966.)

The reduction to practice of a stratified charge combustion system for automotive engines in the form of a bolt-on competitive product was attempted in 1960 and 1961, as part of an all-out company program aimed at smog elimination. The system and devices that resulted from this Walker Manufacturing Co. project showed promise as a fuel economy system, but in the end held little promise for smog reduction. Insights of Projects Stratofire that led to definition changes, theory modifications, and finally to the project cancellation are set forth. (Author abstract)##

04139

J. A. Kenagy

DESIGNING A "CLEAN ROOM" FOR PLASTIC PROCESSING. Mod. Plastics 44, (3) 98-9, 171, Nov. 1966.

A solution to the problems of dust and fume control in a facility handling epoxides, polyesters, and polyurethanes is outlined. A room complying with Federal Standard 209 for a class 100 clean room with laminar down-flow was built to contain casting, encapsulating, and potting operations involving a variety of plastics, hardeners, and catalysts. Exposure to irritating and toxic materials, as well as the existence of a fire hazard in the use of epoxy systems cured with benzyl dimethylamine, polyester resin systems catalyzed by organic peroxides, and urethane systems were involved. The hazardous fumes are removed by the exhaust on the downdraft benches which discharges to the outside. The quantity of acetone, amine hardeners, peroxides, and other flammable or toxic materials is kept to a minimum in the room. A bank of five blowers recirculates the air from the space beneath the floor grating to a plenum chamber in the ceiling where the air is filtered before being returned through the ceiling. The air contains zero particles per cubic foot of 0.5 micron and larger. There is a pop-out escape door in addition to the regular door in case of fire.##

04179

Z. Hertvik and O. Kralik

GAS REMOVAL FROM BITUMINOUS COAL PITS IN THE OSTRAVA-KARVINA DISTRICT. Czech. Heavy Ind. (Prague) 11, 34-6, 1966.

Degassing stations are used to remove gases from bituminous coal mines, especially in reducing methane exhalation by an average of 30 per cent. The reduced exhalation makes possible an improved venting of the pits, smaller air shafts, and thus reduced investment costs. The pits are also prepared for more rapid accessibility and for seam working. It becomes possible to use electric power on a wider scale and thus reduce the use of compressed air which is more expensive. The removal of mine gas is controlled and the possibility of its industrial utilization investigated. Absolute safety of operation of the degassing station is ensured by its perfect equipment with safety and control devices. (Author summary modified)##

04226

THE DESIGN AND DEVELOPMENT OF THE AIR PUMP FOR THE GENERAL MOTORS AIR INJECTION REACTOR SYSTEM. Gen. Motors Eng. J. 1966. pp. 30-5

The development of the General Motors Air Injection Reactor system for controlling the concentrations of unburned hydrocarbons and carbon monoxide in vehicle exhaust emissions required engine modifications and the design of new components. The most vital component in the system is the air pump, designed and manufactured by the Saginaw Steering Gear Division. The pump developed by Saginaw engineers is a semi-articulated vane type positive displacement pump. The design displacement is 19.3 cu in. per revolution with high volumetric efficiency and low horsepower consumption. Additional design criteria included durability consistent with the life of the vehicle and satisfactory performance without maintenance. (Author abstract)##

04279

S. T. Gadomski

DRY-PACKED BEDS FOR THE REMOVAL OF STRONG-ACID GASES FROM RECYCLED ATMOSPHERES. Naval Research Lab., Washington, D.C., Chemistry Division. (NRL Rept. No. 6399.) Aug. 30, 1966. 6 pp.

CFSTI, DDC: AD 642 274

Under certain conditions, strong-acid gases can be formed in recycled atmospheres by the combustion of halogenated hydrocarbons. One control measure involves the use of a dry absorbent filter. Li_2CO_3 has already been used as an absorbent in these filters as a result of a screening test of a number of scavenger materials. In this report the absorptive properties of some other potentially useful materials were examined. Baralyme and soda lime were superior to Li_2CO_3 in air at 76 deg F and over 50% R.H., while the silica-alumina catalyst with monoethanolamine (MEA) impregnant and the silica-magnesia catalyst were almost as

effective as Li_2CO_3 . However, Baralyme, soda lime, various basic materials (MEA, gaseous NH_3 , Na_2CO_3 , and quinoline) supported on the silica-alumina catalyst, and the silica-magnesia catalyst were all useless at 140 deg F. especially under dry conditions. Li_2CO_3 , therefore, still remains as the most effective absorbent throughout the range of probable conditions. (Author abstract)##

04357

S. Dauer

(COMBUSTION TRIANGLE FOR FLUE GASES FROM COMPOUND FURNACES.)
Das Verbrennungsdreieck für Rauchgase aus Mischfeuerungen.
Brennstoff-Wärme-Kraft (Duesseldorf) 17, (5) 232-7, May 1965. Ger.

In order to utilize high value fuels, residues of production processes which are not sufficient for the power production needed, other fuels have to be used in addition and compound furnaces become necessary. These type furnaces are available for all sizes of steam generators and varied fuels can be burned either individually or combined in one combustion chamber. If several combustion chambers are used, the flue gases, after the combustion process, flow combined through the rest of the boiler surface. However, incomplete combustion may result if flues of various characteristics are used. The flue gases have to be controlled and analyzed by chemical or physical methods. For this analysis, a combustion diagram is of great value. The construction of such a diagram is discussed in the following equations: Equation of the enlarged combustion triangle by occurrence of hydrogen in the flue gas. Equation of the enlarged combustion triangle by occurrence of hydrogen in the flue gas. Equation of the enlarged combustion triangle by occurrence of loss of carbon. Equation of the enlarged combustion triangle by simultaneous occurrence of hydrogen in the flue gas and loss of carbon. Influence of carbon loss on air proportion. Mixed (compound) fuels. Mathematical formulas are given for the construction of a combustion triangle.##

04374

K. Yamazaki and Nenryo Kyokaishi

EXHAUST CONTROLS FOR AIR POLLUTION. (J. Fuel Soc. Japan Tokyo) 44, (460) 564-74, Aug. 1965. Jap.

Principal differences in the burning mechanisms of premixed and diffusion flames are discussed in relation to carbon or soot formation in order to elucidate the nature of exhaust from gasoline or diesel engine vehicles. The contents of exhaust pollutants (carbon monoxide, nitrogen oxide, hydrocarbons and their incomplete combustion products) vary extensively according to the driving mode of vehicle operation, as in idling, acceleration, cruising and deceleration. It is important to note that hydrocarbon emission is extremely remarkable in the deceleration step. Diesel exhaust is rather clean compared to gasoline exhaust. Exhaust control devices, catalytic and afterburner, developed in America are briefly reviewed. Improvement of the

engine itself in order to reduce incomplete combustion is discussed. American estimations of future hydrocarbon emission under exhaust controls are cited. (Author summary)##

04417

AUTO EXHAUST STANDARDS WILL TIGHTEN. Chem. Eng. News 44, (20) 56-8, May 16, 1966.

Stricter standards regarding automobile exhausts are being sought, necessitating a more sophisticated approach to control systems by auto manufacturers. It is conjectured that controls based on reactive hydrocarbons, rather than total hydrocarbons, are likely. Many laboratories are presently assembling data on the reactivity of various hydrocarbons, but much more is needed. The continuing work on the modification of engines to reduce the emission of undesirable exhaust products is described. The need for standards regarding the emission of nitrogen oxides is controversial. However, research is proceeding on possible ways to control nitrogen oxides, concentrating primarily on catalytic systems. A diagram illustrating the formation of photochemical smog is included.##

04470L

R. H. Johns, R. P. Garwig, and M. Markels, Jr.

CATALYTIC COMBUSTION OF ATMOSPHERIC CONTAMINANTS IN SPACE VEHICLE ATMOSPHERES. Atlantic Research Corp., Alexandria, Va.
May 1965. 70 pp.
DDC, AD 465 711

The general purpose was to study the kinetics of oxidation of various atmospheric contaminants by several catalysts. A differential rate method was utilized to determine a reaction rate that depended only on catalyst type and was therefore useful for comparing catalyst performance independent of reactor geometry. The oxidation of 0.1 per cent of methane and Freon 12 as contaminants in air was investigated. A reactor and gas preheater were devised which allowed precise temperature control. Hopcalite, palladium supported on alumina, vanadium pentoxide, and silver permanganate were the catalysts considered. Palladium was found to be more effective catalyst than Hopcalite for oxidizing methane. Palladium was also effective in oxidizing Freon 12, but the catalyst was poisoned with respect to further oxidation of methane. Differential rates at various temperatures up to 600 F were determined to compare catalyst performance. Neither vanadium pentoxide nor silver permanganate significantly oxidized methane at temperatures up to 600 F.##

04529

R. J. Everett, L. W. Brewer, G. W. Edwards, A. Juskiewickz, T. A. Linn, Jr., R. O. Mills, and A. J. Jack

INDUSTRIAL HYGIENE HANDBOOK. Sandia Corp., Albuquerque, N. Mex., Industrial Hygiene Lab. (Rept. No. SC-RR-64-562.) Feb. 1965. 152 pp.

This handbook covers procedures, devices, and equipment for controlling possible occupational hazards at Sandia Corporation. Occupational hazards are usually divided into two general classifications: exposure to toxic chemical agents and exposure to physical agents or environmental factors. Chemical agents can enter the body by three methods: inhalation, skin contact, or ingestion. Inhalation and skin contact are the most important because the majority of occupational diseases result from inhalation of dusts, fumes, vapors, gases, and mists or from skin contact with chemical materials. Toxic materials, when inhaled, are frequently rapidly absorbed into the blood or into the fluids in the lungs. A classification of the chemical agents is given which is valuable for control purposes.##

04535

R. G. Woodland, M. C. Hall, and R. R. Russell

PROCESS FOR DISPOSAL OF CHLORINATED ORGANIC RESIDUES. J. Air Pollution Control Assoc. 15, (2) 56-8, Feb. 1965.

A continuous process for the disposal of halogen-containing organic residues has been developed. This process is based on the decomposition of wastes into gaseous byproducts by high temperature reactions with air and steam. The exit gases, which are essentially carbon dioxide, nitrogen, and hydrogen halides, can be scrubbed with water, thereby completely eliminating atmospheric pollution. A unique refractory-lined recuperative heat furnace has successfully operated in this fashion to dispose of more than 20 million pounds of liquid residues (average decomposition: 60% Cl₂; 35% carbon; and the remainder oxygen, hydrogen, and others) during the last year. This process is cheaper than most conventional disposal methods (i.e., ground burial) and offers the added advantage of complete and permanent disposal. (Author abstract)##

04558

D. P. Thornton, Jr.

PLATINUM OXIDATION CATALYSTS IN THE CONTROL OF AIR POLLUTION. Platinum Metals Rev. 7, (3) 82-7, July 1963.

A description is given of the control of noxious products in waste gases by platinum catalysts. Platinum alloys are supported on specially prepared alloy steel ribbons, formed into mat-like beds of various sizes and shapes. Temperature required to initiate catalytic oxidation is discussed. Several typical applications are cited and schematics are included.##

I. M. Khanin, V. I. Yakovlev, M. B. Kartsynel

A SPRAY-TYPE BENZOLE SCRUBBER WITH RADIALLY-SLOTTED GAS DISTRIBUTORS. Coke Chem. (USSR) (English Transl.)

(1) 30-5, 1965. Russ. (Tr.)

The aim was to present the results of a study of the aerodynamics of a new stage-type benzole scrubber with radially-slotted gas distributors. It has been found that: 1. The radially-slotted distributors distribute the stream quite evenly across the scrubber, irrespective of how the gas is supplied (radially α equals 0 degrees, along a secant α equal 35. degrees, or tangentially α equals 90 degrees); 2. Increasing the number of plates in the top and bottom rows of the distributors from 8 to 16 does not affect the distribution of the gas; 3. The gas distribution through the scrubber is impaired by increasing the depth of the slots between the two rows of plates. Although reducing the depth of the slots improves the distribution, it also increases the resistance of the scrubber; 4. The distribution of the gas improves noticeably as it passes through the distributors. There is no doubt that recovery improves as the number of distributors (and, consequently, the number of stages as well) increases; 5. Increasing the flow rate of the gas does not substantially affect the pattern of its distribution across the scrubber. However, the resultant increased turbulence of the gas jets emerging from the distributor slots improves the absorption; and 6. The resistance of a commercial stage-type scrubber with a gas throughput of 84670 cu m/h would be 53 mm water gauge. (Author conclusions modified)##

B. S. Chittawadgi and A. N. Voinov

MECHANISM OF ACTION OF FERROCENE ON SMOKE REDUCTION IN DIFFUSION FLAMES. Indian J. Technol. (India) 3, (m) 209-11, July 1965.

The effect of addition of ferrocene on the smoke point (maximum height attained by a flame when a fuel burns in a standard lamp under standard conditions) of different fuels and on the formation and growth of carbon particles in a 240 mm diffusion flame was investigated. A standard smoke point apparatus was used, the method used being similar to the one recommended in British and Indian standards. The smoke points of the following fuels were determined: benzene, isooctane, isooctane-benzene mixture, diesel fuel (cetane No. 50) and gasoline A-72 (octane No. 68). The change in smoke point with different concentrations of ferrocene added to these fuels was determined also. Ferrocene increased the smoke point of gasolines and diesel oils appreciably. It reduces the size of carbon particles and increases their specific surface area. It has been suggested that ferrocene catalytically accelerates the rate of oxidation of carbon particles and thus reduces the smoke formation in diffusion flames.##

T. V. L. Rao

DIESEL SMOKE. J. Inst. Engrs. (India) (Calcutta) 46, (1)
5-19, Sept. 1965.

This paper studies the feasibility of improving the combustion characteristics in a Diesel engine with a view to eliminate smoke, suppress noise and reduce the cost of operation and maintenance. Based on a study of the reaction kinetics of combustion and the associated problems, the effects of secondary fuel injection and film vapourization on the elimination of smoke are analyzed. The other features of combustion in a Diesel engine, e.g., augmentation of supply of air and its utilization, atomization, vapour formation, mixture distribution, provision of adequate velocity to the air, and construction of the combustion chamber, are also studied. (Author summary)##

04659

POLLUTION BY EXHAUST: U.S. LAW AND A U.K. SYSTEM. Engineering
(London) 203, (5260) 213-6, Feb. 10, 1967.

A British system for the control of toxic exhaust emissions which is inexpensive promises excellent results and minimum power loss. It is emphasized that California's problem with photochemical smog and the meteorological conditions which result in the continual recirculation of the air are extremely rare in Europe. b8carbon monoxide is considered the more serious problem. There has been a suggestion that the Los Angeles atmosphere be analyzed before and after a two-day ban on motor-cars to determine just how much pollution is caused by car exhaust. A very important contribution can be made by the Duplix induction system which employs a hot spot to assist vaporization in the manifold during part-throttle conditions only. The Zenith Duplex system vaporizes the fuel in a by-pass or primary manifold during idling, part-throttle, and over-run when emissions are at a maximum. At the same time, the primary manifold is inoperative at full throttle, so maximum power is virtually unaffected. Charts are given representing the California regulations based on cold starting, idling, accelerating, and stopping to resemble normal city driving. A typical emission trace is given showing hydrocarbon emission from a standard 1200 cc engine during deceleration, acceleration, cruising, and idling. The emission with the Duplex induction system was 377 ppm of hydrocarbons with only a minor peak at maximum depression compared to 1638 ppm of hydrocarbons with severe peaks during deceleration.##

04771

L. J. E. Hofer, P. Gussey, and R. B. Anderson

SPECIFICITY OF CATALYSTS FOR THE OXIDATION OF CARBON MONOXIDE
ETHYLENE MIXTURES. J. Catalysis 3, (1-6) 451-60, 1964.
(Presented at the Catalysis Club Spring Symposium, Pittsburgh
Pa., May 10, 1963.)

The specificity of 5 different catalysts for the oxidation of ethylene and carbon monoxide was determined in a microcatalytic reactor at temperatures from 50 to 600 C. On all 5 catalysts CO oxidized more readily than ethylene. Complete removal of CO occurred on the cobalt oxide at room temperature, on the copper oxide-chromium oxide on alumina catalyst at 100 C, on both copper oxide and iron oxide at 200 C, and on chromium oxide at 450 C. On cobalt oxide, iron oxide, chromium oxide, and the copper oxide-chromium oxide on aluminum oxide the presence of CO enhanced the oxidation of ethylene. Conversely the presence of ethylene inhibits the oxidation of CO markedly in the case of cobalt oxide and iron oxide. Significant chemisorption at any temperature was not observed for chromium oxide or copper oxide. The other 3 catalysts showed significant quantities of chemisorption for both ethylene and CO. With chromium oxide, ferric oxide, and cobalt oxide, hydrogen was produced in amounts up to 2% of the hydrogen in the initial ethylene. (Author abstract)#

04838

R. D. Reed

CONTROLLED ENDO-EXOTHERMIC OXIDATION OF INDUSTRIAL WASTES. Pre-(Presented at the Oklahoma State Univ. Conference on Industrial Wastes, Stillwater, Nov. 16, 1965.)

Time, temperature, and turbulence are factors in disposal by oxidation. The deciding factor for design temperature is the proximity of molecules of fuel to molecules of oxygen. Complete combustion, as defined by the author, does not exist if 500 ppm of the toxic or noxious material is in the flue gases. Average target concentration at grade and downwind of the stack is in the order of 0.10 ppm or perhaps less. The concentrations of substances which will cause odor nuisance are restated. The residence time factor must provide for the time interval required for conversion of the liquid to the gaseous state. In disposal of liquid streams and when mineral salts are present, the mineral exits from the furnace in the form of its oxide in sub-micron size particles.##

04856

E. Z. Pinfer

FUEL OIL ADDITIVES FOR CONTROLLING AIR CONTAMINANT EMISSIONS. J Air Pollution Control Assoc. 17, (1) 43-5, Jan. 1967.

An addition of additives to fuel oils prior to combustion is one way of reducing combustible contaminant emissions to the outer air. Reported test results show that some additives improve, moderately, the combustive properties of fuel oils. Combustion is also improved but to a lesser degree, in boiler systems that are deficient in operation and design. Being combustible, polynuclear hydrocarbons emissions would be reduced by use of additives. Other types of additives to reduce slagging and inhibit corrosion from combustion of fuel oils are also available. The cost of using additives is low. Improved additives are required, especially ones to better combustion in the deficient boiler systems. These can be found by research and literature surveys. Their effectiveness and nontoxicity would be confirmed by laboratory and field testing. (Author abstract)##

04871

W. M. Jones

THE ADSORPTION OF BENZENE VAPOUR FROM AN AIR STREAM, BY BEDS OF CHARCOAL. II. THE RATE-CONTROLLING MECHANISM. J. Appl. Chem. 16, 349-55, Dec. 1966.

The rate-controlling mechanisms discussed are: (i) mass transport of vapour in the air; (ii) an irreversible surface reaction, controlled by a thin, stagnant layer of air around the charcoal granules; (iii) a reversible surface reaction, also controlled by a thin layer of air; (iv) diffusion of vapour into the granules. In each case, a linear equilibrium adsorption isotherm of benzene vapour by charcoal is assumed. An electrical analogue of the obtained are discussed. It is concluded that diffusion of vapour into the granule as the rate-controlling mechanism, gives the best description of the observed results. (Author abstract##

04874

W. M. Jones

THE ADSORPTION OF BENZENE VAPOUR FROM AN AIR STREAM, BY BEDS OF CHARCOAL. I. THE MOST EFFICIENT PHYSICAL ARRANGEMENT OF THE BED. J. Appl. Chem. 16, 345-9, Dec. 1966.

Air is often cleaned by passing contaminated air through a granular bed of an adsorbent such as charcoal. In such a situation the rate of flow of air is fixed and there is an upper limit to the physical size of the bed and an upper limit to the resistance of the bed to air-flow through it. The problem considered is the optimum size of granule to be used in the bed and the optimum shape of the granule, leading to the longest life-time of the bed. An empirical answer to the problem is given for the uptake benzene by a BCNU steam-activated charcoal; apparatus, experiments and results used are described. The method of working and the conclusion are applicable to any vapour/solid system. (Author abstract)##

04888

K. J. Springer

INVESTIGATION OF DIESEL POWERED VEHICLE ODOR AND SMOKE (MONTHLY PROGRESS REPT. NO. 2, FEB. UK MAR. 15, 1967). Southwest Research Inst., San Antonio, Tex., Vehicle Emissions Research Lab. Mar. 26, 1967. 16 pp.

Progress is reported on: catalytic muffler evaluation; engine derating; exhaust dilution and oxidation; Jacobs engine brake; fleet test of smoke suppressant; odor correlation chemistry; statistical analysis; and humidity control.##

ARCO Chemical Co. Anaheim, Calif. Feb. 1967. 13 pp.

THE ATLANTIC RICHFIELD VEHICLE VAPOR RECOVERY SYSTEM.

The nature of the evaporation loss problem is briefly reviewed, and the control system developed for reducing these losses is described. All tank losses during vehicle operation are prevented by eliminating the vent and using a non-venting or one-way fill cap. The mixture of air and hydrocarbon vapor, normally vented from the tank, is ducted forward through a separate line to a condenser where any liquid condensable at ambient temperature is separated and returned to the tank. The uncondensed hydrocarbon plus the air flows from the top of the condenser to the crankcase ventilation system for induction into the engine where it is burned as air-fuel mixture. Any vapor which may come from the tank during the soak period is drawn into the crankcase by the slight vacuum which accompanies the decline in temperature. Vapor and excess liquid from the carburetor float bowl, resulting from boiling of the fuel or from afterfill during a soak, is skimmed from the bowl and ducted to the condenser for separation. The liquid flows to the fuel tank and the vapor to the crankcase by way of the crankcase ventilation system. Only one avenue is open to the atmosphere - the air cleaner - and the filter element partially impedes the escape route.##

04899

H. D. Daigh and W. F. Deeter

CONTROL OF NITROGEN OXIDES IN AUTOMOTIVE EXHAUST. API (Am. Petrol. Inst.) Preprint. (Presented at a Session on Automobile Exhaust Gas, 27th Midyear Meeting, American Petroleum Inst., Division of Refining, San Francisco, Calif. May 17, 1962.)

Large differences exist in the concentration of nitrogen oxides in the exhausts from different makes and models of vehicles and for different modes of vehicle operation. Maximum quantities of nitrogen oxides are emitted during high-speed cruising with large incremental increases occurring for each 10-mph increase in speed. Full-throttle acceleration is another mode of operation which causes the emission of large quantities of nitrogen oxides. Nitrogen oxides can be reduced by several methods. Modification of ignition advance and carburetion and changes in fuel composition reduced emissions but did not achieve the 80-percent reduction which was the goal of this investigation. However, the use of recycled exhaust gas was effective, and reductions of 80 percent or more were generally obtained. A modified system for recycling exhaust gas was developed which offers an operable, inexpensive method for reducing emissions of nitrogen oxides. Adequate vehicle performance was achieved by recycling the exhaust at elevated temperatures and by designing the system to shut off the flow at idle and wide-open throttle. Concentrations of carbon monoxide and hydrocarbons (the latter during deceleration only) were also reduced. Limited testing with this system did not reveal any adverse operating effects or abnormal deposit problems. The results indicated that moderate changes can be made in the ignition and carburetion of those vehicles requiring such changes

with little sacrifice of nitrogen oxides reduction. Individual inert gases, such as nitrogen and carbon dioxide, were equally effective for reducing nitrogen oxides emissions. The effectiveness appears to be due to a modification of the combustion process resulting in lower peak temperatures. A thorough study of combustion should be made to identify those conditions influencing the combustion phenomenon and to determine the optimum conditions for reducing the concentrations of nitrogen oxides. (Author abstract)##

04962

R. G. Lunche, E. E. Lemke, R. L. Weimer, and J. A. Verssen

AIR POLLUTION ENGINEERING IN LOS ANGELES COUNTY. Los Angeles County Air Pollution Control District, Calif. July 1, 1966. 51 pp.

Los Angeles County, the largest heavily-industrialized, semi-tropical area in the world, is afflicted with a serious and well-publicized air pollution problem. This problem is accentuated by average wind speeds of less than 6 miles per hr., and temperature inversions on more than 260 days per year, which restrict dispersion of the air contaminants generated by the activities of seven million people. Since 1939 population has more than doubled, industry has expanded from approximately 6000 establishments to more than 20,000 in 1966, and automobile registration, gasoline consumption and fuels usage have increased sharply. In addition to nearly two decades of expenditures by the District for research engineering and enforcement, industry has expended during this same period 127 million dollars for the installation of new control equipment units and 882 million dollars for basic production equipment. This program is preventing some 5085 tons of various air contaminants from entering the Los Angeles atmosphere each day. Of this total, control measures of the petroleum industry are responsible for removing some 3425 tons. The prohibition of burning of high sulfur fuels accounts for another 535 tons. The ban on single chamber incinerators and open burning prevents another 605 tons from entering the atmosphere. The control of air contaminants from mineral and metallurgical industries accounts for another 420 tons. Of the 5085 tons of various air contaminants now prevented from entering the Los Angeles atmosphere from stationary sources each day, 1195 tons are hydrocarbons, 1320 tons are SO₂, 1945 tons are CO, 470 tons are aerosols, and 155 tons are oxides of nitrogen. The program will not be complete however, until effective control over the gasoline-powered vehicle, fuel oil burning and organic solvent usage is carried out.##

05147

L. S. Caretto and K. Nobe

CATALYTIC COMBUSTION OF HYDROCARBONS WITH COPPER OXIDE. II. CYCLIC COMPOUNDS. California Univ., Los Angeles, Dept. of Engineering. (Rept. 63-4.) 1963. 59 pp.

In order to extend the study of the effects of chain length, saturation, and structure on catalytic combustion of hydrocarbons'

applicable to catalytic afterburners for auto exhaust, kinetic behavior pertaining to copper oxide catalytic activity with cyclic compounds was investigated. The experimental apparatus consisted of a bench scale catalytic reactor and preheater with controls on flow and temperature and an electronic analyzer using a flame ionization detector to measure the hydrocarbon concentrations into and out of the reactor. Three compounds, benzene, cyclohexene, and cyclohexane were studied. The flow rates used ranged from 130 liters/hour to 600 liters/hour measured at room temperature. Initial concentrations used ranged from 190ppm to 2000ppm. The lowest temperature at which oxidation was measured was 195 C. The highest temperature used in the experiments was 360 C; at this temperature all compounds were greater than 90 % oxidized. The data were found to fit an apparent half order rate equation with activation energies of 29.9, 26.6, and 14.5 kcal/mole for benzene, cyclohexane, and cyclohexene, respectively. The relative positions of the oxidation rates of benzene and cyclohexane were approximately the same; the benzene being greater over the temperature range studied. The cyclohexene rate was initially greater than the benzene rate but as the temperature increased, it became less than the benzene oxidation rate. An error analysis indicated a lower limit was set to the range of conversion measurements by the increase of experimental errors at lower conversions. Diffusion calculations indicated that diffusion played a role at higher conversions. The derived kinetic equations neglected these points and should not be rigorously applied to higher conversions. (Author abstract modified) **

05149

W. F. Hamilton, M. Levine, and E. Simon

SMOG ABATEMENT. Lockheed Aircraft Corp., Burbank, Calif.
(Dec. 1, 1959). 48 pp. (Rept. No. 14163.)

Techniques were developed for simulating typical smog polluted atmospheres. Methods and materials for reducing or preventing smog formation as measured by ozone level were studied. Several classes of materials were found effective in various degrees. Best results were obtained by direct addition of iodine to polluted atmospheres. Additions were effective both prior to smog generation by irradiation or after smog formation occurred. Attempts to introduce inhibiting materials in gasoline through an internal combustion engine were unsuccessful. (Author abstract modified) **

05155

W. Linville, and W. H. Parmelee

A STUDY OF CRANKCASE VENTILATION SYSTEM CONTROL DEVICE
INSTALLATIONS ON THE LOS ANGELES COUNTY FLEET. Los Angeles
County b8air Pollution Control District, Calif. (June 1961).
83 pp.

Ninety-four vehicles were studied to determine cost, service life, and effect on the engine. During the nine-month period of the test, more than 1.5 million miles were run. Two basic types of crankcase ventilation system control devices were installed: the

Variable Orifice Metering Valve system, and the Direct Vent Tube System. Both devices functioned satisfactorily throughout the test period. The variable orifice metering valve systems accumulated 957,115 miles on 50 vehicles. No increase in maintenance or service costs resulted from the use of this system but the combustion chamber and induction system deposits were slightly greater than on similar vehicles not fitted with the crankcase ventilation system. The cost of the variable orifice system for new cars will be approximately \$6 and for used cars from \$11 to \$35, including labor costs. No service life complaints were received on the variable orifice system. The direct tube to the air cleaner type of ventilating system accumulated 633,783 miles on 44 different vehicles. The increased maintenance or service costs resulted from the use of this system either, but here, too, the combustion chamber and induction system deposits were slightly greater than on the vehicles not fitted with a crankcase ventilation system. The original material cost for the direct tube system was approximately \$3 per unit with the installation labor costs approximately \$5. The direct vent tube system required no servicing throughout the period of the test. Crankcase ventilation control systems of either of the types tested effectively reduce the amount of hydrocarbons emitted from the crankcase; that original cost is moderate, reliability is excellent, and service expense is negligible; and, although deposits in the engine are increased slightly, the increase is not of a magnitude to increase measurably the cost of engine maintenance.##

05209

F. J. Woods, and J. E. Johnson

THE IGNITION AND COMBUSTION PROPERTIES OF ACTIVATED CARBON CONTAINING ADSORBED HYDROCARBONS. Naval Research Lab., Washington, D.C., Chemistry Div. July 28, 1964. 32 pp. (NRL Rept. No. 6090.)

Activated carbon contained in large filter beds is used in nuclear submarines for removal of odors and trace contaminants. Because organic vapors are concentrated in this way in the carbon, a study was made to get information for assessing the fire hazards involved in maintaining the carbon filter in the ventilation system of the submarines. In this study, spontaneous ignition of submarine-exposed carbons occurred at temperatures as low as 490 F in air at one atmosphere. Exothermic oxidative reactions occurred in a flow system at temperatures as low as 390 F. Combustion of carbons containing hydrocarbon produced considerable quantities of carbon dioxide and carbon monoxide, and significant amounts of these gases were evolved even under precombustion conditions. Of a number of carbons which had been used in submarines, the lowest flash point found was 160 F. (Author abstract)##

05214

Bureau of Mines, Washington, D. C. (Jan. 1963 48 pp.) (Rept. No. TID-8213.)

DEVELOPMENT OF DEPLETED-URANIUM CATALYSTS FOR DESTRUCTION OF AIR POLLUTANTS IN AUTOMOBILE EXHAUST (REPORT OF RESEARCH PROGRESS-FISCAL YEAR 1962).

Catalysts were tested for oxidation activity in the continuous flow system. Four catalysts, all impregnated on alumina spheres, were active enough to oxidize isopentane from 0.2 percent concentration to below 0.033 percent at 600 C. in the presence of 2 percent carbon monoxide and 4 percent oxygen at an hourly space velocity of 10,000, (which corresponds to a reasonably sized muffler of 1/2 cubic foot volume for an average automobile.) Two catalysts were also active enough to oxidize the carbon monoxide content from 2 percent to 1.5 percent at temperatures below 400 C. A promoted uranium catalyst was shown to be effective in oxidizing automotive exhaust when used in a muffler of a 1/2-ton truck. With a nonleaded gasoline practically complete conversion of hydrocarbons and carbon monoxide was obtained during the idle portion of the cycle and fairly high conversions of the hydrocarbons were obtained while cruising at 30 mph. Carbon monoxide produced by the engine during the 30 mph cruise was less than 0.3 percent. At this low concentration, carbon monoxide was not oxidized by the catalyst. However, this quantity emitted to the atmosphere is not of significant pollutant value. In operating the engine under idle conditions from a cold start the temperature of the exhaust is insufficient to start and sustain catalytic activity. However, during the driving cycle the temperature of the exhaust leaving the engine is sufficient to maintain high catalytic activity. After reaching operating temperatures (400 C.) the catalytic reactor generates enough heat to operate effectively even at idle conditions for extended periods. With a leaded gasoline there was a gradual loss in catalytic activity. The efficiency of the catalyst in oxidizing hydrocarbons and carbon monoxide decreased by 23 percent over a period of 122 hours and 1,366 miles with the leaded gasoline (2 ml TEL/gallon). This rate of decline is excessive for commercial application. To retard the decline in activity, a replaceable zone of unimpregnated alumina spheres, located before the catalytic reactor, may be sufficient to remove most of the lead.##.

05250L

K. Nobe, and M. A. Accomazzo

CATALYTIC COMBUSTION OF HYDROCARBONS WITH COPPER OXIDE. I. Methane, Ethane, and Propane. California Univ., Los Angeles, Dept. of Engineering. (Rept. No. 61-83.) Dec. 1961. 39 pp.

The catalytic combustion of hydrocarbons present in low concentrations is of particular interest in the search for methods to control air pollution. The results are reported of the heterogeneous oxidation of methane, ethane and propane with a CuO-Al₂O₃ (1:1) catalyst with a BET surface area of 120 sq m/gm and a mean pore radius of 65A. The combustion was studied at initial hydrocarbon concentrations in the range 650 to 5,000 p.p.m., in the temperature range 313 to 591 C and gas space velocities 6,000/hr. The hydrocarbon concentrations were measured with a Carad flame ionization analyzer and detector. The experimental results showed that for gas space velocities up to 10,000/hr., 90% combustion was attained at temperatures above 580 C, 500 C and 480 C for methane, ethane and propane, respectively. The results indicated that the degree of hydrocarbon oxidation increased with increase in chain length. The experimental kinetic data was found to fit empirical rate equations which were one, three-fourths, and three-fifths order with respect to methane, ethane and propane concentrations respectively.

05300

Lodwick, J. R.

CHEMICAL ADDITIVES IN PETROLEUM FUELS: SOME USES AND ACTION MECHANISMS. J. Inst. Petrol. (London) 50, (491) 297-308, Nov. 1964. (Presented at the Northern Branch Symposium, Manchester, England, Apr. 23, 1964.)

The paper enumerates the types of anti-oxidants, copper deactivators, corrosion inhibitors, combustion chamber modifiers, anti-icing compounds, anti-knock agents, and anti-static additives in current use or proposed for use in the near future. Where possible the action mechanisms whereby these additives operate have been given and discussed. (Author summary)

05320

Grant, Eric P.

DO EXHAUST CONTROLS REALLY WORK? In: Vehicle Emissions, Part II, SAE Progress in Technology Series, Vol. 12, Society of Automotive Engineers, Inc., N. Y. 1966, p. 291-296. 6 refs. (Presented at the SAE WEST Coast Meeting, Los Angeles, CALIF., Aug. 8-11, 1966.)

Descriptions of exhaust control systems used on 1966 vehicles are given. California Motor Vehicle Pollution Control Board (CMVPCB) is carrying out a surveillance program to gather data relative to the efficiency of these systems; exhaust emission results obtained on 1966 vehicles in cold- and hot-start tests are presented together with other data gathered. It was found that, based on emission tests of 404 vehicles in public use, average emissions of 800,000 1966-model cars and light trucks are within California standards of 275 ppm hydrocarbons and 1.5 percent carbon monoxide; emission levels in public use are higher than in proving ground testing; and 1966-model cars are 70 percent lower in exhaust emissions than existing cars.

05380

Knopp, H. E. U. Joachim, and G. Baumann

THE INFLUENCE OF GASOLINE INJECTION ON THE EXHAUST GASES OF MOTOR VEHICLES. (Beeinflussung der Kraftfahrzeugabgase durch Benzineinspritzung.) Motortech. Z. (Stuttgart) 26, (9) 353-61, Sept. 1965 and Bosch Tech. Ber. 1 (4), 206-20, (Sept. 1965). Ger. (Tr.)

The emission of carbon monoxide, hydrocarbons and oxides of nitrogen from various engines with intake-manifold fuel-injection systems, and in some cases from their carburetor equipped counterparts, was measured. Under steady running conditions, a fuel injection system offers advantages by making possible to adopt the characteristics from point to point to obtain the most favorable exhaust conditions. This adoption is described for both a mechanically and an electronically controlled injection system. Fundamental advantages are obtained with a fuel-injection system under non-steady running conditions, during acceleration and on the overrun. A great influence of engine design on hydrocarbon

emission is detectable. Gasoline intake manifold injection offers a sure way of meeting the current requirements of the California test of a CO content of 1.5 percent by volume. If the limit is going to be reduced to 1.0 percent as of 1970, as has been announced then it would seem possible to stay within this value through additional efforts. As shown in the examples of the small and the large engine, it is possible to fulfill the current hydrocarbon requirements of the test, provided the engine design takes into account the demands made on the exhaust gas. The NO₂ emission behaves exactly in an opposite fashion to the CO and hydrocarbon emissions, because it is at a maximum when the other components reach minimum values. At the present state of our knowledge it is not possible to influence this through the mixture. It is fortunate that the percentage of nitrogen oxides at low partial load values of the California cycle is low. In principle it makes more sense to provide maximum combustion completion for the fuel in the combustion chambers, rather than to install afterburners. Injection offers the additional advantage of smaller fuel consumption and larger rotational momentum.

05409

B. F. Hrutfiord and J. L. McCarthy

SEKOR I: VOLATILE ORGANIC COMPOUNDS IN KRAFT PULP MILL EFFLUENT STREAMS. TAPPI 50, (2) 82-58 Feb. 1967.

As part of a program of development of a process for stripping aqueous effluents for kraft pulp mill odor reduction (SEKOR), a study has been made of the volatile organic compounds that may be steam-distilled from kraft pulp mill effluent liquors. Some compounds have been isolated and characterized by gas chromatography. The materials studied include an oil isolated from blow gas condensate, an aqueous blow gas condensate, and several crude sulfate turpentine. Compounds identified include hydrogen sulfide, methyl mercaptan, dimethyl sulfide, dimethyldisulfide, methanol, ethanol, acetone, methyl isobutyl ketone, alpha-pinene, beta-pinene, delta 3-carene, camphene, limonene, cineole, and alpha-terpineol. A large number of additional compounds have been detected. Turpentine from a number of sources have been analyzed and compared. (Authors' abstract) **

05415

A. K. Ghosh, D. P. Rajwar, and D. Bhattacharyya

A MICRO-METHOD FOR RAPID TESTING OF CATALYSTS FOR THE OXIDATION OF COMBUSTIBLE GASES. Chem. Ind. (6), 255- 8 (Feb. 11, 1967).

The micro-method described is of particular use in cases where the catalyst should be tested quickly, precisely and with minute amount of the material. The oxidation of combustible gases (hydrogen, hydrocarbons, etc.) is carried out over catalyst deposited on a platinum wire-wound mica foil that may be heated electrically. An embedded thermo-couple measures the temperature at which the oxidation takes place as well as the extent of conversion. Provision for sampling of the oxidation products is also made for periodic analytical checks on the extent of conversion determined. Both the catalyst and the compensator are placed in

the flow duct in such a manner that the filaments do not lie directly in the main stream. Only the convection currents from the stream maintain steady supply of gas to the filaments. A set of aspirators and traps is employed for the supply of the gas freed from carbon dioxide and moisture. A calibration curve for methane oxidation is obtained initially by recording the maximum rise in temperature due to oxidation of methane-air mixtures of known composition. The curve is used for determining the degree of conversion of the oxidation reaction. The temperature of the filament is regulated by adjusting a suitable series resistance and carefully read by means of the potentiometer bridge. Methane-air mixture is passed at the rate of 200 ml. per minute. The degree of conversion is computed from the observed differential temperature rise and that in the calibration curve. As there is no need to analyse oxidation products in a separate apparatus, this method offers an advantage over other methods of rapid assessment. The observations of the oxidation temperature and of the corresponding extent of conversion take place almost simultaneously and the observed repeatability has been found to be fairly high.##

05471

J. Oliver

THE PAINT FINISHER AND AIR POLLUTION. Prod. Finishing
(Cincinnati) pp. 62-9. Apr. 1967.

Rule 66 adopted by Los Angeles County, July 28, 1966 requiring tighter control of the 550 tons of solvent capor discharged daily appears to be a precursor of regulatory action in other areas. The rule was based on smog chamber tests of the photochemical reactivity of various solvent vapors. Rule 66 prohibits the discharge of more than 15 pounds of organic material into the atmosphere daily from heat-cured, baked, or heat-polymerized material unless all organic material has been reduced 85% or to not more than 15 pounds daily. With air-drying finishes containing no photochemically reactive solvents there are no restrictions. Control measures include a greater use of water - based coatings and the substitution of a mixture of oxygenated solvents and aliphatic hydrocarbons for aromatic solvents. Where formulation changes do not control the exhausts from spray booths or baking ovens, alternative controls include absorption, liquid scrubbing, incineration, and catalytic combustion. Substantial tax benefits are under consideration in some states for companies installing pollution-abatement equipment.##

05537

Clarke, P. J., Gerrard, J. E., Skarstrom, C. W., Vardi J., Wade, D. T.

AN ADSORPTION REGENERATION APPROACH TO THE PROBLEM OF EVAPORATIVE CONTROL. Society of Automotive Engineers, Inc., New York. Preprint.
(Presented at the Automotive Engineering Congress, Society of Automotive Engineers, Detroit, Mich., Jan. 9-13, 1967, Paper 670127.)

An approach to the containment of evaporative emissions of hydrocarbon fuel from automotive vehicles, using an adsorption system, is described. The concept of the system is based upon controlled adsorption-desorption cycling phased to engine operation modes. Feasibility is shown for both the containment of hydrocarbon vapors which would normally be lost to the atmosphere, and the feeding of these vapors to the engine under conditions such that both exhaust emissions and engine operation are unaltered. Extensive performance data are furnished on three cars equipped with exhaust control devices, and system design is treated in a semiempirical fashion demonstrating the flexibility of the approach. (Author abstract)

05742

Middleton, J. T.

CRITERIA FOR CERTIFICATION OF MOTOR VEHICLE POLLUTION CONTROL DEVICES IN CALIFORNIA. J. Air Pollution Control Assoc. 13 (2), 78-80 (Feb. 1963). (Presented at the 55th Annual Meeting, Air Pollution Control Association, Chicago, Ill., May 20-24, 1962.)

It is the purpose of this paper to give the criteria for the acceptance of devices and present some of the data used in establishing them. It is presently estimated that crankcase emission control systems are installed on about 10 percent of the State's eight million motor vehicles and thereby effect a 2 1/2 percent reduction in hydrocarbon emissions. This small but significant beginning in returning clean air to California will be greatly increased with the mandatory installation of crankcase devices on used cars, trucks, and buses.

05822

A. C. Stern

PROSPECTS FOR EXHAUST CONTROL BY ENGINE MODIFICATION. Preprint. (Presented at the Research Conference on Motor Vehicle Exhaust Emissions and Their Effects, Los Angeles, Calif., Dec. 7, 1961.)

Automotive research is much needed on internal combustion engines designed to reduce pollution emissions from their operation. If progress is to be made toward the smog-free automobile, a new sense of mission and a lot more fiscal support has to be given and competent researchers have to be encouraged to undertake the work. Although we cannot predict the results of research, the several possible approaches which are available lead one to be optimistic as to the probability of achieving reduction in exhaust emissions by engine design modifications.##

05832

F. L. Hartley, C. C. Moore, and J. B. Gregory

THE SMOGLESS AUTOMOBILE. (J. Air Pollution Control Assoc.) 10 (4) 143-6 (Apr. 1960). (Presented at the 52nd

Annual Meeting, Air Pollution Control Association, Los Angeles, Calif., June 22-26, 1959.)

Recent studies show that losses from the carburetor float bowl and the fuel tank are significant and can amount to 20 to 30% of the total hydrocarbons emitted from cars in the Los Angeles Basin. The purpose was to show how current fuel systems may be changed to effectively reduce, if not virtually eliminate, these losses. Automobiles with intentionally plugged external vents were operated at altitude and low altitude, employing winter and summer gasolines, and running under mild, and hot weather conditions. No complaints were received from any of the drivers that plugging the external vent has interfered with normal car operation. A drain-back system was installed which empties the contents of the carburetor bowl into the fuel tank immediately when the engine is turned off. This system is fitted with a vacuum-operated valve which is closed while the engine is running so that warm gasoline from the carburetor bowl is not continuously circulated to the tank. The drain time of the carburetor bowl is approximately one minute. During this drain time some fuel does evaporate but our experiments show that hot soak losses are reduced by 95%. The fuel tank was insulated with two sheets of asbestos paper, a sheet of aluminum foil, and a final layer of asbestos cloth. On the average, losses from the insulated tank are reduced by about 70%. A vacuum-actuated valve was installed which closes the fuel tank vent during engine operation. By combining both insulation and fuel tank vent closure, fuel tank losses are reduced by about 90%. A fuel tank cap is provided which acts both as a pop-off valve in the event pressure exceeds two pounds within the tank and also as a vacuum breaker which allows air to go into the tank as it is required. A vacuum reservoir acts as a delay mechanism in opening the drain-back valve. A fuel pressure regulator protects the float bowl.##

05859

I. S. Deckert, R. G. Lunche, and R. C. Murray

CONTROL OF VAPORS FROM BULK GASOLINE LOADING. J. Air Pollution Control Association. 8(3)223-7, 230-3 (Nov.1958). (Presented at the 50th Annual Meeting, Air Pollution Control Association, St. Louss, Mo., June 2-6, 1957.)

An intensive development program by the petroleum industry has succeeded in producing equipment capable of collecting and dispersing of the hydrocarbon vapors displaced during the bulk loading of gasoline into tank vehicles. Refinements to the various types of loading arm assemblies have overcome the problems posed by tank settling during loading and liquid drainage from the loading spout after loading, as well as eliminating "open topping". Inasmuch as equipment manufacturers have been involved in the development program, the equipment items comprising a control system are commercially available. Where the loading into tank vehicles is performed near existing vapor recovery facilities (or gathering lines) absorption plants or fuel gas systems, they can be used to dispose of the vapors. At other locations, such as bulk terminals or bulk plants, where such facilities do not exist, a separate package-type disposal system has been devised. This latter system employs absorption of the displaced vapors in liquid gasoline at about 200 lbs. pressure to recover all but a few per cent of the displaced hydrocarbon vapors. Each of the described

types of control equipment has been installed and in operation for nearly a year and each has proven workable and effective. A systematic program of maintenance should guarantee continued usage without excessive costs. Hydrocarbon vapor emissions have been reduced by about 30 tons daily. These controls represent investments of approximately three million dollars by the petroleum industry and payouts are estimated at thirty months to five years.##

05899

D. S. Mehta S. Calvert

GAS SORPTION BY SUSPENSIONS OF ACTIVATED CARBON IN WATER. Environ. Sci. Technol. 1 (4), 325-31 (Apr. 1967). (Presented at the Symposium on Industrial Air Pollution Control, 59th Annual Meeting, American Inst. of Chemical Engineers, Detroit, Mich., Dec. 4-8, 1966).

The objective of this research was to study and analyze the process of mass transfer as applied to gas sorption by suspension of absorbent particles in liquid. Major factors of interest in this study are equilibrium relationships and rates of transfer. In gas transfer to suspension of absorbent particles the solute gas first dissolves in the absorbent and from liquid it is absorbed by the absorbent particles. Thus, there are transport steps from gas to interface, through liquid, from liquid to solid, and through solid. It is necessary that there be a useful adsorption capacity on the wet solid, but high equilibrium capacity does not necessarily ensure high rates. The rates and the factors affecting rates must be investigated. It has been shown that the controlling factor, for the rates of transfer to suspensions, is the solubility of the solute gas in water. The results of the study suggest that the overall efficiency of the system for sorption by suspensions can not be greater than the intrinsic efficiency of the system for physical absorption of the compound under the same hydrodynamic conditions. The solubility of benzene, toluene, and trichloroethylene in water were determined at 25 C. The absorption isotherm of CO₂ on wet Nuchar C-190 was determined in the range of 0 to 0.003 atm at 25 C. The absorption capacity of water can be increased to a great extent by addition of an adsorbent. In the presence of 2% (by wt.) activated carbon, the capacity of water increases by 0.2 times for CO₂, by 21 times for propane, and by 142 times for butane at 1 atm. pressure and 30 C. The overall efficiency for sorption goes through a maximum with the increase of activated carbon concentration. The increase is explained by a mathematical model for the rates of transfer and the decrease is suggested to be due to hydrodynamic factors. Suspensions would give a high overall efficiency in a practical contactor for compounds with high intrinsic efficiency for physical absorption.##

05929

W. S. Tyler

CATALYTIC OXIDATION OF ODOROUS INK SOLVENT VAPORS. ((Proc. Tech. Conference, Mid-Atlantic States Sect., Air Pollution Control Assoc., Newark, N.J.,)) 1-7 (1962).

This article reports the engineering approach to the development of controls for fumes emitted during high speed printing operations. It was found that the kerosene-like solvent used was being partially oxidized to irritating and obnoxious aldehydes by the severe drying conditions, i.e., hot circulating air blast of 650 - 700 F. After pilot plant runs to test catalytic oxidation, it was concluded that 30 to 40% of the recirculated solvent vapors were oxidized to objectionable materials without a catalyst being present, and with one present, 90 to 95% of the solvent vapors being recirculated were converted to unobjectionable CO₂ and water. With this encouraging information, the Pt catalyst installation was made. A second installation provided a six deep catalyst bed of half the original cross sectional area. This not only evened out the flow across the bed but appeared to improve efficiency as evidenced by increased temperature rise across the catalyst. Location of the catalyst in the circulating systems has the disadvantage of using about 4 times as much catalyst as would be required in the stacks with their much smaller fans. This disadvantage is more than compensated by the simplicity of operation and the fuel gas economy. Catalytic oxidation not only reduces the partly oxidized hydrocarbons discharged but also the amount of tar formed in process.##

05966

S. T. Yuster, P. Staudhammer, N. Zuber, and E. K. Selover

EXHAUST CONTROL DEVICES: AN INVESTIGATION OF NON-CATALYTIC AFTERBURNING. (In: First report of air pollution studies.) ((California Univ., Los Angeles, Dept. of Engineering.)) (Rept. No. 55-27.) (July 1955). 41 pp.

A non-catalytic afterburner was designed and tested on a 1941 Plymouth-6 engine. The afterburner was designed to provide a favorable reaction zone for the completion of the oxidation of hydrocarbons in the exhaust. High temperatures were maintained in the afterburner by minimizing the heat losses; and surfaces were provided on which the oxidation resistant materials, such as ketones, could be oxidized. Secondary air, preheated in a heat exchanger, was introduced into the afterburner to insure the presence of adequate oxygen. While the extent to which the combustion can be completed in the afterburner is dependent upon many factors, the temperature of the reacting gases is the most important variable. This temperature, unfortunately, is mainly controlled by the engine characteristics and load. A power output of 15 hp was required in order to produce a high enough exhaust gas temperature (1370 F) for the afterburner to reduce the hydrocarbon concentrations in the exhaust stream from 600 ppm to less than 20 ppm. The surface provided by packing the afterburner chamber with spherical silicate pebbles was found to promote the combustion process. The packing in this form, however, was impractical because of its high heat capacity and attendant long warm-up period. A porous plate which combines favorable surface effects with a short thermal time constant was being considered. An equation describing the behavior of the afterburner was derived in which two constants had to be evaluated experimentally. This equation was found to correlate satisfactorily the experimental results. By means of this semi-empirical relationship, the performance of this particular afterburner when coupled to any engine can be calculated if the engine characteristics are known. (Author summary modified)##

EFFECTIVENESS OF EXHAUST CONTROLS OF 1966 VEHICLES BY THE STATE OF CALIFORNIA MOTOR VEHICLE POLLUTION CONTROL BOARD, AUG. 10, 1966. 90th Congress. pp 275-84. ("Air Pollution-1967, Part I (Automotive Air Pollution)" Senate Committee on public Works, Washington, D.C., Subcommittee on Air and Water Pollution, Feb. 13-14, 20-21, 1967.

Based on emission tests of 404 vehicles in public use, the average emissions of the 800,000 1966-model cars and light trucks are within the California standards of 275 parts per million hydrocarbons and 1.5 percent carbon monoxide. Emission levels in public use are higher than in proving ground testing. This means that the 1966-model cars are approximately 70% lower in exhaust emissions than the existing car population. There is a very wide range of emissions (at least five to one) between individual cars, even with new exhaust systems. Available data indicate that there may be emission deterioration as mileage accumulates with the exhaust control systems in public use. 150 private owners of 1966 cars with exhaust control systems and 65 owners of 1965 cars without exhaust control systems have been interviewed with regard to the driveability of their cars. Slightly less satisfaction with driveability was indicated on 1966 models compared to 1965. However, some makes made substantial improvements in satisfaction with certain driveability characteristics. Exhaust emission control is sensitive to proper adjustment and proper servicing of the engine and control system. Driveability also is affected by proper engine adjustment. The vehicle manufacturers and car dealers have done a good job of training mechanics regarding the exhaust control systems. However, results on the 1966 models indicate that many engines are maladjusted. Efforts should be redoubled to develop better approaches to vehicle service.##

06127

Hess, K. and R. Stickel

SOOT-FREE COMBUSTION OF PETROCHEMICAL WASTE GASES. Zur russfreien Verbrennung Petrochemischer Abgase. Chem. Ingr. Tech. (Weinheim) 39, (5-6) 334-40, Mar. 20, 1967. Ger.

If soot formation is to be avoided in the combustion of petrochemical waste gases, the flame must be supplied with sufficient oxygen in a mixture of steam and air. The equations of reaction (water gas process) and heat content are set up and solved by an iterative digital computer method. The results were experimentally checked with a turbulent acetylene flame. Concentrations and flow velocity were measured for the onset of luminosity and generation of soot. Large flow velocities ensure good mixing with the surrounding air, thereby reducing the required quantities of steam. For economic reasons it is therefore desirable to work with high-velocity flames, but the stability of the flame and the noise generated by it set practical limits. The numerical results of the theoretical and experimental investigations are represented in 13 diagrams as well as in three schematics for suggested designs for burners.

PROBLEMS OF AIR POLLUTION DUE TO VEHICLE EMISSIONS GASES. J.
Japan Soc. Mech. Engrs. (Tokyo) 69,575, 1568-72, Dec. 1966. Jap.

The reduction of air pollution due to automotive exhaust is estimated to cost the Japanese tax payer \$42 million. Likewise, a great expense will be incurred in correcting pollution from steam power plants. Automobile exhaust causes pollution in local areas such as heavy traffic circles. The harmful effects of such pollutants as CO, SO₂, NO, hydrocarbons, formaldehyde, and dusts are discussed, especially pollution due to CO. A supplement of secondary air to convert CO to CO₂, and the even distribution of gases to the cylinders would be useful in cutting pollution. The production of various hydrocarbons by the engine is tabulated. Another possible method for lessening the concentration of automotive emissions would be in construction of over- and under-passes to avoid bottlenecks on the highway. This method would be cheaper than design and installation of engine modifications for each car. For example, it is estimated that it would cost \$900 million per year for cars in the United States to be properly equipped to control automotive emissions, which money could more favorably be used in carefully designed construction of 3000 miles of highway.

PRESSURE RELIEF AND BLOWDOWN: FUNDAMENTALS OF ENGINEERING
OFFSITES AND UTILITIES FOR THE HPI (PART 6). Petro/Chem
Engr. 39, (6) 53-4, 56, 58, May 1967.

The provisions to dispose of the vapors and liquids discharged by various pressure-relieving devices such as safety and relief valves, rupture disks, pressure-control valves, and furnace emergency blow-down valves are outlined. In the open systems, the vapors and liquids are permitted to discharge directly to the atmosphere, primarily within the process unit. In the closed system, the vapors or liquids are discharged to a flare, burning pit, or blowdown drum and are used especially with offsite facilities. Hydrocarbons with a molecular weight greater than 80 are usually discharged to a water-quenched blowdown drum. Hydrocarbons having a molecular weight of less than 80 which are discharged on a continuous basis are usually discharge through a closed system to a flare or burning pit. Hydrocarbons having a molecular weight of less than 80 which are discharged intermittently from relief valves or rupture discs are discharged directly to the atmosphere except where restricted by local ordinances or where there is a hazard of explosives concentrations at ground level. Where smokeless flares are required, one method is to induce greater air flow by a series of steam jets giving a flame which is invisible in the daytime. Water-quench blowdown tanks provide a facility in which hot liquids can be cooled prior to ultimate disposal. A blowdown drum and vent can be used for liquid hydrocarbons which are not expected to vaporize appreciably. The method of disposal varies with the hazard.##

Mencher, S. K.

CHANGE YOUR PROCESS TO ALLEVIATE YOUR POLLUTION PROBLEM. Petro/Chem. Engr. 39, (6) 21-4, May 1967.

The waste disposal problems involved in the production of olefins by thermal cracking of hydrocarbons are reviewed as illustrative of the sophisticated development of by-product usage by the petrochemical industry and the solution of waste disposal problems by economically sound methods. Both air and water pollution are covered because of their close relationship. The loss of hydrocarbons from a 500 million lb/yr ethylene plant has been calculated as 10,430 lb/day or 0.21 percent loss on the plant feed. The techniques to maintain a low level of hydrocarbon emissions include: floating roof tanks to control evaporation loss; vapor recovery lines to vents of vessels that are continually filled and emptied; manifolding of purge lines used for startups and shutdowns to vapor recovery systems or to the flare system; venting of vacuum jet exhaust lines to recovery systems; shipments by pipeline rather than by car or truck; covering of waste water separators; and the use of flare stacks which operate with steam or air injection to obtain smokeless combustion. The H₂S should be extracted from sour gas streams with a suitable solvent. With large quantities of H₂S it might be advisable to extract the H₂S for eventual sulfur recovery. The mercaptans are converted by various sweetening processes into odorless disulfides. The mercaptans can also be stripped from the caustic solutions used for their absorption by steam, flue gas, or air. Flue gas stripping converts the mercaptans chemically and the solution can then be severed.

06221

THE COLLECTION OF TRICHLOROETHYLENE AND PERCHLOROETHYLENE VAPORS. La Captation des Vapeurs de Tri et de per. ((Galvano (Paris))) 36, (361) 123, 125-6, 152, Feb. 1967. Fr.

The collection of solvent vapors such as Trichloroethylene and perchloroethylene from the atmosphere of work areas is required to prevent the contamination of the air and to make the operation an economical one by reducing the cost of degreasing. The classical methods used are based on the condensation of the vapors on pipes in which cold water is circulated or by adsorption on activated charcoal. In some cases a combination of the two methods is used. The method used depends on the concentration of the solvent in air, the temperature and pressure of the solvent, eventual contamination of the solvent, the degree of recovery desired, and the limitations imposed by the equipment. Condensation is practical only in high concentrations of vapor where complete removal of the solvent from the air is not required. In the use of activated charcoal it is necessary to reverse the process by vaporizing the collected vapor with steam for recovery and to permit the reuse of the charcoal. It is also possible to recover some solvents by percolation of liquids from decanting operations through activated charcoal.##

J. Rousseau

ATMOSPHERIC CONTROL SYSTEMS FOR SPACE VEHICLES. (Air Research Manufacturing Co., Los Angeles, Calif.,) 260p., Mar. 1963. (Technical Documentary Rept. No. ASD-TDR-62-527, Part I.) (Contract No. AF 33(616)-8323.) (Project No. 6146.) (Task No. 614609.)

The studies performed on gas supply subsystems have shown that supercritical storage of atmospheric constituents is preferable to other storage methods. Cabin humidity control by the cooler-condenser process, with subsequent liquid water separation, seems to be the only suitable method of water removal at present. The choice of a carbon dioxide management subsystem is essentially based on the vehicle mission duration. For short-duration missions, lithium hydroxide appears the only attractive chemical means of carbon dioxide control. Depending on the design cabin conditions, carbon dioxide removal by freeze-out technique is definitely applicable to missions shorter than two weeks. For moderate to long-duration missions, carbon dioxide removal by molecular sieve adsorption is indicated. For long-duration missions, carbon dioxide removal by the electrodialysis process appears attractive because of the simplicity resulting from the continuous nature of this process. The problems associated with oxygen recovery from carbon dioxide arise from the integration of the carbon dioxide reduction subsystem with the rest of the atmospheric control system. Hydrogen required for the process is produced by water electrolysis. A control problem is associated with desorption of molecular sieve beds at a rate consistent with stoichiometric composition of the gases entering the catalyst bed. Heat recovery from the methanation process also presents a problem. Trace contaminant removal subsystem design is based on assumptions relative to the contaminant production rates within the space vehicle cabin. (Author's abstract, modified)##

06285

W. R. Calvert

DEVELOPMENT OF AN IMPROVED PROCESS FOR THE CATALYTIC OXIDATION OF ATMOSPHERIC CONTAMINANTS IN SUBMARINES. (Navy Marine Engineering Lab., Annapolis, Md.) Jan. 1966. 23 pp. (MEL R&D Rept. No. 449/65.)

Studies in the development of an improved catalytic oxidation process reveal that polluted air causes other problems along with the corrosion which has been experienced in submarines. CO/H₂ burner troubles are explained by data showing inhibition of Hopcalite due to adsorption of CO₂ and organic halides and showing catalyst granules turning to dust because of thermal fracture. Minimization of air pollutants is necessary, and preprocessing to remove certain materials before the catalytic oxidation is a necessary part of air purification. (Author abstract)##

A. N. Skvortsov, V. V. Kudryashov, V. G. Mukhin

FOAMS FOR DUST CONTROL AT SUB-ZERO TEMPERATURES. (In: Air Pollution in Mines - Theory, Hazards, and Control.) Akad. Nauk SSSR., p. 224-231, 1962. Translated from Russian CFSTI: TT 66-51043

The possibility was examined of combining compatible surfactants manufactured by U.S.S.R. industry with antifreezes for water such as NaCl, CaCl₂ and Al₂(SO₄)₃, compatibility being understood as the quality of resulting in a solution which does not separate into layers and does not produce precipitates. There were also grounds to assume that in addition to lowering the freezing temperatures of our foaming agents these salts would improve the stability of the foams. A low-cost foam - forming preparation was developed which consists of an aqueous solution of 1.2% azolyat B (sodium salt of polyalkyl benzene sulfonic acid) and 6-20% NaCl, the latter playing the part of stabilizer. The foaming agent makes possible the preparation of stable foam with a high volume factor at sub-zero temperatures (down to 16.5C). According to tests made in a mine at sub-zero temperatures, the foam prepared with the foaming agent developed by the authors of the present paper can be used for the fixing of coal dust.##

06479

H. Setzer and A. Kaufman

DESULFURIZATION OF LIQUID HYDROCARBON FUEL FOR FUEL CELLS. (Interim technical progress rept. Jan. 10-July 10, 1966). Pratt and Whitney Aircraft, East Hartford, Conn. (July 30, 1966). 58 pp. (Rept. No. PWA-2885.) CFSTI, DDC: AD 643183

This report covers the work performed during the period January 10, 1966 to July 10, 1966 on contract DA-44-009-AMC-1446(T). Removal of Organic Sulfur Compounds from Liquid Hydrocarbon Fuels. It was the purpose of this contract to investigate the feasibility of using, and to select a method for utilizing, sulfur-blearing fuels of the JP-4, CITE or cell powerplants by desulfurization of the fuel. System studies were made and catalytic guard chamber materials evaluated experimentally to select a desulfurization technique and guard chamber catalyst-absorbent material. These investigations show that using the optimum desulfurization process with a 100-hour replaceable cartridge results in approximately a 3% weight increase in the indirect hydrocarbon-air fuel cell system if JP-4 with 400 ppm sulfur is used rather than a sulfur-free hydrocarbon fuel. Two catalysts (both of which are high nickel content, hydrogenation catalysts) were found to perform very effectively as catalyst-absorbent materials for desulfurization in the presence of steam reformer reactants. Finally, a demonstration test with JP-4 containing 470 ppm sulfur was run using an existing hydrogen generator modified for operation with a desulfurization cartridge and utilizing recycled dilute hydrogen. The 200-hour test without loss in performance demonstrates the potential of this method for utilizing JP-4 or CITE in indirect hydrocarbon-air fuel cell powerplants. (Author summary)##

D. W. Marshall

CATALYTIC OXIDATION OF METHANE AT LOW SPACE VELOCITIES.
Air Force Flight Dynamics Lab., Wright-Patterson AFB,
Ohio, Research and Technology Division. (June 1966). 34 pp.
(Technical Rept. AFFDL-TR-66-56.)

The feasibility of removing methane from an airstream by catalytic oxidation at low flows was investigated by passing a one percent, by volume, methane in airstream through an inhouse designed and fabricated stainless steel reactor. The reactor contained either Hopcalite, 5% V2O5, 5% M003 on alumina, or one of the following materials supported on alumina: 0.5% palladium, 0.5% platinum, 0.5% rhodium and 0.5% ruthenium. Some discontinuity in the data reported in the literature on methane oxidation at or around the transition flow region prompted a closer investigation in this area. In addition, space velocities around 500 fills per hour were used to insure chemical equilibrium and for comparison with the more common value of approximately 15,000 fills per hour used in most industrial applications. Experiments performed using the above catalysts revealed no deleterious effects associated with operating in the transition flow region, but did point out the advantage of using high space velocities for maximum catalyst utilization. The palladium catalyst proved superior to all others tested and catalyzed the reaction to completion at 560 F. Conversion versus temperature curves are plotted for each catalyst flow rate combination and the effect of space velocity on conversion at constant temperature is shown for the Hopcalite and palladium catalysts. Variables which affected the accuracy of experimentation most are discussed and possible improvements suggested. (Aughor abstract)##

06534

L. A. Chambers

GASOLINE COMPOSITION AS A FACTOR IN AIR POLLUTION. Preprint.
(Presented at the American Chemical Society Meeting, Atlantic
City, N.J., Sept. 16, 1959.)

The evidence accumulated by the Air Pollution Control District of Los Angeles for modifying gasoline composition as a means of reducing the formation of smog was illustrated. Studies were made with exhaust from engine operations using fuels of high, very low and intermediate olefin content. The evidence included correlations between the following: Relationships between fuel composition and eye irritation; gasoline composition to exhaust composition; fuel olefins to plant damage; gasoline composition to aerosol formation; and gasoline compositions to ozone, aldehyde, and other intermediate formations. No fully adequate conclusion as to the explicit relationship between gasoline composition and smog can be formulated at present. It is evident that fuel constituents influence the smog forming properties of exhausts and that certain blends of gasoline are superior to others in this respect.##

06611

Rengstorff, G. W.

FORMATION AND SUPPRESSION OF EMISSIONS FROM STEELMAKING PROCESSES. In: (Open Hearth Proc., Philadelphia, Pa.), 1961, Vol. 44, p. 120-147. 7 refs. (Presented at the 44th Conf., Nat. Open Hearth Steel Comm. of the Iron & Steel Div., Phila., Pa., April 10-12, 1961.)

Much new information delineating the effect of process variables on iron-smoke formation has been developed from experiments on a 2-lb converter. This information has been combined with detailed analysis of the reactions between gases and molten iron to provide valuable clues for understanding the mechanism of smoke formation. Progress is being made toward achieving this understanding. From a practical standpoint, it appears that the possibility of adding methane to suppress smoke in bessemer converters has merit. The finding that an increased gas-inlet jet velocity decreases smoke in top blowing needs verification. If true, it will probably be of considerable practical importance. (Author's conclusions, modified) ##

06633

Constan, G. L.

MASS TRANSFER IN DROPS UNDER CONDITIONS THAT PROMOTE OSCILLATION AND INTERNAL CIRCULATION (A DOCTOR'S THESIS). (In partial fulfillment for the degree of Doctor of Philosophy, (Case Inst. of Tech., Cleveland, Ohio.) 143p, 1961

Single drops supported on hypodermic tubing have been studied in a wind tunnel to determine the effect of drop oscillation on mass transfer. The systems studied for the case where internal resistance controls consisted of absorption of SO₂ gas by drops of glycerine, propylene glycol, and ethylene glycol. The results can be expressed in terms of effective diffusivity. No significant effect was noted in glycerine, whereas the glycols gave effective diffusivity values of 2-8. Frequencies, amplitudes, and internal circulation velocities in the drops were studied by cinematography, and are compared with predicted magnitudes. The effect of oscillation on external mass transfer coefficients was studied by sublimation of naphthalene spheres. In the cases where the vibrational velocity was less than the stream velocity, no effect was noted; this is in agreement with heat transfer studies. A technique has been developed for studying the effect of internal circulation on effective diffusivity, using forced circulation through a drop suspended on hypodermic tubing. A "pseudo-film thickness" is determined as a function of circulation velocity, and presents a means of predicting effective diffusivity. This technique has been demonstrated for the system SO₂ and H₂O, giving results in fair agreement with a correlation found in the literature.##

06636

Bureau of Mines, Washington, C.C.

AIR POLLUTION RESEARCH PROGRESS REPORT FOR THE QUARTER ENDED MARCH 31, 1968. In cooperation with the Public Health Health Service.) (Mar. 31, 1967) 87 pp.

This report covers progress on research in the following areas: Sulfur dioxide removal from flue gas; Removal of sulfur oxides from flue gas with manganese oxide and improved regeneration; Economic evaluation of processes for the removal of sulfur dioxide from flue gas; Characteristics and removal of pyritic sulfur from selected American coals; Pollution by chlorine in coal combustion; Flame characteristics causing air pollution; Characteristics and photochemical reactivity of vehicular emissions; Mechanisms of air pollution reactions; Effects of engine, fuel and combustion system parameters on vehicular emissions; Composition, smoke and odor of diesel exhausts.##

06674

M. V. Alekseyeva, and V. A. Khrustaleva

A STUDY OF AUTOMOTIVE EXHAUST GASES. U.S.S.R. Literature on Air Pollution and Related Occupational Diseases, Vol. 7, 279-84, 1962. (Gigiena i Sanit.,) 25 (5), 10-4, 1960. Russ. (Tr.)

CFSTI: 62-11103

Air samples taken in the immediate vicinity of automotive exhausts during heavy traffic conditions were analyzed for formaldehyde, acrolein, ketones, unsaturated and aromatic hydrocarbons, and CO. The data obtained are correlated with the type of vehicle and type of fuel used. Results showed that incomplete fuel combustion in motor vehicles was a potent source of air pollution. The effectiveness of a platinum catalytic oxidizing device for treatment of exhaust gases was tested and found to reduce pollution.##

06719

Harkness, A. C. and F. E. Murray

GAS PHASE OXIDATION OF METHYL MERCAPTAN. Intern. J. Air Water Pollution, Vol. 10, p. 245-251, 1966. 8 refs.

The reaction between methyl mercaptan and oxygen in the gas phase has been examined in the temperature range 201 to 275 C. Sulfur dioxide is the chief product of the reaction, being formed together with methane at the start of the reaction. Other products of the reaction are carbon monoxide, carbon dioxide, hydrogen, formaldehyde and methanol. In the presence of excess oxygen, complete conversion to sulfur dioxide is obtained quickly at 275 C. At lower temperatures and lower oxygen content much of the sulfur remains unaccounted for. In confirmation of previous work the rate of reaction was found to be strongly accelerated by oxygen and to be inhibited by mercaptan.##

S. Nozaki

(SELECTION OF AIR FILTER.) Kuki Seijo (Clean Air-J. Japan Air Cleaning Assoc., Tokyo) 2, (2) 20-9, 1964. Jap.

Various considerations are given to the selection of air filters for dusts (not gases): the type of indoor pollution being controlled, type of filter desired, relation between combination of filters and efficiency, air resistance, rate of collection, maintenance, and economics. The kinds of dust collectors available and the sizes of particles collected are tabulated. For example, the large cyclone can be used for particles between 20 microns and 1 mm in size, the small cyclone for particles between 20 microns and 0.1 mm, the electrical precipitator for 0.01 to 0.01 mm size particles, and the supersonic collector for particles 0.05 to 2 microns in size. Tabulations were made of the collection of dusts and mists of such substances as cadmium, phosphorus, lead, o-dinitrocresol, barium, pentachloronaphthalene, sulfuric acid, manganese, etc. Standard temperatures and humidities were maintained according to season, the values conforming to U.S. Air Force Technical Order 00-25-203 for clean rooms. A discussion of the efficiency and advisability of using two or three filters is given. In each case, total air resistance had to be considered. Calculation for rates of collection are also given.##

07224

E. Fiala and E. G. Zeschmann

THE EXHAUST GAS PROBLEM OF MOTOR VEHICLES (PART 2). Zum Abgasproblem der Strassenfahrzeuge (Teil 2). Automobiltech. Z. (Stuttgart) 67(12), 419-22 (Dec. 1965). Ger.

The CO content of cigarette smoke was determined by means of the Orsat apparatus and the Draeger probe. The CO concentration varied between 2 to 5% which is about ten times the concentration in the engine exhaust gas of an automobile cruising at constant speed. The origin of unpleasant odors of two-stroke engines was traced back to strongly heated hydrocarbons forming aldehydes. The effects of various adjustments of the carburetor on the CO concentration were determined. Optimal positions of the choke plate and other adjustable parts of the carburetor were determined for some compact cars. Photographs illustrate the experimental set-up, and results are presented in graphs. Ignition limits of mixtures of air, nitrogen, and n-heptane were determined. The exhaust gas composition can be improved considerably with little effort if the loss of some peak power is tolerated.##

07362

Feist, H. J.

ELIMINATING ODORS BY CATALYTIC COMBUSTION. ((Die Geruchsbeseitigung durch katalytische Verbrennung.)) Text in German. Stadtthygiene (Uelzen/Hamburg), 16 (3):55-61, Mar. 1965. 11 refs.

With the rapid growth of the chemical industry, air pollution by odors has also increased. Catalytic oxidation and reduction offer possibilities for an economic solution of the problem. The principles of catalytic reactions are described. In a table the properties of four catalysts are compared with each other. These catalysts are: platinum on metal, platinum-palladium on ceramics, copper-chromium on aluminum oxide, and platinum on ceramics. The effectiveness of a catalyst depends on the gas mixture, the temperature, the type of catalyst, and the ratio: volume of gas/hour/volume of catalyst. The heat generated by the catalytic process is usually used to preheat the gas before it enters the catalyst. If the concentration of combustible substances is sufficient, steam may be produced in addition. An example is quoted where 47,000 cu. m. gas per hour with a latent heat of 400 kcal/cu. m. produce 31 tons of steam per hour. The equipment pays for itself in 2 1/4 years. For gases of low heat content, catalytic combustion under increased pressure is advantageous. Most economical is a gas turbine which compresses the gas and, after it has passed the catalytic chamber, uses the hot cleaned gas. The use of a gas turbine is recommended for gas volumes of more than 100,000 cu. m./hr, if measures for air pollution control become necessary.##

07560

STAINLESS STEEL ANTI-SMOG MUFFLERS--CUT AIR POLLUTION. J. Air Pollution Control Assoc., 9(2):83-84, Aug. 1959.

In August, 1956, installation of anti-smog mufflers was started on the Los Angeles City Schools' 81 big passenger buses. The muffler is almost entirely fabricated from chromium-nickel stainless steel, in order to resist oxidation and corrosion at the high operating temperatures. The muffler is designed to dispose of the unburned fuels presented in the exhaust system of a gasoline engine. It consists of a primary burning tube (pilot tube) through which the bulk of the exhaust gases pass during operations of low exhaust volume. Air is introduced through an adjustable opening into this tube and the resulting mixture is ignited by a long-reach spark plug. The current model was designed for heavy-duty gasoline-powered trucks and buses with 550 to 750 cu in. piston displacement. The mufflers have proved to be 97 percent effective in eliminating smog-producing hydrocarbons from engine exhausts (one of the principal causes of air pollution) on Los Angeles City School and Transit System buses. Users report less back pressure resulting in increased horsepower and gas mileage and improved engine performance. Some of the mufflers have successfully operated more than 100,000 miles without failure.##

07613

Ridgway, S. L. and J. C. Lair

AUTOMOTIVE AIR POLLUTION: A SYSTEMS APPROACH. J. Air Pollution Control Assoc., 10(4):336-340, Aug. 1960. 1 ref. (Presented at the 52nd Annual Meeting, Air Pollution Control Assoc., Los Angeles, Calif., June 21-26, 1959.)

The application of systems engineering to the control of pollution from automotive exhaust is illustrated. First, the design and complex mechanical function of the flame afterburner system are analyzed. The efficiency of the device is discussed. Secondly,

an analysis is made of the natural meteorological modulation of the concentration of air pollution to form an estimate of the results that might be brought about by the control of emissions. By examination of past records, September was found to be the worst month of the smog season. Concentrations of ozone and carbon monoxide for the month of September from 1955-1958 were studied. It was deduced, on the basis of analysis, that a pollutant which contributes to smog formation must be reduced in concentration by a factor of 2 or 3 in order to reduce the worst September experience to the level of the best. The efficiency of control devices required to reduce today's pollution is calculated.##

07620

Suter, H. R.

RANGE OF APPLICABILITY OF CATALYTIC FUME BURNERS. J. Air Pollution Control Assoc., 5(3):173-175, 184, Nov. 1955. (Presented at the 48th Annual Meeting, Air Pollution Control Assoc., Detroit, Mich., May 22-26, 1955.)

A more detailed exposition of the mechanism of vapor-phase catalytic oxidation is presented. Catalytic oxidation proceeds through 3 steps: adsorption on the active surface; chemical reaction; and, desorption. During adsorption turbulence will assist in the diffusion process and shapes of catalyst supports promoting laminar flow should be avoided. The clearance between active surfaces should be small. The general field of applicability for vapor-phase oxidation in the air pollution control field lies in streams containing combustible matter at concentrations below the lower limit of explosibility. The limitations may be physical, chemical, or practical and economic. Noncombustible inorganic solids are not affected by the catalyst, and should be absent from the stream lest they accumulate and cover the active surface. The material to be oxidized must yield innocuous products in order to serve the purposes of air pollution control. Specific catalyst poisons must be absent. Catalytic oxidation units are not bought "off-the-shelf" but are specially designed for various applications.

07836

Benforado, David M.

AIR POLLUTION CONTROL BY DIRECT FLAME INCINERATION IN THE PAINT INDUSTRY. J. Paint Technol., 39(508):265-266, May 1967. 1 ref. (Presented at the 44th Annual Meeting, Federation of Societies for Paint Technology, Washington, D. C., Nov. 4, 1966.)

Direct-flame incineration is discussed and up-to-date information available is summarized. Direct-flame incineration is an air pollution control process in which objectionable organic vapors or organic particulates are converted to harmless carbon dioxide and water vapor. The organic emissions are destroyed by exposure under the proper conditions to temperatures of 1000-1400 deg. F in the presence of a flame. Heat recovery equipment to cut down fuel costs is usually easily justified. A typical forced draft direct-flame incineration system with heat recovery showing how solvent vapors are eliminated from a can coating process is presented. Compared with other control processes for organic emissions, direct-

flame incineration is capable of achieving a high level of effectiveness. The basic variables affecting the design of a direct-flame incinerator are: (1) Incineration temperature; (2) The length of time the contaminated air is held at this temperature; and (3) The amount of turbulence or mixing designed into the combustor. Applications in which direct-flame incineration has been used successfully by paint manufacturers include controlling the exhaust from: resin and varnish cookers; and phthalic anhydride plants. Applications in which direct-flame incineration has been successfully used by industrial finishers include control of emissions from bake ovens such as automobile can coating, sheet metal, and wire enameling.

07846

Robison, J. A. and W. M. Brehob

THE INFLUENCE OF IMPROVED MIXTURE QUALITY ON ENGINE EXHAUST EMISSIONS AND PERFORMANCE. J. Air Pollution Control Assoc., 17(7):446-453, July 1967. 6 refs.

A large, steam-heated, fuel vaporization tank was utilized as a carburetor in multicylinder engine testing at steady-state operating conditions. In comparison to normal carburetion, the tank provided improved air fuel mixture quality, i.e., completely vaporized fuel, thoroughly mixed with air, and at elevated temperatures. Although not a practical piece of engine hardware, the tank provided a means of determining the extent of gains to be made with improved mixture quality. Improved mixture quality produced slight reductions in rich mixture hydrocarbon and carbon monoxide concentrations but did not reduce the minimum emissions of these two exhaust contaminants. Minimum fuel consumption was similarly unaffected by improved mixture quality. The most important benefit of improved mixture quality was derived from improved geometric and cyclic fuel distribution; a substantial extension of the misfire lean limit. The significance of lean limit operation and its relationship to reduced exhaust contaminants is discussed in detail. (Authors' abstract)##

07881

Grumer, J., M. E. Harris, V. R. Rowe, and E. B. Cook

EFFECT OF RECYCLING COMBUSTION PRODUCTS ON PRODUCTION OF OXIDES OF NITROGEN, CARBON MONOXIDE AND HYDROCARBONS BY GAS BURNER FLAMES. Preprint, Bureau of Mines, Pittsburgh, Pa., 42p., 1967. 24 refs. (Presented at the Symposium on Air Pollution Control Through Applied Combustion Science, 16th Annual Meeting, American Inst. of Chemical Engineers, New York City, Nov. 26-30, 1967)

Gas appliances designed to lessen the emission of oxides of nitrogen, carbon monoxide, and hydrocarbons, are desired. The formation and decay of oxides of nitrogen and carbon monoxide in the secondary combustion zone of gas-burner flames were investigated as functions of temperature, cooling rate (temperature gradient), and degree of recycling of combustion products into the primary combustion zone of the flame; preliminary measurements were made on hydrocarbons from flames. Recycling, though effective in reducing nitrogen oxides concentrations in effluent from gas

appliances, makes the flames longer and less stable. Nitrogen oxides may be reduced by keeping the primary combustion temperature as low as possible, preferably no higher than about 3,000 deg. F., and by starting to cool the combustion gases as soon as possible to about 2,300 deg. F at which temperature concentrations of nitrogen oxides do not increase within the residence time in most gas appliances. Concentrations of carbon monoxide are lowered by recycling of flue gases. The oxidation rate of carbon monoxide is strongly increased by increasing the oxygen concentration. Although the point has yet to be proven by future research, it appears that carbon monoxide concentrations may best be lowered by appliance designs that allow rapid induction of secondary air into the secondary combustion zones. Hydrocarbons can escape from gas burner flames by flowing from the preheat zone of partially lifted flames through the dead space into the surrounding cold atmosphere. Recycling of combustion gases, very low fuel-air ratio, and very high flow rates tend to promote partial lifting of flames from burner ports. It is possible that the emission of hydrocarbons by gas appliances may largely be avoided by designing for well-seated flames on burner ports.

07882

Kaiser, E. R. and S. B. Friedman

THE PYROLYSIS OF REFUSE COMPONENTS. Combustion, 39(11): 31-36, May 1968. 5 refs. Presented at the Symposium on Air Pollution Control through Applied Combustion Science, 16th Annual Meeting, American Institute of Chemical Engineers, New York, N.Y., Nov. 26-30, 1967.

Exploratory laboratory tests of destructive distillation of organic wastes, and the prospects for complete gasification of the organic matter are reported. The objective is to determine the quantity and quality of the product gas that might be produced for use as a hot, raw boiler fuel, and possibly for chemical manufacture. Results show that by heating to 1500 F out of contact with air, the organic matter in municipal refuse can be converted to gas, organic liquids, water and char in roughly equal proportions by weight. The relative yields will be affected by the rate of heating. Higher yields of gas result from rapid heating. The fixed gases have a calorific value of 350-400 Btu per standard cu ft. The organic liquids range from alcohol to pitch. An extension of the investigation to include complete gasification and analyses by chromatography is suggested.

07884L

M. Lew, R. Woodruff, W. Johnson, W. Musa

ION EXCHANGERS IN REMOVAL OF AIR CONTAMINANTS. San Francisco Bay-Naval Shipyard, Vallejo, Calif., Chemical Lab.-8024-66, PR-1, ((30))p., March 1967. ((50)) refs.

DDC: AD 808060L

The ability of ion exchangers to be synthesized, modified, regenerated, or used in customary form to react with gaseous air contaminants and effect removal of these contaminants from air was studied. Results show that treated and untreated ion exchangers will react with a variety of gaseous materials and thereby cause removal of these materials from air. Reactions

which occur between ion exchange resins and ionized reactants in aqueous media will likely occur in gaseous systems. The possibilities of reactions between exchangers and organic contaminants at nominal temperatures cannot necessarily be foreseen. Favorable reactions between organic vapors and exchanged groups on ion exchange resins are being sought.##

07893

Stern, Arthur C.

AIR POLLUTION CONTROL - PROBLEMS FOR THE AUTOMOTIVE ENGINEER. Preprint, Public Health Service, Washington, D. C., National Center for Air Pollution Control, 15p., ((1967)). (Presented at the National West Coast Meeting, Society of Automotive Engineers, Portland, Oreg., Aug. 16, 1967.)

The contribution of the automobile and other gasoline power vehicles to pollution are discussed. The adverse effects and the contributing pollutants are cited. Control efforts are being undertaken under the mandate of the Motor Vehicle Air Pollution Control Act, which authorizes the establishment of standards for the emission of substances harmful to public health. Compliance certification of new motor vehicles and engines and the technical problems involved are discussed. Approaches to vehicular-emission control are discussed, specially the inter-relationship of engine, fuel, and refinery design. The corresponding problems of the automotive engineer are cited.

07971

Kukin, Ira

CHEMICAL SUPPLEMENTS IN AIR POLLUTION CONTROL PROGRAMS. Apollo Chemical Corp., Clifton, N.J., FL-67-65, ((32))p., 1967. 12 refs. (Presented at the National Fuels and Lubricants Meeting, New York, N. Y., Sept. 13-14, 1967.)

Several classes of chemical additives for petroleum fuels and coals have been developed that reduce air pollutants from smoke stacks. These are: (1) combustion catalysts, (2) smoke-suppressants, (3) oil-ash (slag) modifiers, (4) absorptive agents, (5) SO₃ neutralizing agents. The application of these products to specific air pollution reduction programs is shown by several case histories involving the following power plants: (1) 4-cycle diesel trucks, (2) 2-cycle diesel buses, (3) diesel power generating equipment, (4) gas turbine for peaking operations, (5) school heating equipment with No. 4 oil, (6) industrial plant boiler with Bunker C fuel, (7) refinery boiler burning No. 6 oil and gas, (8) marine steam plant, (9) utility power plant, (10) coal-fired utility. These specific examples cover the known types of polluting materials from fuel and coal burning power plants. A ready guide for specific utilization of the chemical treatments is summarized. It has been shown that chemical supplements are 80 to 100% effective for improving the combustion of the fuels resulting in a decrease of smoke, particulate matter, odors and aerosols as well as acidic and acrid SO₃ with a resultant reduction in stack plume. Chemical supplements appear to be uneconomical generally to completely eliminate SO₂ from the exhaust gases. There are indications, however, that by reducing

the aerosols forming soots and particulate matter from the exit gases, the smog-forming tendencies of SO₂ are reduced substantially.##

08075

Griswold, S. S.

REGULATION OF NEW MOTOR VEHICLES. Preprint, Public Health Service, Washington, D. C., Division of Air Pollution, 7p., 1966. (Presented at the National Conference on Air Pollution, Washington, D. C., Dec. 12-14, 1966.)

The problem of air pollution from motor vehicles is discussed. The basis for the discussion is the Motor Vehicle Air Pollution Control Act. It is an amendment to the Clean Air Act of 1963 and was signed by President Johnson on October 20, 1965. It is designed to achieve uniform national control by limiting the emission from all new motor vehicles introduced into commerce, whether manufactured in the United States or imported from abroad. It authorizes the Secretary of Health, Education, and Welfare to establish standards for the emission of any substance which in his judgment is, or may be, injurious to public health or welfare and to require compliance with these standards. At the same time the Act specifies that appropriate consideration be given to technological feasibility and economic costs in prescribing standards applicable to new motor vehicles or engines. Federal emission standards were formally promulgated on March 30, 1966. These standards are applicable to the 1968 model year and reflect those currently in effect in the State of California. To implement these standards, to test for compliance and, generally, to provide the necessary machinery for insuring that the public gets the control it needs, the Abatement Branch of the Division of Air Pollution is establishing a fully equipped laboratory at the Willow Run Airport near Detroit. This laboratory also has the responsibility for evaluating the adequacy of existing standards and the need for more severe standards and less complex test procedures. Field surveys of equipped vehicles in California and elsewhere are also being conducted. Initial certification of new systems is approved on the basis of performance of test vehicles, but the continued approval for succeeding years will be determined by the systems' effectiveness when evaluated under realistic driving conditions.##

08080

Rukin, I.

UTILIZATION OF ADDITIVES IN CONTROLLED COMBUSTION PRODUCTS. Preprint, Apollo Chemical Corp., Clifton, N. J., 11 p., 1966. (Presented at the MECAR Technical Symposium on Combustion and Air Pollution Control, Oct. 25, 1966.)

Practical applications of chemical additives for reducing air pollution with petroleum fuels are discussed. Successful results have been achieved in the field by the use of additives for fuel oils, both distillate and residual fuels. The major pollutants are: (1) black particulate matter representing primarily unburned hydrocarbons; (2) sulfur oxides (SO₂ and SO₃). With distillate fuels, where the sulfur content generally is below 0.5%, our primary concern is particulate matter and to a somewhat

lesser degree, carbon monoxide, aldehydes and nitrogen oxides. With residual fuels, sulfur, as SO₂ and SO₃, is the dominant consideration, although the ability to reduce black smoke emission by means of chemical additive is certainly a valuable contribution to air pollution control. The three effective classes of chemical additives are: (1) combustion catalysts, (2) oil-ash slag modifiers, and (3) chemical neutralizing agents. In some cases, these chemical agents can be combined to give one or more benefits. In a recent trial at a power plant, one of our products, SSI-3(R), reduced the black smoke at the same time that it lowered the SO₃ content of the flue gas from 90 to 5 parts per million. The case histories cited show how chemical additives are being used to reduce air pollution at the same time that they make their contribution to better overall fuel utilization. AAM##

08082

J. Meaney, R. L. Novack

INVESTIGATION OF CATALYTIC COMBUSTION OF IMPURITIES OF AIR.
Bolt, Beranek, and Newman, Inc., Cambridge, Mass.,
Prototech Co., Contract NAS-6085, NASA-111, NASA-CR-66368,
58p. June 30, 1967.

CFSTI: N67-29987

A study was made of the catalyzed combustion of impurities in air. These studies included laboratory tests of several configurations of corrugated catalyst support to minimize air flow resistance and optimize catalyst length. The two catalysts used were; platinum and palladium, and the three impurities were hydrogen, carbon monoxide, and methane. A catalytic coil consisting of parallel corrugated ribbons of chromel alternated with layers of asbestos coated with precious metal catalyst, constructed to provide straight-through channels for air passage, was used to oxidize carbon monoxide, hydrogen and methane, present as dilute (0.5%) impurities in air. Platinum when applied to the asbestos was significantly inferior to palladium for the oxidation of methane. In addition, the catalyst operating temperature was found to decrease with increasing surface concentration of palladium, with length of catalyst, and with decreasing channel size. From this, a plan for an integrated air purification system including heat exchanger and insulation was developed, based on a laboratory tested catalyst. The system should remove virtually all of the carbon monoxide and hydrogen from the air while leaving a residual of no more than 250 ppm of methane.**

08084

A. Michaels

STATUS REPORT. (SOLID WASTE DISPOSAL) Preprint,
Philadelphia, Pa., (7) p., (1966). (Presented at the
National Conference on Air Pollution, Washington, D. C.,
Dec. 13, 1966, Paper No. D-1.)

The air pollution contribution made by urban society in disposing of solid wastes, is discussed. It has been reported that an average of 4.5 lbs. of refuse per person each day, is generated,

as normally collected for disposal. Although no refuse disposal method apportionment was available, an attempt was made to estimate the percentage disposed of by the various methods used in order to evaluate the relationship of refuse disposal to air pollution. It is estimated that 10-15% of all refuse is disposed of by incineration. It is further estimated that 20 to 25% of urban refuse is disposed of by open burning. Approximately 40% of all refuse is disposed of by landfilling, and 10% by various other methods including hog feeding, grinding, salvage and reclamation, etc. The quantity of particulates emitted by incineration varies from 10-60 lbs. per ton of material burned. Open burning accounts for quantities varying from 60-100 lbs. per ton. Particulate emissions are tabulated for the disposal methods. In addition to particulate matter, poor refuse disposal by combustion results in the emission of gaseous pollutants, particularly carbon monoxide and hydrocarbons. If all of the refuse currently disposed of by burning were to be properly incinerated, the total particulate emissions would be 800,000 tons per year, harmful gaseous emissions would be negligible and the total pollution contribution would be well under 1% of the total annual pollution quantity. Even if all refuse were to be incinerated properly, the total pollution emission quantity would be under 1 1/2%. It would appear that the disposal of refuse by incineration need not cause meaningful air pollution.**

08162

Matsak, V. G.

THE PURIFICATION OF AIR POLLUTED BY VAPORS AND GASES. In: Survey of U. S. S. R. Literature from Russian by B. S. Levine. National Bureau of Standards, Washington, D. C., Inst. for Applied Tech., Vol. 3, 177-185, May 1960.
CPSTI: TT 60-21475

Methods for the recovery and purification of noxious substances ejected by gas exhaust and ventilating installations are reviewed. It was found easier to purify exhaust gases than ventilating air. The methods include: Chemical purification method, Condensation method, Liquid absorption method, and Absorption by solid absorbents (adsorption). Present methods for air and gas purification can be rendered close to 100 percent free of most acid and alkali gases, organic solvent vapors and some other gases. But no effective and cheap method has been found up to the present for the recovery of carbon monoxide. Purification of air from solvent vapors, such as gasoline, acetone, acetates, etc. can be used effectively only in the case of tail gases and not in the purification of ventilating air, even though it is effective in both instances; the high cost makes its use for purification of ventilation air economically prohibitive. The possibility of using solid absorbents, such as activated charcoal and silicagel for the purification of ventilation air may apply to many cases. The primary obstacle lies in the high cost of adsorbent material and in the consumption of considerable electric energy in overcoming the pressure drop of recuperating installations.

Sourirajan, S. and Mauro A. Accomazzo

THE APPLICATION OF THE COPPER OXIDE-ALUMINA CATALYST FOR AIR POLLUTION CONTROL. Can. J. Chem. Eng. (Ottawa), 39(2):83-93, April 1961. 8 refs.

The catalytic combustion of 1-hexene present in diluent nitrogen in the concentrations of 1170 ppm and 3000 ppm by excess oxygen, has been studied in the presence of CuO-Al₂O₃ (1:1) catalyst in the temperature range 242 deg. to 424 deg. C. and gas space velocity in the range 4000-16,000 hr.⁻¹. The experimental data on the kinetics of the reaction were found to fit an empirical half-order law with respect to the 1-hexene concentration. The presence of water vapor in the reactants was found to have no effect on the efficiency of the catalyst at temperatures higher than 400 deg. C. The above results were similar to those obtained for the catalytic oxidation of n-hexene studied earlier. The possible use of the above copper oxide-alumina catalyst for the simultaneous removal of hydrocarbons and carbon monoxide present in the auto exhaust gases has been tested, making use of a 1955 six-cylinder automobile engine run on leaded gasoline fuel. The hydrocarbon and carbon monoxide concentrations encountered in these studies varied in the range 170-16,000 ppm and 1-7 percent respectively. It was found that the minimum initial temperature of the catalyst bed required for the complete removal of both hydrocarbons and carbon monoxide, simultaneously, was 226 deg. C. under no load condition, 342 deg. C. under an engine load of 2.5 hp, 400 deg. C. under an engine load of 5.1 hp or higher, and 236 deg. C. under deceleration conditions. The catalyst showed no deterioration in performance even after 100 hours of continuous service in conjunction with the above auto exhaust gases. Authors abstract

08345

Cooper, Jonathan C. and Frank T. Cunniff

CONTROL OF SOLVENT EMISSIONS. Proc. MECAR Symp., New Developments in Air Pollution Control, Metropolitan Engineers Council on Air Resources, New York City, p. 30-41, Oct. 23, 1967.

Four different approaches can be taken toward controlling solvent vapor emissions from industrial and commercial operations. One way is to avoid air pollution entirely by using water as the solvent. A second approach is to reduce the severity of the pollution by changing to organic solvents with low photochemical reactivity. A third control method is to destroy the escaping solvent vapors by incineration. When properly designed and installed this method is very effective and the capital costs involved are moderate. The fourth type of control method is to capture the emitted solvent vapors so that the solvent can be recovered for reuse. Three techniques are available - adsorption of the vapors in a scrubbing liquid, condensation by cooling, and adsorption on activated carbon. Of these, activated carbon adsorption is the most generally applicable and is capable of achieving the highest degree of solvent recovery, with resulting attractive payout.##

Rowson, H. M.

DESIGN CONSIDERATIONS IN SOLVENT RECOVERY. Proc. MECAR Symp., New Developments in Air Pollution Control, Metropolitan Engineers Council on Air Resources, New York City, p. 110-128, Oct. 23, 1967.

The growing understanding of the adsorption process has led to the ability to modify the properties, such as pore size distribution and overall activity of the adsorbent, to suit the particular separation that is required. This has been accompanied by much development in the last few years of the fixed bed and fluid bed mechanical contacting that is available to carry out these separations, and as a result of these parallel developments, it is now possible to carry out with very great efficiency a large number of complicated separations. The fixed bed plant consists of a number of vessels containing activated carbon into which the solvent laden gas stream is introduced in turn. The solvent laden stream is allowed to flow through the carbon bed, the solvent is adsorbed onto the activated carbon, and the solvent free air is discharged into the atmosphere. In the fluidized bed process, the solvent laden air or gas stream is passed upwards through the adsorber vessel which contains a number of shallow fluidized beds of activated carbon. The solvent is progressively adsorbed onto the carbon, and the solvent free air is discharged through dust collectors to the atmosphere. This process has a number of advantages compared with the fixed bed process: 1. Exceptional contacting between solvent and adsorbent giving very high efficiencies; 2. Complete continuous automatic operation, with minimum labor requirements; 3. Competitive in cost for the medium and larger installation; 4. Low stripping steam usage (about half that of equivalent fixed bed plants). 5. Low ground area requirement; 6. High concentration of solvent in recovered aqueous liquor simplifying onward processing; 7. Inherently safe even with highly inflammable solvents. Factors affecting the choice of solvent recovery systems include 1. Air flow, 2. Concentration of solvent, 3. Solvent type and 4. Operating continuity. For the majority of applications in a well maintained fixed bed plant, efficiencies of 97% to 98%, defined as the ratio of solvent outlet to inlet concentration over the adsorber, are quite easily achieved. In a well run fluid bed plant, efficiencies of 99% measured over the adsorber are quite readily attainable. Other new applications for adsorption techniques include the removal of small quantities of noxious material from large volumes of air, the separation of hydrocarbon gases, and the control of SO₂ emission from power station flue gases.##

08365

Howard G. Maahs, Lennart N. Johanson, Joseph L. McCarthy

SEKOR III: PRELIMINARY ENGINEERING DESIGN AND COST ESTIMATES FOR STEAM STRIPPING KRAFT PULP MILL EFFLUENTS. TAPPI, 50(6):270-275, June 1967. 9 refs.

An illustrative, preliminary engineering design and cost estimate has been carried out relative to the SEKOR-B

(refluxed column) process. As a basis for such calculations, experimental determinations have been made of vapor-liquid equilibrium constants for the sulfur-containing components. CH_3SH , $(\text{CH}_3)_2\text{S}$, and $(\text{CH}_3)_2\text{S}_2$ in dilute concentration in water at 1 atm total pressure, and, also, for the substances limonene, alphapinene, and alpha-terpineol, which are major constituents of the recovered volatile oil. It is shown that all substances are of higher volatility than water and may be steam-stripped, and that alpha-terpineol and dimethyl disulfide are the most difficult to strip from water. The optimum feed/steam ratio, reflux rate, and number of stages required to strip H_2S and the above components from condensates of a 400 ton/day kraft pulp mill were calculated. To reduce the concentration of $(\text{CH}_3)_2\text{S}_2$ to 1% of its feed concentration, capital cost was estimated to be \$51,500 to treat 1,000,000 lb/day of blow and relief gas condensates. If amortized over a 5-year period, this capital cost together with operating costs is estimated to result in a total cost per ton of dry pulp of \$0.25/ton for 5 years and of \$0.13/ton thereafter. If the sale of recovered crude SEKOR oils at \$0.04/lb is feasible, and if hot process water is valued at \$0.03/1000 gal, the above costs for treating blow and relief gas condensates are estimated to approximately \$0.07/ton pulp. The cost and design bases used are described in some detail to allow potential users to undertake similar calculations compatible with local conditions, and, thus, to obtain alternate costs per ton of pulp if so desired. AAM##

08476

Sherwood, Peter W.

NEW DEVELOPMENTS IN HYDROCARBON GAS TECHNOLOGY. ((Neues aus der Kohlenwasserstoffgas-Technologie - Folge 13.)) Text in German. Gas Wasserfach (Munich), 108(15):402-403, April 1967.

Efforts have been made to combat SO_2 pollution by obtaining sulfur from stack gases as a by-product. An apparatus from the Institute of Technology in Tokyo and one developed by Monsanto work on the same principle. Stack gases containing 0.2% sulfur dioxide are separated from the fly ash and passed through V2O5, thereby converting the sulfur dioxide to sulfite. Monsanto then condenses the sulfite to 70% sulfuric acid, while the Japanese add ammonia to the sulfite to form ammonium sulfate, which can be used as fertilizer. In both methods the purified waste gas contains only 0.02% sulfur dioxide. Wide use of gas fuel cells by 1970 is predicted by the Institute of Technology in Chicago. The cells may be used in mass production items such as automobiles within 10 years; in some trial cells efficiencies of 70-80% have been obtained already. The most commonly used fuel is hydrogen, although the economical production and safe handling of this fuel still presents problems. Cells using hydrazine and methanol are under development. For power plants of 10 to 1,000 kW., paraffin fractions, which are split by a nickel catalyst at 500-1,000 deg C., seem to be the most economical fuel for the near future.##

Lohner, Kurt, Herbert Muller, and Walter Zander

ABOUT THE PROCESS-TECHNIQUE OF THE COMBUSTION OF EXHAUST GASES IN GASOLINE ENGINES IN STATIONARY OPERATIONS. ((Über die Verfahrenstechnik der Nachverbrennung der Abgase von Ottomotoren bei stationärem Betrieb.)) Text in German. VDI (Ver. Deut. Ingr.) Z. (Duesseldorf), 109(31):1488, Nov. 1967.

To reduce the amount of carbon monoxide and hydrocarbon emission during the stationary operation of engines without deleterious effect on the engine, certain modifications were undertaken. It was found that complete combustion can be obtained by the addition of air at a fast or medium engine speed. However at idling speed enough exhaust gases are formed to make additional combustion necessary. By adding air directly into the cylinder during the exhaust cycle, a nearly complete combustion can be obtained. Since this procedure is expensive, the simpler procedure of adding the air behind the exhaust valve and providing combustion by means of catalysts was undertaken. A small catalyst vessel was constructed for idling speeds with a bypass to reduce any excessive exhaust gas pressure which might build up at full speed operation. The catalyst was placed directly behind the motor to facilitate quick warm-up of the engine. The catalyst can also be placed near the exhaust vents providing an afterburner for each cylinder. To obtain a process with few moving parts, wires with an array of catalyst beads were placed vertical to the exhaust gas stream. The effectiveness of this procedure is comparable to the bypass procedure, but the catalyst must endure temperatures above 1,000 deg C at full speed, shortening its effective life, since there is no provision by a bypass.##

Hoffman, Heinz

EXHAUST GAS PROBLEMS WITH GASOLINE AND DIESEL MOTORS. I. GASOLINE ENGINES. ((Abgasprobleme bei Otto- und Dieselmotoren. I. Ottomotoren.)) Text in German. Erdoel Kohle (Hamburg), 20(8):564-568, Aug. 1967.

The California Test and the events which produced the California and U.S. Government laws for the reduction of air pollution from gasoline engines are described. The differences between the California and U.S.A. specifications are outlined. The conditions in regard to air pollution from gasoline engines in various European cities are discussed and compared with those found in Los Angeles. The Europa test, concerned mainly with CO emission, is described, evaluated, and compared with the U.S.A. tests which set limits for both CO and hydrocarbons. The three most important control methods for exhaust gases are: 1) Catalytic oxidation, which is unsatisfactory, because the catalyst weakens after 8,000 km. (it became nearly ineffective at the end of a 23,000 km. test run). 2) The Chrysler Clean Air Package system, which depends on a particular combination of gasoline mixture and ignition time, so that with small alterations in the combustion

chamber the conditions of the U. S. law are fulfilled. 3) The exhaust air injection system, which depends on air being blown into the exhaust system. This system, which is used by Ford and General Motors, also fulfills the U.S. requirements.##

08536

Miller, M. R. and H. J. Wilhoyte

A STUDY OF CATALYST SUPPORT SYSTEMS FOR FUME-ABATEMENT OF HYDROCARBON SOLVENTS. J. Air Pollution Control Assoc., 17(12): 791-795, Dec. 1967. 8 refs.

In a stainless steel pilot plant system, operating with combined thermal incineration and catalytic oxidation, studies have been made of the influence of catalyst-support geometry on abatement efficiency. Catalyst supports tested were ceramic spherical pellets, metal foils, and ceramic honeycomb structures, all with precious metal catalyst. Data obtained cover a range of space velocities from 30,000 to 175,000 scf/hr-cu ft bed and a range of catalytic reactor temperatures from 150 to 450 deg C. Results show that optimum fume-abatement performance is obtained by combining incineration and catalytic oxidation and that catalyst support geometry has a significant effect on performance. (Authors# abstract)

08567

Derndinger, Hans-Otto

MOTOR VEHICLE ENGINES. ((Kraftfahrzeugmotoren)) Text in German VDI (Ver. Deut. Ingr.) Z. (Dusseldorf), 108(19):842-845, July 1966. 10 refs.

Two new designs in motor vehicle engines are described. In one engine the compression ratio was raised to 11.2:1 by direct injection of air into the engine, creating a strong rotation of air around the cylinder shaft. A savings of 10-20 percent of fuel was obtained. In the second design the compression ratio was raised to 14:1 to 17:1 by external ignition using a specially developed spark plug. Greater fuel savings and a low carbon monoxide and uncombusted hydrocarbon content in the exhaust were obtained. A detailed description of the California test for automobile exhaust gas emissions as well as figures for the amount of permissible carbon monoxide and hydrocarbon emissions in California and in the United States at large, beginning in 1968, are given. Five methods to reduce the emission to the California standards are described: (1) fuel injection; (2) reuse of combustible gases which escape around the piston into the crankcase; (3) the Chrysler Cleaner Air Package (CAP); (4) recombustion (a good portion of the combustible gases can be burned in the exhaust manifold by the addition of air directly behind the exhaust valve); (5) catalytic recombustion at low temperatures. At the present time the catalyst is easily poisoned, particularly by lead deposits. Further technological developments along this line are possible.

Gamer, Carl H. and Martinus Hus

ECONOMICS OF HYDROGEN PRODUCTION AND HYDROTREATING. (Wirtschaftliche Herstellung von Wasserstoff und Hydrotreating.) Text in German. Erdoel Kohle (Hamburg), 20(7):482-484, July 1967. 17 refs. (Presented at the Annual Meeting, German Assoc. for Mineral Oil Science and Coal Chemistry and the Austrian Society for Petroleum Sciences, Munich, Oct. 138 1966)

The increased upgrading of oil refinery processes--requiring additional sources of hydrogen--is advocated for Germany. Despite added costs, such steps should result in financial gains of over 60 percent; moreover, the probable future limitations of sulfur content in fuels by means of governmental air pollution control regulation also suggests increased use of such hydrogen refining processes. Other technical advantages of the use of hydrogen production facilities are cited. The conditions and costs of hydrogen production for three different processes (steam methane pyrolysis, steam naphtha pyrolysis, partial oxidation) are tabulated. In the future it may be desirable, as an air pollution abatement measure, to combine thermal power plants with refineries so as to convert the heating oil to heating gas through partial oxidation= should this actually become an accepted practice, considerable added savings in hydrogen production--hence in upgraded refinery processes--will be realized.

08604

Fiala, Ernst, and Zeschmann, Ernst-Georg

IRKSOMENESS OF EXHAUST GAS ODOR. ((Lastigkeit von Abgasgeruch.) Text in German. VDI (Ver. Deut. Ingr.) Z. (Duesseldorf), 109(24):1139-1141, Aug. 1967. 5 refs.

The fresh air dilution of automotive exhaust gases at which the odor was just detected by 10 subjects was used to measure the odor intensity. The engine was operated at various conditions and with air added directly toward exhaust valve. The subjects first breathed fresh air, to which untreated exhaust was added until the odor was detected. The amounts of carbon monoxide and hydrocarbons were measured at this point, for each of the different operating conditions. The same procedure was repeated with the addition of air toward the exhaust valve. Graphically presented data show that while the emission of CO and hydrocarbons considerably diminished with the addition of air, the odor intensity of the gas increased significantly.

08831

ZENITH DUPLEX INDUCTION SYSTEM. Automobile Engr., 57(3):96-99, March 1967.

The basic features of the Zenith Duplex Induction System are presented. The emission of hydrocarbons and carbon monoxide from the exhaust is effected primarily by increasing efficiency of combustion in the cylinders. The basic aim is to supply a dry, but not overheated, mixture to the cylinders. A relatively small-bore mixture-feed pipe is used in parallel with the main

manifold, whereby the mixture is taken through an exhaust-heated chamber and dried. Two throttle valves are employed, one controlling flow in the main system and the other controlling flow through the small-bore pipe. An interconnecting linkage is arranged so that one throttle opens, before picking up and opening the other. When the main throttle valve is closed the small-bore system is open. During the initial stages of acceleration from rest or low speeds, the mixture is diverted through the exhaust-heated chamber and returned to the main tract down-stream of the secondary valve. The heat-exchanger box has thin sections between the exhaust gas and the fuel-air mixture so that the time lag, between the starting of the engine from cold and its warming up sufficiently for control of the mixture, is minimized. With this system low air:fuel ratios can be adopted. Sudden acceleration does not wet the walls of the manifold as the pressure within it rises, and therefore a potential source of variation in mixture strength is eliminated. The mixture does not have to be enriched for winter conditions. All these features lead to significant fuel economy as well as reduction of hydro-carbon and carbon monoxide emissions.##

08837

Kane, J. M.

STATUS FORECAST FOR AIR POLLUTION CONTROL - 1972. Air Eng., 9(3):33-34, 37, March 1967.

A forecast of what will happen in the field of air pollution control in the next five years is presented. The pollutants covered are smoke, visible dusts, visible plumes, hydrocarbons, diesel engine fumes and smokes, and oxides of sulfur.##

09027

California Motor Vehicle Pollution Control Board. Preprint, ((16))p., May 20, 1967.

EFFECTIVENESS OF EXHAUST CONTROLS IN PUBLIC USE.

Analysis of emissions from automobiles with exhaust control devices indicates a 70% reduction in hydrocarbons and a 50% reduction in CO compared to the existing car population in California. However, the data indicate an emission deterioration trend with mileage. Some indications of these trends are: (1) All emission trends go over the hot-start standards of 250 ppm hydrocarbons and 1.22% carbon monoxide before 12,000 miles is reached; and (2) All emissions except one manufacturer's carbon monoxide show significant deterioration beyond the mileage normally associated with deposit buildup in the combustion chambers. Spark timing and idle speed inspection data on 50 new cars and 100 privately-owned cars show large percentages of the cars are outside the tolerances when new and the percentages increase significantly with time and mileage indicating that they are being further maladjusted in the field. It is concluded that car companies must multiply their efforts in the following areas: (1) Improvement of basic performance ability of exhaust systems; (2) Adjustment to factory specifications at the factory; (3) Actual performance of proper adjustments by dealer service personnel as part of their training program; and (4) Development of fixed or limited range adjustments.##

Katherine C. Hellwig

LIQUID FUELS FROM COAL WITH H-COAL. Preprint, Hydrocarbon Research, Inc., New York, 6p., 1966. (Presented at National Coal Association Technical-Sales Conference and Bituminous Coal Research, Inc., Annual Meeting, Sept. 14-15, 1966, Pittsburgh, Pa.)

The H-Coal process is based upon a new reactor concept known as the ebullated bed reactor. Dried and pulverized coal is combined with recycled oil to form a slurry. This slurry is fed continuously with hydrogen into a reactor containing a bed of ebullated catalyst. The coal is catalytically hydrogenated and converted to liquid and gaseous products. Products are separated and result in fractions of gas, light distillate, mid-distillate, and vacuum bottoms slurry. In this reactor system 90% of the coal on the moisture- and ash-free basis is converted to liquid and gaseous products. Liquid products from the coal hydrogenation step are hydrocracked, hydrotreated, and reformed to produce gasoline, No. 2 furnace oil, and a very small amount of No. 6 fuel oil. All of the No. 2 furnace oil can be converted to gasoline if desired. Benzene and liquid petroleum gas (LPG) may be recovered and sold. An economic summary for an H-Coal refinery with a nominal capacity of 1000,000 barrels per standard day (BPSD) is presented. Three cases are presented. The first case produces gasoline and furnace oil in a ratio of 2 to 1. The second case produces all gasoline, and the third case is the same as the second case with the exception that 12,000 BPD of LPG and 3000 BPD of benzene are recovered. Based on the progress made in development of the H-Coal process it is expected to be ready for commercialization in the early 1970's and will provide the coal industry with a means to compete for the gasoline market and to utilize the large reserves of high-sulfur fuel.**

09325

D. W. Golothan

DIESEL ENGINE EXHAUST SMOKE: THE INFLUENCE OF FUEL PROPERTIES. AND THE EFFECTS OF USING BARIUM-CONTAINING FUEL ADDITIVE. Preprint, Society of Automotive Engineers, 23 p., 1967. 11 refs. (Presented at the Automotive Engineering Congress, Detroit, Mich., Jan. 9-13, 1967. Paper 670092.)

Even though the combustion gases of diesel fuel are much less toxic than those of gasoline, exhaust smoke has increased proportionately with the number of diesels in use and has become a major problem. This paper describes the influence of base fuel composition on smoke, and the results of using a barium-containing additive in the fuel. The toxicological aspects of using the additive are considered, together with certain other side effects that might arise. Details are also given of the various means for measuring smoke, and of existing legislation to control the nuisance. (Author's abstract)**

09329

Sullivan, R. E., W. Cornelius, and D. L. Stivender

A COMBUSTION SYSTEM FOR A VEHICULAR REGENERATIVE GAS TURBINE FEATURING LOW AIR POLLUTANT EMISSIONS. Preprint, Society of Automotive Engineers, 20p., 1968. 18 refs. (Presented at the Combined Fuels and Lubricants, Powerplant and Transportation Meetings, Pittsburgh, Pa., Oct. 30-Nov. 3, 1968, Paper 680936.)

The combustion system developed for the GT-309 regenerative gas turbine is used to illustrate pertinent structural, performance, and exhaust emission considerations when designing for a vehicular gas turbine application. The development of each major component and the performance of the combustion system as a whole are reviewed. The satisfactory performance and durability potential of the GT-309 engine combustion system have been demonstrated by extensive operation in a component test facility and in several test cell and vehicle installed engines. Exhaust emissions of unburned hydrocarbons and carbon monoxide are minimal and are of no concern from an air pollution standpoint. No objectionable exhaust smoking and odor are produced. As is the case with current spark ignited and compression ignition engines, the emissions of oxides of nitrogen in the present state of development do not satisfy the proposed 1980 California limit for this air pollutant on an equivalent weight flow basis. (Authors' Abstract)

09337

Lawrence G., J. Buttivant, and C. G. O'Neill

MIXTURE PRE-TREATMENT FOR CLEAN EXHAUST --- THE ZENITH "DUPLEX" CARBURATION SYSTEM. Preprint, Society of Automotive Engineers, 18p., 1967. 4 refs. (Presented at the Mid-Year Meeting of the Society of Automotive Engineers, Chicago, Ill., May 15-19, 1967, Paper 670484.)

A carburetor adapted to exploit the control of exhaust emissions through consistency of metering and mixture quality, particularly in conjunction with a dual bore inlet manifold, is discussed against the background problems faced by the European motor industry. The development and incidental research data which determined the design are followed by a description of production and quality assurance techniques, with special reference to the evolution of automatic flow testing apparatus. (Authors' abstract)##

09793

LeDuc, Marc F.

ADSORPTION EQUIPMENT. In: Air Pollution Engineering Manual. (Air Pollution Control District, County of Los Angeles.) John A. Danielson (comp. and ed.), Public Health Service, Cincinnati, Ohio, National Center for Air Pollution Control, PHS-Pub-999-AP-40, p. 192-201, 1967.
GPO: 806-614-30

The mechanisms of the adsorption process and adsorption equipment are described with particular emphasis on activated carbon as the adsorbent. Saturation, retentivity, adsorption of mixed vapor, heat of adsorption and carbon regeneration are included in the discussions. Activated carbon is most suitable for removing organic vapors. It adsorbs substantially all the organic vapor from the air at ambient temperature regardless of variations in concentration and humidity conditions. The limitation for molecules capable of removal by physical properties is that they must be higher in molecular weight than the normal constituents in air. In general, removal is practical for gases with molecular weight over 45. Probably the only solvent used with molecular weight below 45 is methanol. The design and operation of the fixed-bed adsorber, conical fixed-bed adsorber, and continuous adsorber are described and illustrated. An activated carbon adsorption bed should be protected from particulate matter that can coat the surface of the carbon. This can be accomplished by the use of efficient filters. Corrosion of the bed must also be prevented. Corrosion can be controlled by the use of stainless steel or by application of a protective coating of a baked phenolic resin. Polar and non-polar solvents are equally adsorbed by activated carbon, but the recovery of polar compounds on stripping with steam requires an additional step of fractionation to effect a separation from the aqueous solution. Other solids possessing adsorptive properties are alumina, bauxite, bone char, decolorizing carbons, Fuller's earth, magnesia, silica gel, and strontium sulfate. Their industrial uses are listed.

09795

Chatfield, Harry E. and Ray M. Ingels

GAS ABSORPTION EQUIPMENT. In: Air Pollution Engineering Manual. (Air Pollution Control District, County of Los Angeles.) John A. Danielson (comp. and ed.), Public Health Service, Cincinnati, Ohio, National Center for Air Pollution Control, PHS-Pub-999-AP-40, p. 210-232, 1967.

GPO: 806-614-30

Gas absorption equipment is designed to provide thorough contact between the gas and liquid solvent in order to permit interphase diffusion of the materials. This contact between gas and liquid can be accomplished by dispersing gas in liquid or vice versa. Absorbers that disperse liquid include packed towers, spray towers and venturi absorbers. Equipment that uses gas dispersion includes plate or tray towers and vessels with sparging equipment. The principles of designing plate towers and packed towers are discussed in detail. The following items are included in the discussion on packed towers: packing materials, liquid dispersion, tower capacity, tower diameter, number of transfer units, height of a transfer unit, and pressure drop through packing. An example of calculations involved in designing a packed tower for the removal of NH_3 is illustrated. Liquid flow, plate design and efficiency, flooding, liquid gradient on plate, plate spacing, tower diameter, and the number of theoretical plates are included in the discussion of plate towers with specific emphasis on bubble cap plates. An example of the calculations involved in determining the number of plates required and estimated diameter of a plate tower is illustrated. The choice of gas absorption equipment is usually between a packed tower and a plate tower. Both devices have advantages and disadvantages. Factors which the final selection

should be based upon are listed. Spray-type absorbers and venturi absorbers are also briefly discussed. These towers are primarily used for removing particulates from gas streams, though they have some gas absorption applications. The gaseous air contaminants most commonly controlled by absorption include SO₂, NH₃, NO_x, and light hydrocarbons.

10047

Conn, A. L. and J. B. Corns

EVALUATION OF 'PROJECT H-COAL'. American Oil Co., Whiting, Ind., Research and Development Dept., Contract 14-01-0001-1188 Proj. 612 78p., Dec. 8, 1967.
CFSTI, DDC: PB 1777068

A feasibility study of the 'H-coal' process is presented which covers experimental works, conceptual design, and economics. The H Coal process is the manufacture of hydrocarbon liquids by hydrogenation of coal. Parts of the process discussed include: Coal preparation, coal hydrogenation, heavy gas oil hydrogenation, fluid coking, middle distillate hydrotreating, middle distillate hydrocracking, naphtha treating and reforming, naphtha recovery, hydrogen manufacture, hydrogen compression and sulfuric acid and ammonium sulfate plant. Based upon a thorough study of the process and the economics involved, the H-coal process is seen to be competitive with other means of petroleum manufacture.

10458

Wood, F. C., O.C.Eubank, and J. Sosnowski

HYDROCRACKING SPREADS INTO NEW AREAS. Oil Gas J., 66(25):83-84, 89, June 17, 1968. 11 refs.

Hydrocrackers are built primarily to produce gasoline from heavy oils, but other product volume and quality demands are influencing the design of new installations. Equipment modifications, feedstock properties, yields, and product properties for various hydrocracking processes are enumerated.

10539

May, Hans and Harry Schulz

A NEW DISTRIBUTING INJECTION SYSTEM AND ITS POTENTIAL FOR IMPROVING EXHAUST GAS EMISSION. Society of Automotive Engineers, Preprint, 10p., 1968. 24 refs. (Presented at the Automotive Engineering Congress, Detroit, Mich., Jan. 8-12, 1968, Paper 680043.)

The control principles and the design of a fuel injection system are described. In this system, injection time and injection pressure are controlled independent of each other. The injection time is controlled by two rotating discs having slots, which are turnable to each other and which are turned by the influence of a centrifugal governor in connection with a three-dimensional cam.

With the three-dimensional cam, a punctiform scanning of engine characteristics can be realized. Some results obtained with this injection system are shown for example, fuel quantity characteristic, CO and n-hexane characteristic of a 4-cyl 4-stroke engine, injection pressure distribution dependent on crank angle, and consumption loops for injection and carburetor operation. (Authors' abstract, modified)##

10568

Schiele, G.

ELECTRIC CLEANING OF WASTE GASES FROM CARBON ELECTRODE BAKING FURNACES. ((Elektrische Reinigung der Abgase aus Elektrodenbrennofen.)) Text in German. Aluminium 43(3):171-174, March 1967.

Waste gases from carbon electrode baking furnaces contain extremely fine tar vapors with a range of boiling temperatures. These vapors can be precipitated most effectively by means of electrofilters. The gases in many cases must be cooled before tar vapor removal, due to the differences in boiling temperatures; if this step were not taken, the amount of tar vapor reaching the atmosphere would still be too high despite the filter's efficiency. The industrial application of the electrostatic precipitation gas cleaning process is described and illustrated.##

10637

Il'nitskii, A. P., A. Ya Khesina, S. N. Cherkinskii, and L. M. Shabad

EFFECT OF OZONATION UPON AROMATIC HYDROCARBONS, INCLUDING CARCINOGENS. ((Vliyanie ozonirovaniya na aromaticheskie, v chastnosti kantserogennye, uglevodorody.)) Hyg. & Sanit. (English translation of: Gigiena i Sanit.), 33(1-3):323-327, Jan.-March 1968. ((11)) refs.

CFSTI: TT 68-50449/1

The efficiency of ozone in the inactivation of carcinogenic hydrocarbons was studied. Experiments were performed with 1,2-benzanthracene (BA), 1,2,5,6-dibenzanthracene (DBA), 9,10-dimethyl-1,2-benzanthracene (DMBA), 3,4-benzpyrene (BP) and pyrene (P) in various concentrations. Ozone concentration was 0.4 g per liter mixture. Ozonation was performed for periods 1, 2 1/2, 5 and 10 min. Results of experiments demonstrated that: carcinogenic hydrocarbons are vigorously destroyed by ozone. Aromatic hydrocarbons vary in their resistance towards ozone, 3,4-benzpyrene appearing to be the most stable. The resistance of a carcinogenic substance (3,4-benzpyrene) to ozone was found to vary according to whether it was in solution or adsorbed on particles of coal, soil, etc., it was found to be less stable in solution. Ozonation is probably very efficient for the purification of central water supplies containing dissolved carcinogens.##

Alekseyeva, M. V., A. S. Ozerskiy, and V. A. Khrustaleva

DECREASING THE CONCENTRATION OF TOXIC EXHAUST FROM AUTOMOBILE ENGINES. ((O snizhenii kontsentratsii toksicheskikh otrabotannykh gazov avtomobil' nykh dvigatelei.)) Translated from Russian, Gigiena i Sanit. (Moscow), No. 27:3-7, Dec. 1962. 1 ref.

Automobile engines idling during change of gear, braking, or standing operate in a regime during which the toxicity of exhaust gases increases substantially. This is due to the fuel rich mixture yielding a high percentage of incomplete combustion products. This phenomenon has been studied and an air-fuel ratio regulator was developed which is mounted in the intake line and starts operation automatically when the engine idles. Gas samples with and without the device were analyzed under various operating conditions. Without the device carbon monoxide contents ranged from 3.2 to 7.8% while with use of the device it was only 0.4%. Also the concentration of benzene, acrolein, and formaldehyde decreased substantially. The device was tested on city buses with good results.##

10945

Allt, P. K., P. Datta, W. A. T. Macey, and B. Semmens

REACTIONS OF SULPHUR-CONTAINING HYDROCARBONS IN AN ELECTRICAL DISCHARGE. J. Appl. Chem. (London) 18(7):213-217, July 1968.

A study has been made into the effects of a low frequency semi-corona discharge on carbon disulphide, ethyl mercaptan, amyl mercaptan and thiophene present as 1-2% sulphur/hydrocarbon mixtures. Semi-corona discharge, which was carried out at atmospheric pressure, has resulted in the partial desulphurisation of the sulphur-containing hydrocarbon mixtures. The efficiency of the desulphurisation was influenced by the techniques employed and by the nature of the central electrode. In almost all instances the reactions were accompanied by the formation of solid material. (Authors' abstract)##

11033

Gamble, B. L.

CONTROL OF ORGANIC SOLVENT EMISSIONS IN INDUSTRY. Preprint, Continental Can Co., Inc., Chicago, Ill., ((24)) p., 1968. 4 refs. (Presented at the 61st Annual Meeting, Air Pollution Control Association, St. Paul, Minn., June 23-27, 1968, Paper 68-48.)

Extensive and careful source testing is required in order to evaluate a solvent emission pollution problem and to select suitable emission control equipment. When new equipment is considered, the system needs which are based upon a study of the functions to be performed, are determined. Test equipment is

important for appraisal of performance of emission control equipment. For on site testing, the hydrogen flame ionization detector offers a reasonable approach for direct reading instrumentation design. Control methods for limiting the emission of solvents can be classified as Process Modification, Incineration, and Solvent Recovery. Discussion of these methods are given. Pictures and diagrams of control equipment and systems used in the control of organic solvent emissions are presented.##

11058

W. Teske

IMPROVEMENTS IN THE PROCESSES AND OPERATION OF PLANTS IN THE CHEMICAL INDUSTRY LEADING TO REDUCED EMISSION. Staub
(English translation), 28(3):25-33, March 1968.
CFSTI: TT 68-50448/3

The emissions from chemical plants can be reduced, in special cases, by changing the production process or, in general, by using a gas cleaning method. Change in the production process may be achieved by a basic alteration of the process itself, by changing the mode of operation, by modifying the equipment and by using a different raw material. For this purpose, the doublecontact method for sulphuric acid production, the pressure method for nitric acid recovery and the introduction of a covered carbide furnace are mentioned as examples. The superphosphate process, viscose process, production of betanaphthol, production of thermal phosphoric acid and production of calcium chloride are given as examples for waste gas cleaning. (Author's summary)##

11234

K. C. Tessier, and H. E. Bachman

FUEL ADDITIVES FOR THE SUPPRESSION OF DIESEL EXHAUST ODOR AND SMOKE. PART I: PROPOSED MECHANISM FOR SMOKE SUPPRESSION. Preprint, American Society of Mechanical Engineers, New York, 8p., 1968. 28 refs. (Presented at the ASME Winter Annual Meeting and Energy Systems Exposition, New York, N. Y., Dec. 1-5, 1968, Paper 68-WA/DGP-4.)

A combination of odor mask and barium containing additive in diesel fuel is effective in reducing smoke, odor and irritation from diesel exhaust. It has shown no injurious effects on fuel systems, exhaust systems or engines. This paper discusses the engine evaluation of these additives in American diesel engines. The major implications of using barium additives in the fuel are discussed as well as possible mechanisms for their action. Of special interest is a description of the results of using the Ricardo, high speed cine technique to visually study the combustion of additive treated fuel. This technique shows in a spectacular way that smoke clearing occurs principally in the combustion chamber. (Authors' abstract; modified)##

EFFECTIVENESS OF EXHAUST CONTROLS ON 1966 VEHICLES. 11p., Aug. 10, 1966. 6 refs. California Motor Vehicle Pollution Control Board

Emission tests on 404 1966-model cars with exhaust controls in public use confirm that the vehicle manufacturers have done a good job of building cars with low emissions. However, field data on emissions higher than proving-ground results and some deterioration of emissions with mileage, indicate that more effort is needed on emission control in the field. (Author's abstract)##

11548

Cantwell, E. N., I. T. Rosenlund, W. J. Barth, F. L. Kinnear and S. W. Ross

A PROGRESS REPORT ON THE DEVELOPMENT OF EXHAUST MANIFOLD REACTORS. Preprint, Society of Automotive Engineers, Inc. New York, 56p., 1969. 22 refs. (Presented at the International Automotive Engineering Congress, Detroit, Mich., Jan. 13-17, 1969, Paper 690139.)

Exhaust manifold reactor systems using air injection have been developed to control exhaust emission levels of a variety of vehicles to less than 50 ppm hydrocarbons and 0.5 per cent carbon monoxide. These systems have been shown to be compatible with other control systems used to reduce evaporative emissions and oxides of nitrogen. Manifold reactors were constructed which were sufficiently durable to control emissions effectively for 100,000 miles when run in accordance with the mileage accumulation schedule suggested in the Federal emission control device certification procedure. Problem areas hampering immediate application of reactor systems are described. Manifold reactor units are large and will not fit in the engine compartments of many vehicles; furthermore, some current engine configurations are not suited to the installation of reactors. Current reactor construction techniques are costly and materials of proven durability are relatively expensive. In addition, at the present stage of development, some carburetor enrichment is required which results in lower fuel economy. While preliminary work has indicated that these problems are probably amenable to solution much additional development will be required. (Authors' abstract)##

11912

S. Ruschenburg

EXHAUST GAS MEASUREMENTS DURING A SIMULATED TRAFFIC JAM IN A ROAD TUNNEL. ((Abgasmessungen bei simuliertem Verkehrsstau in einem Strassenverkehrstunnel.)) Text in German. Stadttehygiene, 19(6):109-113, June 1968.

Prior to the opening of the Klostervall-Glockengresserwall Tunnel, the Hamburg Construction Office for Bridge Construction and Engineering, utilizing 20 diesel trucks and 40 gasoline-powered automobiles (Volkswagens), tested the efficiency of the tunnel's built-in mechanical ventilators and

studied the problem of diminished visibility from diesel exhausts. Schematic drawings of the 55m tunnel with locations of measuring, regulation, and warning instruments are presented. A study was made of the carbon monoxide (CO), nitrous gases, and benzene hydrocarbons in the tunnel atmosphere while the vehicles, standing bumper to bumper, idled for 20 minutes to stimulate the worst possible traffic conditions. Following an initial increase during startup, the CO concentration decreased slightly and thereafter increased to 20 ppm with the diesel trucks after 50 minutes. CO increased to 330 ppm after 25 minutes and 380 ppm after 50 minutes with the gasoline-powered automobiles. Neither the lower explosive limit nor the maximum allowable hygienic concentration was reached for the benzene hydrocarbons. No evidence of any danger from visibility impairment was found. Measurements made at the various measuring stations showed uniform distribution of CO in the tunnel although none of the air turbulence which would have been created by moving traffic was present. The ventilators were able to move the air column towards the tunnel exit. The study shows that continuous surveillance of tunnel air for CO is needed and that automatic installations for measuring and regulating CO and for warning against it are preferred to manual operations.##

12503

Battelle Memorial Inst., Richland, Wash.

APPLICABILITY OF ORGANIC LIQUIDS TO THE DEVELOPMENT OF NEW PROCESSES FOR REMOVING SULFUR DIOXIDE FROM FLUE GASES. (FINAL PHASE I.) Contract PH-22-63-19, (114)p., March 1969. 32 refs. CFSTI: PB 183513

A study was undertaken, the purpose being to survey the literature and, on the basis of the findings, to assess the applicability of organic liquids to the development of new processes for removing SO₂ from fossil fuel fired power plant stack gases. This literature search also extended to the process engineering field to indicate the preferred methods of contacting the sorbent with the flue gas and the preferred technique of sorbent regeneration and recovery of sulfur values. A preliminary assessment of the applicability of organic liquids for cleaning both smelter effluent and power plant flue gases were made, and conditions required to assure adequate effluent gas plume dispersion were reviewed. Economic factors important to the comparison of organic liquids as scrubbing agents were reviewed, along with other means of sulfur dioxide removal.

12998

EXHAUST PURIFIERS CLEAN THE AIR. Mater. Handling Eng., 24(8): 108-110, Aug. 1969.

Air inside Armstrong Rubber Company's West Haven, Conn. warehouse is kept clean by using a combination of exhaust blowers and LP gas lift trucks fitted with catalytic mufflers. Three blowers on each of the three storage floors are used to change interior air in the 600,000 sq ft building. The LP gas-fueled lift trucks are fitted with PTX purifiers. Platinum on a special ceramic support catalyzes the oxidation of the CO, hydrocarbons, and exhaust odors into CO₂ and H₂O vapor. The catalyst lasts thousands of hours without requiring replacement. The purifiers replace the conventional mufflers and work well

with LP gas, white gasoline, or diesel fuel. They warm up in 30 to 45 sec. Zenith Corp. has equipped its seven tractors and 42 lift trucks with Oxy-Catalyst catalytic mufflers. These vehicles are fueled with 87 octane naphtha gasoline. Exhaust gases are oxidized into CO₂ and H₂O as they pass through a bed of catalyst-coated pellets in the purifier. The mufflers require maintenance after 500 to 600 hrs of use. A 90 psi air stream is used to blow off carbon deposits and more pellets are added. After 2000 hrs of operation, the entire catalytic bed is replaced.

13033

Griffing, Margaret E., Frances W. Lamb, and Ruth E. Stephens

METHOD OF CONTROLLING EXHAUST EMISSION. (Ethyl Corp., New York, N.Y.) U.S. Pat. 3,449,063. 4p., June 10, 1969. 5 refs. (Appl. May 13, 1966, 10 claims).

A method is presented for reducing unburned hydrocarbons, carbon monoxide, and nitrogen oxides of the exhaust gas from internal combustion engines operating at an air/fuel ratio of 15 by contacting the exhaust gases with oxygen, ammonia, and a catalyst. Additional oxygen is first injected into the exhaust stream. Ammonium carbonate is added and vaporized to ammonia by the heat of the exhaust gases. The ammonia, oxygen, and exhaust gases are then contacted with the catalyst at a temperature between 600 and 800 F. The catalyst consists of an alumina support impregnated with 0.001 to 25 wt % copper oxide and with 0.001 to 3 wt % palladium.

13036

Innes, William Beveridge

CATALYTIC MUFFLER. (American Cyanamid Co., Inc., Stamford, Conn.) U.S. Pat. 3,449,086. 4p., June 10, 1969. 5 refs. (Appl. Sept. 22, 1964, 1 claim).

A catalytic muffler for the control of hydrocarbons emitted in internal combustion exhaust gas is presented. The muffler is of simple construction, readily adaptable for positioning in the exhaust line and is designed to minimize the destructive fluidization of the catalyst particles which has been prominent in previous catalytic mufflers. This catalytic muffler is of the radial type with the annular catalyst located between a central foraminous gas-distributing pipe and an outer cylinder retaining sleeve. Fluidization of the catalyst is prevented by having an unperforated retaining sleeve top.

13144

Stephens, Ruth E., Daniel A. Hirschler, Jr., and Frances W. Lamb

OXIDATION CATALYSTS. (Ethyl Corp., New York, N. Y.) U. S. Pat. 3,447,893. 8p., June 3, 1969. 7 refs. (Appl. Feb. 4, 1966, 8 claims).

In purification of exhaust gases from an internal combustion engine, a catalyst must operate effectively under a range of temperatures from 400 to 1800 F. A method is presented for oxidation of the unburned hydrocarbons and the carbon monoxide components of exhaust gas. The exhaust gas is contacted with a catalyst consisting of a transitional alumina support containing from 0.01 to 5 wt % silica, and as a catalytic agent, copper oxide containing 0.5 to 25 wt % copper and 0.5 to 10 wt % cobalt or silver and a combination of cobalt and vanadium in oxide form. The catalyst will operate at the required range of temperatures, oxidizing the carbon monoxide and unburned hydrocarbons.

13217

Mattia, Manlio M.

PROCESS FOR REMOVING ORGANIC CONTAMINANTS FROM AIR. (Day & Zimmermann, Inc., Philadelphia) U. S. Pat. 3,455,089. 4p., July 15, 1969. 3 refs. (Appl. Nov. 27, 1967, 4 claims).

A process is presented for removing organic contaminants from air by adsorption. This is accomplished in a continuous process by using several parallel adsorbers, with one or more of the units being regenerated while one or more remain on stream. Contaminants driven from the adsorbers during regeneration are used as fuel for heating the regenerating gases. Adsorbent beds, such as activated charcoal, that normally are adversely affected by the very high temperatures associated with direct burning can be used in the system. Combustion products are preferably recycled through the adsorber so that only treated exhaust leaves the system.

13467

Young, Stewart W.

FUME DESTROYING PROCESS. (Thiogen Co., San Francisco, Calif.) U.S. Pat. 1,094,767. 3p., April 28, 1914. (Appl. August 15, 1911, 5 claims).

Decomposition or reduction of sulfur dioxide and formation of sulfur occur simultaneously when sulfurous fumes are subjected to the action of a heated carbonaceous fuel in the presence of a calcareous substance or solid reagent, or the action of a highly heated hydrocarbon fuel in the presence of a reagent. Fumes are then cooled to a temperature at which the sulfur will not recombine with oxygen. Decomposition is accelerated by the use of lime, lime rock, or any substance which has the property of neutralizing the sulfurous acid of the fumes.

13497

Saito, T., E. Shirasaki, and N. Toriyama

STUDIES ON SULFUR IN ACETYLENE GAS GENERATED BY DRY TYPE GENERATORS AND METHOD OF GAS PURIFICATION. Text in Japanese. J.J. Synthetic Organic Chem. (Japan), 27(4):345-351, April 1969. 7 refs.

This study involved the removal of sulfur components from acetylene by washing with dilute sodium hypochlorite. Crude acetylene generated from calcium carbide containing more than 1% calcium sulfide contained a small amount of hydrogen sulfide. Alpha, beta, alpha prime, beta prime-tetrachlorodiethyl sulfide was extracted after purification of the precipitates in the mist separator using a solution of pH 6.5-7.3. Hydrogen sulfide was effectively removed by washing crude acetylene with 10% aqueous NaOH before treatment with sodium hypochlorite.

13551

Faith, W. L.

AIR POLLUTION ABATEMENT. SURVEY OF CURRENT PRACTICES AND COSTS. Chem Eng. Progr., 55(3):38-43, March 1959. 8 refs.

Pollutants and control methods of the chemical manufacturing, pulp, petroleum refining, steel, food, and cement manufacturing industries are reviewed. Chief pollutants from the chemical industry are dilute vent gases, acid mists, waste sulfides, nitrogen oxides, combustible wastes, and dust. Vent gases are best controlled by catalytic oxidation, sulfides by caustic scrubbers, nitrogen oxides by catalytic reduction, combustible wastes by incineration, and dust by filtration. No standard procedure has been adopted for abatement of acid mists. Pulp and paper industry pollutants are fly ash, dust and odors. Electrostatic precipitators, dust scrubbers, and spray towers are used to combat these problems. Air pollution by the petroleum refining industry is caused by sulfur compounds and hydrocarbon loss. Sulfur compounds can be reduced by absorption and hydrocarbons by several control methods. The main pollutant from the steel industry is dust, which can be controlled by electrostatic precipitators and wet scrubbers. The main problem of the food industry is control of odor, which is combatted by activated carbon adsorbers. Dust from cement industries is best controlled by glass fabric bag filters or cyclone collectors. Costs for 1959 are given for the various control methods.

13554

Cohn, Johann G. E.

METHOD OF REMOVING NITROGEN OXIDES FROM GASES. (Engelhard Industries, Inc., Newark, N. J.) U. S. Pat. 3,118,727. 4p., Jan. 21, 1964. 9 refs. (Appl. Oct. 12, 1956, 11 claims).

A process is described for recovering heating values and purifying waste gases produced by the oxidation of ammonia in the production of nitric acid. Waste gases are mixed with a hydrocarbon fuel and the mixture is passed over a 0.1 to 5.0% by weight rhodium and/or palladium supported catalyst at the reaction temperature of 700-725 F. The heat generated in passing the mixture over the catalyst may be used to raise the gas temperature or to generate steam isothermally. Space velocity for the reaction may be in the range of 60,000-110,000 standard vols of gas/vol of catalyst/hr. The more hydrocarbon fuel used, the more complete is the removal of nitrogen oxides.

13783

Miller, E. B.

ADSORPTION BY SILICA GEL. II. Chem. Met. Eng., 23(25):1219-1222, Dec. 22, 1920. (Presented before the Am. Inst. Chem. Eng., Montreal, June 28, 1920).

The most satisfactory method for recovering solvent vapors after they have been adsorbed by silica gel, consists of heating the gel and sending steam directly through it. For volatile solvents such as ethyl ether, acetone, benzene, and gasoline, 150 C is considered the optimum temperature to bring about rapid distillation of the vapors from the gel. It was found that using a 1% mixture of ether vapor and air, silica gel adsorbs an amount of ether corresponding to 14.4% of its own weight; and, using a 3.08% mixture, it adsorbs 15.5% of its own weight. In each case it adsorbed at 8% of its weight at 100% efficiency. The results of experiments conducted on the adsorption efficiency for acetone, benzene, and petroleum ether are presented graphically.

13784

Messen-Jaschin, Gregori

APPARATUS FOR PURIFYING AIR. (G. A. Messen-Jaschin, Sarnen, Switzerland) U. S. Pat. 3,434,267. 7p., March 25, 1969. 20 refs. (Appl. Sept. 1, 1965, 9 claims).

An installation for purifying street air from automotive exhaust gases is described. A number of electrofilters are located in two rows on opposite sides of the street below the street level. Ventilators suck in the air to be purified from the streets and pass it through the electrofilters. After the air passes through the filter, it is guided through a combustion chamber where carbon monoxide is converted to carbonic acid. The apparatus has a separate air-withdrawing channel connected to each combustion chamber which opens into the side wall of a discharge gutter.

13865

Schuetze, M.

FINE PURIFICATION OF GASES WITH A HIGHLY ACTIVE COPPER CATALYST. (Feinreinigung von Gasen mit einem hochaktiven Kupferkatalysator). Text in German. Angew. Chem., 70(22-23):697-699, Nov. 26, 1958. 7 refs.

A description is given of a novel, highly active copper catalyst which is suitable for removal of O₂, H₂, CO, acetylene, and sulfur compounds from a large variety of gas mixtures by catalytic reaction or by absorption. The impurities are removed at relatively low temperatures, in most cases, down to the limit of detectability.

Agnew, W. G.

FUTURE EMISSION-CONTROLLED SPARK-IGNITION ENGINES AND THEIR FUELS. Proc. Am. Petrol. Inst. Sect. III, vol. 49:242-280, 1969. 26 refs.

Future trends in vehicle and gasoline design for the purpose of meeting increasingly stringent air pollution controls are discussed. Federal exhaust emission standards for 1970 are more stringent than those for 1969. Standards now require 10% lower hydrocarbon and CO emissions and measurement methods have been changed from a concentration basis to a calculated mass basis. Emission control systems are improved and are integral with the power plant and the fuel system. Included in future plans are evaporative emission restrictions, nitrogen oxides emission control, and more stringent hydrocarbon and CO emission controls. New devices available for control include large manifold air injection reactors, catalytic converters, and alternate power plants such as gas turbines, external combustion engines, and electric propulsion. Attention will be given to reducing the extreme deviations of high volatility gasolines in the summer and low volatility gasolines in the winter and reducing eye irritation by reducing the amount of aromatic hydrocarbons in the engine exhaust gas. Propane may be used since it permits leaner mixtures. While emission standards are met, companies will try to maintain or improve present levels of driveability, reliability, fuel economy, cost, and owner convenience. At the same time, the oil industry will be making necessary changes to ensure that the new hardware systems will operate with the greatest possible satisfaction to the car owner.

14004

Franzky, Ulrich

COUNTERACTING OFFENSIVE ODORS CAUSED BY ORGANIC COMPOUNDS. (Bekämpfung von Geruchsbelaestigungen, die durch organische Verbindungen verursacht sind). Text in German. Staub, Reinhaltung Luft, 28(3):113-119, March 1968. 13 refs.

The importance of removing odorous components from waste air and exhaust gases is now recognized, but the selection of an appropriate purification process is complicated by the proliferation of chemical processes and treatment methods. A survey of the most popular methods is given and measures that can be taken to improve conditions in a small plant are pointed out. (Author summary modified)

14028

FILTRATION OF WASTE AIR FROM DRY CLEANING MACHINES. (Filterung der Abluft aus Reinigungsmaschinen). Text in German. Wasser Luft Betrieb, 13(4):127-128, April 1969.

The fifth regulation of the Law for the Prevention of Air Pollution in North Rhine-Westphalia of 1967 is now in effect. It concerns all machines for cleaning and drying textiles, leather

goods, or furs if they operate with chlorinated hydrocarbons in the form of trichloroethylene or perchloroethylene. The regulations pertain to all sizes of machines so that tumble driers and coin-operated cleaners are also affected. In a departure from other regulations, a specific method for cleaning of the waste air is required, namely, filtration with activated coal. The concentration limit cannot exceed 200 mg of solvent per cu m waste air. Commercially available activated coal is capable of storing 25 to 35% more solvent than must be regenerated. For this reason, installation of two filters is recommended. The efficiency of a charcoal filter is rather high, so lower concentrations than the prescribed limit concentration are obtained. Since the odor threshold of trichloroethylene fluctuates between 260 and 520 mg/cu m and that of perchloroethylene is 360 mg/cu m, the effectiveness of the filter can be roughly evaluated by the presence or absence of odor at the filter outlet. According to the regulations, official inspections will be made once a year without charge. For this purpose, the Draeger trace gas-measuring unit will be used. The solvent retained by the activated coal can be recovered and returned to the process. Investment costs should be amortized within two years.

14036

Taylor, R. E. and R. M. Campau

THE IIEC - A COOPERATIVE RESEARCH PROGRAM FOR AUTOMOTIVE EMISSION CONTROL. Proc. Am. Petrol. Inst., Sect. III, vol. 49:309-327, 1969. 5 refs.

The Inter-Industry Emission Control Program, which now is comprised of six petroleum companies and five automobile manufacturers (including four foreign firms), was established in 1967 and expanded in 1968 to pool the research efforts of the two industries in the design and development of a virtually emission free, gasoline-powered vehicle. Specific targets call for a 90 to 97% reduction in the hydrocarbon, carbon monoxide, and nitrogen oxide emissions of a typical vehicle and are aimed at improving the quality of the Los Angeles Basin, considered the most critical air shed area in the United States. Of some 17 research projects begun under the program, those associated with catalysts, thermal reactors, exhaust gas recirculation, and modification of fuel properties are receiving the major current attention, using techniques ranging from mathematical modeling to component hardware development and testing, to the building and testing of complete concept cars, which combine various emission control sub-systems into fully-functioning automobiles for total emission evaluation, durability testing, and product acceptability evaluation. Descriptions of the various research problems and methods are given. Because of Federal emissions testing requirements, much of the total effort is directed toward designing exhaust control systems that can operate at high efficiency almost from the moment of engine start-up. Summaries are given of the investigations underway that deal with the fuel and hardware components of a spark ignition engine; these involve the development of additives to suppress nitrogen oxide formation, hydrocarbon combustion-improving additives, hydrocarbon deposit-modifying additives, surface tension and emulsifying agents, and the study of the effect of fuel volatility on exhaust and evaporative emissions.

Saito, Takeshi

AUTOMOBILE EMISSION AND MOTOR OILS. (Dorogai soko sharyo ni saiteki no sekyu tenka zai). Text in Japanese. Junkatsu (J. Japan Soc. Lubrication Engrs.), 14(2):61-69, 1969. 11 refs.

Exhaust gas, blowby gas, and carburetor vapors constitute automotive emissions. A Positive Crankcase Ventilator (PCV) recycles carbon monoxide- and hydrocarbon-containing blowby gas from the crankcase to the cylinder. A 'road draft system' results when there is no recycle. A high grade motor oil, e.g., 'long life', is necessary to prevent the PCV tube from becoming filled with sludge and the PCV bulb should be a 'zigle' pin type. The motor oil test is discussed at length and the sludge characteristics of a new oil are evaluated on the basis of its total alkali number.

14202

Bjerklie, J. W. and B. Sternlicht

CRITICAL COMPARISON OF LOW-EMISSION OTTO AND RANKINE ENGINE FOR AUTOMOTIVE USE. Preprint, Society of Automotive Engineers Inc., New York, 16p., 1969. 16 refs. (Presented at the International Automotive Engineering Congress, Detroit, Mich., Jan. 13-17, 1969, Paper 690044.)

Rankine cycle external combustion engines, which are currently used for low emission power plant systems, are considered in terms of their application to automobiles meeting future pollution requirements. A comparative study of theoretical reciprocating and rotary Rankine cycle engines using steam and organic fluids with existing Otto automotive engines indicates that the performance of the former should be superior with respect to size, torque, economy, emission, response, maintenance, and reliability. Use of external combustion, which means that the engine can use the same fuel burned in power plants, will reduce fuel cost and produce inherently lower emissions. With presently available fluids and with the most practical machinery presently known, the steam reciprocator is best able to compete with the Otto cycle engine. However, development of an 'ideal' low temperature, nontoxic, nonflammable fluid should lead to vapor engines significantly better than the reciprocating steam engine. These engines will require no regenerator or superheater and will not have the cost and size disadvantage of the steam system. Reciprocating vapor engines will develop very high torque merely by feeding high pressure vapor to the cylinder. It is hoped that chemical and petrochemical companies will concentrate on the development of the 'ideal' fluid.

14264

Ebersole, G. D.

HYDROCARBON REACTIVITIES OF MOTOR FUEL EVAPORATION LOSSES. Preprint, Society of Automotive Engineers, Inc., New York, 8p., 1969. 12 refs. (Presented at the International Automotive

Engineering Congress, Detroit, Mich., Jan. 13-17, 1969, Paper 690089.)

A calculation technique that accounts for nonlinear relations between reactivity and mixture concentration was developed and used to study the hydrocarbon reactivity of evaporation losses from a variety of original fuels. Results of calculated data show that diluting the concentration of light olefins in an original fuel, normally accomplished by additions of butane, pentane, or saturated base stocks, reduces reactivities of hydrocarbon evaporation losses. It was concluded that the effects of fuel composition on evaporation losses is a parallel study needed for complete assessment of the benefits that changes in fuel composition may have on photochemical smog formed from the evaporation losses.

14297

Hind, C. J.

CLEAN AIR AND THE DIESEL. Indian Eastern Engr. (Bombay), 111(2):77-79, Feb. 1969.

A defense of the diesel engine against criticism that it is a heavy contributor to air pollution is presented. Under ideal conditions if all gasoline engines were replaced by diesel engines, the emission of carbon monoxide, aldehydes, and nitrogen oxides would be reduced, carbon dioxide, hydrocarbons, and soot would be increased, and sulfur dioxide would be unchanged. Carbon dioxide is not seen as a health hazard, and hydrocarbons are not considered dangerous, as they are in parts of the U. S., because the other conditions necessary for the creation of photochemical smog, particularly climatic factors, are not present in the U.K. Carbon monoxide, possibly the emission most hazardous to health, would be reduced to almost negligible amounts. Sulfur dioxide would necessarily be kept to a minimum, since in diesel engines the sulfur content of the fuel is deliberately kept very low to reduce internal corrosion of engines. In addition, because the diesel engine is more efficient than the gasoline engine, the absolute quantity of fuel oil used would be reduced, thus lowering the total impurities discharged into the atmosphere. Efforts are underway to reduce the major pollutants from diesels: smoke (carbon) and odor (sulfur dioxide). Supercharging by making use of energy remaining in the exhaust gases to drive a turbine and compressor, is seen as one way of maintaining a satisfactory fuel/air ratio for smokeless operation and greater efficiency as fuel input is increased. Improvements in the combustion process are being investigated as an engineering goal and to reduce odorous emissions.

14326

Hardison, L. C.

A SUMMARY OF THE USE OF CATALYSTS FOR STATIONARY EMISSION SOURCE CONTROL. Franklin Inst. Research Labs., Philadelphia, Pa., Materials Science and Engineering Dept. and Public Health Service, Durham, N. C., National Air Pollution Control Administration, Proc. First Natl. Symp. on Heterogeneous Catalysis for Control of Air Pollution, Philadelphia, Pa., Nov. 1968, p. 271-296.

Catalysts have been used for about 20 years for oxidizing hydrocarbons to prevent their emission into the atmosphere. Initially, all-metal catalysts of the Suter-Ruff type, in which the active catalytic material is conducted to the surface of a base metal support by means of an electrochemical process were used; they were most commonly of the platinum-palladium group. These continue to be the most widely used catalysts for stationary source control, but ceramic honeycomb-supported and particulate-supported catalysts have had significant application. Particulate catalysts are widely used in petroleum refining and chemical processes, and to a limited extent in air correction. Ceramic honeycomb materials have an advantage over particulate catalysts in that the pressure drop for a given amount of ceramic surface area is only a very small fraction of that across the particulates. While the scientific basis of catalysis is not as clear as that of many of the other industrial arts, the thermodynamics are sufficiently well known that catalysts can be characterized with good success. A summary of the thermodynamic reactions involved in catalysis is given. The use of catalytic air pollution control equipment in such industries as wire enameling, kettle cooking (particularly in paint manufacturing), metal lithographing, the chemical process industries and many others is described. Additional applications for catalytic air pollution control continue to appear as regulations and community standards for air quality become more rigid. An appendix presents a sample computer analysis of catalytic solvent burning.

14333

Dwyer, F. G.

CATALYST SYSTEM MORPHOLOGY AND DESIGN. Franklin Inst. Research Labs., Philadelphia, Pa., Materials Science and Engineering Dept. and Public Health Service, Durham, N. C., National Air Pollution Control Administration, Proc. First Natl. Symp. on Heterogeneous Catalysis for Control of Air Pollution, Philadelphia, Pa., Nov. 1968, p. 73-86. 13 refs.

Common gaseous pollutants that are amenable to catalytic transformation are discussed. Sulfur dioxide is eliminated by catalytic hydrodesulfurization, oxidation with a vanadium pentoxide catalyst, or reduction with carbon monoxide in flue gases. Nitrogen oxides are eliminated by reduction with chromite and copper oxide catalysts, which lose their effectiveness. Carbon monoxide is removed from atmospheric gases by catalytic oxidation. More is known about the mechanism of CO oxidation, which is catalyzed by transition metal oxides and noble catalysts, than about any other methods. Carbon monoxide also can be oxidized in the presence of H₂ over MnO₂, and indium doped ZnO, based on electronic charge transfer. Mechanisms for the oxidation of hydrocarbons are similar to those for CO oxidation but more catalyst efficiency. Interaction of gaseous pollutants presents a problem in finding the right catalyst. The complexity of the problem is seen in the exhaust from internal combustion engines. Here, CO and unburned hydrocarbons are converted by catalytic oxidation and nitrogen oxides are converted by catalytic reduction. The transition metal oxide and noble metal catalysts must be supported on a base for ease of handling, cost, and thermal stability. Problems encountered in treating industrial gas streams are those of dilution. A

further complication arises if the diluent interferes in some manner with the reaction being catalyzed. Poisoning effects, which are present in all heterogeneous catalytic reactions, must also be considered. Although none of the catalysts is a panacea, each brings the solution of air pollution closer.

14341

Lunche, Robert G.

FUME AND ODOR DESTRUCTION BY CATALYTIC AFTERBURNERS. Franklin Inst. Research Labs., Philadelphia, Pa., Materials Science and Engineering Dept. and Public Health Service, Durham, N. C., National Air Pollution Control Administration, Proc. First Natl. Symp. on Heterogeneous Catalysis for Control of Air Pollution, Philadelphia, Pa., Nov. 1968, p. 297-320. 6 refs.

The operating and design aspects of the catalytic afterburning process are reviewed, and its application and effectiveness are discussed on the basis of the experience of the Los Angeles County Air Pollution Control District in testing a wide variety of catalytic afterburners in industrial use. Because of certain operating characteristics of these afterburners, they represent a partial oxidation process which produces compounds in the treated effluents that are often more offensive and odorous than the original fumes and odors. Investigations by the District show that partial oxidation produces olefinic and other oxidation products that often increase the eye-irritating, photochemical smog-forming potential of treated effluents to levels greater than those of the original fumes and odors. In general, an afterburner must oxidize 90% or more of the carbon in the entering materials to CO₂ to be judged effective. On the basis of the District's own experience and reports of others, the actual performance of catalytic afterburners for reducing many fumes and odors is considered inadequate. Without an advance in performance, it does not seem likely that catalytic afterburners will be able to comply with Los Angeles County's organic emissions standards unless the operating temperatures are at a level that renders the catalyst unnecessary.

14353

Yagi, Shizuo, Kazuo Nakagawa, Akira Ishizuya, and Yasuhito Sato

A STUDY IN THE DEVELOPMENT OF EXHAUST EMISSION CONTROLS FOR SMALL DISPLACEMENT HONDA ENGINES. Preprint, Society of Automotive Engineers, Inc., New York, 20p., 1968. 11 refs. (Presented at the West Coast Meeting, Society of Automotive Engineers, San Francisco, Aug. 12-15, 1968, Paper 680527.)

In the small displacement, high-speed, high-performance spark ignition engines being developed by Honda, the difficulties in reducing exhaust emissions without seriously impairing inherent engine characteristics are different from those encountered with the large displacement engines generally used in American cars. The tandem throttle valve system was developed as a control device to minimize exhausts emissions during the frequent accelerations and decelerations in normal driving conditions. The system serves to restrict the flow of fuel from the low-speed system of the carburetor, to prevent fuel remaining on the intake manifold wall from flowing into the

cylinders, and to aid the fuel not restricted from flowing into cylinders to burn completely by adding secondary air. The application of an air injection reactor system in small displacement engines reduced carbon monoxide and hydrocarbon concentrations. The effect of 'squish action' in a hemispherical combustion chamber on exhaust emissions promotes better mixing of the gases, thereby increasing the flame speed and resulting in more complete combustion in the cylinder. Through research and development, many of the difficulties were overcome, and satisfactory results were obtained in exhaust emission control under certain limited operating conditions.

14424

Massa, Victor F. and George P. Gross

METHOD AND APPARATUS FOR TREATING AUTOMOTIVE EXHAUST GAS.
(Esso Research and Engineering Co., Inc., Linden, N. J.) U. S. Pat. 3,460,901. 3p., Aug. 12, 1969. 6 refs. (Appl. June 11, 1965, 2 claims).

The invention provides a method for abating air pollution from automobile exhaust gas. It is concerned primarily with lowering the emission of unburned hydrocarbons and carbon monoxide by addition of an oxidation-initiating compound of aqueous hydrogen peroxide which promotes the conversion of the pollutants to innocuous CO₂ and H₂O. The liquid oxidant can be aspirated into exhaust gas for afterburning or injected in other ways suitable for dispersing it in carrier gas or directly in exhaust gas ports. An example of a device used for aspirating comprises a venturi scrubber and jet stream. This device can be adjusted to vary the amount of the oxidant in response to engine demand. The carrier gas in which the hydrogen peroxide-water mixture is dispersed can be air or recycled exhaust gas. By a simple valve mechanism, flow of the oxidant can be controlled and limited to periods of engine operation when unburned hydrocarbon emission tends to be highest, e.g., acceleration, deceleration, or idling. The system described can be used with both spark ignition and compression ignition engines. Further applications of the method include the treatment of exhaust gases containing lead residues or halogen compounds present in antiknock additives.

14459

Weaver, E. E.

EFFECTS OF TETRAETHYL LEAD ON CATALYST LIFE AND EFFICIENCY IN CUSTOMER TYPE VEHICLE OPERATION. Preprint, Society of Automotive Engineers, Inc., New York, 8p., 1969. 18 refs. (Presented at the International Automotive Engineering Congress, Detroit, Mich., Jan. 13-17, 1969, Paper 690180.)

Effects of four levels of tetraethyl lead (TEL) on the efficiency and life of a commercially available hydrocarbon and carbon monoxide catalyst were investigated. The four fuels used in mileage accumulation were the base Indolene with no added lead and blends containing respectively 0.5, 1.5, and 3.0 ml TEL per gallon. The vehicles were eight Fords equipped with 289-CID non-emission controlled 2-V engines, unmodified except for a lean carburetor and the catalytic exhaust system. The

eight vehicles were paired off and each pair operated on one of the four fuel blends. In each pair, a radial flow converter, which required no supplemental air, was located under the front seat in one vehicle and near the rear axle in the other vehicle. Exhaust emissions were monitored at approximately 3000-mile intervals during accumulation of 18,000 miles in customer-type service. Tetraethyl lead in the fuel adversely affected the rate of warm up, the ability of the catalyst to remove hydrocarbons from the exhaust, and accentuated the differences in performance between front and rear converters as mileage was accumulated. On non-lead fuel, the catalyst performed well in preferentially removing olefins and aromatic hydrocarbons to yield an exhaust of very low reactivity, until problems were encountered with losses of catalyst. The catalyst removed CO, aliphatic aldehydes, and acetylenes equally well on leaded or non-leaded fuel. (Author abstract modified)

14463

Nelson, Edwin E.

HYDROCARBON CONTROL FOR LOS ANGELES BY REDUCING GASOLINE VOLATILITY. Preprint, Society of Automotive Engineers, Inc., New York, 24p., 1969. 20 refs. (Presented at the International Automotive Engineering Congress, Detroit, Mich., Jan. 13-17, 1969, Paper 690087.)

Evaporative emissions from automobiles can be reduced by lowering gasoline volatility. A 3 psi reduction in Reid vapor pressure will reduce evaporative losses by about 50%. A test program was conducted to determine if new and used cars presently on the road in the Los Angeles basin could operate satisfactorily on lower volatility gasoline. A 12% decrease in total vehicle hydrocarbon emissions, equivalent to 228 tons of hydrocarbons per day, could be obtained by lowering the Reid vapor pressure by 3 psi. Gasoline with reduced volatility gave acceptable driveability and could be used to provide a significant reduction in hydrocarbon emission.

14505

Haritatos, Nicholas J. and Phillip D. Harvey

SULFUR RECOVERY. (Chevron Research Co., San Francisco, Calif.) U. S. Pat. 3,463,611. 9p., Aug. 26, 1969. 8 refs. (Appl. May 1, 1967, 11 claims).

The invention presents an economical method of manufacturing sulfur from hydrogen sulfide and other sulfur compounds present in the oil fed to a hydroconversion process. It produces a sufficiently high ratio of hydrogen sulfide to inert gas (usually carbon dioxide) to recover sulfur by the Claus process. A purge stream is withdrawn from a hydroconversion zone recycle gas stream containing hydrocarbons, hydrogen, hydrogen sulfide, and other gases. The purge stream is then passed to a partial oxidation zone where hydrocarbons are partially oxidized to hydrogen, carbon monoxide, and carbon dioxide. Hydrogen sulfide and carbon dioxide are removed from the partial oxidation zone effluent and fed to the Claus process. Hydrogen and carbon

monoxide present in the oxidation zone effluent are recycled to the hydroconversion zone. Separation of the hydrogen sulfide and carbon dioxide in the partial oxidation zone is accomplished economically by a physical absorption process at 500-2000 psig.

14519

Frysinger, Galen R.

HYDROGEN REFORMING FOR FUEL CELLS. Franklin Inst. Research Labs., Philadelphia, Pa., Materials Science and Engineering Dept. and Public Health Service, Durham, N. C., National Air Pollution Control Administration, Proc. First Natl. Symp. on Heterogeneous Catalysis for Control of Air Pollution, Philadelphia, Pa., Nov. 1968, p. 459-476.

Fuel cells are basically reactors of hydrogen and oxygen. They are being considered for use in hydrocarbon-air fuel cell engines which may have better pollution characteristics than conventional engines. Since oxygen is readily available, the problem is one of converting liquid hydrocarbons into hydrogen fuel with lightweight equipment. Direct anodic oxidation is not practical because of the amount of platinum catalyst required. Another approach to hydrocarbon reforming is based on the internal reforming cell in which the catalyst is located next to a silver-palladium anode in the fuel cell. This anode transmits the hydrogen formed in the reformer cavity directly to the fuel cell where it is oxidized electrochemically on an electrolyte. Hydrogen formation depends on current density of the fuel cell, which is reduced by catalyst degradation. However, desulfurization cartridges should protect reformers against excessive catalyst degradation. High reliability in fuel cell systems is achieved by feeding fuel and water through digital injection systems rather than through stroke piston pumps. Fuel cell reactions using hydrogen and oxygen are clean, since water is the only offgas product. Even using a hydrocarbon fuel, these cells will enable 1980 emission standards to be met.

14604

Hamblin, R. J. J. and W. J. Faust

CATALYTIC SYSTEMS FOR LEADED AND UNLEADED GASOLINE EXHAUSTS. Franklin Inst. Research Labs., Philadelphia, Pa., Materials Science and Engineering Dept. and Public Health Service, Durham, N. C., National Air Pollution Control Administration, Proc. First Natl. Symp. on Heterogeneous Catalysis for Control of Air Pollution, Philadelphia, Pa., Nov. 1968, p. 131-159.

The problems of achieving complete catalytic combustion of oxidizable components other than unburned hydrocarbons, carbon monoxide, and nitrogen oxides are discussed. A catalyst placed in the exhaust system must be capable of dealing with lead, halogens, sulfur, and phosphorus in all combinations with oxygen and with each other. The catalyst must have a size and shape consistent with requirements for good flow distribution and low pressure drop. The catalyst bed itself and the individual particles must also not be subject to plugging by particulate matter. A catalytic converter lowers the

concentrations of all pollutants in the exhaust gas stream and does not manufacture any new ones. The automobile manufacturers achieved significant reductions in carbon monoxide and hydrocarbon emission levels by controlling carburetion and ignition and by adding secondary air to the exhaust system. However, the still lower levels of emission desired after 1970 will be difficult to attain without further losses in vehicle performance. They may even be unattainable without catalytic converters. The use of present-generation catalysts may permit the recovery of the performance that already is sacrificed by engine modifications. The development of catalysts which can operate successfully for extended mileage on leaded fuels was accomplished. The performance of catalysts on unleaded fuels is outstanding. With leaded or unleaded fuel, a catalytic converter coupled closely to the exhaust manifold, under any engine operating conditions, assures lower emission levels than any other system.

14608

DePalma, T. V. and M. W. Perga

DIESEL ENGINE POLLUTANTS. PART II. CONTROL. Franklin Inst. Research Labs., Philadelphia, Pa., Materials Science and Engineering Dept. and Public Health Service, Durham, N. C., National Air Pollution Control Administration, Proc. First Natl. Symp. on Heterogeneous Catalysis for Control of Air Pollution, Philadelphia, Pa., Nov. 1968, p. 221-234.

A catalytic system to control diesel engine pollutants is discussed. Catalytic oxidation of pollutants to carbon dioxide and water is the most desirable method to use. Several catalysts accomplished the task of odor improvement and reduction of gaseous combustibles; these are made of spherical alumina-base materials, one of which contains a noble metal. The real advantage to the solution of the environmental pollution problem by catalysis is its operational persistence. It not only oxidizes odorous oxygenates but also efficiently consumes other combustibles such as carbon monoxide and hydrocarbons. Converter and catalyst design criteria are based on maximum throughput from the engine. Space and mass velocity are selected to give high pollutant conversion even with maximum exhaust gas output. Gas flow distribution must be controlled so that catalyst utilization is complete. This is accomplished by designing low pressure drop beds, minimizing head losses, and balancing velocity and static heads within the converter. The design problem becomes critical when one understands that an exhaust pollution control system must operate under a very wide range of conditions. Engine characteristics also affect the performance of a catalytic system. The two-stroke diesel engine, when compared to the four-stroke engine, exhausts a greater volume of gases which are lower in temperature and more dilute. These conditions diminish the reaction rate for oxidation and make conversion of pollutants more difficult. System design changes in the inlet screen have eliminated the sooting of the catalyst in that area. The need for rapid and accurate evaluation of exhaust gas odorants is obvious. From the catalyst development standpoint an accurate appraisal method is necessary in order to demonstrate subtle differences in performance. A catalytic system was developed which reduces odor emissions from diesel

powered vehicles, which oxidizes hydrocarbons and carbon monoxide with high efficiency, and which can be fitted into existing muffler spaces.

14609

McLouth, B. F., H. J. Paulus, and A. J. Roberts

INCINERATION OF EPOXY GLASS LAMINATES TO RECOVER PRECIOUS METALS. American Society of Mechanical Engineers New York Incinerator Div., Proc. Natl. Incinerator Conf., New York, 1968, p. 171-175. (May 5-8).

Recovery of precious metals from electrical circuits printed on epoxy-impregnated fiberglass laminates was carried out by incineration of the scrap and rejected printed circuits at controlled temperatures, which resulted in the liberation of a considerable amount of unburned hydrocarbons and obnoxious odors into the atmosphere. The glass laminates consisted of approximately 65% fiberglass (by weight) and 35% epoxy resins. The material contained no chlorines and not more than a trace of sulfur, but 16% petra-bromo had been added to the resins to permit the use of the final product under various ambient temperatures. In addition, there was variance in type and consistency of the epoxy scrap. Based on information obtained by research on the combustion characteristics of the material, a prototype unit was constructed and tested. After successful testing of the prototype unit, a new incinerator was installed that solved the problem of hydrocarbon and odor emission. A control system was designed that should assure proper burner operation and unit temperatures and at the same time be flexible in case adjustments become necessary in the new unit. The new incinerator simplifies recovery of the precious metals due to more consistent ash quality. Polyesters and other plastics, as well as wool and vinyls have been burned in this incinerator, all with equal success.

14723

Derndinger, Hans-Otto

MOTOR VEHICLE ENGINES. (Kraftfahrzeugmotoren). Text in German. VDI (Ver. Deut. Ingr.) Z. (Duesseldorf), 110(21):978-982, July 1968. 8 refs.

Recent developments in the field of exhaust gas cleaning are discussed. Since the passage of laws in the U. S. A. limiting the concentrations of carbon monoxide and of unburned hydrocarbons in the engine exhausts, automobile manufacturers have developed various methods of meeting these legal requirements. Most of them are based on the principle of afterburning, e.g., manifold air oxidation and thermal reactors. The Clean Air Package aims at accurate adjustment of the carburetor and delays the ignition, guaranteeing a more complete combustion, although the exit gases have higher temperatures. Another method is gasoline injection. The effects of these measures are beginning to be felt. In Los Angeles, the steep increase in hydrocarbon emissions has been reversed. Great efforts are being made to reduce the emissions by 1980 to the 1940 level. To achieve this end, further

measures are required. Control measures tend toward a smaller ratio of combustion chamber surface to combustion chamber volume. Careful sealing will eliminate the emission of unburned hydrocarbons from the fuel tank evaporation. The two toxicants which have received little attention to date by legislators are lead and nitrogen oxides. In conclusion, the marketing of two new Wankel engines is mentioned.

14728

Krynitsky, John A.

MILITARY PROCUREMENT PROBLEMS RESULTING FROM AIR POLLUTION CONTROLS. Preprint, National Petroleum Refiners Association, Washington, D. C., 11p., 1968. (Presented at the National Fuels and Lubricants Meeting, New York, N. Y., Sept. 11-12, 1968, FEL-68-61.)

The efforts of the Department of Defense (DoD) to comply with Federal and local air pollution control regulations are coordinated by its Environmental Pollution Control Committee, established in January, 1966. As an example of these efforts, to comply with Rule 66 of the Los Angeles Air Pollution Control District which severely restricts the emission of organic materials to the atmosphere and involves many paints and cleaners used by DOD installations and contractors, substitute fluids and solvents are being sought and catalytic incinerators for destroying the vapors are being employed. A time-phased 5-year program for compliance is now in effect. The Department, which may be the biggest buyer of heating oil in the world, is also greatly affected by standards for Federal facilities limiting the emission of pollutants from the burning of fossil fuels. These include limits on particulate emissions, on the visual density of smoke, on vapor losses from gasoline and other volatile organic materials, and on sulfur oxide emissions. Efforts are being concentrated on obtaining adequate supplies of low sulfur heavier burner fuel oils. DOD has adopted a policy of converting to fuel of 1% sulfur content as soon as practical in order to comply with or surpass all local regulations and provide leadership in pollution control. A program to monitor the quality of fuels being received from suppliers is in operation. Five-year plans covering 313 military installations in the three service branches have been drawn up for the phased and orderly correction of air pollution deficiencies, and are now under review.

14757

Meites, Leonard

WEB PRINTERS AND AIR POLLUTION CONTROL. Web Printer, 1(6):1-7, 1969.

Air pollution from web printing plants consists mainly of a smoke problem, which is relatively simple to control with afterburners, and an odor problem, which presents considerable control difficulties. The most practical means of counteracting odors from paper coatings, ink solvents, improperly adjusted gas burners, and soiled papers is by either catalytic or thermal combustion. The first works best with a pure gas stream from the press dryer; in practice, however, the effluent of a press dryer may have

impurities which can cause trouble with the catalyst and must therefore be considered when the system is designed. Direct flame combustion can handle impurities in the dryer effluent since its temperature range is from 1000 to 1400 F. The initial cost of a catalytic afterburner system is higher than that of a thermal system, but its operating costs are usually considered lower, although recently there has been some controversy on this point. The possibility of controlling pollution by using mild and low aromatic solvents is briefly discussed; the inks now used in web presses contain photochemically-reactant hydrocarbon solvents which violate regulations such as Rule 66 of the Los Angeles County Air Pollution Control District, and therefore require the installation of highly efficient afterburners. It is noted that the cost of air pollution control are mitigated somewhat because good afterburners reduce condensate formation on oven walls and thus increase production and improve printing quality.

14830

Meyers, R. A., J. L. Lewis, and J. S. Land

PHASE I REPORT. APPLICABILITY OF ORGANIC SOLIDS TO THE DEVELOPMENT OF NEW TECHNIQUES FOR REMOVING OXIDES OF SULFUR FROM FLUE GASES. TRW Inc., Redondo Beach, Calif., TRW Systems Group, Contract PH22-68-46, Report 10669 6003-RO-00, 52p., Oct. 31, 1968. 39 refs.

CFSTI: PB 185 887

A literature search was conducted to select promising organic solids for removing sulfur dioxide from flue gas, and a preliminary chemical systems analysis for candidate SO₂ removal materials was performed. Organic materials were selected on the basis of ability to take up sulfur dioxide, price and availability, thermal stability, regenerability, and mechanical properties. Five organic materials were identified which offered promise for removing sulfur dioxide from flue gas. These were cellulose, nigrosin, poly(N-vinylcarbazole), pyrolyzed poly(vinylchloride), and pyrolyzed poly(acrylonitrile). The specific cellulose was waste newsprint, sawdust and cotton. The results of the preliminary chemical systems analysis demonstrate that organic solid sulfur dioxide recovery from flue gases is economically feasible where certain criteria are met. The analysis was keyed to thermal regeneration of the organic solids. However, in the case of cellulosic materials, chemical reaction and conversion of the products to useful commodities may also be a feasible process. As so little is known about the parameters involved in conversion processes at this time, a consideration of this type of regeneration was not included. (Author summary modified)

14850

Trayser, D. A., F. A. Creswick, J. A. Gieseke, H. R. Hazard, A. E. Weller, and D. W. Locklin

A STUDY OF THE INFLUENCE OF FUEL ATOMIZATION, VAPORIZATION, AND MIXING PROCESSES ON POLLUTANT EMISSIONS FROM MOTOR-VEHICLE POWERPLANTS. Battelle Memorial Inst., Columbus, Ohio, Columbus Labs., Contract CPA 22-69-9, Phase Rept., 145p., April 30, 1969. 120 refs.

A study of automotive engine induction systems was conducted. The objective of this non-experimental program was to explore incentives and approaches for reducing exhaust emissions by extending the lean-mixture operating limit through improved induction-system performance. The study was divided into four major subtasks: development of mathematical descriptions of induction-system phenomena; evaluation of methods for measuring mixture characteristics; conception of approaches to the definition and measurement of mixture quality; and evaluation of alternative atomization methods. The results of this study indicated that extension of the present limits, made possible by improved air-fuel distribution, can lead to modest but worthwhile reductions in emissions of both unburned hydrocarbons and carbon monoxide and to substantial reductions in the emission of nitrogen oxides. Minimizing or eliminating the liquid-fuel film on the intake manifold walls was concluded to be the most promising approach to achieving improved distribution. The liquid film can be reduced by employing atomizing devices that will produce droplet sizes approaching 10 to 20 microns under all operating conditions, by designing the induction system for minimum impaction of fuel droplets, and by heating the manifold walls to vaporize the fuel that is avoidably impacted. Recommendations included an experimental program comprising the design, fabrication, and evaluation of an induction system with a carburetor employing an alternative, improved atomization device and a low-impaction intake manifold.

14944

Fukuchi, Tomoyuki and Takeo Yamamoto

A FEW IDEA ON COUNTERMEASURE AS TO BE CONNECTION WITH EXHAUST GAS FROM GAS-WORKS AND DAMAGE ON MANDARIN. (Toshigasu seizokojyo no haigasus to mikan no higai narabini sono taisaku ni kansuru shokosatsu). Text in Japanese. Kogai to Taisaku (J. Pollution Control), 5(9):17-23, Sept. 1969. 22 refs.

Because mandarin oranges fell from trees before the harvest period, waste gas from a gas works near the orange orchard was suspected to be the cause. With this idea as a starting point, the relationship between waste gas and ripening oranges was examined in a laboratory. The possibility that the ripening period had been accelerated by other factors, such as hydrocarbon gases, especially ethylene, was considered. It was reported by Magill that the tomato is influenced by hydrocarbons such as ethylene, 0.1 ppm; acetylene, 50 ppm; propylene, 50 ppm; and butylene, 50,000 ppm. Thus, a very small amount of ethylene has a great influence on ripening fruit. According to the result analysis of the waste gas, the assumption that windblown ethylene influenced the ripening orange is reasonable. The boiler system for waste gas control is shown. By means of chemical reactions, ethylene vanished at 260 C. Gas compounds are first prevented from entering the boiler and are then sent to a reservoir tank and mixed with catalyst and steam, and finally discharged in vapor form. By this treatment, the waste gas compounds are vaporized. Since this boiler system has been used at the gas works, damage to oranges has decreased.

Hein, G. M. and R. B. Engdahl

A STUDY OF EFFLUENTS FROM DOMESTIC GAS-FIRED INCINERATORS.
(American Gas Association, Inc., New York, Proj. DG-3M, 27p.,
June 1959. 24 refs.

Measurements were made of the effluents from nine domestic gas-fired incinerators, including two new prototype models, five new commercial units, and two older units. Standard test charges that typified wet domestic wastes and dry combustible materials, and two special refuse mixtures were burned. A free-standing chimney provided natural draft for the units. Sampling and analytical techniques were based on recognized methods. The concentrations in ppm in the flue gas and the emission rates in pounds per ton of refuse burned were determined for aldehydes, nitrogen oxides, organic acids, ammonia, and hydrocarbons. Grain loadings and emission rates were determined for particulate matter which included tarry organic materials. Odor and smoke density were also determined. Results demonstrated that significant reduction in emissions has been achieved through recent improvements in incinerator design. When wet domestic wastes are incinerated in new units, of up to 6-fold decreases in the rate of aldehyde emissions are achieved. Decrease in organic acids is 3-fold; decrease in saturated hydrocarbons is 8-fold. Although nitrogen oxides have increased 3-fold because of increased gas in the afterburner, their concentration is still lower compared to other combustion sources. Smoke, odor, and particulate matter emissions decreased to acceptable levels. Comparison of these emission rates with those from municipal incinerators shows that the new improved gas-fired domestic incinerators have lower particulate emissions, and, in general, equally low emissions of gaseous pollutants. Emissions from improved gas-fired units were in most cases lower than those from other incinerators and large gas- and oil-fired industrial heating units; they were much lower than those from automobile exhaust. The results of the study provide a basis for modification of the present restrictions in certain areas on the use of gas-fired domestic incinerators and for confirmation of their present acceptance in other areas.

Lee, R. C. and D. B. Wimmer

EXHAUST EMISSION ABATEMENT BY FUEL VARIATIONS TO PRODUCE LEAN COMBUSTION. Preprint, Society of Automotive Engineers, Inc., New York, 20p., 1968. 15 refs. (Presented at the National Fuels and Lubricants Meeting, Tulsa, Okla., Oct. 29-31, 1968, Paper 680769.)

Differences in the power producing capacities and exhaust emission characteristics of various spark-ignition-engine fuels are frequently obscured by interactions involving the particular engine system used in the comparison. In an attempt to minimize this problem, gasoline, propane, methane, and a hydrogen-methane fuel gas were compared in a single cylinder engine under conditions that were optimum for each fuel. The resulting data, coupled with an estimated duty cycle

representative of traffic service, permitted the development of internally comparable data on fuel consumption and exhaust emissions. Smog-inducing hydrocarbon emissions from the exhaust of a propane-fueled engine can be less than 13% of the minimum value obtainable with a gasoline fueled engine. Such emissions would be substantially eliminated with a well designed methane engine. Engines designed for propane and methane should have substantially no carbon monoxide in the exhaust, and only 40-50% as much nitric oxide as an engine designed for gasoline. In addition, lower specific fuel consumptions are possible with propane and methane. These benefits are primarily the result of better lean combustion performance with the two gaseous fuels. It is recognized that a fuel gas that might be steam-reformed from a liquid fuel would have even better lean mixture combustion behaviour and lower emissions than propane or methane. (Author abstract modified)

15257

Groezinger, H.

IMPROVEMENTS IN EXHAUST GAS COMPOSITION OF CARBURETOR ENGINES. (Abgasentgiftung bei Vergasermotoren). Text in German. Motortech. Z. (Stuttgart), 29(9):355-365, 1968. 14 refs..

Recently developed measures for reducing automotive emissions are reviewed. The carburetor, the ignition system, the shape of the combustion chamber, stroke vs bore ratio, design of the intake pipe, and the cooling system are responsible for the amount of emissions. The amount of CO and hydrocarbon emissions can be reduced (1) by oxidizing the CO and the unburnt hydrocarbons in the exhaust system through air injection (afterburning) and (2) by limiting the emissions from the cylinders. Optimum reduction of emissions through afterburning depends on an adequate air injection, a carefully adjusted fuel-to-air ratio, and on a proper timing of ignition. Measures involving the carburetor include a limiting device for maximum and minimum fuel-to-air ratio at idling engine, a device for thorough fuel mixing at idling and partially loaded engine, adjustment of the fuel/air ratio at idling engine to the different frictional forces of new and used engines, closer tolerance of the bypasses, exact adjustment of the temperature of the fuel/air mixture to the temperature of the engine, etc. Transport of the fuel/air mixture to the cylinders and uniform distribution are of great importance for emission control. Several illustrations of the distribution of the fuel/air mixture by various types of carburetors are given. Improvements through modification of the carburetor are indicated in graphs. In California, hydrocarbon emissions by automobiles have been limited to 275 ppm, CO emission to 1.5%. In 1969, the Federal Republic of Germany will limit CO concentrations at idling engine to 4.5%.

15271

Andersen, Holger C.

CLEANING OF INDUSTRIAL GASES WITH PRECIOUS METAL CATALYSTS. (Industrielle Gasreinigung mit Edelmetallkatalysatoren). Text in German. Dechema Monograph., 40(616-641):325-33, 1962. 28 refs.

The applications of platinum metals as catalysts for removing acetylene from olefins, cleaning coke-oven gas, and treating residual gases from the nitric acid production are reviewed. Of the family, platinum palladium is particularly suited for the hydration of acetylene so that only a few ppm remain. Recent laboratory tests indicate that at gas throughputs of up to 4500 standard cu m/hr/cu m catalyst, the addition of hydrogen can be reduced to a mole ratio between hydrogen and acetylene of 2. In the case of coke-oven gases, acetylene, nitrogen oxides, carbon oxysulfide, and diolefins are converted into harmless, easily removable compounds by palladium and ruthenium catalysts. Catalytic treatment of residual gases from nitric acid production has three goals: the removal of noxious components, recovery of the nitrogen in pure form for re-use at the ammonia synthesis, and production of heat. Recent laboratory tests show that the process can reduce the nitric oxide content of waste gases to 9 ppm.

15321

Eberan-Eberhorst, R.

FORWARD-LOOKING EXHAUST GAS RESEARCH FOR THE AUTOMOTIVE PETROL ENGINE. (Abgasforschung zukunftsweisend fuer den Fahrzeug-Otto-motor). Text in German. Motortech. Z. (Stuttgart), 30(9):315-323, Sept. 1969. 18 refs.

The influence of engine operation modification on the emission of such exhaust gas components as CO, hydrocarbons and nitrogen oxides is discussed. The use of an evaporator helps reduce carbon monoxide emission to the lowest possible concentration. A spinning motion in the air intake pipe also reduces the CO content. The type of carburetion has almost no effect on the CO or hydrocarbon emission. Study of the influence of temperature cooling agent on hydrocarbon emission showed that emission could be considerably reduced by raising the temperature of the agent. When the engine acts as a brake, hydrocarbon emissions jump to high concentrations due to misfiring. Spiral-like intake pipes or vortex-imparting installations in the intake system, tangential inlets or deflector valves have a considerable influence on hydrocarbon emission, which is decreased because the wall layer is completely burned due to the higher turbulence. This however, costs power. Compression of the intake air and spark timing also reduce these emissions. With a commonly used idling mixture containing 3% CO, the hydrocarbon emissions of a 1-liter four cylinder engine were reduced from 1720 ppm at 30 degree ignition advance to 180 ppm at 18 degree ignition delay. The emission of nitrogen oxides can be reduced by exhaust gas return to the fresh air which reduces the caloric value of the fuel/air mixture and by water injection into the intake pipe. Tests with the latter method showed that nitrogen oxide emissions could be reduced from 2000 ppm to 583 ppm. At lambda equal to one, a 20% addition of exhaust gas has the same effect as water injection at a water to fuel ratio of 1:2.

15327

Rothe, Wilfried, Karl Achenbach, and Guenther Bretschneider

NEW PROCESS FOR DESULFURIZATION OF HYDROCARBONS AND TECHNICAL GASES. (Ein neues Verfahren zum Entschwefeln von

Kohlenwasserstoffen und technischen Gasen). Text in German. Erdoel Kohle (Hamburg), 17(5):352-356, May 1964. 37 refs.

A newly developed process for desulfurization of aliphatic, naphthenic, and aromatic hydrocarbons with sodium oxide or sodium hydride is described. Gaseous hydrocarbons are passed over sodium oxide tablets or granules; the best results were achieved with a 1:1 mixture of Na_2O and NaCl . The reaction of the sulfur compounds with Na_2O follows the equation $2\text{Na}_2\text{O} + \text{RSR} \rightarrow \text{Na}_2\text{S} + 2\text{NaOR}$, where R equals an organic radical or H. At the prevailing temperature, NaOR dissociates again with separation of carbon. A theoretical quantity of 124 g Na_2O is necessary for binding 32 g of sulfur; otherwise 200 kg of the Na_2O - NaCl desulfurizing mixture can bind 25.8 kg sulfur. In experiments with a scaled-down model, 9 to 10 kg S (more than 70% of the theoretical value) were bound per 100 kg desulfurizing mass. In the laboratory, gasolines with various boiling points were evaporated at temperatures from 150 to 200 C and passed over the Na_2O - NaCl mass which was heated to 220 C. The results showed that 95 to 99% of the total sulfur could be removed. The successful laboratory results encouraged experiments with a 0.5 ton/day model. Light gasolines with sulfur content of less than 6 ppm and benzenes with sulfur content of less than 5 ppm were used. The theoretical absorption capacity could not be reached, owing to traces of moisture and organic nitrogen and oxygen compounds. The process can also be used for cleaning technical gases such as nitrogen and hydrogen.

15343

Lumiaro, Pentti

THE TECHNICAL PRINCIPLE OF OPERATION OF EXHAUST GAS PURIFIERS. (Pakokaasunpuhdistimien teknillinen toimintatapa). Text in Finnish. Teknillinen Aikakauslehti, no. 4:71-73, April 1969.

The main principle of exhaust purification for internal combustion engines is as complete a combustion as possible. About 20-30% of the hydrocarbons reaching the tailpipe are derived from crankcase ventilation. The air injection reactor (AIR) system used by three large U. S. automobile manufacturers offers no advantages in terms of fuel consumption and slightly decreases the net capacity of the motor. The controlled combustion system (CCS) used by General Motors preheats the air arriving at the cylinder intake while the motor is warming up or during idling or low-speed operation. Volvo passenger cars make use of twin carburetors in conjunction with CCS, which offers the advantage of a slight fuel economy. The Chrysler Motors cleaner air package (CAP) makes use of a special vacuum valve used in conjunction with new types of carburetor, distributor, and gear box. This valve interprets motor speed and load in such a way as to control the timing of ignition in the distribution. Use of transistorized ignition systems has been abandoned as impractical, but thyristorized ignition has been successfully tested on numerous vehicles. Since the lifetime of motor vehicles in Finland is about 9 years, there are many American vehicles lacking exhaust purification, whereas Volvo cars always have had exhaust purifiers as standard equipment. Exhaust purification laws would thus tend to favor Scandinavian industry. The argument that domestic manufacturing

of autos would help combat pollution seems absurd when Finnish manufacturers are constantly marketing motorized appliances that foster pollution and have been banned in Sweden for this reason.

15418

HOT GAS ENGINE REVIVAL. Design Components Eng., no. 2:10-13, Jan. 15, 1969.

A description of the hot gas engine used to decrease air pollution by diesel fumes is presented as developed by the Philips Research Laboratories at Eindhoven in Holland. All hot gas engines depend on compressing a gas at high temperature and expanding it to a low temperature, allowing the gas to do work on a piston. Heat is conserved within the engine by incorporating a heat exchanger between the permanently hot chamber and the permanently cold chamber. The regenerator receives heat from the media during expansion and returns it to the media during recompression, when the gas is again pushed back into the hot chamber. Most of the multi-cylinder engines are based on work carried out on single-cylinder units. The invention of the rhombic drive enabled the use of the out-of-phase layout and obviated the need for the pressurized crankcase. It consists of a geometric shape enclosed by the piston rod yoke and displacer rod yoke, and their associated connecting rods at any position during the engine cycle. The working gas is maintained at high pressure by an ancilliary pump which serves to vary the mean effective pressure within the cylinder and the power developed by the engine. A cylinder burner air preheater shrouds the nest of heater tubes during engine operation. The 'roll-sock' seal is used to seal the piston rod and prevent oil from entering the cylinder from the crankcase. Analyses carried out on the burner exhaust gases revealed the following: 1-2 ppm of unburnt hydrocarbons, 0.007-0.030% carbon monoxide, and 100-200 ppm nitrogen oxides.

15453

AUTOMATED LINE FOR THE PRODUCTION OF EXTRUDED AIR ROTORS. Mach. Prod. Eng., 113(2917):748-752, Oct. 9, 1968.

The General Motors air injector reactor, used with high-performance automobile engines and in cars equipped with manual transmissions, controls the exhaust emission of hydrocarbons and carbon monoxide. Fresh air is injected into the engine exhaust ports to produce a higher degree of afterburning and to ensure that the final exhaust gas composition is acceptable. Supplementary air is supplied by pumps. Possible methods were studied for mass production of the air pumps at the rate of 13,000 per day. Raw material and machining requirements were reduced and stronger parts obtained when the air pump rotors were cold extruded: the slug is sheared from a bar, coined, extruded, and restruck. Slug shearing is carried out on a Verson 250-ton press operating at 60 strokes per minute. Sheared slugs are rolled down a discharge chute to a conveyor which delivers them to an automatic weighing and segregating unit. Acceptable slugs drop into one chute; overweight and underweight slugs slide down separate chutes. Upsetting of the sheared slugs is performed on a Bliss 800-ton knuckle-joint press. Upset slugs are washed

and receive a normalizing annealing treatment to produce a uniform structure and a hardness of 45 to 50 Rockwell B. Prior to extrusion, the slugs are cleaned, phosphate coated, and lubricated. Extrusion of the rotors is carried out on a Clearing 1500-ton, eccentric, gear-driven mechanical press. Final forming of the closed bottoms of the rotors is carried out by a restrike operation performed on a Bliss 1500-ton knuckle joint press. Piercing of slots in the rotors and formation of notches to serve as chipbreakers during subsequent machining are performed on a Danly 100-ton press. External surfaces are finished on Landis plunge grinding machines; bores are finished on Bryant Centalign internal grinding machines. Air sealing between the high and low pressure areas of the pumps is provided by spraying exterior surfaces of the rotors with an abradable coating.

15513

Jackson, Marvin W.

EXHAUST HYDROCARBON AND NITROGEN OXIDE CONCENTRATIONS WITH AN ETHYL ALCOHOL-GASOLINE FUEL. Preprint, Society of Automotive Engineers, Inc., New York, 33p., 1964. 29 refs. (Presented at Society of Automotive Engineers Summer Meeting, Chicago, June 8-12, 1964.)

The exhaust hydrocarbon and nitrogen oxide concentrations of a single-cylinder engine operating on a 25% wt ethyl alcohol-75% gasoline fuel are compared to those of the same engine operating on gasoline. Comparisons at an air-fuel ratio below 15.3 indicate that adding ethyl alcohol to gasoline reduces exhaust hydrocarbon concentrations but increases nitrogen oxide concentrations. At an air-fuel ratio higher than 15.3 ethyl alcohol reduces both hydrocarbon and nitrogen oxide concentrations. However, tests at the same air-fuel ratio indicate that ethyl alcohol increases surge and, in some cases, results in a power loss. To overcome these performance problems, the ethyl alcohol-gasoline fuel must be operated at about the same percent theoretical air as gasoline and comparative tests at the same percent theoretical air show that the additive has little effect on exhaust hydrocarbon and nitrogen oxide concentrations. The fuel mixture offers no promise for reducing pollution by automobiles. (Author abstract modified)

15526

Hitch, B. F., R. G. Ross, and H. F. McDuffie

TESTS OF VARIOUS PARTICLE FILTERS FOR REMOVAL OF OIL MISTS AND HYDROCARBON VAPOR. Oak Ridge National Lab., Tenn., ORNL-TM-1623, 26p., Sept. 7, 1966.
CFSTI: TM 1623

Various filter and adsorbent materials were examined for possible use in removing oil mists and hydrocarbon vapors. A controlled flow of oil was injected into a heated nickel reaction vessel to cause vaporization and some cracking of the oil. Helium flowing through the reaction vessel carried the oil mist and hydrocarbon vapor through a filter system. Filter effectiveness was determined by the use of a hydrocarbon

detector, gravimetric analysis, and gas chromatographic analysis. Good removal of mists was achieved by the use of a combination of felted metal fibers, and ceramic fibers in a configuration proposed for use in the molten salt reactor experiment. Granulated charcoal removed hydrocarbon vapors (C6 and above) in a manner consistent with the established adsorption isotherms for this material. (Author abstract modified)

15614

Olesov, N. A.

EFFECT OF NAPHTHENIC SOAP ON THE PROPERTIES OF INDUSTRIAL DUST. (Deystviye mylonafata na svoystva tekhnologicheskoy pyli). Text in Russian. Tsement, no. 9:14-15, 1969. 3 refs.

Pilot-plant studies revealed that the introduction of naphthenic soap into furnace flue gas increases the fluidity of the dust by approximately 20% and reduces R20 (R is an unspecified radical) and SO3 content of the dust by a factor of about two. The specific resistivity of a layer of collected dust remained within the same limits as dust without the additive (1000 to 10,000 megohm-cm) thus maintaining electrostatic precipitator effectiveness. Addition of naphthenic soap to dry ground raw material such as cement increased the mobility of the raw material powder by 6-7% and its volumetric weight by 5-7%. In addition, the load on the main grinder drive was reduced by 5%, improving grinder operation and reducing power consumption. The experiment lasted for 70 hrs, during which time 2.93 tons of dry naphthenic soap were introduced.

15765

Newman, Daniel J.

ELIMINATION OF NITROGEN OXIDES FROM GAS STREAMS. (Chemical Construction Corp., New York) U. S. Pat. 3,467,492. 6p., Sept. 16, 1969. 2 refs. (Appl. Nov. 6, 1964, 13 claims).

Conventional processes for eliminating nitrogen oxides from waste gas streams, such as tail gases from nitric oxide production, involve reacting methane with waste gases in one catalytic step, after which the waste gas is passed through a waste heat boiler and/or a gas turbine; or in two catalytic beds with intermediate cooling. The former method presents difficulties in design and operation; the second requires an intermediate exchanger or boiler, as well as ancillary control devices. In the present invention, nitrogen oxides are eliminated by a sequence involving two or more catalyst beds. The waste gas stream is divided into at least two portions; one portion is heated to 900 F and mixed with a proportion of methane less than the stoichiometric requirement for complete reaction with the oxygen and nitrogen oxides contained in the first portion. The gas mixture is then passed through the first bed where the stream temperature is raised to 1000-1400 F. Because the reaction with methane is not complete, the catalyst bed is not subjected to overheating and deterioration. The reacted gas mixture from the first bed is then quench-cooled to 900 F by the addition of a second portion of

methane and cold waste gas. If only two beds are used, sufficient methane is added between beds to react with all the nitrogen oxides, and a final reacted stream free of nitrogen oxides is produced from the second bed. Advantages of the process are the substantial savings resulting from the elimination of the intermediate exchanger and reduction of the size of the heater required to preheat gases. In addition, improved operation is provided because the valves controlling the flow of waste gas and intermediate mixtures can be operated at low temperature.

15772

Okuno, Tosihide

THE REACTION BAD ODOR SUBSTANCES WITH OZONE. (Akushu seibun to ozon o hannosei). Text in Japanese. Kogai to Taisaku (J. Pollution Control), 5(8):633-639, Aug. 15, 1969. 8 refs.

The removal of industrial odors by the use of ozone oxidation was studied, and their properties and behavior were described with the introduction of electron theory. Malodorous components are amine-ammoniacal compounds, lower aliphatic acidic compounds, sulfurous compounds, olefin-paraffin hydrocarbons, and other organic compounds. Olefinic hydrocarbons have a characteristic odor and a reaction mechanism for olefinic hydrocarbons and ozone was described. One of the most general reactions of the carbon-carbon double bond is an addition of ozone and rearrangement of the resultant ozonide whereby the ozonide is directly hydrolyzed by boiling with water. Secondary and tertiary amines were employed to examine reactivity and reaction products. Reactivity was determined by measuring residual ozone quantity, and reaction products were monitored by gas-chromatography. Tertiary amines reacted extensively with ozone and formed various compounds. Acrylic ester monomer, used as a raw material of acrylic acid resin, is very odorous. An oxidation experiment using acrylic ester and methacrylate was done for the removal of this odor. Acrylic ester reacted faster than methacrylate; a reaction of acrylic ester with ozone proceeded relatively fast, so this odor can most readily be removed by selecting appropriate reaction conditions. In conclusion, not all odorous components can be removed by ozone oxidation, due to the difficulty in reducing 1 ppm of malodorous components to 1 ppb (99.9% removal rate). Optimum reaction conditions and apparatus must be found for the use of ozone reaction methods on odorous sources.

15778

PROCESS OF PURIFYING GASES, ESPECIALLY SYNTHESIS - AND FUEL-GASES. (Gesellschaft fuer Lind's Eismaschinen A. G., Hoellriegelskreuth, Germany and Lurgi Gesellschaft fuer Waermetechnik m. b. H.) British Pat. 692,804. 13p., June 17, 1953. (Appl. Sept. 13, 1950, 16 claims).

A process for purifying gases derived from synthesis, cracking, hydrogenation, and other chemical processes was invented. Undesirable components of the gases, particularly hydrogen sulfide, organic sulfur compounds, carbon dioxide, resin-forming compounds, and low boiling hydrocarbons, are removed simultaneously in a washing and cooling process. The washing operation is done

at 0 C or lower and 2 atm pressure with a polar washing agent. The washing operation can be carried out in a series of stages with the same or different washing agent. The freezing point of the washing liquid must be lower than the washing temperature. The liquid is usually composed of oxygen-containing compounds such as low molecular weight alcohols, ethers, esters, ketones, and organic acids or nitrogen-containing compounds such as ammonia, amines, and pyridine bases. Complex-forming metal salts may be added to the washing agent to increase the solubility of all the components to be washed out. The regeneration of the washing agent is done in stages to remove the substances separately in a concentrated form.

15836

Hooker, George W., Lewis R. Drake, and Stephen C. Stowe

SULPHUR DIOXIDE RECOVERY METHOD. (Dow Chemical Co., Midland, Mich.) U. S. Pat. 2,368,545. 4p., Jan. 30, 1945. (Appl. Aug. 18, 1939, 11 claims).

A method for recovering substantially pure sulfur dioxide from mixtures with other gases or low boiling hydrocarbons involves the absorption of sulfur dioxide in liquified diolefin sulfones, preferably butadiene sulfone and isoprene sulfone. Equimolar mixtures of these or other cyclic sulfones, obtained by melting or by addition of a solvent, have great absorptive capacities for sulfur dioxide. Gaseous mixtures can be treated in scrubbing towers or other equipment suitable for extractants. Sulfur dioxide is evaporated from mixtures by warming the sulfone solution between 70-100 C, the temperature range below that at which sulfone decomposes. The vaporized sulfur dioxide is collected in the usual manner and the extractant is recovered for further use. Other compounds in the sulfur dioxide mixture are relatively unaffected by the sulfone treatment. The ratio of the recovered sulfur dioxide is four times that of sulfur dioxide recovered by using water as an extractant. In addition, sulfone treatment, unlike water treatment, does not involve the formation of a corrosive acid solution. Suggested applications of the method include the treatment of sulfur dioxide-nitrogen-oxygen mixtures produced by sulfur oxidation processes and hydrocarbon mixtures produced by petroleum processes.

15837

Hebbard, George M.

RECOVERY OF SULPHUR DIOXIDE AND DIOLEFINS FROM SULPHONES. (Dow Chemical Co., Midland, Mich.) U. S. Pat. 2,384,376. 7p., Sept. 4, 1945 (Appl. Nov. 3, 1941, 7 claims).

When liquified sulfur dioxide is used to separate diolefins such as butadiene from cracked-oil gas or mixtures of the gas and hydrocarbons, a sulfone is formed and then chemically decomposed to form a gaseous mixture of sulfur dioxide and olefin. Separation of the sulfur dioxide from the mixture by scrubbing with water is unsatisfactory because of the heat required for vaporization and the corrosive nature of the resulting sulfuric acid. An improved method for recovering sulfur dioxide from a sulfone thermally decomposes the sulfone, at pressures sufficient

to liquefy the mixture, in the presence of a liquid paraffin hydrocarbon of boiling point higher than the diolefin. The solvent also effectively separates the reaction products to inhibit or prevent recombination into the sulfone. Suitable solvents are hexane, octane, or decane and liquid petroleum fractions such as gasoline, naptha, or kerosene. The sulfone-solvent mixture is passed through the heating zone of a 'sulfone decomposer' and heated to 120-150 C. Here the sulfone is partially decomposed into sulfur dioxide and the diolefin. The resulting liquified mixture is then cooled below 120 C and, while maintained under pressure, passed to an extraction tower. Additional quantities of liquified sulfone are passed through the tower in countercurrent flow. The resulting solution of sulfur dioxide and sulfone is continuously withdrawn from the bottom of the tower; the solution of diolefin and 1 quid paraffin hydrocarbon is continuously withdrawn from the bottom of the tower. The reaction products of the solution are vaporized and collected in a form of 95% or higher purity. The solvent is cooled and returned to the tower for recyling.

15861

Johnson, Ava J.

PROCESS FOR THE SEPARATION OF ACIDIC GASES FROM FLUIDS. (Shell Development Co., San Francisco, Calif.) U. S. Pat. 2,368,595. 4p., Jan. 30, 1945. (Appl. Aug. 29, 1941, 7 claims).

The invention describes process for removing acidic gases, such as H₂S, CO₂, HCN, SO₂, found in natural gas, petroleum fractions, and coke oven gas from a water immiscible fluid. It deals especially with the purification of normally gaseous hydrocarbons containing objectionable quantities of H₂S. The method consists of scrubbing the flowing fluid at an elevated pressure of 200-1000 pounds per square in. with a nonalkaline water. A portion of the acid gas is extracted by the nonalkaline water to form acidulated water and a first residual fluid. The acidulated water is separated from the first residual fluid. The residual fluid is then scrubbed with a lean base solution chosen from organic hydroxy amino bases or salts of inorganic strong bases and relatively weak acids of low volatility. Another portion of the acid gas is extracted to form a fat solution and a second residual fluid. The fat solution is separated from the fluid and refluxed with steam at a lower pressure to produce a vapor composed of acid gas, steam and a residual lean base solution for use in another scrubbing cycle. The acidulated water is stripped with steam vapor to vaporize the acid gas and condense water substantially free of the acid gas. The invention accomplishes a high degree of purification of fluid with a minimum expenditure of heat for regeneration of the absorption medium.

15862

Rosenstein, Ludwig

GAS PURIFICATION AND SEPARATION PROCESS. (Shell Development Co., San Francisco, Calif.) U. S. Pat. 2,368,600. 5p., Jan. 30, 1945. (Appl. Jan 24, 1942, 5 claims).

The invention increases the efficiency of processes for removing H₂S, HCN, CO₂, etc., from hydrocarbon liquids by reducing the

amount of heat required for regeneration or by removing more impurity from a spent solution with a given amount of heat. The fluid is contacted in a scrubber with a heat-regenerable absorbent solution to form a fat, or spent, solution which contains the impurities. The absorbent solution i.e., aqueous Na_2CO_3 or aqueous K_3PO_4 , contains a solute which removes the impurities and a solvent which vaporizes above the boiling point of the impurities. The fluid is separated from the fat solution which is regenerated at reduced pressures for further scrubbing. The improvement in the invention comprises the regeneration of the fat solution in a primary stripper to produce a lean solution and vapors. The vapor is composed of gases from the solvent and impurities. A further portion of the lean solution is regenerated in a secondary stripper in indirect heat exchange with the vapors at a greater pressure than in the primary stripper. A secondary lean solution and secondary vapors are produced which also contain gases from the solvent and impurities. The vapors from both strippers are cooled to produce a condensed solvent and vapor containing the impurities. The solvent is separated from the vapor and added to the secondary lean solution. The lean solutions are put into the scrubber in a way that the fluid first contacts the primary and then the secondary lean solution. Fluids that can be scrubbed by the process include natural gas, refinery gas, coke-oven gas, smelter gas, other manufactured gases as well as liquid hydrocarbons.

15875

Hooker, George W. and Franc A. Landee

SEPARATION OF SULPHUR DIOXIDE AND LOW-BOILING HYDROCARBONS FROM MIXTURES THEREOF. (Dow Chemical Co., Midland, Mich.) U. S. Pat. 2,384,378. 5p., Sept. 4, 1945. (Appl. Nov. 3, 1941, 4 claims).

The invention concerns the separation of mixtures of sulfur dioxide and aliphatic hydrocarbons, and particularly the separation of sulfur dioxide and conjugated diolefines to recover each in an anhydrous and purified form. Separation is achieved with two extractants: a liquified organic sulfone and a liquid paraffin hydrocarbon having a boiling point of at least 20 C. Sulfur dioxide is preferably separated from a conjugated diolefine having 5 or less carbon atoms by passing it into the mid-section of an extraction tower. At the same time, a liquid fraction of petroleum is passed into the bottom of the tower. A liquified sulfone of the conjugated diolefine is passed into the tower at the top and dispersed. The flow of liquids is from the tower is under a superatmospheric pressure so they remain in liquid form. During the separation process, the resultant extract of liquid petroleum and conjugated diolefine is withdrawn from the top of the tower. The extract of liquified sulfone and sulfur dioxide is withdrawn from the bottom of the tower, the sulfur dioxide vaporized to leave the sulfone in condition for recycling.

15895

Saitoh, Takeshi, Kazuhiko Takaichi, Masakuni Hirata, and Masaaki Hattori

THE POSSIBILITY OF AUTOMOBILE AIR POLLUTION CONTROL BY LOW PRESSURE PETROLE INJECTION SYSTEM. (Teiatsu gasorin funsha hoshiki ni yoru haiki kaizen no kanosei). Text in Japanese. Waseda Daigaku Rikogaku Kenkyusho Hokoku (Bull. Sci. Eng. Res. Lab., Waseda Univ.), no. 45:6267, 1969.

The fact that automobile emissions can be controlled by petrole injection is well known. The possibility that manifold gasoline injection at a pressure less than 16 atg can reduce carbon monoxide and hydrocarbon contents in engine exhausts was investigated. Injection systems with one, two, three, and four element pumps and nozzles were used which corresponded to the four cylinder engine. Carbon monoxide and hydrocarbon concentrations were measured in various engine loads and speeds and compared with the carburetor system. The results showed that systems with only one or two elements could reduce carbon monoxide concentrations, but not the hydrocarbon content. Three or four elements in the system were required to reduce both carbon monoxide and hydrocarbon emissions, but this was less than the expected value. (Author abstract modified)

15941

Tow, Philip S.

CONSIDERATIONS OF THE FEASIBILITY OF CONTROL OF OXIDES OF NITROGEN. J. Air Pollution Control Assoc., vol. 7:234-240, Nov. 1957. 28 refs.

A review of existing theories of the role of nitrogen oxides and hydrocarbons in ozone and smog formation is followed by a consideration of the nature and contribution of various sources of nitrogen oxides in Los Angeles County and an evaluation of methods for controlling the oxides. In Los Angeles, nitrogen oxide emissions are primarily the result of nitrogen fixation in combustion processes, according to the equilibrium N_2 plus O_2 equals $2NO$. Variables in combustion processes are temperature, excess air, and in the case of automobiles, engine acceleration rate. Theoretical and experimental data show that there is no ready solution for the control of nitrogen oxides as a general atmospheric contaminant. Much experimental work needs to be done before satisfactory devices are developed. The importance of research on the catalytic decomposition of nitric oxide is stressed. It is also suggested that methods of accelerating vapor phase reactions of NO may have applications for controlling nitrogen oxide emissions from stationary sources. Other possible methods of control discussed are absorption, adsorption, and changes in the design of combustion equipment or its operation or changes in fuel.

15966

Jodeck, Paul

METHOD OF SEPARATING SULPHUR DIOXIDE AND THE LIKE FROM LIQUID HYDROCARBONS. (Edeleanu GmbH, Berlin, Germany) U.S. Pat. 1,910,341. 4p., May 23, 1933. (Appl. Jan. 17, 1929, 4 claims).

A process for evaporating and recovering sulfur dioxide from mixtures of liquid hydrocarbons and SO_2 is reported. A mixture

is forced under sustained pressure through a series of alternate heating and separating containers. Sulfur dioxide gas is allowed to evolve in each heating container and is separated from the liquid in the following separating container. The remaining liquid is raised to a higher temperature in the next heating container. The gas is liquified as it evolves. This is cooled in another container while still under sustained pressure. The process has an important application for the refining of mineral oils, increasing the capacity of the refining plant and decreasing the cost of treatment.

15995

Herold, Paul and Georg Markus

RECOVERING HYDROGEN CHLORIDE AND SULPHUR DIOXIDE FROM GAS MIXTURES. (Assignee not given.) U. S. Pat. 2,301,779. 2p., Nov. 10, 1942. (Appl. Nov. 19, 1940, 3 claims).

A method of recovering hydrogen chloride and sulfur dioxide separately from gas mixtures is described. A gas mixture is washed with a medium liquid which consists of aromatic compounds containing oxygen in an ethereal linkage and of aromatic compounds containing oxygen in a phenolic linkage. Suitable compounds are xlenol and diphenyl ether. The gas mixture may either be passed through the liquid while it is stationary or led in a counter-current to the liquid flowing down, preferably in trickling towers charged with filter bodies. The hydrogen chloride leaves the washing liquid in a dry state free of sulfur dioxide. The washing liquid is easily regenerated by expelling the absorbed sulfur dioxide by heating, applying reduced pressure, or by subjecting it to both measures simultaneously. The washing liquid can be reused after cooling.

15999

Bottoms, Robert Roger

PROCESS FOR SEPARATING ACIDIC GASES. (Girdler Corp., Louisville, Ky.) U. S. Pat. 1,834,016. 5p., Dec. 1, 1931. (Appl. Oct. 15, 1930, 7 claims).

A process for the separation of acidic gases from other gases by the use of an absorbent is described. A gas mixture containing hydrogen sulfide, carbon dioxide, or sulfur dioxide, is brought into contact with a liquid or gaseous absorbent. The absorbent is usually a phenylhydrazine or a hydrazine hydroxide. The solution is heated to free the absorbed gases and the absorbent can be recycled.

16020

Clarke, P. J., J. E. Gerrard, C. W. Skarstrom, J. Vardi, and D. T. Wade

AN ADSORPTION-REGENERATION APPROACH TO THE PROBLEM OF EVAPORATIVE CONTROL. Preprint, Society of Automotive Engineers, Inc., New York, 14p., 1967. 5 refs. (Presented at the Automotive

A device for preventing evaporative emissions of hydrocarbon fuel from automotive vehicles is based on a controlled adsorption-desorption cycling in a solid adsorbent system using activated carbon. The system is capable of containing all types of evaporative emissions: carburetor and tank running losses, carburetor hot soak losses, and tank diurnal cycle losses. The three essential components of the system are the canister of adsorbent, the pressure balance valve, and the purge control valve. The canister traps the vapors before they can escape to the atmosphere and holds them until they can be fed back to the engine. The pressure balance valve maintains metering forces in the carburetor exactly as originally designed. When the engine is shut down, the valve closes all external vents and routes vapors from the carburetor exactly as originally designed. When the engine is shut down, the valve closes all external vents and routes vapors from the carburetor bowl to the canister. The function of the purge control is program stripping of the canister and consequent feeding of the hydrocarbon-laden, purge air stream to the intake manifold. Evaporative emissions from cars on which prototype devices were installed were measured according to proposed California standards for carburetor losses per hot soak and for fuel tanks. All data fell within a range of 0.3 to 109 grams, well below the proposed gram losses.

16124

Gross, Edward

DRIVING WITH METHANE. Sci. News, 97(3):73-74, Jan. 17, 1970.

A dual-fuel system was developed which gives cars, trucks, and buses the option of operating on gasoline or on the compressed natural gas, methane. Converting the system is a simple matter and the cost of an entire system is \$350 (1970). The few moving parts in the system and its adaptability permits its continual use. There are only three main functional parts to the system: the cylinders of compressed methane, the regulator, and the gas-air mixer. The pressure cylinders, which range from 30-lb units containing 100 cu ft of gas to 100-lb cylinders containing 300 cu ft, can be put in or under the flatbed of a pickup truck; in the trunk of a car; or under, in, or on a bus or truck. The function of the regulator is to reduce the pressure of the gas coming from the highly pressurized cylinder so that it can feed into the gas-air mixer mounted on top of the carburetor. The mixer, the heart of the system, is the equivalent of a carburetor and air filter and replaces the ordinary air filter that sits on top of the engine. Because of the limited mileage (two 300 cu ft cylinders constitute 120 miles), the system is not meant to be operated on natural gas on the open road where auto emissions are not a problem. It is mainly designed for stop-and-go city traffic. Advantages include quick starting in cold weather, no vapor lock in hot weather, and low maintenance costs because of cleaner fuel. In addition, there is no venting of pollutants from the fuel and no safety problem because the natural gas is lighter than air and rises. Disadvantages include the amount of space taken up by the cylinders because the engine is not modified in any way, and also some power loss at high speeds. The system also accomplishes a 90% reduction in emission of gaseous contaminants.

Bernhart, Alfred

AIR POLLUTION CONTROL EQUIPMENT FOR CARS. Eng. J. (Toronto), 52(12):12-16, Dec. 1969. 15 refs.

In North American cities, cars, trucks, and aircraft contribute 57% of the air pollutants; in Los Angeles, the percentage is 68%. At 50 mph, the average car emits 80 cu m/hr of exhaust gases which contain 17 lbs/hr carbon dioxide, 3.5 lbs/hr carbon monoxide, 0.5 lbs/hr hydrocarbons, 0.5 lbs/hr nitrogen oxides, 4 gram/hr of lead particles, and 0.4 to 0.7 micrograms of benzo(a)pyrene. Engine exhausts contribute 97% of the total carbon monoxide emission, plus 65% of the total hydrocarbons, plus 100% of the nitrogen oxides; crankcase ventilation, 3% of the total carbon monoxide, plus 25% of hydrocarbons; carburetor, 5 to 10% of hydrocarbons; and the gasoline tank, 10 to 15% of the hydrocarbons. Combinations of crankcase emission return systems, evaporation proof carburetors and gasoline tanks, crankcase control devices, engine modification systems, or air injection systems should reduce daily emissions to 2.4 lbs of carbon monoxide, 0.05 lbs of hydrocarbons, and 0.08 lbs of nitrogen oxides. The devices will not reduce carbon dioxide emissions, which are expected to increase from 40 to 52 lbs per day. The cost of these devices will account for only 1.5% of the purchase price of a car.

Piatt, V. R.

SUBMARINE ATMOSPHERES AND AIR POLLUTION. Scientiae, 104(687):358-374, 1969. 9 refs.

The development of air purification and oxygen replenishment systems for submarines is reviewed. The absorption of carbon dioxide, which constitutes about 1% of submarine atmospheres, was usually accomplished by soda lime in the 1920's and by lithium hydroxide in the 1930's and 1940's. Even today these are the preferred absorbents when logistics permit replacement of used canisters or when submergence is less than two weeks. Regenerative monoethanolamine must be used during the extended submergence of nuclear submarines. Carbon monoxide concentrations are kept within threshold limit values by catalytic hydrogen burners, which also burn most of the hydrocarbons present. Since the major source of hydrocarbons in submarines are paints, it is advisable to refrain from painting for a month prior to and during submergence. Of other trace contaminants, methane is most resistant to catalytic combustion. Its sources are refrigerator gases and septic systems. Other sources of gases include solvents, lubricating oils and greases, medicines, diesel fuel, shaving lotions, and chemical fluids. By controlling the quantity of these items, the contaminants are kept to a few ppm at the most. On submarines oxygen is provided by electrolytic generators that decompose water into oxygen and hydrogen. Electrostatic precipitators remove most of the aerosols from smoking and other sources, and filter some of the other aerosols and adsorbable gases. The equipment is discussed in terms of its application to open atmospheres.

Lang, Ludwig

AN APPARATUS FOR CLEANING THE EXHAUST GAS OF AN INTERNAL COMBUSTION ENGINE. (Nainenkikan no haikigasu o jokasuru sochi). Text in Japanese. (Paul Heintz Fitteler, Germany.) Japanese Pat. Sho44-20525. 8p., Sept. 3, 1969. 1 ref. (Appl. Sept. 7, 1966).

With conventional cleaners for engine exhaust, difficulties arise in activating the catalyst at low temperatures and keeping the temperature constant without overheating the catalyst. The present invention provides a solution to these problems of catalytic exhaust gas. Exhaust gas is injected with air before reaching the catalyst chamber which consists of two nozzle units, one a blender and the other the catalyst housing. The catalyst is formed into a basket shape. Its upstream side is covered with a stream-lined thin, solid shell without a hole, its downstream side with a shell with grooves or holes. One converging passage is provided around the catalyst along the inner wall of the chamber and another converging channel provided along the center line of the catalyst. The end of the channel is partially or totally closed. The device is a key to the present invention and is a kind of improved bypass system. The catalyst oxidizes both carbon monoxide and unburnt hydrocarbons. When the engine speed is low, e.g., below 60 km/h, the mixture of air and gas is lead through the catalyst. When the speed is high, the gas mixture is bypassed around the catalyst, since the catalytic reaction is not required at high temperatures.

Chikira, Hiroo

EXHAUST GAS CLEANER. (Haikigasu seijosochi). Text in Japanese. (Assignee not given.) Japanese Pat. Sho44-22566. 3p., Sept. 26, 1969. 2 refs. (Appl. May 13, 1966).

An insulated chamber is located behind an engine manifold. The interior of the chamber is kept at around 1000 C and provided with air. Exhaust gas components such as carbon monoxide or hydrocarbons are instantly burnt away. The device of the present invention comprises a combustion chamber, a heat insulator, a preheater, and a stirrer. The cylindrical combustion chamber is composed of heat-resistant material. The heat insulator, which consists of layers of reflecting insulators, surrounds the combustion chamber. The preheater houses the heat insulator. Air is first heated in the preheater before entering the combustion chamber. Inside the combustion chamber, a stirrer is provided to mix the exhaust gas with the air. Since carbon monoxide oxidizes at 600-660 C, and hydrocarbons at 680-800 C, the chamber temperature is high enough. The merits of the invention are that no catalysts are used and that the chamber is compact enough to be installed in narrow spaces near the engine. There is no loss in engine power.

Downer, Whit

AMMONIA ABSORPTION: REFRIGERATION SELECTED FOR GASOLINE PLANT.
Refining Eng., vol. 29:C25 to C30, July 1957. 1 ref.

A 200-ton capacity ammonia absorption refrigeration unit at a gas processing plant chills incoming gas to 0 F for the separation of gas liquids. The only moving component in the system is an ammonia liquor pump: widely varying loads are automatically handled with no mechanical adjustments required. Power requirements are directly proportional to the refrigeration load. Liquid recovery, based on the total available in the incoming gas stream, is propane, 19%; butanes, 47%; and 14 RVP natural gasoline, 95%. This corresponds to a total liquid recovery of 25,800 gal per day, including 8600 of propane, 7500 of butanes, and 9569 of natural gasolines. The operation of the ammonia refrigeration system, low temperature gas separator, and ammonia fractionator is given in detail. Advantages of the absorption refrigeration system are its low costs and operating flexibility. Though taking up more room than a compression plant, the absorption unit is constructed entirely out-of-doors: no buildings are needed to protect the equipment. In small size ranges, the initial costs of absorption systems are relatively high, varying from \$700 to \$1500 per ton of refrigeration. In contrast, initial costs for units over 100 tons are less than \$400 per ton.

EXHAUST AIR PURIFICATION AND SOLVENT RECOVERY IN GRAVURE
PRINTING. Gravure, 1969:10-12, 64, March 1969.

The operation and economic aspects of a German solvent recovery system for gravure printing shops are reviewed. Exhaust air from rotary presses is first forced through a filter to extract paper dust and small paper particles and then through one or several parallel adsorbers filled with activated carbon. Continuous operation requires at least two adsorbers which can be charged and regenerated alternately. Regeneration of the activated carbon is accomplished by steam treatment, followed by drying and cooling in gravel placed underneath the activated carbon layer. The economic operation of the recovery system depends on a high solvent concentration in the exhaust air and on automatic operation. To eliminate variations in solvent content of the exhaust gas, each exhaust pipe on the individual printing units can be equipped with a shutter that closes automatically as soon as the unit comes to a standstill; air free of solvent cannot be exhausted. The solvent content of air from the adsorbers is measured by continuously functioning analyzers. When small amounts of solvent are detected, the adsorber in question is automatically shut off from the exhaust air stream. Estimated operating costs for recovering 98% or more of the toluol used during printing are between \$15-20 per long ton of toluol recovered.

16444

Varshavskiy, I. L. and R. V. Gargala

PROTECTION OF CITY AIR FROM MOTOR VEHICLE EXHAUST GASES. (Zashchita vozdukha gorodov ot vykhlopnykh gazov avtotransporta). Text in Russian. In: Sanitation Measures Against Air and Water Pollution in the Planning of Cities. (Ozдорovleniye vozdukhogo i vodnogo basseynov gorodov). Government Committee on Civil Building and Architecture (ed.), Lecture series no. 2, Kiev, Budivel 'nik, 1968, p.56-61.

Carbon monoxide and hydrocarbon levels in areas of heavy traffic in Moscow exceed permissible levels by as much as tenfold, even though these conditions are far better than in U. S. or West European cities. Studies made in the USSR have shown that the CO emission per km of travel of a motor vehicle depends on the travel speed, road quality, and fuel system, but has little connection with the amount of carbon monoxide given off during idling. Some 50 stations for dynamic testing of individual cars for harmful emissions have been set up in Moscow. These stations make about 600,000 tests per year. Various means of improving combustion and eliminating crankcase fumes are reviewed. The use of electric cars, especially those utilizing direct conversion of chemical energy of a fuel to electrical energy, is seen as the ultimate answer to this problem. Research in this area is being carried out in the USSR.

16484

Salooja, K. C.

CONTROL OF AIR POLLUTION DUE TO PETROL ENGINES. Chartered Mech. Engr., 15(7):301-305, July 1968. 22 refs.

Four sources of major pollutants from vehicles are discussed. The exhaust accounts for 65%; the crankcase, 20%; and the carburetors and fuel tank, the remainder. Among engine design features, the fuel-air system has the greatest influence on the emission of pollutants. Fuel injection systems, although more expensive, eliminate the drawbacks of carburation. Variations in fuel composition have little influence on exhaust emission. The U. S. legal limits for carbon monoxide, hydrocarbons, and nitrogen oxides in exhaust gasses are given. Methods, such as the Man-air-ox system, of reducing CO as well as hydrocarbon pollutants are discussed. The most useful future developments will be those that improve the performance of the fuel-air induction system, the exhaust manifold, catalytic converters and after-burners. In addition, the concentrations of pollutants in the atmosphere of busy thoroughfares injurious to health must be determined.

16486

Carter, J. W.

ADSORPTION PROCESSES. Chem. Process Eng., 47(8):37-44, Aug. 1966. 30 refs.

The fundamental principles of adsorption by molecular sieves for the preparation of high-purity materials are discussed. The concept of 'mass transfer zone' has been utilized in the design of adsorbers. Both adiabatic and isothermal adsorption are surveyed. The application of adsorption techniques provides pure hydrocarbon feedstocks free from sulfur compounds, water, and carbon dioxide. The physical features of useful adsorbents such as activated alumina, silica gel and activated charcoal are characterized. The amount of adsorbate an adsorbant material will take up at equilibrium is important in determining the maximum capacity of adsorption equipment. A simple circuit of a fixed adsorber bed, the most widely-used form of adsorption plant, is shown and discussed.

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