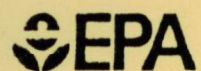


United States
Environmental Protection
Agency

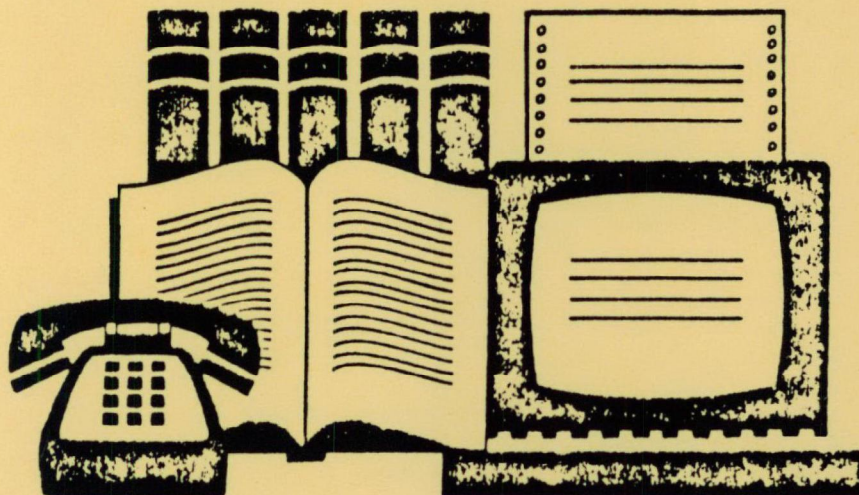
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The materials in this short bibliography were obtained from several databases, so there is a variation in format. Many of the citations listed here are from 1986 and 1987 sources. There are many other reports and articles on the subject which can be accessed through the library.

EMISSIONS FROM WOOD COMBUSTION

0182379 *86-041845

SAMPLING AND ANALYSIS METHODS FOR USE IN SOURCE APPORTIONMENT STUDIES TO DETERMINE IMPACT OF WOOD BURNING ON FINE PARTICLE MASS,

STEVENS ROBERT K.

EPA, NC,

ENV INTL, 1985, V11, N2-4, P271(13)

JOURNAL ARTICLE AEROSOL SAMPLING AND ANALYSIS PROCEDURES WHICH MAY BE USED TO OBTAIN AMBIENT AIR MEASUREMENTS FOR INPUT INTO SOURCE APPORTIONMENT STUDIES ARE DESCRIBED. THE PROCEDURES AND MEASUREMENTS CAN BE EMPLOYED IN ESTIMATING THE IMPACT OF WOOD BURNING ON AMBIENT PARTICULATE LOADINGS. AMBIENT WINTERTIME FINE PARTICLE COMPOSITIONS IN DENVER, CO, AND ALBUQUERQUE, NM, ARE USED AS EXAMPLES FOR RECEPTOR MODEL CALCULATIONS.

0184461 *86 053040

ASSESSING THE IMPACT OF RESIDENTIAL WOOD COMBUSTION USING A SOURCE AND RECEPTOR MODEL,

MEYER RICHARD L.

ALASKA PACIFIC UNIV,

J ENV HEALT, SEP-OCT 85, V48, N2, P62(5)

JOURNAL ARTICLE TWO INDEPENDENT MODELS ARE USED TO DETERMINE THE IMPACT OF RESIDENTIAL WOOD COMBUSTION ON WINTER PARTICULATE LEVELS IN EAGLE RIVER, AK. A SOURCE EMISSION MODEL BASED ON A WORST CASE CONDITION FOR WOOD BURNING INDICATED THAT ABOUT 70% OF THE PREDICTED WINTER PARTICULATE LEVEL OF 140 MG/CU M IS DUE TO RESIDENTIAL WOOD COMBUSTION. A RECEPTOR MODEL ACCURATELY PREDICTED TOTAL SUSPENDED PARTICULATE MATTER CONCENTRATIONS, AND PARTICULATES COULD BE APPORTIONED BETWEEN MAJOR SOURCES.

1209823 PB86-222924/XAB

Integrated Air Cancer Project, Source Measurement

Leese, K. E. ; McCrillis, R. C.

Research Triangle Inst., Research Triangle Park, NC.

Corp. Source Codes: 045968000

Sponsor: Environmental Protection Agency, Research Triangle Park, NC. Air and Energy Engineering Research Lab.

Report No.: EPA/600/D-86/152

Jul 86 25p

Presented at APCA annual meeting, Minneapolis, MN Jun 86. Sponsored by Environmental Protection Agency, Research Triangle Park, NC. Air and Energy Engineering Research Lab.

Languages: English

NTIS Prices: PC A02/MF A01 Journal Announcement: GRAI8622

Country of Publication: United States

Contract No.: EPA-68-02-3992

The paper describes tests of four woodstove operating parameters at two levels each: burn rate, wood moisture, wood load, and wood type. A half-factorial experimental test design allowed statistical evaluation of the effects of each parameter on measured emissions of polycyclic aromatic hydrocarbons (PAHs), particulates, total hydrocarbons (THCs), CO, elements, and C1-C7 hydrocarbons. The control of burn rate and wood moisture content were the most statistically significant parameters affecting organic emissions. Elemental emissions were most significantly affected by burn rate and wood type. Overall, significant changes, even reductions in total organic emissions, can be made just by the way a woodstove is operated.

1224704 PB87-119897/XAB

Test Method Evaluations and Emissions Testing for Rating Wood Stoves
(Final rept. Jun 85-Apr 86)

Cottone, L. E. ; Messery, E.
Engineering-Science, Fairfax, VA.
Corp. Source Codes: 077488000

Sponsor: Radian Corp., Research Triangle Park, NC.; Environmental
Protection Agency, Research Triangle Park, NC. Air and Energy Engineering
Research Lab.

Report No.: EPA/600/2-86/100

Oct 86 147p

Prepared in cooperation with Radian Corp., Research Triangle Park, NC.
Sponsored by Environmental Protection Agency, Research Triangle Park, NC.
Air and Energy Engineering Research Lab.

Languages: English

NTIS Prices: PC A07/MF A01 Journal Announcement: GRAI8703

Country of Publication: United States

Contract No.: EPA-68-02-3994; EPA-68-02-3850

The report gives results of a comparison of three sampling methods for
wood burning stoves: the EPA Modified Method 5 (MM5), the Oregon Method 7
(OM7), and the ASTM Proposed Method F180. It also addresses the effect that
emission format (grams per hour, grams per kilogram wood burned, micrograms
per Joule heat output) has on the intermethod correlations. Five stoves
(two catalytic, one noncatalytic generic, one noncatalytic high efficiency,
and one catalytic fireplace insert) were tested. Test results showed good
correlations between the total train emissions obtained with each method.
The strength of the correlations varied with the emission format: the grams
per hour format showed the strongest correlation. POM emissions showed a
general (but weak) correlation with total emissions when the grams per hour
format was used; there were no correlations when the emissions were
expressed in either of the other two formats.

Descriptors: *Air pollution; *Combustion; *Stoves; Combustion products;
Performance; Quality assurance; Tables(Data)

Identifiers: *Air sampling; *Wood burning appliances; Stationary sources;
NTISEPAORD

Section Headings: 68A (Environmental Pollution and Control--Air Pollution
and Control); 81A (Combustion, Engines, and Propellants--Combustion and
Ignition)

0184112 *86-054221

CHARACTERIZATION AND SOURCE APPORTIONMENT OF WINTERTIME AEROSOL IN A
WOOD-BURNING COMMUNITY,

SEXTON KEN ; LIU KAI-SHEN ; HAYWARD STEVEN B. ; SPENGLER JOHN D.
HEALTH EFFECTS INST, MA,

ATMOSPHERIC ENV, 1985, V19, N8, P1225(12)

RESEARCH ARTICLE A STUDY INVESTIGATED THE EFFECTS OF RESIDENTIAL
WOOD-BURNING EMISSIONS ON AMBIENT AEROSOL CONCENTRATIONS IN WATERBURY, VT,
DURING JANUARY-MARCH 1982. DATA ON TOTAL, INHALABLE, AND RESPIRABLE
PARTICLES WERE COLLECTED AT THREE MONITORING SITES. PARTICULATE CARBON
ACCOUNTED FOR MOST OF THE RESPIRABLE PARTICULATE MASS, WHILE SULFATE
COMPRISED NO MORE THAN 25%. ELEVATED POTASSIUM/IRON RATIOS AND HIGH
PARTICULATE-PHASE C CONTENT WERE CONSISTENT WITH EXPECTED CONTRIBUTIONS
FROM RESIDENTIAL WOOD COMBUSTION. A VARIETY OF SOURCE APPORTIONMENT
TECHNIQUES INDICATE THAT LONG-RANGE TRANSPORT AND LOCAL SOURCES ARE THE
MAJOR DETERMINANTS OF WINTERTIME FINE FRACTION MASS CONCENTRATIONS.

1212639 PB86-224326/XAB

Evaluation of Low-Emission Wood Stoves

(Research rept. (Final))

Shelton, J. W. ; Gay, L. W.

Shelton Research, Inc., Santa Fe, NM.

Corp. Source Codes: 086397000

Sponsor: California State Air Resources Board, Sacramento.

Report No.: RR-1086; ARB-R-86/279

Jun 86 117p

Sponsored by California State Air Resources Board, Sacramento.

Languages: English

NTIS Prices: PC A06/MF A01 Journal Announcement: DRA18623

Country of Publication: United States

Emissions and efficiencies of five residential woodburning heaters were measured. Measured emissions included particulate matter (PM), carbon monoxide (CO), hydrocarbons (HC), polycyclic aromatic hydrocarbons (PAHs), benzene, oxides of nitrogen (NOx), total combustibles, elemental carbon, cyanide (CN-), ammonia (NH3) and creosote. Three fuels were used, although not in all appliances -- dimensional Douglas fir lumber (as specified in the Oregon and Colorado emissions standards), seasoned oak logs and green oak logs. The appliances consisted of a conventional airtight stove, a catalytic stove, two non-catalytic advanced technology stoves, and a wood pellet stove. Appliance effects were strong. All products of incomplete combustion (PM, CO, HC, benzene, PAH, elemental carbon, creosote and combustibles) were lowest for the pellet burner, next lowest for the catalytic stove, and highest for the conventional airtight stove.

Descriptors: *Heating equipment; *Stoves; Combustion products; Aromatic polycyclic hydrocarbons; Carbon monoxide; Cyanides; Ammonia; Nitrogen oxides

Identifiers: *Wood burning appliances; *Stationary sources; *Particulate sampling; *Indoor air pollution; Houses; Creosote; NTISCARBRA

Section Headings: 13B (Mechanical, Industrial, Civil, and Marine Engineering--Civil Engineering); 68A (Environmental Pollution and Control--Air Pollution and Control); 97R (Energy--Environmental Studies)

5/7/8

04908559 83141559

Mutagenicity of air samples from various combustion sources.

Moller M; Alfheim I

Mutat Res Jan 1983, 116 (1) p35-46, ISSN 0027-5107 Journal Code:

NNA

Languages: ENGLISH

The emission of mutagens from various combustion sources was compared. Flue gas samples from power plants and boilers burning coal, oil and wood were studied. Little or no mutagenic activity was observed in samples from big boilers operated under optimal conditions. The mutagenic activity of emission samples from different boiler systems burning the same fuel varied considerably. This variation was larger than the difference obtained from boilers of comparable size utilizing different fuels. The highest mutagenic activity was observed in samples from a small coal combustion unit, utilizing the fluidized-bed technique. In this case the activity was highest without metabolic activation. Extracts from all samples contained toxic compounds that, in high doses, inhibited mutagenicity.

1228678 PB87-853495/XAB

Wood Burning Furnaces: Pollution and Environments. 1978-1986 (Citations from the Energy Data Base)

(Rept. for 1978-86)

National Technical Information Service, Springfield, VA.

Corp. Source Codes: 055665000

Jan 87 58P

Supersedes PB85-871218. Prepared in cooperation with Department of Energy, Washington, DC.

U.S. sales only.

Languages: English Document Type: Bibliography

NTIS Prices: PC N01/MF N01 Journal Announcement: GRAI8705

Country of Publication: United States

This bibliography contains citations concerning pollution and environmental aspects with regards to the use of wood burning furnaces. Discussions on air pollution control techniques and environmental impacts of residential and industrial use of wood furnaces are presented. Regulations, measurement, and analysis of pollutant emissions from wood combustion are included. (This updated bibliography contains 122 citations, 19 of which are new entries to the previous edition.)

Descriptors: *Bibliographies; *Furnaces; *Air pollution control; Combustion products; Industrial wastes; Gas analysis; Residential buildings; Environmental impacts; Regulations

Identifiers: *Wood burning furnaces; Air pollution detection; NTISNTISE; NTISNERACD

Section Headings: 68A* (Environmental Pollution and Control--Air Pollution and Control); 97J* (Energy--Heating and Cooling Systems); 89B* (Building Industry Technology--Architectural Design and Environmental Engineering); 41GE (Manufacturing Technology--General); 94GE (Industrial and Mechanical Engineering--General); 88E (Library and Information Sciences--Reference Materials)

5/7/7

05011810 83244810

Effect of emissions from residential wood stoves on SCE induction in CHO cells.

Hytönen S; Alfheim I; Sorsa M

Mutat Res Jul 1983, 118 (1-2) P69-75, ISSN 0027-5107 Journal Code: NNA

Languages: ENGLISH

The SCE-induction capacity of emissions from an airtight horizontal baffled residential wood stove was investigated in CHO cells. The samples were taken under normal and starved air conditions, from burning birch and spruce separately. Both particle phase and vapour phase were collected. All samples induced a dose-related response in SCE both with and without a metabolic activation system, the rat-liver microsomal fraction. The burning conditions in the stove influenced the mutagenicity of the emissions more than the type of wood; the smoke from wood burning under starved air conditions was more than one order of magnitude more potent in inducing a significant SCE response. With all samples, the response in SCE induction was highest without metabolic activation. The toxicity of the samples, especially those without S9, limited the dose-range tested.

1212634 PB86-223096/XAB

Comparisons between MM5 (Modified Method 5), DM7 (Oregon Method 7), and Draft ASTM Measurements of Wood Stove Emissions

McCrillis, R. C. ; Merrill, R. G. ; Westlin, P. R. ; Weant, G. E. ; Wagoner, D. E.

Engineering-Science, Inc., Cary, NC.

Corp. Source Codes: 086405000

Sponsor: Radian Corp., Research Triangle Park, NC.; Environmental Protection Agency, Research Triangle Park, NC. Air and Energy Engineering Research Lab.

Report No.: EPA/600/D-86/150

Jul 86 20p

Prepared in cooperation with Radian Corp., Research Triangle Park, NC. Sponsored by Environmental Protection Agency, Research Triangle Park, NC. Air and Energy Engineering Research Lab.

Languages: English

NTIS Prices: PC A02/MF A01 Journal Announcement: GRAI8623

Country of Publication: United States

Contract No.: EPA-68-02-3996

The paper compares three candidate sampling methods--the EPA Modified Method 5 (MM5), the Oregon Method 7 (DM7), and the ASTM proposed Method F180--preparatory to selecting a wood stove operating procedure and related emission sampling method. (NOTE: The EPA is developing a New Source Performance Standard for wood burning stoves. This is one of several issues to be resolved during the development process). Five wood stoves (two catalytic, one noncatalytic generic, one noncatalytic high efficiency, and one catalytic fireplace insert) were tested. Results showed good correlations between the emission measurements obtained with each method.

Descriptors: *Air pollution; Stoves; Combustion products; Performance

Identifiers: *Wood burning appliances; Stationary sources; Air sampling; NTISEPAORD

Section Headings: 13B (Mechanical, Industrial, Civil, and Marine Engineering--Civil Engineering); 68A (Environmental Pollution and Control--Air Pollution and Control); 97R (Energy--Environmental Studies)

5/7/6

05170183 84094183

Air pollution emission profiles of toxic and trace elements from energy related sources: status and needs.

Lioy PJ

Neurotoxicology Fall 1983, 4 (3) #103-12, ISSN 0161-813X

Journal Code: OAP

Contract/Grant No.: ES 00260; CA 13343

Languages: ENGLISH

The preceding was by no means a comprehensive analysis on the present state of knowledge on trace elements in combustion sources, or the differences that would be expected. However, it does point to avenues and directions of some of the future research. Also, the needs 1) to resolve source in areas of great emissions complexity, or 2) to assign sources of specific hazardous materials. Current efforts are focussed on understanding the impact of particular sources of pollutants at a receptor site. This information will provide the means for assessment of any potential hazard of a source to the general community and the size and mass distribution of these materials at a receptor. Considering the types and volume of data necessary to catalog source types and eventually assess community impacts, the development of a national resource with far more sensitive and accurate multielement analysis of air pollutants is warranted. Interaction of air quality and nuclear analytical research groups in collaborative research projects should be fostered and commitments made to develop pools of large and small users.

5/7/4

05474957 85090957

Short-term bioassays of fractionated emission samples from wood combustion.

Alfheim I; Becher G; Honsslo JK; Lazaridis G; Lofroth G; Ramdahl T; Rivedal E; Salomaa S; Sanner T; Sorsa M

Teratogenesis Carcinogenesis Mutagenesis 1984, 4 (6) 459-75, ISSN 0270-3211
Journal Code: VM9

Languages: ENGLISH

Extracts of an emission sample from wood burning, consisting of particles and volatiles, have been fractionated on an HPLC silica gel column into five fractions of increasing polarity. Nonfractionated samples and the individual fractions have been tested in three different short-term bioassays: the Ames Salmonella assay, the sister chromatid exchange (SCE) induction-test in Chinese hamster ovary cells (CHO), and the cell transformation test on Syrian hamster embryo (SHE) cells. Most of the total activity was found in the volatile part of the sample with all three bioassays, whereas the particle extract had the highest activity per unit mass extracted. The second most polar fraction contained most of the mass and was also highly active in all assays. The most polar fraction was very potent in the Salmonella assay, but showed only a weak response in the eukaryotic bioassays. Storage of the samples for several months at 0 degrees C revealed that the bacterial mutagens present in the most polar fraction were labile; the mutagenicity was almost totally lost after 1 year's storage.

5/7/4

05223895 DOC TYPE: ARTICLE GENUINE ARTICLE#: SN914 21 REFS
ALDEHYDE EMISSIONS FROM WOOD-BURNING FIREPLACES (ENGLISH)
LIPARI F; DASCH JM; SCRUGGS WF
GM CORP, DEPT ENVIRONM SCI, RES LABS/WARREN//MI/48090
ENVIRONMENTAL SCIENCE & TECHNOLOGY, V18, N5, P326-330, 1984
?840

5/7/5

05184272 84108272

Mutagenicity testing of high performance liquid chromatography fractions from wood stove emission samples using a modified Salmonella assay requiring smaller sample volumes.

Alfheim I; Becher G; Honsslo JK; Ramdahl T

Environ Mutagen 1984, 6 (1) 91-102, ISSN 0192-2521 Journal Code: E1Y

Languages: ENGLISH

Organic extracts of emissions from wood combustion have been fractionated by high performance liquid chromatography (HPLC) into 25-28 fractions. Each fraction was tested for mutagenic activity in a modified Ames Salmonella/microsome bioassay requiring one-third of the test volumes needed for the usual test. Direct mutagenic activity was noted predominantly in the most polar fractions, whereas indirect mutagenic activity was associated with the fractions containing polycyclic aromatic hydrocarbons (PAH) and with polar fractions probably consisting of aza-arenes and aromatic amines.

06174995 87148995

Mutagenicity assay of emission extracts from wood stoves: comparison with other emission parameters.

Lofroth G; Lazaridis G; Rudling L

Nordic School of Public Health, Gothenburg, Sweden.

Sci Total Environ (NETHERLANDS) Dec 31 1986; 58 (3) p199-208, ISSN 0048-9697 Journal Code: UJO

Languages: ENGLISH

The emission from wood stoves of several types of air pollutants has been measured under standardized burning conditions with emphasis on the amount of organic compounds and determination of the mutagenic activity with the Salmonella/microsome assay. The study corroborates earlier findings that conventional wood stoves can be a significant source of hydrocarbon and tar compounds in the ambient air. The emission of mutagenic compounds comprise both compounds requiring mammalian activation and compounds which are active in the test without exogenous activation. The mutagenicity tests show that nitroaromatic compounds are present in wood stove emissions, although the emission of nitrogen oxides is low. A wood stove constructed using the downdraft principle emitted much less hydrocarbons and tar, less mutagenic components and slightly less carbon monoxide than conventional wood stoves.

0184461 *86-056040

ASSESSING THE IMPACT OF RESIDENTIAL WOOD COMBUSTION USING A SOURCE AND RECEPTOR MODEL,

MEYERS RICHARD L.

ALASKA PACIFIC UNIV,

J ENV HEALTH, SEP-OCT 85, V48, N2, P62(5)

JOURNAL ARTICLE TWO INDEPENDENT MODELS ARE USED TO DETERMINE THE IMPACT OF RESIDENTIAL WOOD COMBUSTION ON WINTER PARTICULATE LEVELS IN EAGLE RIVER, AK. A SOURCE EMISSION MODEL BASED ON A WORST CASE CONDITION FOR WOOD BURNING INDICATED THAT ABOUT 70% OF THE PREDICTED WINTER PARTICULATE LEVEL OF 140 MG/CU M IS DUE TO RESIDENTIAL WOOD COMBUSTION. A RECEPTOR MODEL ACCURATELY PREDICTED TOTAL SUSPENDED PARTICULATE MATTER CONCENTRATIONS, AND PARTICULATES COULD BE APPORTIONED BETWEEN MAJOR SOURCES.

86-07758

Sins of emission

Keough, J.

Address not stated

ENERGY REV VOL. 13, NO. 2, P. 59, Publ.Yr: 1986

SUMMARY LANGUAGE - ENGLISH

Languages: ENGLISH

Heating with wood saves about 100 million bbl of oil/year, according to the Wood Heating Alliance. The stoves also produce an enormous amount of air pollution, including polycyclic organic matter (POM) which contains carcinogens. Wood stoves could be emitting 7 million tons of particulate matter-52,000 tons of (POM), 19 million tons of carbon monoxide, and 159,000 tons of hydrocarbons-into the atmosphere yearly by 2005, according to Environmental Protection Agency (EPA) estimates. States, the wood stove industry, and the EPA are concerned about the pollution. Some states and cities have adopted emission standards or banned wood-burning under certain conditions. Prodded by lawsuits brought by New York and the Natural Resources Defense Council, the EPA intends to propose national emission standards during January 1987. Catalytic combustors can cut particulate emissions by as much as 86 percent, while increasing thermal efficiency by 20-30 percent. This article appeared in Sierra 71(1) Jan./Feb. 1986, 22-27.

87-00056

Receptor modeling study of Denver winter haze

Lewis, C.W.; Baumgardner, R.E.; Stevens, R.K.; Russwurm, G.M.

Atmos. Sci. Res. Lab., U.S. EPA, Research Triangle Park, NC 27711, USA

ENVIRON. SCI. TECHNOL. VOL. 20, NO. 11, pp. 1126-1136, Publ.Yr: 1986

SUMMARY LANGUAGE - ENGLISH

Languages: ENGLISH

A multiple-regression single-element tracer method in combination with SO₂ sub(2) and NO sub(x) emissions inventory scaling was used to estimate source contributions to fine and coarse aerosol mass and light extinction, measured in Denver during January 1982. Motor vehicles were the largest contributor to average fine particle mass (42%) and daytime light extinction (47%). Electric power generation was next largest, at 23% and 44%, respectively. Wood burning contributed 12% and 14%, respectively. The electric power contribution estimate was based entirely on emission inventory scaling and thus correspondingly more uncertain. Fine mass concentrations averaged only half as large as those measured in a similar field study conducted in late 1978. During high-pollution periods, the motor vehicle impact during the day and the woodsmoke impact during the night were relatively greater than their averages.

76076140 v4n10

Mechanisms of particle entrainment & combustion & how they affect emissions from wood-waste fired boilers

Adams, T.N.

7th Biennial National Waste Processing Conference & Exhibit (formerly National Incinerator Conference) A762147 Boston, Massachusetts

23-26 May 76

American Society of Mechanical Engineers

Papers in 1976 ASME National Waste Processing Conference Proceedings' (Book No. 100096), May 76; \$22.50 to ASME members, \$45 to non-members (includes Discussions Booklet to be published Nov 76); ASME Order Dept., 345 East 47th Street, New York, N. Y. 10017, USA.

7/7/5

86-07782

Gaseous tracers in receptor modeling: Methyl chloride emission from wood combustion

Edderton, S.A.

Oregon Grad. Cent., OR, USA

DISS. ABST. INT. PT. B - SCI. & ENG VOL. 46, NO. 12, Pt.1, Publ.Yr: 1986

SUMMARY LANGUAGE - ENGLISH; Order No. FAD DAB523662.

Languages: ENGLISH

The model and the statistical and experimental techniques for using gaseous species to trace sources of particulate air pollution are developed. The model is implemented in a simple environment and the results are compared with those obtained from the concurrent application of other models. In particular, measurements of elevated concentrations of the gas methyl chloride, CH₃Cl, in the Portland, Oregon area are used to quantify the contribution of residential wood combustion to fine particulate pollution. The method requires accurate measurements of the gas to aerosol ratios in the source emissions and knowledge of all sources contributing to the ambient concentrations of the gases.

87-00071

Particulate, carbon monoxide, and acid emission factors for residential wood burning stoves

Burnet, P.G.; Edmisten, N.G.; Tiegs, P.E.; Houck, J.E.; Yoder, R.A.

OMNI Environ. Serv. Inc., 10950 S.W. Fifth St., Suite 160, Beaverton, OR 97005, USA

J. AIR POLLUT. CONTROL ASSOC VOL. 36, NO. 9, pp. 1012-1018,

Publ.Yr: 1986

SUMMARY LANGUAGE - ENGLISH

Languages: ENGLISH

Emissions from residential wood burning stoves are of increasing concern in many areas. This concern is due to the magnitude of the emissions and the toxic and chemical characteristics of the pollutants. Recent testing of standard and new technology woodstoves has provided data for developing a family of particulate and carbon monoxide emission factor curves. This testing has also provided data illustrating the acidity of woodstove emissions. The particulate and carbon monoxide curves relate the actual stove emissions to the stove size and operating parameters of burn rate, fuel loading, and fuel moisture. Curves relating stove types to the acidity of emissions have also been constructed. Test data show actual emissions vary from 3 to 50 grams per kilogram for particles and from 50 to 300 grams per kilogram for carbon monoxide. Since woodstove emissions are the largest single category of particulate emissions in many areas, it is essential that these emissions be quantified specifically for geographic regions, allowing meaningful impact analysis modeling to be accomplished. Emission factors for particles and carbon monoxide are presented from several stove sizes and burn rates.

87-00295

Ubiquitous occurrence of 2-nitrofluoranthene and 2-nitropyrene in air

Ramdahl, T.; Zielinska, B.; Arey, J.; Atkinson, R.; Winer, A.M.; Pitts, J.N., Jr.

Statewide Air Pollut. Res. Cent., Univ. California, Riverside, CA 92521, USA

NATURE VOL. 321, NO. 6068, pp. 425-427, Publ.Yr: 1986

SUMMARY LANGUAGE - ENGLISH

Languages: ENGLISH

Several nitrated polycyclic aromatic hydrocarbons (nitro-PAH) are direct-acting mutagens and/or carcinogens, and are important constituents of combustion emissions and ambient air. These nitro-PAH are emitted from various combustion sources including gasoline and diesel engine exhaust, aluminium smelting effluent, coal fly ash, wood smoke, and cigarette smoke condensates. Of these, diesel engine exhaust is the best characterized. more than 50 nitrated polycyclic aromatic compounds having been identified by Paputa-Peck et al., including 1-nitropyrene (1-NP) as the single most abundant nitro-PAH. Evidence of the atmospheric formation of nitro-PAH has come only recently, from observations that 2-nitropyrene (2-NP) and 2-nitrofluoranthene (2-NF) neither of which has been reported to be emitted from combustion sources, are among the major nitro-PAH present in ambient air. The authors present data from several locations which demonstrate that these two atmospherically formed nitro-PAH are ubiquitous in tropospheric ambient air.

87-00275

Source emission characterization of residential wood-burning stoves and fireplaces: Fine particle/methyl chloride ratios for use in chemical mass balance modeling

Edgerton, S.A.; Khalil, M.A.K.; Rasmussen, R.A.

Environ. Phys. and Chem. Sect., Battelle Columbus Div., Columbus, OH 43201, USA

ENVIRON. SCI. TECHNOL VOL. 20, NO. 8, pp. 803-807, Publ.Yr: 1986

SUMMARY LANGUAGE - ENGLISH

Languages: ENGLISH

The results of an experiment to determine the ratio of fine aerosol to methyl chloride in residential wood burning are presented. Accurate measurements of this ratio are necessary for receptor models that use methyl chloride as a unique tracer of woodsmoke and for chemical mass balance (CMB) models that include methyl chloride in the wood-burning source composition matrix. It is demonstrated how the values of the fine particle to methyl chloride ratios for various types of wood and burn conditions may be used in a stratified sampling scheme to determine a composite value of the ratio. The ratio is used in a CMB calculation to estimate the wood-burning contribution to fine particulate concentrations in a residential neighborhood. Ratios of several hydrocarbon gases to CO sub(2) in residential wood burning are also presented for use in models that may attempt source reconciliation of hydrocarbon species.

5/7/77

80070330 v8n9

Air emissions from combustion of wood in space-heating stoves

Hughes, T. W.

Monsanto-Environmental

73rd Annual Air Pollution Control Association Meeting & Exhibition 802

0184 Montreal, Canada 22-27 Jun 80

Air Pollution Control Association

Paper No: 80-15.4

Abstracts (Eng) in booklet form, 15 Jul 80, \$5.00: APCA, P.O. Box 2861, Pittsburgh, PA 15230. Papers (Eng) ordered individually, 14 Jul 80, \$3.50 per paper prepaid: Publications Dept., APCA, above.

Languages: English

Doc Type: CONFERENCE PAPER

80070161 v8n9

Particulate emissions from wood burning and the implications for health

Butcher, S. S.

Bowdoin College

73rd Annual Air Pollution Control Association Meeting & Exhibition 802

0184 Montreal, Canada 22-27 Jun 80

Air Pollution Control Association

Paper No: 80-22.5

Abstracts (Eng) in booklet form, 15 Jul 80, \$5.00: APCA, P.O. Box 2861, Pittsburgh, PA 15230. Papers (Eng) ordered individually, 14 Jul 80, \$3.50 per paper prepaid: Publications Dept., APCA, above.

Languages: English

Doc Type: CONFERENCE PAPER

81025559 v9n3

The contribution of wood combustion to national pollutant emissions

Jeasmar, D. R.; Kurstedt, H. A.

Virginia Polytechnic Inst. And State Univ., Blacksburg, VA 24061

3rd Miami International Conference on Alternative Energy Sources 804
0451 Bal Harbour, Florida 15-17 Dec 80International Association for Hydrogen Energy; Clean Energy Research
Institute; University of Miami (School of Engineering and Architecture);
International Atomic Energy Agency; International Association for Housing
Science; International Solar Energy SocietyAbstracts (Eng) in bound volume, 15 Dec 80; Clean Energy Research Inst.,
Univ. of Miami, Coral Gables, FL 33124. Papers (Eng) in hardcover volume,
Nov 81; Hemisphere Publishing Corp., Washington, DC.

Languages: English

Doc Type: CONFERENCE PAPER

83015084 V11N3

Method for sampling and analysis of organic emissions from residential
wood combustionCooke, M.; Allen, J.M.; Graham, M.S.; Knight, C.V.; Knight, D.K.; Kubers,
D.W.

Battelle's Columbus Lab.

American Chemical Society 184th National Meeting 8230001 Kansas City,
MO 12-17 Sep 82

American Chemical Society (ACS)

For information please contact: American Chemical Society, A.T. Winstead,
1155 16th St. NW, Washington, DC 20036, USA

Languages: ENGLISH

83039402 V11N7

A comparison of emissions from residential wood/coal stoves and a
residential wood-chip burner

Truesdale, R.S.

Res. Triangle Inst.

Stationary Combustion NO sub(x) Control 1982 Joint Symposium 8245022
Dallas, TX 1-4 Nov 82Environmental Protection Agency (EPA); Electric Power Research Institute
(EPRI)1983, Proceedings available: Ms. Janet Runyan, Acurex Corporation, 485
Clyde Ave., Mountain View, CA 94042, USA, Price: \$40.00

Languages: ENGLISH

83027722 V11N6

Characterization of wood combustion emissions

Guenther, F.R.; Chesler, S.N.

Organic Analy. Res. Div., Natl. Bureau Standards, Washington, DC 20234

Analytical Chemistry and Applied Spectroscopy, 34th Pittsburgh Conference and Exposition 8310046 Atlantic City, NJ 7-12 Mar 83

Society for Analytical Chemists of Pittsburgh (SACP); Spectroscopy Society of Pittsburgh (SSP)

Abstracts booklet available to conference registrants. For information on individual papers please contact authors directly

Languages: ENGLISH

86-04659

Wood smoke: Measurement of the mutagenic activities of its gas- and particulate-phase photooxidation products

Kleindienst, T.E.; Shepson, P.B.; Edney, E.O.; Claxton, L.D.; Cupitt, L.T.

Northrop Serv., Inc., Environ. Sci., Research Triangle Park, NC 27709, USA

ENVIRON. SCI. TECHNOL VOL. 20, NO. 5, pp. 493-501, Publ.Yr: 1986

SUMMARY LANGUAGE - ENGLISH

Languages: ENGLISH

Dilute mixtures of wood combustion emissions (with and without additional NO sub(x)) were irradiated in a 22.7-m super(3) Teflon smog chamber. The effluent was tested for mutagenic activity by exposing *Salmonella typhimurium*, strains TA100 and TA98, to the filtered gas-phase components. The particulate matter was tested by using the plate incorporation procedure. Without added NO sub(x), irradiated dilute wood smoke showed a measurable increase in mutagenic activity for gas-phase products only. Additional NO sub(x) was added in other irradiations to enhance the formation of gas- and particulate-phase products. Although only lower and upper limits were obtainable, the gas-phase products showed considerably more activity (1.1-8.2 revertants/ mu g) in TA100 exposures than did the particulate product extracts. With TA98 the activities of both phases were comparable on a mass basis. Since the total quantity of gas-phase components was greater than the particulate-phase components, the mutagenic

0185041 *86-061445

THE MAKING OF AN EMISSIONS STANDARD,

MING JIM

COLORADO DEPT OF HEALTH,

WOOD N ENERGY, MAR 86, V6, N4, P60(4)

JOURNAL ARTICLE AN ADVISORY COMMITTEE FORMED UNDER THE COLORADO AIR QUALITY COMMISSION IN 1981 FOUND THAT RESIDENTIAL WOOD- AND COAL-BURNING SYSTEMS CONTRIBUTE TO VISIBILITY IMPAIRMENT AND TOTAL PARTICULATE CONCENTRATIONS. REGULATIONS WERE THEN IMPLEMENTED TO ESTABLISH EMISSION STANDARDS FOR RESIDENTIAL WOOD STOVES. A WOOD STOVE CERTIFICATION PROGRAM WAS ALSO INITIATED. DEBATE BETWEEN REGULATORS AND POLICY MAKERS OVER PARTICULATE COLLECTION AND FUEL LOADING TEST METHODS IS CHRONICLED.

1170314 DE86002025/XAB

Empirical Analysis of Residential Woodburning ImpactsLipfert, F. W. ; Dupuis, L. R. ; Daum, M. ; Srackangast, A.
Brookhaven National Lab., Upton, NY.

Corp. Source Codes: 004545000; 0936000

Sponsor: Department of Energy, Washington, DC.

Report No.: BNL-51829

Oct 84 41p

Languages: English

NTIS Prices: PC A03/MF A01 Journal Announcement: GRAI8606;

NSA1100

Country of Publication: United States

Contract No.: AC02-76CH00016

An analysis is presented of air-quality-related problems associated with use of residential firewood, with emphasis on the intermountain region of the Western United States (defined as that region between the Continental Divide and the Cascade/Sierra Mountains. Meteorological dispersion characteristics are analyzed and compared as are measured particulate concentrations. A new algorithm for the prediction of county level wood usage is developed, and results are presented for the entire country. The intermountain region is shown to have the highest potential for air pollution impacts due to space heating, and the available particulate measurements confirm this finding. Specific impacts due to wood combustion are not presented, however, pending development of usage information on a subcounty level. Since the most severe impacts from residential wood combustion appear to be confined to this one geographic region, a state or local approach to regulation of wood combustion air pollution appears to be more appropriate than a Federal level approach. However, urban air quality impacts should be reanalyzed with the new usage data before this recommendation is final. (ERA citation 11:003747)

1143544 PB85-218816/XAB

Emission Control Effectiveness of a Woodstove Catalyst and Emission Measurement Methods Comparison

McCrillis, R. C. ; Merrill, R. G.

Environmental Protection Agency, Research Triangle Park, NC.
Air and Energy Engineering Research Lab.

Corp. Source Codes: 034680076

Report No.: EPA/600/D-85/132

1985 19p

Languages: English

NTIS Prices: PC A02/MF A01 Journal Announcement: GRAI8521

Country of Publication: United States

The paper gives results of measurements of emissions from a prototype catalytic and a generic noncatalytic stove over a range of burnrates. For the catalytic stove, simultaneous EPA Modified Method 5 (MM5) samples were obtained before the catalyst and in the stack. For both stoves, Oregon Method 7 (OM7) and Condor dilution samplers (CDS) were operated simultaneously with the MM5 train at the stack location. Volatile organic samples were obtained by integrated bag sampler at the stack location. Results show a generally predictable correlation between MM5, OM7 and CDS results. Emission rates, based on MM5, were about twice those based on OM7 and CDS. Catalyst emission reduction effectiveness (by MM5) ranged from 72 to 98%. Catalyst inlet emissions appear to be affected by the test sequence: a high burnrate test produced higher emissions when preceded by a low burnrate test than when preceded by a high burnrate test. Volatile organic emissions were about the same at all burnrate on the catalytic stove and at low burnrates on the noncatalytic stove. At a high burnrate, the noncatalytic stove produced substantially less. All MM5 samples tested positive for polynuclear aromatic hydrocarbons.

1093154 PB85-105336/XAB

**Characterization of Emissions from the Combustion of Wood
and Alternative Fuels in a Residential Woodstove**

(Final rept. Feb 81-Mar 84)

Truesdale, R. S. ; Mack, K. L. ; White, J. B. ; Leese, K. E
Cleland, J. G.

Research Triangle Inst., Research Triangle Park, NC.

Corp. Source Codes: 045968000

Sponsor: Industrial Environmental Research Lab., Research
Triangle Park, NC.

Report No.: RTI/1914-39-01F; EPA/600/7-84/094

Sep 84 143p

Languages: English

NTIS Prices: PC A07/MF A01 Journal Announcement: GRAI8501

Country of Publication: United States

Contract No.: EPA-68-02-3170

The report gives results of a comparison of emissions from the combustion of alternative fuels to those from wood in a residential woodstove, and of a study of the effects of woodstove operating parameters on combustion emissions. Overall, oak wood is the best fuel tested, considering both emissions and stove operation. Compressed wood logs with binders and bituminous coal produce the highest emissions of SO₂, particulate, and NO_x. Compressed wood logs without binders and treated lumber produce the highest PAH emissions. Important parameters affecting CO emission levels are fuel structure and, to a lesser degree, combustion air flow. SO₂ emission levels are related directly to fuel sulfur content. NO_x emissions are controlled by fuel nitrogen content and combustion air flow rate. Organic emissions are affected by fuel consumption rate, fuel structure, and the amount of air through the stove. Total discharge severities for PAHs measured during this study indicate that PAHs are the pollutants of highest concern in the flue gas effluent stream. PAH formation is affected by combustion air flow, firebox temperature, and fuel structure. Bioassay results indicate the presence of both mutagens and promutagens in the organic extracts of flue gas samples from both wood and coal combustion tests.