THE INVESTIGATION AND CLASSIFICATION

OF INERT INGREDIENTS IN PESTICIDE FORMULATIONS

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FOREWORD

This report summarizes the significant findings and the methodology that was employed in the investigation and classification of inert ingredients of pesticide formulations under Contract 68-01-3431. It should be emphasized that the true final products of this contract are the 1225 file folders containing the data and evaluations for each compound.

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INTRODUCTION

Background to Study

An important, but less emphasized to date, aspect in the regulatory processes for pesticides is the thorough identification, evaluation, and control, when necessary, of inert ingredients in pesticide formulations. A December 1975 GAO report to the Congress recommended that complete testing be required for those inert ingredients used in pesticide formulations that may present health or environmental hazards. The report further advised EPA to reassess its policy on inert ingredients and to develop appropriate guidelines for the testing.

In evaluating the safety of pesticides, toxicologists have required extensive long and short term toxicological testing of the active ingredients of the pesticide. Generally little or no toxicological information on other ingredients of the formulation, i.e., the inerts, has been required. The 1974 discovery that vinyl chloride, an inert propellent used in some pesticide aerosols, causes a rare form of liver cancer brought about the necessity for thoroughly evaluating the potential danger of inert ingredients.

Since there are over a thousand inert ingredients among the many pesticide formulations presently in use, it became immediately important to the Office of Pesticide Programs to perform an initial chemical and toxicological review of these substances. The purpose of this review was to highlight those inerts which either because of adverse toxicological data or a scarcity of valid data should be examined in a more detailed study.

Objectives and Scope of Study

The major objective of this study was to identify those inerts used in pesticide formulations that may present health or environmental hazards. The intention of this study was not to perform complete or detailed studies (eg. criteria documents) on any single compound. It has been our understanding throughout this study that those inerts identified as possible hazards will later require a supporting document compiled from an in-depth literature search. The biochemical and toxicological data collected under this contract would provide an excellent starting point in the formulation of these documents.

Some of the tasks required to achieve the objectives of this contract were not readily apparent until after the work was initiated. Once the EPA-provided list of inerts was received, it became apparent that for internal purposes it would be necessary to revise the computer listing. This was because of such things as duplicate names, incorrect synonym listings, and improper classifications of compounds (compounds listed as inerts which were actually actives). Thus one of the objectives of the contract became the revision and correction of the computer listing of inerts. This should prove especially helpful to EPA for updating their computer file of inerts.

A third objective of this study was to provide the basis for a central data bank for inert compounds. The data collection formats were developed with this in mind. That is, emphasis was placed on developing a data collection format that includes all pertinent biochemical and toxicological data and has the capability to be updated and revised as needed.

A final objective of this contract was to develop a chemical evaluation strategy that would provide meaningful results with a limited level of effort. (The inerts were evaluated at a cost of less than $100./compound). Thus, only the most important and pertinent literature sources and computer data bases were searched. The strategy that was developed includes a comprehensive collection of relevant biochemical and toxicological data, sufficient to provide the basis for a meaningful toxicological evaluation and classification.

Approach

The first step in the inert investigations was to correct the inert listing and eliminate the duplication of compounds. This was accomplished by chemically classifying the entire 1606 inert listings. This not only eliminated duplication but also facilitated the data collection and evaluation for similar compounds.

The next step was the development of the data collection formats. Four separate formats were developed depending on the type of compound. (eg. active, true inert, natural product, surfactant). These were formulated from biochemical and toxicological inputs with emphasis placed on developing a flexible format that could be updated or revised at a later date. After EPA review and approval, the formats were finalized and became the foundation for the data collection.

Initially, the literature searchers reviewed standard texts and reference documents primarily for chemical and physical properties and general toxicity information. Next the on-line data bases were queried and the appropriate abstracts ordered from the National Library of Medicine. Once the abstracts were received (3 days) they were reviewed by information specialists and the appropriate data was transferred to the formats. Next the data was reviewed and verified from a biochemical standpoint. At this time, further searches were initiated if deemed appropriate by the biochemist. The file folder (containing the format, abstracts, review articles, etc.) was then submitted to the toxicologist for review, evaluation and classification. The format was then edited and final typed on magnetic cards and submitted to EPA for review on a weekly basis.

INERT LISTING

Problems Encountered and Correction Procedures

The Inert List furnished by EPA contained 1606 entries. Of these, 302 were designated Active (A) i.e., those which are also on the EPA Active Pesticide List. 129 were Natural (C), materials which occur naturally. 116 were Trash (T), materials which are chemically undefinable. 396 were Synonyms (S) of the Inert (I) ingredients. There were 663 Inert (I), materials which are not also used as active agents in pesticide formulations.

In these 1606 entries, a variety of problems were encountered:

(1) A large number of duplications (one compound have 2 or more numbers) were observed.

(2) Numerous compounds were entered as Inert (I) when they were actually Active (A), as found on the EPA Active Pesticides List.

(3) Several compounds were entered as Natural (C), when they were actually Trash (T) or vice versa.

(4) A few compounds were entered as trash (T) when they were actually not Trash, but. in fact Inert (I) or vice versa.

(5) A few typographical errors were also observed.

(6) A few errors were reported which consisted of one number assigned to two different compounds.

(7) A combination of any of the above.

Accordingly, the errors were rectified and reported as follows:

- when a compound was assigned 2 or more numbers, the lowest number was retained, while, the other(s) was deleted.
- when a compound was incorrectly designated, as (S) or (I) or (C) or (T), the proper designation replaced the incorrect one
- when the error clearly was typographical, the appropriate correction was made
- when one number was assigned 2 different compounds, one of the compounds was assigned a new number
- when more than one type of error was observed for a single entry, an appropriate combination of corrections was reported.

These corrections and revisions are shown in Appendix 1. They are listed by EPA Accession Number as they appeared on the original computer printout.

Chemical Classification

On receipt of the original list of 1606 inerts, an effort was made to write structural formulas for all of the chemicals. Some of the inerts were listed by trade names for which a description of the product could not be found; some were undefinable; some were only partially described; some were natural products; some were technical products with indefinite compositions; some were reaction products with no identity; some were polymers described only by type; and some names were in error.

After resolution of these difficulties, chemical structures were written for a large number of the compounds or materials. A hand-written listing of these chemical structures and accession numbers was developed and is in Appendix 2.

The chemically definable compounds (or materials) were classified or grouped by chemical type. The inorganic chemicals were classified according to their anions, except for the elements which were listed as such. These chemical classes are shown in Table 1. (page 8)

The organic chemicals were classified roughly in accordance with a chemical classification scheme used within EPA.

By grouping similar chemicals together, the evaluation of the toxicological, environmental, and other data was facilitated. In many cases, assessments of toxicology could be made for compounds having no data because there was data available on very similar compounds that were within the same chemical grouping.

Because chemical names were not consistent with any one system, the 9th Collective Index of the American Chemical Society Chemical Abstracts Name and Registry number were provided for each compound whenever possible. The Registry number is particularly valuable in computer searching because this number provides immediate access to the information on each chemical in the various data bases.

Following the classification and compilation of the chemicals and materials, a similar type of classification was needed for the surfactants. Surfactants of one type or another are found in almost every pesticide formulation, so that surfactants are undoubtedly one of the most important types of inert ingredient of pesticide formulations. The classification of surfactants presents some problems because many of these materials are technical products with incompletely defined compositions. The difficulty here was resolved by adoption of a classification system advanced by McCutcheon in the 1974 comprehensive compilation of Detergents and Emulsifiers/North American Edition. In this system, surfactants are divided into 58 chemical categories. As in the chemical classification, the

surfactant classification scheme groups together similar chemicals or materials, and it was possible to derive information on chemicals or materials for which there was no information. For surfactants, McCutcheon's system is superior to that of the chemical structure classification because it does provide classifications for technical products, i.e., for those materials with incompletely defined compositions. These chemical classifications appear in Appendix 3.

The following compounds, listed in 40 CFR 180.1001, were not located in the listing of inerts supplied by EPA. In many instances, the compounds are closely related but not identical to inerts found in the listing. Some are dyes, which are used in very small amounts. A few are foods, flavors, natural products, or derivatives thereof. Some indefinite substances are also included.

Ammonium bicarbonate
Bacillus, thuringiensis fermentation solids and; or solubles
Ethylene methyl phenylglycidate
Furcelleran
Licorice root
Mono and diglycerides of C8-C18 fatty acids (some included)
Petroleum hydrocarbons, synthetic isoparaffinic conforming to 21CFR121.1154
Polyethylene, oxidized, conforming to 21CFR 121.1142
Poly (methylene-p-nonylphenoxy)-poly(oxyethylene) ethanol; the poly (oxyethylene) content averages 4-12 moles
Rhodamine B (dye)
Sodium acid pyrophosphate
Soy protein isolated
Starch (potato, tapioca and wheat)
Tetrahydrofurfuryl alcohol
Acrylamide, acrylic acid resins (see 1011)
α-Alkyl (C12-C18)-ω-hydroxypoly (oxyethylene/oxypropylene) heteric polymer in which the oxyethylene content averages 13-17 moles and the oxypropylene content averages 2-6 moles
1,3-Butylene glycol dimethacrylate
Cinnamon
Clove
Coal (derived only from anthracite and bituminous coals)
Condensation product of orthophenylphenol with 5 moles of ethylene oxide
Ammonium thiosulfate
Cod liver oil
Dextrose
Fish oil
Lactose
Magnesium lime
Petroleum hydrocarbons, light odorless conforming to 21CFR 121,1182
Petroleum naptha conforming to 21CFR 121.1203
Petroleum wax conforming to 21CFR121.1156
Phosphorus oxychloride
Poly (methylene-p-tert-butylphenoxy)-poly (oxyethylene) ethanol; the poly (oxyethylene) content averages 4-12 moles
Potassium aluminum silicate
Polysorbate 65 conforming to 21CFR121.1108
Propyl p-hydroxybenzoate
Sodium aluminum silicate
Sodium lauryl glyceryl ether sulfonate
Sperm oil conforming to 21 CFR121.1179
Tartrazine (dye)
Xanthan gum
α-Alkyl (C12-(18)-omega-hydroxy-poly(oxyethylene) sulfosuccinate, isopropylamine and N-hydroxyethyl isopropylamine salts of; the poly (oxyethylene) content averages 3-12 moles
N,N-Bis [α-ethyl-omega-hydroxy - poly (oxyethylene) alkylamine; the polyoxyethylene) content averages 3 moles; the alkyl groups (C 14-C18) are derived from tallow, or from soybean or cottonseed oil acids
Coke (from anthracite and bituminous coals only and petroleum)
Cyclohexane
Diallylphthalate

Dipotassium hydrogen phosphate
FD&C Green No. 6 (dye)
FD&C Violet No 2 (dye)
Ferric chloride
Furfural byproduct
Locust bean gum
Maleic anhydride diisobutylene copolymer, sodium salt
Pigment red 48 (dye)
Polyoxyethylated primary anine (C14-C18); the fatty amine is derived from an animal source and contains 3% water; the poly-(oxyethylene) content averages 20 miles
Tri-tert-butylphenol polyglycol ether (MW 746)
Zinc orthophosphate
Calcium and sodium salts of certain sulfonated petroleum fractions (mahogany soaps): calcium salt molecular weight 790-1,020 sodium salt molecular weight 400-500
FD&C Blue No. 1 (dye)
FD&C Red No. 17 (dye)
Fenugreek
Fluoroapatite
(3-Lauramidopropyl) trimethylammonium methyl sulfate
Methyl Violet 2 B (dye)
Partial sodium salt of N-lauryl-α-iminodipropionic acid
Polyvinylacetate as defined in 21CFR121.1059
Rosin, gum
Rosin, tall oil
Sodium polyflavinoid sulfonate, consisting chiefly of the copolymer of catechin and leucocyanidin
Vanillin
Wood rosin acid, potassium salts conforming to 21 CFR 121.2592
Sodium isopropyl isohexylnaphthalenesulfonate
Sodium monoalkyl and dialkyl (C8-C18) phenoxy-benzene-disulfonate mixtures containing not less than 70% of the monoalkylated product

TABLE 1

CHEMICAL CLASSES

INORGANICS

- Aluminates
- Azides
- Borates
- Bromides
- Carbonates
- Chlorates
- Chlorides
- Chromates
- Elements
- Fluorides
- Hydroxides
- Manganates
- Molybdates
- Nitrates
- Oxides
- Phosphates
- Phosphites
- Silicofluoride
- Silicates
- Sulfates

- Sulfites
- Thiocyanates
- Thiosulfates

ORGANICS

- Acids
  - -Aliphatic Acids (C_1 -C_{18})
  - -Aliphatic acids, metallic salts, soaps
  - -Aliphatic acids, ammonium or amine salts
  - -Aliphatic acids, esters
  - -Aliphatic acids, hydroxy
  - -Aliphatic acids, polyethoxy esters
  - -Aliphatic acids, anhydride
  - -Aliphatic acids, amides
  - -Aliphatic acids, chlorinated
  - -Aliphatic acids, amine derivatives
  - -Aliphatic acids, other derivatives
  - -Aliphatic acids, sulfoethyl ester (salt)
  - -Dicarboxylic acids, aliphatic
  - -Dicarboxylic acids, esters
  - -Dicarboxylic acids, sulfated, salts
  - -Aromatic acids, esters
  - -Aromatic acids, amides
  - -Aromatic acids, imides
  - -Aromatic acids, salts
  - -Phthalates
  - -Naphthenic acids, esters
  - -Naphthenic acids, salts
  - -Citric acid derivatives
  - -Anthranilic acid derivatives
  - -Methacrylic acid derivatives
- Alcohols - Hydroxy Compounds
  - -Alcohol, aliphatic
  - -Alcohols, cyclic
  - -Alcohols, poly
  - -Alcohols, ethers - polyethoxy derivatives
  - -Alcohols, polyethoxy-polypropoxy derivatives
  - -Alcohols, polyethoxy, polypropoxy compounds
  - -Alcohols, polyethoxy-formaldehyde resins
  - -Alcohols, sugar (sorbitol & mannitol) & derivatives

-Alcohols, sugar acids & derivatives
-Alcohols, glycols, dihydroxy compounds
-Alcohols, glycol derivatives
-Alcohols, glycerol esters (fats)
-Alcohols, peroxide

- Aldehydes
  -Aldehydes, aliphatic and aromatic
  -Aldehydes, arsenic compounds
  -Aldehydes, cellulose derivative
  -Aldehydes, cyanuric acid
  -Aldehydes, dicyclopentadiene derivative
  -Aldehydes, dithiocarbamate
  -Aldehydes, epoxy compounds

- Alkyne derivatives

- Amines
  -Amines, aliphatic & salts
  -Amines, oxides
  -Amines, alicyclic
  -Amines, aromatic & cycloparaffin
  -Amines, polyethoxy compounds

- Quaternary ammonium compounds
  -Alkyl
  -Pyridinium
  -Imidazolinium
  -Other

- Imidazolines

- Imino Compounds, bisethoxy

- Oxazolines

- Tetramine derivatives

- Nitrilo Compounds

- Ethylene diamine & triamine derivatives

- Amine sulfonate

- Ethers
  - -Ethers, aromatic
  - -Ethers, dioxymethylene compound
  - -Ethers, polyether
  - -Ethers, other
- Guanidine derivative
- Halogen compounds
  - -Aliphatic chlorinated hydrocarbons
  - -Fluorocarbons & chlorofluorocarbons
  - -Brominated hydrocarbon
  - -Aromatic chlorine compounds
  - -Polychlorinated compounds
- Heteronitrogen-oxygen Compound
- Heteroxygen Compounds
- Hydantoin
- Hydrocarbons
  - -Aliphatic
  - -Aromatic
- Ketones
- Nitrile
- Nitrite
- Nitro Compounds
- Peroxides
- Phenolic Compounds
  - -Phenols
  - -Coumarin derivatives
  - -Aromatic polyhydroxy compounds
- Phosphates & phosphites
  - -Esters
  - -Polyethoxy
  - -Nitrilophosphonate
  - -Salts
- Polymers

- Pyrrolidines
- Silicones
- Sulfates & Sulfonates
  - -Sulfates & salts
  - -Sulfates, polyethoxy
  - -Sulfates, amine salt
  - -Aliphatic sulfonic acids & salts
  - -Sulfonic acid, amine salt
  - -Aromatic sulfonic acids & salts
  - -Aromatic sulfonamides
  - -Sulfonated aromatic ethers
  - -Sulfonium compounds
  - -Lignin sulfonates
  - -Taurines
- Sulfoxide
- Terpenes
- Thiazoles
- Thiourea
- Urea, ureides

INVESTIGATION AND EVALUATION OF INERT INGREDIENTS

Development of Data Collection Formats

The data collection formats were developed with the following considerations:

- Availability and type of chemical and toxicological data required for evaluation
- Level of effort that could be applied to individual compounds
- Types of compounds on the list (ie. active, true inert, trash, natural, synonym)

These formats were developed with the expectation that individual data items would be updated or revised at a later date. The following four formats were utilized: (Sample completed formats appear in Appendix 4).

- Format I – This six-page format is the longest, most detailed format and is used for evaluation of the true inert compounds.
- Format II – This one-page form is used to list the "C" (natural), "T" (trash) and the "A" (active pesticide) inerts. It is also used to correct errors in the EPA Inerts list. These errors include typographical errors, improper names, duplication of names, etc.
- Format III – Format III is a two-page form for substances that are generally recognized as safe by FDA (GRAS), or for other inerts whose relative safety is supported by abundant data and/or other FDA clearances.
- Format IV – A three-page format is used for a special group of 250 surface active agents which can be broken down into a number of chemical groups that are environmentally and toxicologically similar. The information on these compounds is limited and much of it is categorical in nature, necessitating a somewhat specialized, shortened form. Some of the information on the surfactants was obtained through correspondence with manufacturers, and provisions are made for this.

On the following pages are the four data collection formats with appropriate explanations for individual data items.

Format 1

A. EPA Accession Number and Name

The number and name of the compound as designated on the EPA Inert List.

B. American Chemical Society Chemical Abstracts Service (CAS) Name and Registry Number

The name and number of the compound assigned by the American Chemical Society Chemical Abstracts Service in the 9th Collective Index of Chemical Abstracts. The CAS name and Registry Number will be obtained either from Chemline Chemical Abstracts, the EPA-furnished printout of CAS data, the NIOSH Registry of Toxic Effects of Chemical Substances or the EPA Toxic Substances Control Act Candidate List of Chemical Substances.

C. Other Names

Includes synonyms as found in the Merck Index, the NIOSH Registry of Toxic Effects of Chemical Substances, the EPA-furnished printout of CAS data and Chemline. These synonyms of a compound are preceded by the abbreviation of the synonym type: (EPA S), indicating the EPA synonym designation; (T), for trade names; and (S), for other synonyms.

D. Chemical Composition:

The empirical formula and molecular weight (MW) are given in this section when available and follow the Hill System (for organic compounds, the order of symbols is C, then H then all other elements alphabetically, i.e. $C_{15}H_{26}O_2N$ will be recorded as C15-H26-N-O2.) For salts, polymers and addition compounds, the formula is printed in two or more parts separated by periods. When a chemical formula is not available, a general description may be given.

E. EPA Chemical Code

To be filled in by the EPA when it becomes available.

F. Molecular Structure

When known and available, a representation of the molecule showing the arrangement of the atoms or structural groups is drawn.

G. Chemical and Physical Properties

Obtained from the Merck Index, or the Chemical Rubber Company Handbook of Chemistry and Physics. All temperatures are in degrees Celsius.

1. Solubility – the solubility of a substance in water and other liquids, at room temperature (25°C), unless otherwise specified.

2. Specific Gravity or Density – specific gravity or density is reported with temperature, e.g., SG-20 1.321 or SG-20/4 1.321, where 20 is the temperature of the material and 4 indicates comparison with water at 4° Celsius.

3. State, Color, Odor, E.c. – as mentioned in the literature.

4. MP, BP, VP – melting point, boiling point, and vapor pressure data are listed with the conditions at which the measurements were made, e.g., BP (10) 176° indicates that the boiling point under 10mm pressure was 176° C; VP (25) 20 means that the vapor pressure at 25°C was 20mm.

5. Corrosiveness – indicates, when available, if the compound is corrosive.

6. Technical Products and Impurities – indicates the availability and impurities of compounds, if information is available.

7. Stability – includes information on hydrolysis, photolysis, half life, chemical reactivity or volatility, or a general qualitative statement on the compound's stability.

H. Use as an Inert

The use or uses of the inert compound as specified by the EPA and obtained from the U. S. Code of Federal Regulations: 40 part 180.1001. See J.2 Government Regulations-EPA. Occasionally these uses are obtained from journal articles or abstracts and from the Farm Chemicals Handbook. When no use is available in the literature, a probable use is sometimes suggested.

I. Other Uses

Besides their uses in pesticide formulations, these compounds often have many other varied uses which are listed here. The "Active?" question is a check-off point to insure that each individual inert is checked against the EPA Active Pesticides List. If an inert is found to also occur on the Active List, a Format II is used in place of Format I.

J. Government Regulations

1. FDA – as mentioned in the U. S. Code of Federal Regulations: 21, Food and Drug Administration, Part 121, 1976.

2. EPA – as mentioned in the U. S. Code of Federal Regulations: 40. Protection of the Environment 180.1001, 1976.

3. OSHA – as mentioned in the U. S. Code of Federal Regulations: 29, Occupational Safety and Health Administration, Part 1910. 1000, 1976.

4. NIOSH – as mentioned in the National Institute of Occupational Safety and Health Criteria Documents. NB: NIOSH does not set standards, but does recommend standards to OSHA.

5. DOT – as mentioned in the U. S. Code of Federal Regulations; 49, Department of Transportation, 1976.

6. Other Federal – Miscellaneous federal regulations are listed here, along with Threshold Limit Values (TLV's) and Ceiling Values for workroom air as established by the American Conference of Governmental and Industrial Hygienists (ACGIH). These TLV's and Ceiling Values are specified in Threshold Limit Values for Chemical Substances and Physical Agents in the Workroom Environment with Intended Changes for 1975; ACGIH, Cincinnati, Ohio, 1975.

7. State, County – State and local regulations are listed here when found in the general literature.

8. Foreign Countries – Foreign restrictions and regulations as mentioned in the general literature are listed here when available.

K. Manufacturers

Manufacturers and suppliers are listed here and are obtained from the Chemical Marketing Reporter, OPD Chemical Buyers Directory, Schnell Publishing Co., New York: 1977.

L. Environment

1. Effect – on air and water quality, vegetation, fish and other aquatic organisms, and birds.

2. Conversion Products (Metabolites, Degradation Products) – as mentioned in the general literature.

3. Fate – chemical and biochemical reactions in the environment, transport in soils, aquatic systems, and biota.

4. Persistence – retention time of compound in the environment as found in the literature.

5. Bioaccumulation – data as mentioned in the general literature on the accumulation of a compound in the biota.

M. Toxicology

Abbreviated summaries elaborating representative references are presented. Toxicity to non-human mammals (M.2). is restricted to studies on animals used to predict potential human hazard, and includes mice, rats, and rabbits, guinea pigs, cats, dogs and simians. Also included are some studies performed in vitro i.e. mutagenic studies on microbial systems. Literature references used here include abstracts obtained from on-line data bases, (see O.1 of the format),

review articles, standard toxicology reference volumes,the NIOSH Registry of Toxic Effects of Chemical Substances, The Merck Index and some complete journal articles obtained to clarify nebulous abstracts. Selection of the cited literature was carefully made. It is important to keep in mind that the literature cited is only a representative sample of the available literature, as it was not the objective of the task to perform a complete literature search on the compounds from the EPA Inert List.

N. Sources Used in the Search

Toxline, Medline, Toxback, Cancerline, and Chemline data bases were searched for all inerts. The Merck Index, the NIOSH Registry of Toxic Effects of Chemical Substances and several standard texts and references were also searched.

O. Recommendations

Following a professional review of the data presented on the format, a brief summary/recommendation is written and the compound is assigned to one of the following hazard classes:

Class 1. This category of inerts will contain those found to have chemical, toxicological or environmental characteristics that require immediate attention.

Class 2. Available data indicate probable cause for alarm because chemical structure is similar to a known toxicant, or a metabolic environmental pathway may result in breakdown to a known toxicant, or irreversible chronic effects are known, e.g., neurotoxicity, irreversible eye damage, skin sensitization, etc. Massive fish kills or other environmental effects may also trigger this category.

Class 3. Hazard data inadequate for total review where it is apparent that the use of the inert would indicate certain test requirements.

Class 4. No hazard data found or complete testing published i.e., ideal situations.

Class 5. Nature of inert does not allow chemical definitions, i.e., manure, corn, rotten eggs, etc.: however, it is reasonable to assume no hazard exists.

Class 6. Miscellaneous Class – errors in number or name; the name could not be properly identified. number incorrect, incorrect classification, etc.

P. References and Review Articles

The references which yielded useful data on the compound are listed here in normal bibliographic manner. Ten primary references are printed as part of the format and are numbered if used in the data collection process. Additional references are then added to this list of primary sources.

Format II

A. EPA Access Number and Name:

The number and name of the compound as designated on the EPA Inert List.

B. Description

When possible the Chemical Abstracts Services (CAS) name and number are given. For many of the "C" or natural products, a dictionary definition is given in this space. Possible structures are drawn here for some of the "T" or Trash compounds. This space is left blank when a Format II is used to correct errors in the EPA Inerts List.

C. Use as an Inert

The use of compound in a pesticide formulation as specified in the EPA Code of Federal Regulations: 40 part 180.1001. For some compounds a probable use is specified. This space is left blank when a Format II is used to correct errors in the EPA Inerts list.

D. Problems Encountered

Explains that the title compound occurs on the "T" (trash), "C" (natural) or "A" (active) list. In the case of a listing error: this space is used to show exactly what the error is and what action has been taken.

E. Recommendation

The "C" (natural) and "T" (trash) compounds are assigned to a hazard class and a brief statement explains the reasoning behind the classification (see hazard classes in Format I).

F. Sources Used in Search

The on-line data bases, Merck Index and NIOSH Registry were searched for the "C" and "T" compounds. The information provided for the Active compounds came mainly from the EPA-furnished list of Chemical Abstracts Service data.

Format III

Format III is essentially an abbreviated version of Format I. The compounds for which Format III is used are mostly GRAS substances (generally recognized as safe by the FDA), or other substances whose relative safety is well substantiated. Format III is identical to Format I, except for the following sections:

J. Government Regulations

All government regulations are listed in one section without any division.

L. Environment

Pertinent environmental data regarding occurrence in nature, environmental effects, accumulation, persistence and biodegradation are all listed in this section with no divisions.

M. Toxicology

Selected data regarding any aspects of toxicology, human or non-human, is presented in this one section.

P. References and Review Articles

Only the references actually used are listed in this section.

Format IV

A. EPA Accession Number and Name

The number and name of the compound as designated in the EPA Inerts List.

B. American Chemical Society Chemical Abstracts Service (CAS) Name and Registry Number

The CAS name and registry number when available, as in Format I.

C. Other Names

Synonyms of the title compound are listed here. These synonyms are preceded by an abbreviation of the synonym type: (EPA S), indicating the synonym(s) found on the original inerts list; (S), indicating the synonyms such as those found in the Merck Index, Chemline, the NIOSH Registry, or on the EPA-furnished printout of CAS data.

No trade names are listed in this section on Format IV.

D. Chemical Composition

The empirical formula and molecular weight or a general description as in Format I.

E. Molecular Structure

A drawing of the molecule is included when possible showing the arrangement of the atoms, alkyl chains and ethoxyl groups.

F. Surfactant Class

The 1974 edition of McCutcheon's Detergents and Emulsifiers lists 58 different chemical classes of surfactants. 37 of these classes are represented by the 250 surfactants taken from the inerts list. The appropriate class is listed for each surfactant.

G. Physical Data

Many trade names were available for the surfactant inerts. It was possible to collect physical data for some of them from McCutcheon's Detergents and Emulsifiers and from technical literature supplied by the manufacturers. In this section the trade name along with the chemical name, the manufacturer, the physical state, the product concentration and the H. L.B. are given.

The hydrophilic-lipophilic balance or H. L. B. is a measure of the emulsifying efficiency of a surfactant. It is represented by an arbitrary scale on which the higher values indicate greater hydrophilic character.

The solubility and the ionic character - - whether the surfactant is anionic, nonionic or cationic. are also listed in this section.

H. Usage

The data in this section was obtained from the E. P. A. Code of Federal Regulations; 40 part 180.1001, McCutcheons Detergents and Emulsifiers, and from technical information supplied by manufacturers. When no use is available, a probable use is sometimes suggested.

I. Government Regulations

The EPA and FDA regulations covering each surfactant are listed in this section.

J. Environment

Data concerning biodegradability, metabolites, persistence and aquatic toxicity are recorded here. Very often, the paucity of information required data on similar compounds be used. A standard paragraph on the environmental effects of an entire chemical class of surfactants was often written here for each member of that class. Environmental data was obtained from Human Safety and Environmental Aspects of Major Surfactants, Surfactant Biodegradation, McCutcheon's Detergents and Emulsifiers and from technical information furnished by the manufacturers.

K. Toxicology

All human and non-human toxicity data, except for aquatic toxicity information, is recorded here. As in the previous section it was often necessary to use data on similar compounds and/or to write a brief summary of the toxicity of an entire class of surfactants.

Toxicity information was mainly available from the NIOSH Registry, Human Safety and Environmental Aspects of Major Surfactants, Nonionic Surfactants and Cationic Surfactants. Information was also obtained directly from manufacturers, with a small amount coming from the on-line data bases.

L. Recommendation

After a professional review of the data presented, each group of surfactants was assigned to a hazard class and a brief summary and evaluation of the group was given (see hazard classes in Format I).

M. Bibliography

References are listed in normal bibliographic manner. Literature from manufacturers is cited as "Technical Information" preceded by the manufacturers name.

Data Sources

When the data collection was initiated, key persons (in toxicology and biology) in Government agencies and other organizations were contacted for both published and unpublished information. Representatives from the following organizations were contacted for information pertaining to the inerts:

- NAS
- NCI
- FDA
- NIEHS
- Selected Industrial Concerns (particularly for the surfactants)
- Selected Associations
- NIOSH
- NLM
- Soap and Detergent Association
- FASEB
- NTIS
- DOT – Hazardous Materials Division
- OSHA
- International Labor Organization
- Hazelton Laboratories
- Local University Libraries

Listed in Table 2 are the more significant standard texts, references, periodicals, and on-line data bases that were used in the data collection. Explanations are provided with each listing as to the type of data that was extracted from each individual source.

TABLE 2. SOURCES OF DATA

1. The Merck Index, 9th Ed., Merck and Co., Rahway, N. J., 1976.

   Information on substance definition and usage, synonyms, and physical data such as melting point, boiling point, vapor pressure, molecular weight and formula, physical state, color, odor, solubilities and density. A general toxicity statement was sometimes available.

2. Handbook of Chemistry and Physics, 57th Ed., CRC Press, Cleveland, Ohio, 1976.

   Physical data, i.e. melting and boiling points, vapor pressure, state, color, solubilities and density.

3. Registry of Toxic Effects of Chemical Substances, National Institute of Occupational Safety and Health, U. S. G. P. O., Washington, D. C., 1976.

   Synonyms, molecular weight, quantitative mammalian toxicity data, aquatic toxicity ratings, government regulations and available reviews.

4. EPA – Furnished Print Out of CAS (Chemical Abstracts Service) Data.

   CAS (Chemical Abstracts Service) numbers, synonyms, trade names, and molecular formula.

5. Clinical Toxicology of Commercial Products, M. N. Gleason, et al, 2nd and 3rd Eds., Williams and Wilkins Co., Baltimore, 1963 and 1969.

   Human toxicity data, (mostly symptomatic), occasional case studies and quantitative animal toxicity on fairly well-known compounds.

6. Dangerous Properties of Industrial Materials, N. L. Sax, 2nd Ed., Reinhold Publishing Corp., New York, 1963.

   Limited physical data, symptomatic human toxicity information, occasional case studies and some human toxic doses.

7. McCutcheon's Detergents and Emulsifiers. North American Ed., McCutcheons Division, The Manufacturing Confectioner Publishing Co., Ridgewood, N.J., 1976.

   Name of manufacturer, formula, physical data, usage information. Surfactant classification. Largely used.

8. Surfactant Science Series:
   Nonionic Surfactants, Vol. 1, Schick, M. J. Ed., Marcel Dekker Inc., New York, 1967.
   Surfactant Biodegradation, Vol. 3, Swisher, R. D., Marcel Dekker Inc., New York, 1970.
   Cationic Surfactants, Vol. 4, Jungermann, E., Ed., Marcel Dekker Inc., New York, 1970.

   Classification, information on biodegradation, and mammalian toxicology for surfactants.

9. Human Safety and Environmental Aspects of Major Surfactants, A report to the Soap and Detergent Association, May, 1977.

Environmental and toxicological effects of seven major groups of surfactants.

10. OPD Chemical Buyers Directory. Oil, Paint and Drug Reporter, Schnell Publishing Co., New York, 1976.

Manufacturers and suppliers

11. IARC Monographs on the Evaluation of Carcinogenic Risk of Chemicals to Man, World Health Organization, Geneva.

Comprehensive toxicological evaluation of compounds suspected of being carcinogens.

12. WHO Food Additive Series. World Health Organization, Geneva.

Comprehensive evaluation of the safety of compounds used as food additives.

13. CTFA Cosmetic Ingredient Dictionary, 1st Ed., The Cosmetic Toiletry and Fragrance Association, Inc., Washington, D. C., 1973

CAS numbers, definitions, synonyms.

14. GRAS Monograph Series, U. S. Food and Drug Administration, U. S. G. P. O., Washington, D. C.

Comprehensive evaluation of compounds generally recognized as safe (GRAS) as food additives.

15. Code of Federal Regulations 40. Part 180.1001, U. S. EPA, Washington, D. C., 1976.

Listing of compounds excluded from tolerance requirements when used in pesticide formulations as inert ingredients and limitations on their use.

16. Code of Federal Regulations 21, Part 121-130, U. S. F. D. A, Washington, D. C., 1976.

Restrictions on the use of compounds as food additives or as components of articles coming in contact with food.

17 Code of Federal Regulations 29. Part 1910.1000, U. S. , OSHA. Washington, D. C.

Limitations on employee's exposure to compounds in the working environment.

18. Code of Federal Regulations, 49. Part 172.101. DOT, Washington, D. C., 1976.

Regulations on the transportation of compounds.

On-Line Data Bases

Chemline

CAS Registry name and numbers, molecular formulas, synonyms.

*Toxline and Toxback

Abstracts on human and animal short and long term toxicity studies, environmental effects, adverse drug reactions, metabolic studies, usage information, many studies on carcinogenesis and co-carcinogenesis, mutagenic and teratogenic effects.

Medline

Abstracts of drug effects and metabolic effects of chemicals in humans and animals.

Cancerline

Abstracts on cancer studies on humans and animals.

*The majority of data used in this study.

Inert Evaluation Procedure and Search Strategy

After the Inert List was corrected, revised and the compounds chemically classified, the evaluation was initiated. In general, the inerts were studied in numeric order from the list. In some cases, particularly when there was a scarcity of data (e.g. surfactants), the compounds were evaluated in the previously discussed chemical classes. The following 23 steps summarize the general evaluation procedure and Figure 1 depicts schematically these activities and the more important data sources.

1. Make up individual folder for each inert compound.

2. Incorporate EPA-furnished printout listing accession number(s), CAS number, synonyms, trade names and the molecular formula (this printout is not available for all compounds).

3. Search Registry of Toxic Effects of Chemical Substances (NIOSH) for: names, molecular weight, LD50's, TDLO's and other quantitative toxicity data for the different routes of administration, aquatic toxicity ratings, OSHA regulations, DOT regulations, NIOSH and ACGIH recommended standards, molecular formula, and indication of neoplasms (TFX: NEO), teratogenesis (TFX:TER), and carcinogenicity (TFX:CAR).

4. Search Merck Index for usage information, synonyms and physical data such as melting point, boiling point, vapor pressure, molecular weight and formula, physical state, color, odor, solubilities and density, and for a general toxicity statement.

5. Search CRC Handbook of Chemistry and Physics for physical data as in (4).

6. Search Gleason's Clinical Toxicology of Commercial Products for human toxicity data. Information is mostly symptomatic, some case studies are mentioned and occasionally quantitative animal data (LD50's): a human toxicity rating is assigned to the most common compounds. This reference deals mainly with the fairly well known compounds.

7. Search Sax's Dangerous Properties of Industrial Materials for some physical data similar to (4), symptomatic human toxicity information, occasional case studies, and some human toxic doses.

8. Search several other standard references such as; McCutcheon's Detergents and Emulsifiers, CTFA Cosmetic Ingredient Dictionary, IARC Monographs on the Evaluation of Carcinogenic Risk of Chemicals to Man, WHO Food Additive Series, GRAS Monograph Series. OPD Chemical Buyers Directory, the ACGIH's Threshold Limit Values, the EPA, FDA, OSHA and DOT Code of Federal Regulations and selected review articles and technical reports.

9. Biochemist draws molecular structure.

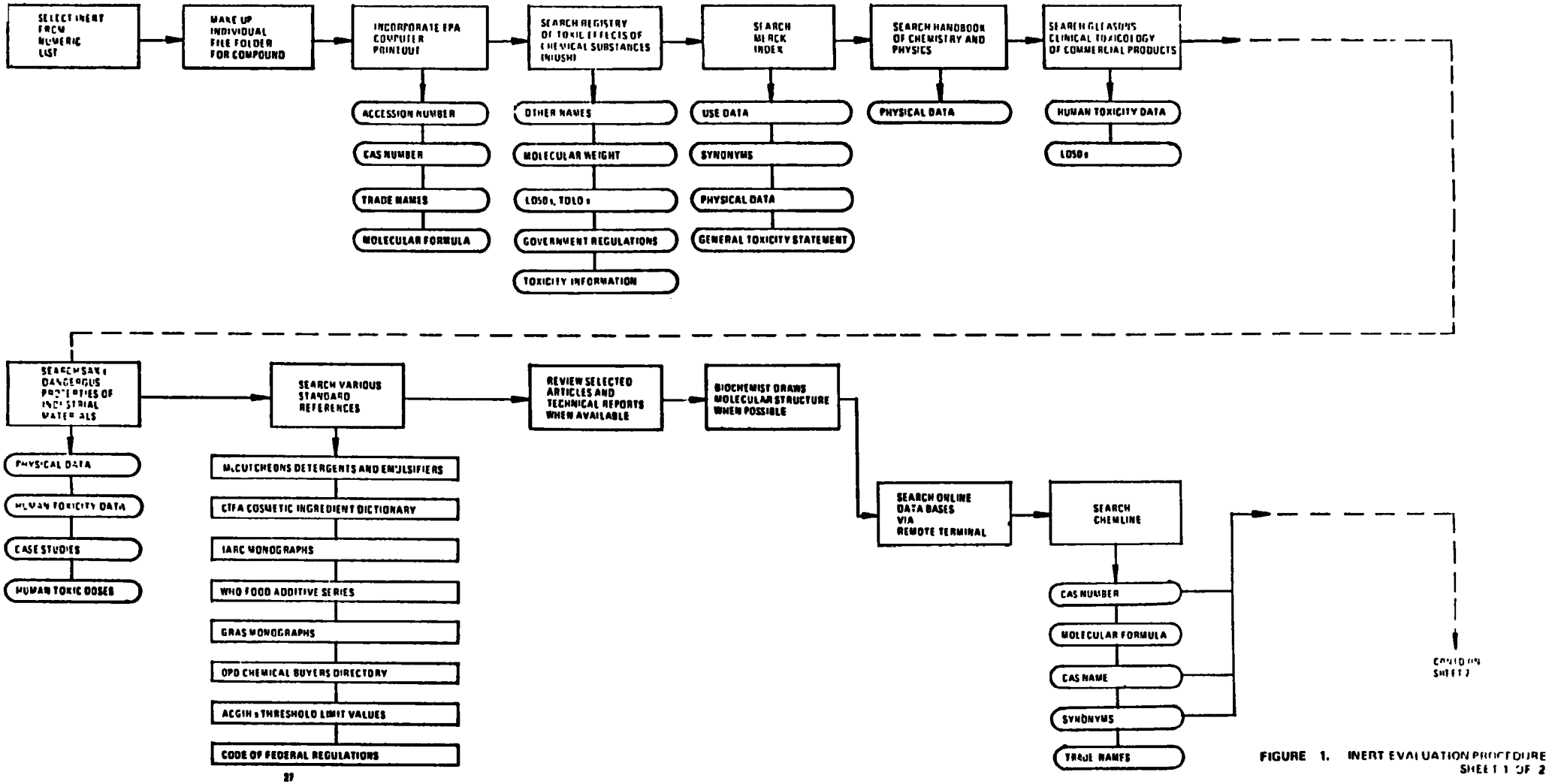


FIGURE 1. INERT EVALUATION PROCEDURE
SHEET 1 OF 2

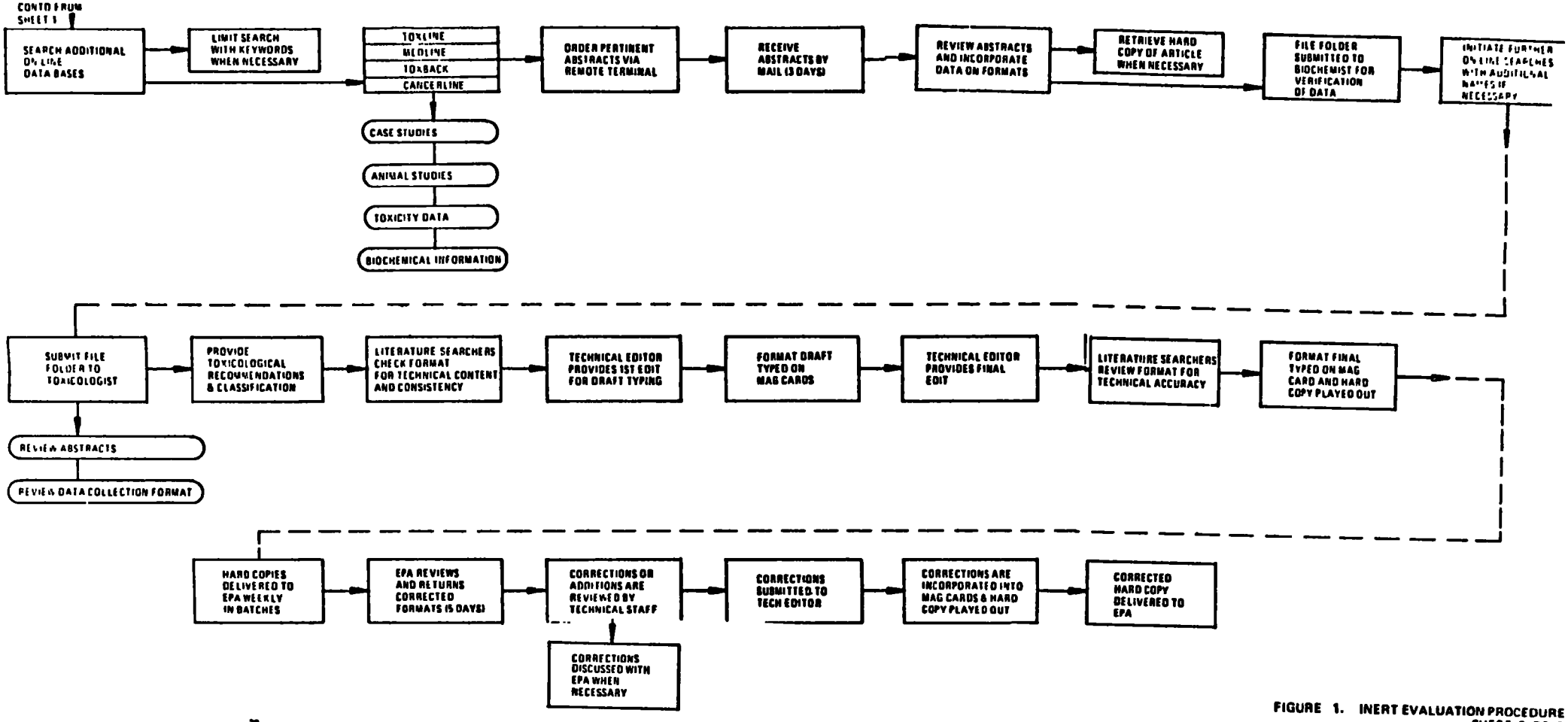


FIGURE 1. INERT EVALUATION PROCEDURE
SHEET 2 OF 2

10. Search On-Line Data Bases.

a) Search CHEMLINE first for CAS number, molecular formula, CAS name, synonyms, trade names (Not all inerts are on CHEMLINE.) CHEMLINE printout information should agree closely with EPA furnished printout, but often does not, particularly the CAS number and name.

b) Use CAS number(s) and names from many of the previous sources to search other data bases (Toxline, Medline, Toxback, Cancerline). If many postings are found limit them to the most applicable ones using keywords such as Toxi:, Terato:, Muta:, Carcino:, Cancer:.

Listed below are five separate examples of various search strategies utilized for the on-line data base search:

Chloroethane EPA 000672

For this compound. a very simple search strategy was all that was needed to turn up a reasonable number of abstracts. The CAS number yielded 11 postings in the data base and the name of the compound yielded 29 more for a total of 40 abstracts.

1, 3-Dibutyl-2-thiourea EPA 000298

No postings were found for this compound. Chemline was then searched for various thioureas. The CAS numbers of these compounds yielded 8 postings. The word "DI: THIOUREA" yielded 21 more for a total of 29 abstracts.

Citric acid, tris(triethylamine) salt of EPA 000433

No specific postings were available on triethylamine citrate. Since the citric acid moiety is known to be of no consequence, the search was concentrated on triethylamine. The CAS number for triethylamine and the word "TRIETHY-LAMINE:" yielded 121 postings.

Calcium Perchlorate EPA 000424

No postings were available specifically on this compound. Information was obtained, however, using "PERCHLORATE:". CAS numbers of other related perchlorate salts were selected from Chemline. These related CAS numbers along with "PERCHLORATE:" yielded 189 postings. The most applicable abstracts were selected by searching the 189 postings with the key words "MUTA:", "TERATO:", "POISON:". "CANCER.", and "CARCINO:". The results of using the key words were added together for a total of 28 final postings.

It was anticipated that very few postings would be available on this compound, so two trade names ("Dowtherm 209" and Dowanol 33B") were used along with the CAS number to search the data base. Two postings resulted from this search, neither of which were the result of using the trade names. In another search statement, the trade names were truncated to "Dowtherm:" and "Dowanol:". The less specific trade names yielded six additional postings. By using these truncated names, a whole family of trade names is searched under the assumption that the members of the family are similar compounds.

c) Wait three days for abstracts to arrive by mail (if any).

d) Review abstracts for case studies, animal studies, metabolism, absorption, teratology. carcinogenesis, mutagenesis, excretion, acute and chronic effects, environmental effects and anything else pertinent to the toxicological evaluation.

e) List any pertinent info from abstracts on form.

11. Get hard copy of abstracts if necessary.

12. Submit folder to Biochemist for verification of chemical information.

13. Make any corrections or additions pointed out by Biochemist; search on-line data bases using any additional names (esp. trade) mentioned by Biochemist.

14. Submit folder to Toxicologist for review of toxicological information, recommendations and classification.

15. Review form and recommendations for errors and consistency.

16. Send form to technical editor for proofreading.

17. Editor sends form to typist.

18. Typist types draft on mag card.

19. Editor reviews draft for typo's, etc.

20. The literature searchers (Chemist and Environmentalist) review rough draft for technical typo's, etc. that the editor may not be able to catch.

21. Typist corrects rough draft on mag card.

22. Typist prints final copy.

23. Copy submitted to EPA.

*At just about any point in this process, but usually near the beginning, additional errors in the EPA inert list may be uncovered and a problem form (Form 2) will have to be made. These errors include duplication of names, spelling, improper synonyms. improper designation (A, C, T, S, I) etc.

Surfactants

Of the 663 inert compounds, approximately 250 were true surfactants. Generally, chemical and toxicological information was scarce and the compounds were very difficult to search.

Initially, the standard evaluation procedure was performed on the 250 individual surfactants. This was not very successful but the limited data that was collected was transferred to the data collection formats. At this time efforts were initiated to contact individual manufacturers of these compounds. A form letter was developed (see Appendix 5) and letters were sent to 180 surfactant manufacturers or formulators. These companies were selected from McCutcheon's Detergents and Emulsifiers, North American Edition. A list of these companies is in Appendix 6. This effort resulted in the acquisition of considerable recent technical literature and information, much of it not available from general literature sources.

Toxicological Classification

As data was collected on individual compounds, the inerts were toxicologically evaluated. Following a professional review of available literature, the inerts were categorized as:

Class 1 This category of inerts contains those found to have chemical, toxicological or environmental characteristics that require immediate attention.

Class 2 Available data indicate probable cause for alarm because chemical structure is similar to a known toxicant, or a metabolic environmental pathway may result in breakdown to known toxicant, or irreversible chronic effects are known, e.g., neurotoxicity, irreversible eye damage, skin sensitization, etc. Massive fish kills or other environmental effects also triggers this category.

Class 3 Hazard data inadequate for total review where it is apparent that the use of the inert would indicate certain test requirements.

Class 4 No hazard data found or complete testing published i.e., ideal situations.

Class 5 Nature of inert does not allow chemical definitions, i.e., manure, corn, rotten eggs, etc.; however, it is reasonable to assume no hazard exists.

Class 6 Miscellaneous Class – errors in number or name; the name could not be properly identified, number incorrect, incorrect classification, etc.

Listed in Table 3 are those compounds which were assigned a Class 1 or 2 hazard classification.

TABLE 3

CLASS 1 AND 2 COMPOUNDS

EPA Accession Number	Compound Name	Hazard Class
419	Phenarsazine oxide	1
623	Dimethylamine	1
692	Hydroxylamine Sulfate	1
695	Lead	1
734	2-Imidazolidinethione	1
766	Dioxane	1
781	Saccharin	1
914	2-Ethylhexanoic acid, nickel salt of	1
83	Diethanolamine oleate	2
272	7-Hydroxy-4-methylcoumarin	2
298	1,3-Dibutyl-2-thiourea	2
308	alpha, beta-Epoxy-beta-methylhydrocinnamic acid, ethyl ester of	2
316	Dichloroanilime	2
332	Tris (2-Butoxyethyl) phosphate	2
343	1-Methyl-2-pyrrolidene	2
433	Citric acid, tris (triethylamine) salt of	2
435	Citric acid, tris (dimethylamine) salt of	2
455	Ethylenediaminetetraacetic acid, tetrakis (triethylamine) salt of	2
461	Ethylenediaminetetraacetic acid, tetrakis (diethanolamine) salt of	2
571	Triethylamine phosphate	2
595	7-(Diethylamino)-4-methylcoumarin	2
706	Diethylenetriamine	2
724	1-Amino-2-propanol nitrite	2
736	1, 3-Diethyl-2-thiourea	2
751	Lead chromate	2
752	N, N'-Dinitrosopentamethylene tetramine	2
753	Dicyanodiamide	2
777	Propylamine nitrite	2
795	Nitromethane	2
843	Nitrilotriacetic acid, tris (triethylamine) salt of	2
850	Aniline	2
882	Triethyl phosphate	2
895	Hexane	2
898	Nonylphenol, barium salt of	2
899	Toluic acid, cadimun salt of	2
941	N-Ethyltoluenesulfonamide	2
976	1, 2-Eposybutane	2
981	Alpha, alpha-Dimethylbenzyl hydroperoxide	2
983	Atropine	2

CLASS 1 AND 2 COMPOUNDS – Continued

EPA Accession Number	Compound Name	Hazard Class
1001	Maleic anhydride	2
1007	Dimethyl ether	2
1009	2, 4, 6-Trinitrophenol, sodium salt of	2
1034	2, 2' - (Ethylamino) diethanol	2
1039	Diisopropanolamine	2
1069	Acetonitrile	2
1070	1, 2, 3-Benzotriazole	2
1085	Triethylamine	2
1093	2-Nitropropane	2
1116	Triethylamine Sulfate	2
1132	3, 4-Epoxycyclohexanecarboxylic acid, (3, 4-epoxycyclohexyl) methyl ester of	2
1193	tert-Butyl peroxide	2
1210	Dibutyldithiocarbamic acid, zinc salt of	2

RECOMMENDATIONS FOR FURTHER STUDY

During the course of the contract, certain additional areas of work were identified. These tasks became apparent as a result of experience gained during the chemical investigations. Some of them are closely related to the initial inerts studies and actually represent more detailed investigations of the original work.

In most cases the compounds in the EPA Inerts List represent defined compounds with specific chemical and physical properties. However, in several instances the compounds listed cover wide ranges of chemicals of varying toxicological and physical properties. These listings should be subdivided and treated as separate compounds. Examples of these are listed below:

- Polyethylene glycol – At least three families are commercially available. The materials vary from liquids to hard waxy solids. The toxicological profiles also vary with the physical properties.
- The Resins – Possibly as many as 50 resins or derivatives of resins from plant sources are commercially available. Some of these are exceedingly strong skin sensitizers. Some degree of division into smaller sub-classes would be desirable.
- Terpenes – Many terpenes or derivatives are available commercially. These vary considerably in their toxic properties.
- The Synthetic Resins – Generally, these materials vary inversely in toxicity with their molecular weight. Thus, the monomers are most toxic. Some segregation by chain length or molecular weight would be useful.
- Isomeric materials – Many solvents and intermediates are available in optically active forms. The toxicological profiles are often quite different from isomer to isomer. Where such materials are available with one isomer predominant, separate evaluations should be performed.

This subdivision of individual listings would provide:

- Uniformity of toxicological classification and assurance that the most appropriate class is assigned to each listing
- Improved definition of toxicological and chemical properties for each listing

- Assistance to EPA in the formulation of future bans or restrictions on selected compounds. That is, by further definition of these specific listings, regulations could be confined to specific designations of compounds. (e.g. one particular family of polyethylene glycol)

This task could serve as a first step in the preparation and writing of specifications for selected compounds pertaining to the formulation of pesticides containing inert ingredients.

A separate task would consist of completing formats on the Active compounds that appeared on the original 1606 listing. These are compounds that appear on the EPA Active Chemical List but are also apparently used as inert ingredients in some formulations.

Prior to the decision to utilize a Format II for these compounds, Potomac Research had started collecting data and completing Format I's on these compounds. Thus a portion of these compounds have been searched or partially searched and the format filled in. Generally, there exists more chemical and toxicological data for these compounds than the true inerts.

By including these compounds in the evaluations, a more complete data base of inerts will result. That is, the total group of compounds will represent those chemicals that are used as inerts in formulations and thus specifications and regulations for inerts can be readily applied to the appropriate compound.

Another worthwhile task would be the formulation of detailed criteria documents on Class 1 and Class 2 compounds. This would include an in-depth literature search on each compound. The preliminary investigations performed during this contract would provide an excellent starting point for such studies. The finished product could be used by EPA in the event of any regulatory action.

APPENDICES

Appendix 1

Appendix 1
Inert List Corrections

NO	NAME	PROBLEM	CORRECTION
12S	Dodecylbenzenesulfonic acid, 2-. (2 - aminoethyl) amino' ethanol salt of	typographical error	corrected as follows; 12S Dodecylbenzenesulfonic acid, 2-_ (2 - aminoethyl) amino' ethanol salt of
12S	Aminoethanolamine dodecyl-benzene sulfonate	improper synonym	number deleted, new number 001224
46T	Tetrasodium N - (1, 2 - dicarboxyethyl) - N - octadecyl sulfosuccinate	not trash	number changed to 4€
62S	cis - 9 - Octadecenyl sulfate, sodium salt of	synonym of 61	number deleted, new number 61S
167	Toluene and xylene alkylated with dicyclopentadiene	indefinite	number changed to 167T
205	2, 2' - Tetradecyliminodi-ethanol	duplicate of 197	205 deleted
206	2, 2' - Hexadecyliminodi-ethanol	duplicate of 198	206 deleted
207	2, 2' - Octadecyliminodi-ethanol	duplicate of 199	207 deleted
213	Optical brightener	indefinite	number changed to 213T
242C	Paper	not natural	number changed to 242T
243C	Glue	not natural	number changed to 243T

257	Zonolite	synonym of 256	number deleted, new number 256S
259	Silica	occurs on the EPA Active Pesticides list	number changed to 259A
271	2, 6 - Di-tert-butyl-p-cresol	duplicate of 689A	271 deleted
271S	2, 6 - Bis (1, 1 - dimethyl-ethyl) - 4 - methyl phenol	synonym of 689A	number changed to 689A (S)
271S	Butylated hydroxytoluol	synonym of 689A	number changed to 689A (S)
271S	BHT	synonym of 689A	number changed to 689A (S)
276	Stearic acid	duplicate of 347A	276 deleted
283S	Carbon	duplicate of 284, improper synonym of 283	283S deleted
294	Vinylacetate copolymer	indefinite	number changed to 294T
295	Stearic acid, aluminum salt of	duplicate of 762	295 deleted
296S	Aluminum stearate	duplicate of 762S	296S deleted
299S	Dibutyl thiourea	synonym of 298	number deleted, new number 298S
302	Polyethylene film	synonym of 1188	number deleted, new number 1188S
318C	Pharmamedia	not natural	number changed to 318T
321C	Flo - float	not natural	number changed to 321T
333S	Tributoxyethylphosphate	synonym of 332	number changed to 332S
340	Phenol	occurs on EPA active pesticides list	number changed to 340A

343	1 - Methyl - 2 - pyrrolidene	typographical error	corrected as follows: 343 1 - Methyl - 2 - pyrrolidine
344S	N - Methyl - 2 - pyrrolidene	synonym of 343	344S deleted, new number 343S, typographical error, corrected as follows: 343S N - Methyl - 2 - pyrrolidine
353	Hydrated lime	synonym of 550A	353 deleted, new number 550A (S)
354S	Calcium carbonate	improper synonym of 354, duplicate of 543A	354S deleted
355C	Paint	not natural, not a synonym of 355	355C deleted, new number created 1223T
356S	Calcium sulfate dihydrate	synonym of 355, improper synonym of 356A	356S deleted, new number 355S
357	Calcium silicate	improper synonym of 357, duplicate of 540A	357 (Calcium silicate) deleted
358	Soapstone	synonym of 361	358 deleted, new number 361S
358C	Fertilizer	not natural	number changed to 358T
358S	Magnesium silicate hydrate	synonym of 361	358S deleted, new number 361S
359	Celite	synonym of 360A	359 deleted, new number 360A (S)
360	Diatomaceous earth	occurs on the EPA Active Pesticides List	number changed to 360A
362C	Perlite	not natural	number changed to 362T
363C	Frianite	not natural	number changed to 363T
365C	Tobacco dust	occurs on the EPA Active pesticides list	number changed to 365A

370C	Medicated block for Phenothiazine	not natural	number changed to 370T
371C	Salt block for Phenothiazine	not natural, probably a synonym of 370	371 deleted, number changed to 370T (S)
373C	Feed supplements	not natural	number changed to 373T
374C	Phosphodust	not natural	number changed to 374T
38LA	Cetyl alcohol	typographical error	corrected as follows: 381A Cetyl alcohol
405	Polybutylene	synonym of 404	405 deleted, new number 404S
410S	2 - (2 - Ethoxyethoxy) ethanol	synonym of 409	410S deleted, new number 409S
410S	Carbitol	synonym of 409	410S deleted, new number 409S
411	Propylene glycol monomethyl ether	synonym of 291	411 deleted, new number 291S
411S	1 - Methoxy - 2 - propanol	duplicate of 291	411S deleted
415	Dipropylene glycol monomethyl ether	duplicate of 1141A	415 deleted
415S	3 - (3 - Methoxypropoxy) - 1 - propanol	synonym of 1141A	415S deleted, new number 1141A (S)
427	Chlorinated biphenyl	occurs on the EPA active pesticides list	number changed to 427A
440	o - Cresol	occurs on the EPA active pesticides list	number changed to 440A
450	Dinitrophenol	occurs on the EPA active pesticides list	number changed to 450A

482	Dodecyland higher aliphatic ketones	indefinite	number changed to 482T
492A	Magfesium sulfate	typographical error	corrected as follows: 492A Magnesium sulfate
512A	Petrolatrum	typographical error	corrected as follows: Petrolatum
515	White oil	indefinite	number changed to 515T
588	D - Limonene	occurs on the EPA active pesticides list	number changed to 588A
596S	4 - Methyl - 7 - diethylamino coumarin	synonym of 595	596S deleted, new number 595S
606S	N, N - Dimethyl - cis- 9 - octadecenylamine benzoate	typographical error	corrected as follows: N, N - Dimethyl - cis - 9 - octadecenylamine benzoate
607	Benzoic acid, N, N - dimethyl - cis, cis - 9, 12- octadienylamine salt of	typographical error	corrected as follows: 607 Benzoic acid, N, N - dimethyl- cis, cis - 9, 12- octadecadienylamine salt of
624C	Lignoflex	not natural	number changed to 624T
626	Stearic acid, magnesium salt of	duplicate of 763	626 deleted
627S	Magnesium stearate	duplicate of 763S	627S deleted
634S	Sodium sulfosuccinate	synonym of 633	634S deleted, new number 633S
648A	Dioctyl sodium sulfosuccinate	synonym of 42A	648A deleted, new number 42A (S)

649	Styrene acrylic copolymer	indefinite	number changed to 649T
655S	Polyoxyethylene octadecyl phenol	synonym of 654	655S deleted, new number 654S
680	Dimethylpolysiloxane	synonym of 311	680 deleted, new number 680S
707C	Chlorinated rubber	not natural	number changed to 707T
708C	Epoxy resin	not natural	number changed to 708T
710	Triisopropylnaphthalene-sulfonic acid, sodium salt of	duplicate of 26S	710 deleted
710S	Sodium triisopropyl naphthalene sulfonate	duplicate of 26	710S deleted
712	Chlorophyll	natural, abundant substance	number changed to 712C
717C	Latex	not natural	number changed to 717T
719C	Dog or cat collar	not natural	number changed to 719T
721	Palmitic acid	duplicate of 275	721 deleted
725	N, N - Dimethyldodecylamine oxide	duplicate of 1068	725 deleted
726	N, N - Dimethyltetradecylamine oxide	duplicate of 156	726 deleted
727	N, N - Dimethylhexadecylamine oxide	duplicate of 157	727 deleted
728	N, N - Dimethyloctadecylamine oxide	duplicate of 196	728 deleted
750	Polysaccharide	indefinite	number changed to 750T
752T	N, N - Dinitrosopentamethy-lene tetramine	not trash	number changed to 752

761	4 - Hydroxybutyric acid, gama - lactone	typographical error	corrected as follows: 761 4 - Hydroxybutyric acid, gamma-lactone
765C	Chlorinated wax	not natural	number changed to 765T
769C	Flavoring	not natural	number changed to 769T
772	Polyethylene polysulfide	indefinite	number changed to 772T
773C	Mineral wool (tile)	indefinite	number changed to 773T
778	N, N - Dimethyl - cis - 9 - octadecenamide	duplicate of 1005	778 deleted
788C	Bois D'arc	indefinite	number changed to 788T
798	Latex polystyrene opacifier	indefinite	number changed to 798T
800S	Sodium oleyl taurine	typographical error	corrected as follows: Sodium oleoyl taurine
803C	Rubber	not natural	number changed to 803T
823	Asbestos fiber	occurs on the EPA active pesticides list	number changed to 823A
828	1, 2 - Dichloropropane	synonym of 486A	828 deleted, new number 468A (S)
866S	Nonylphenyl polyethylene sulfate	improper synonym of 866	name and number deleted
869	Phenyl/trimethylsiloxane	indefinite	number changed to 869T
875	Polyoxyethylene (alkyl C10-C13) ester of phosphoric acid monoethanolamine salt	indefinite	number changed to 875T

887	Sodium salt of phenolic acids	indefinite	number changed to 887T
905C	Shampoo base	not natural	number changed to 905T
938	Dodecylbenzenesulfonic acid, N - (2 - aminoethyl) ethanol-amine salt of	duplicate of 12S	938 deleted
938S	Dodecylbenzenesulfonic acid, 2 (2 - aminoethyl) amino' ethanol salt of	duplicate of 12S	938 deleted
938S	N - (Aminoethyl) ethanolamine salt of dodecylbenzenesulfonic acid	synonym of 12	938S deleted, new number 12S
940	Polyamide resins	indefinite	number changed to 940T
943	Methylated silicones	synonym of 311	943 deleted, new number 311S
946	Sulfonated cod oil	indefinite	number changed to 946T
947	2, 6 - Dimethyl - 4 - hepta-none	synonym of 480A	947 deleted, new number 480A (S)
955	1 - Dodecanol, N, N - diethyl-cyclohexylamine salt of	indefinite	number changed to 955T
956	1 - Tetradecanol, N. N - di-ethylcyclohexylamine salt of	indefinite	number changed to 956T
957	Diethyl cyclohexylamine salts of C12 - C14 fatty alcohols	indefinite	number changed to 957T
958C	Nylon	not natural	number changed to 958T
959	Octadecyloxypoly (ethyleneoxy) ethanol	duplicate of 116	959 deleted
959S	Polyoxyethylene stearyl alcohol	duplicate of 116S	959S deleted

1079	Diglgcol stearate	typographical error	corrected as follows: 1079T Diglycol stearate
1081C	Cardboard	not natural	nubmer changed to 1081T
1083C	Tacks	not natural	number changed to 1083T
1118T	Cocoamino - 2 - hydroxyethyl ropyl sulfate	typographical error	corrected as follows: Cocoamino-2 - hydroxyethyl propyl sulfate
1134T	Carrots	natural product	number changed to 1134C
1144	Acrylic acid polymer	duplicate of 682	1144 deleted
1175T	A - Alkyl (C8 - C15) - omaga - hydroxypolyethylene polyoxypropylene polyoxyethylene (9.5 - 10 moles)	typographical error	corrected as follows: A - Alkyl (C8 - C15) - omega - hydroxy-polyethylene polyoxypropylene polyoxyethylene (9.5 - 10 moles)
1177T	Sodium laury alcohol ethoxy sulfate	typographical error	corrected as follows: Sodium lauryl alcohol ethoxy sulfate
1184	Ecostyloxypoly (ethyleneoxy) ethanol	indefinite	number changed to 1184T
1185	Octadecyloxypoly (ethyleneoxy) ethanol	duplicate of 116	1185 deleted
1186	Hexadecyloxypoly (ethyleneoxy) ethanol	duplicate of 960	1186 deleted
1187	Straget chain blend (14% C20, 32% C18, 51% C16) with 100 moles EO	typographical error	corrected as follows: 1187 Straight chain blend (14% C20, 32% C18, 51% C16) with 100 moles EO
1189	Polyethylene, chlorinated	indefinite	number changed to 1189T

964	Polyoxyethylene polyoxypropylene fatty alcohols	indefinite	number changed to 964T
966S	Potassium lauryl sulfate	synonym of 965	966 deleted, new number 965S
974	Methyl isoamyl ketone	synonym of 973	974 deleted, new number 973S
979	Safflow oil	typographical error	corrected as follows: 979 Safflower oil
984C	Pharmaceutical glaze	not natural	number changed to 984T
999A	Ammonium carbonate	duplicate of 542A	999A deleted
1002T	Tinuvin P	definite, well known compound	number changed to 1002
1008C	Ball powder	not natural	number changed to 1008T
1026	Polyethylene oxide	synonym of 147	1026 deleted, new number 147S
1027	Mixed fatty and rosin acids	indefinite	number changed to 1027T
1028	Tall oil rosin	component of 163	1028 deleted, new number 163S
1030	Vinylbenzene vegetable oil copolymer	indefinite	number changed to 1030T
1042C	Polywax	indefinite	number changed to 1042T
1059	Ethylene glycol monobutyl ether	synonym of 406A	1059 deleted, new number 406A (S)
1059S	2 - Butoxyethanol	duplicated of 406A	1059S deleted
1062	Gum gliatti	typographical error	corrected as follows: 1062 Gum ghatti
1071	Tall oil fatty acids	component of 163	1071 deleted, new number 163S

1079	Diglgcol stearate	typographical error	corrected as follows: 1079T Diglycol stearate
1081C	Cardboard	not natural	number changed to 1081T
1083C	Tacks	not natural	number changed to 1083T
1118T	Cocoamino - 2 - hydroxyethyl ropyl sulfate	typographical error	corrected as follows: Cocoamino-2 - hydroxyethyl propyl sulfate
1134T	Carrots	natural product	number changed to 1134C
1144	Acrylic acid polymer	duplicate of 682	1144 deleted
1175T	A - Alkyl (C8 - C15) - omaga - hydroxypolyethylene polyoxypropylene polyoxyethylene (9.5 - 10 moles)	typographical error	corrected as follows: A - Alkyl (C8 - C15) - omega - hydroxy-polyethylene polyoxypropylene polyoxyethylene (9.5 - 10 moles)
1177T	Sodium laury alcohol ethoxy sulfate	typographical error	corrected as follows: Sodium lauryl alcohol ethoxy sulfate
1184	Ecostyloxypoly (ethyleneoxy) ethanol	indefinite	number changed to 1184T
1185	Octadecyloxypoly (ethyleneoxy) ethanol	duplicate of 116	1185 deleted
1186	Hexadecyloxypoly (ethyleneoxy) ethanol	duplicate of 960	1186 deleted
1187	Straget chain blend (14% C20, 32% C18, 51% C16) with 100 moles EO	typographical error	corrected as follows: 1187 Straight chain blend (14% C20, 32% C18, 51% C16) with 100 moles EO
1189	Polyethylene, chlorinated	indefinite	number changed to 1189T

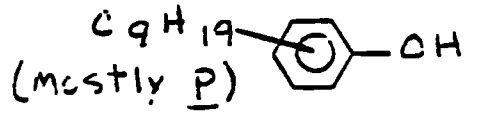
1194S	Di - tert - butyl peroxide	synonym of 1193	1194S deleted, number changed to 1193S
1199C	Carrageenan	well studied, processed natural substance	number changed to 1199
1204T	Polyester esin from ethylene glycol, fumaric acid and rosin	typographical error	corrected as follows: 1204T Polyester resin from ethylene glycol, fumaric acid and rosin
1211S	Zinc dibutyldithiocarbamate	synonym of 1210	1211S deleted, number changed to 1210S
1222S	Polyoxyethylene (4-70 moles) octylphenol	synonym of 1221	1222S deleted, number changed to 1221S
1223T	Paint	new number	created to handle former 355C
1224	Aminoethanolamine dodecylbenzene sulfonate	new number	created to handle former 12S
1225	Tetraglyceryl oleate	new number	created to handle former 679S

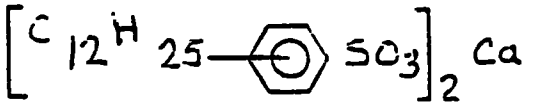
Appendix 2

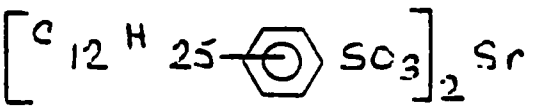
Appendix 2
Molecular Structures

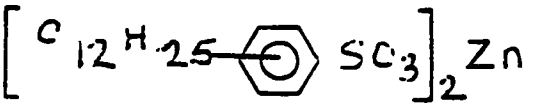
1. 

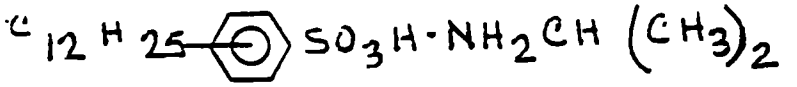
2. 

3. 

6. 

7. 

8. 

9. 

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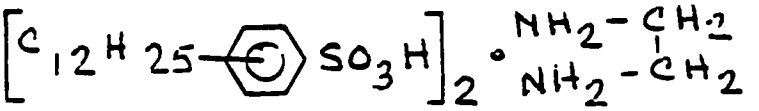
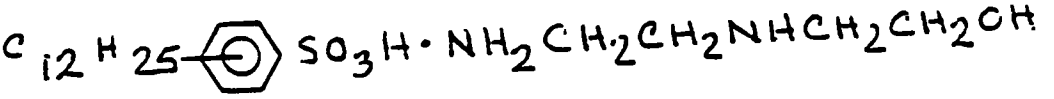
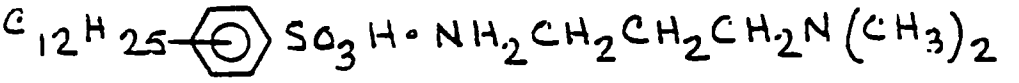
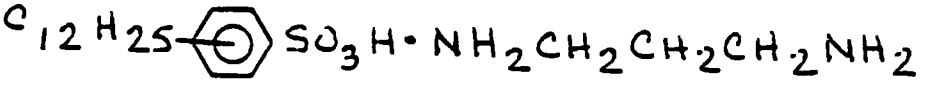
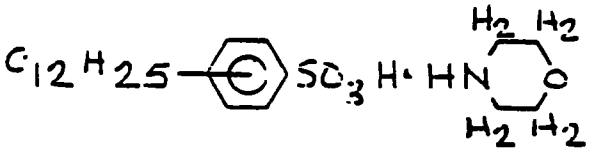
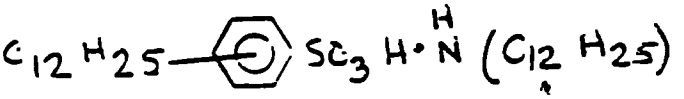
11. 

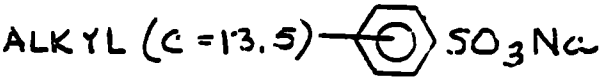
12. 

13. 

14. 

17. 

18. 

19. 

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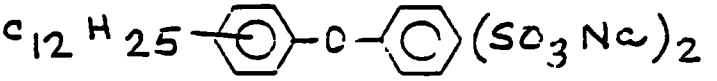
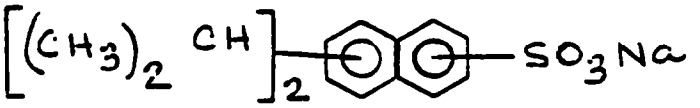
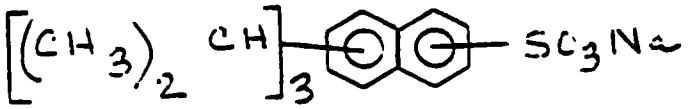
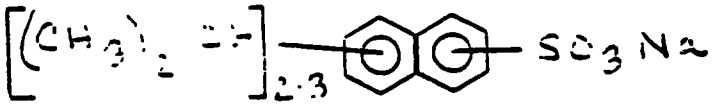
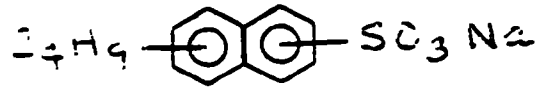
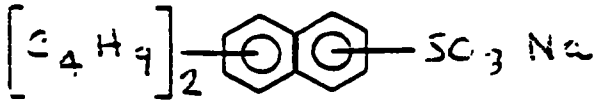
24. 

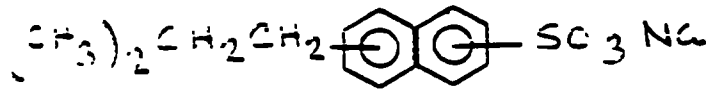
25. 

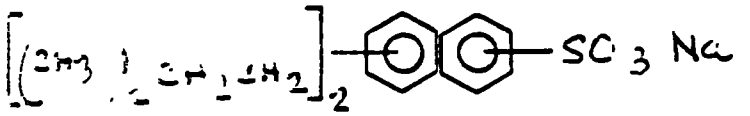
26. 

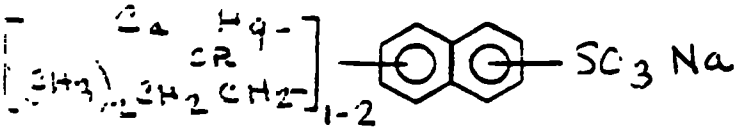
27. 

28. 

29. 

30. 

31. 

32. 

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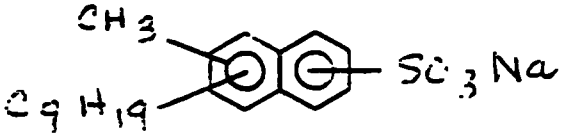
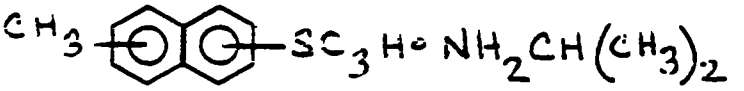
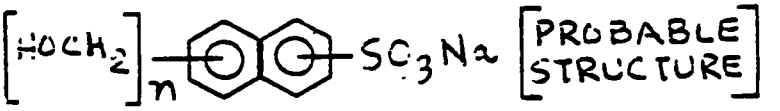
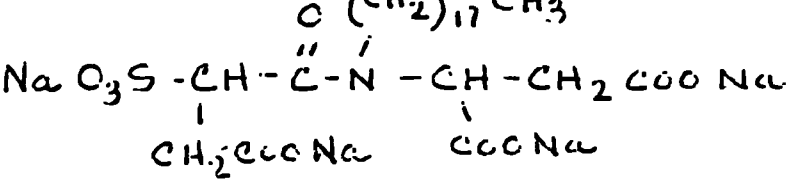
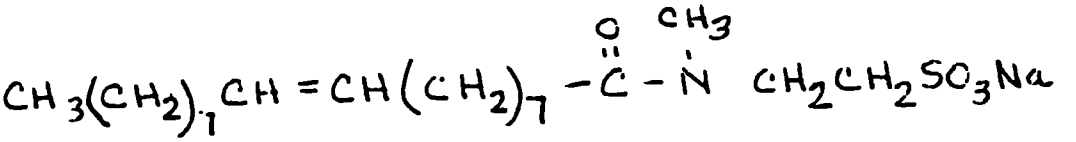
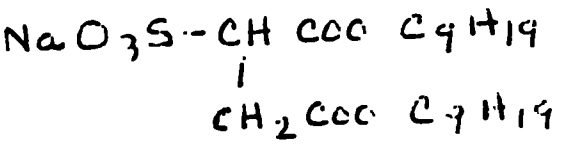
37. 

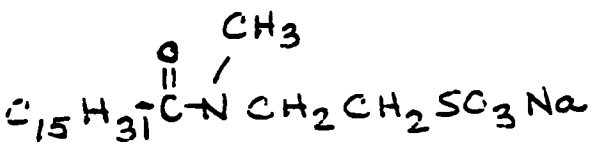
38. 

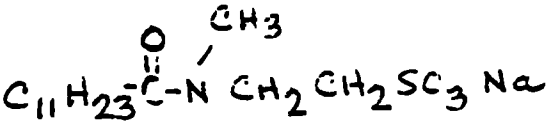
39. 

46. 

53. 

43. 

54. 

55. 

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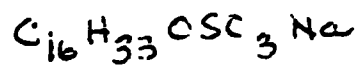
59. 

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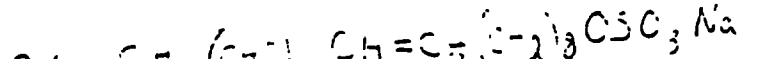
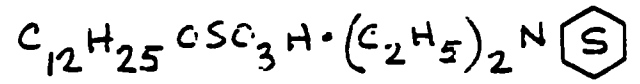
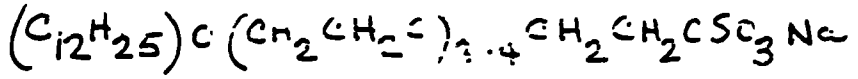
61. 

63. 

65. 

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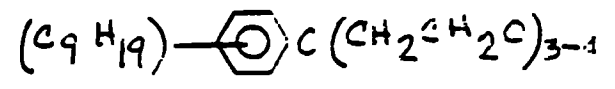
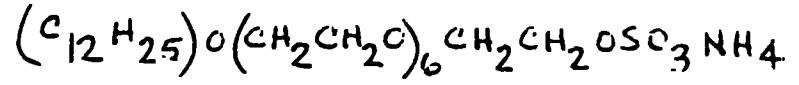
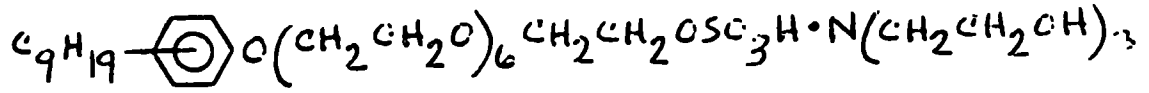
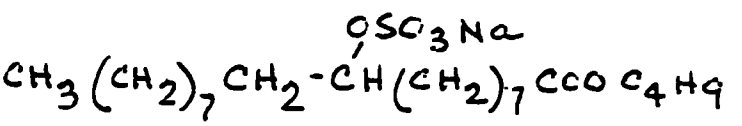
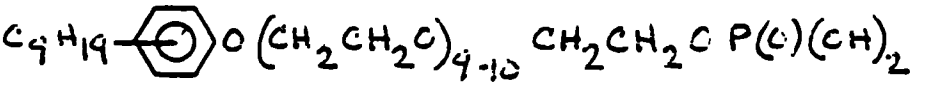
67. 

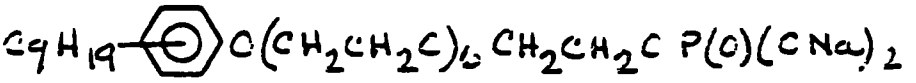
68. 

69. 

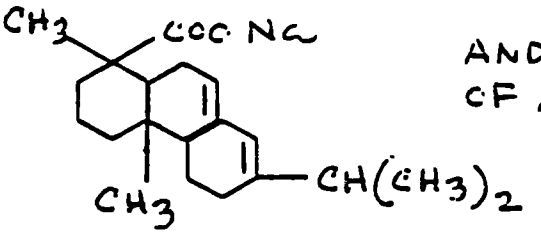
70. 

72. 

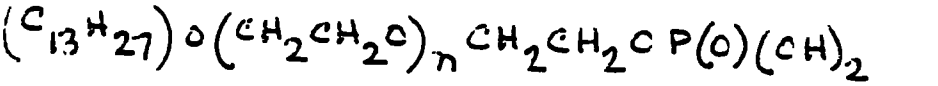
MAY HAVE MORE GROUPS ON PHOSPHATES

73. 

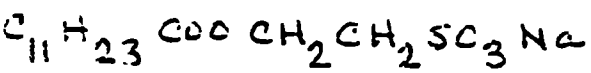
MAY ALSO BE MONO-Na SALT

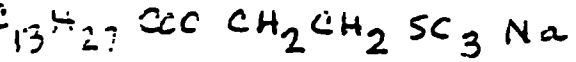
74. 

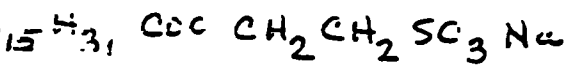
AND RELATED COMPOUNDS OF ACID IN ROSIN

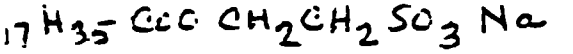
76. 

MAY HAVE MORE THAN ONE GROUP ON PHOSPHATE

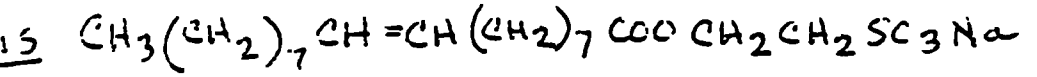
77. 

78. 

79. 

80. 

81. (COCONUT FATTY ACIDS) $CH_2CH_2SO_3Na$

82. 

83. <u>cis</u> $CH_3(CH_2)_7CH=CH(CH_2)_7COOH \cdot NH(CH_2CH_2OH)_2$

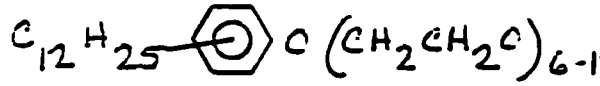
86. CH_3NHCH_2COONa

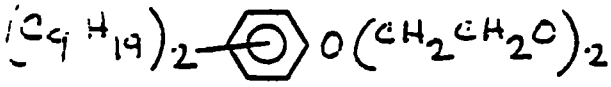
93. $(C_{12}H_{25})O(CH_2CH_2O)_nCH_2CH_2OH$

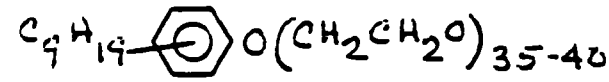
108. $HO(CH_2CH_2O)_n-C_6H_8(OH)_6$ HEXAOLEATE

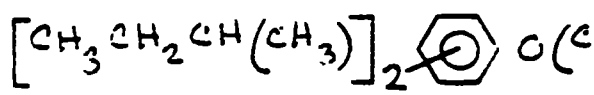
109. $HO(CH_2CH_2O)_n-C_6H_8(OH)_6$ TETRAOLEATE

110. $HO(CH_2CH_2O)_{40}C_6H_8(OH)_6$ PENTA TALL [illegible] - ESTER

112. 
$[C_{12}H_{25}$ = A PROPYLENE TETRAMER]

113. 
$[C_9H_{19}$ = A PROPYLENE TRIMER]

114. 

115. 

116. $C_{18}H_{37}O(CH_2CH_2O)_nCH_2CH_2OH$

117. $C_7H_{15}C(O)NHCH_2CH(OH)CH_3$

118. $C_5H_{11}C(O)NHCH_2CH(OH)CH_3$

124. $CH_3(CH_2)_7CH=CH(CH_2)_7C(O)N(CH_2CH_2OH)_2$

125. $C_{11}H_{23}C(O)NHCH_2CH_2OCH_2CH_2OCH_2CH_2OH$

126. $C_{13}H_{27}C(O)NHCH_2CH_2OCH_2CH_2OCH_2CH_2OH$

127. $C_{15}H_{31}C(O)NHCH_2CH_2OCH_2CH_2OCH_2CH_2OH$

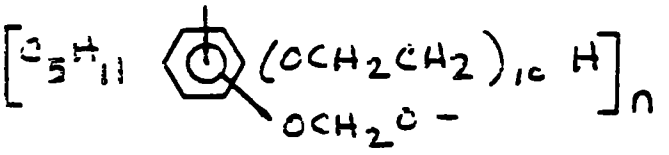
128. $C_{17}H_{35}C(O)NHCH_2CH_2OCH_2CH_2OCH_2CH_2OH$

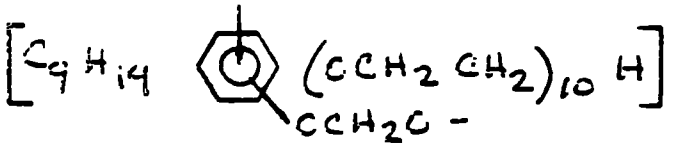
129. COCO NUT OIL FATTY ACID-

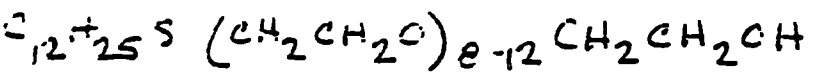
$-NHCH_2CH_2OCH_2CH_2OCH_2CH_2OH$

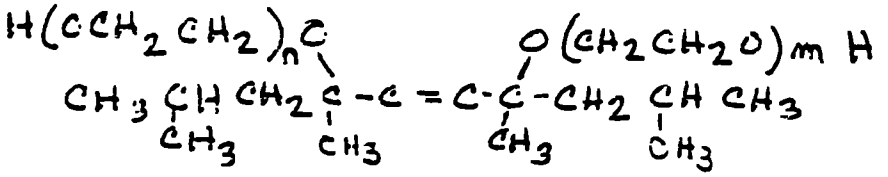
135. $C_7H_{15}C(O)NHCH_2CH(CH_3)O(CH_2CH(CH_3)O)_{10}-$
$-(CH_2CH_2O)_5CH_2CH_2OH$

136. $C_5H_{11}C(O)NHCH_2CH(CH_3)O(CH_2CH(CH_3)O)_{10}-$
$-(CH_2CH_2O)_5CH_2CH_2OH$

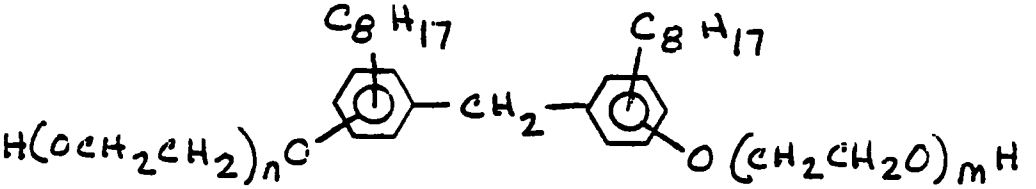
137.  POLYMERIZED

138.  POLYMERIZED

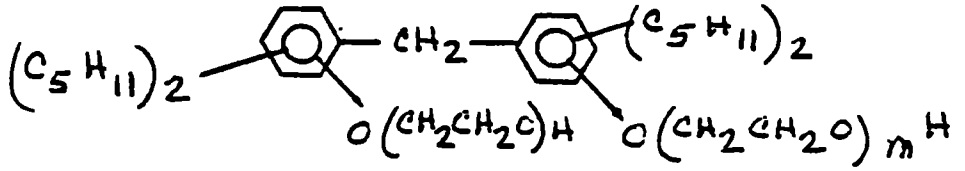
139. 

140. 

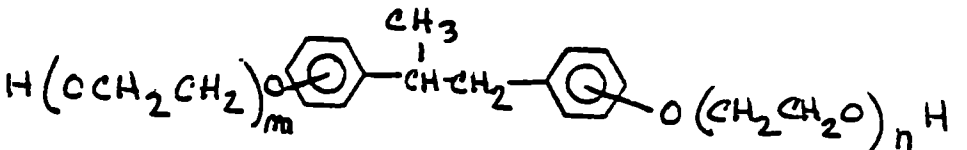
3.5 MOLES OF ETHYLENE OXIDE

141. 

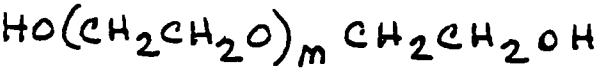
12 MOLES ETHYLENE OXIDE

142. 

(18 MOLES ETHYLENE OXIDE)

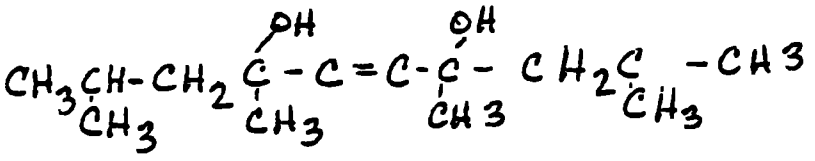
143. 

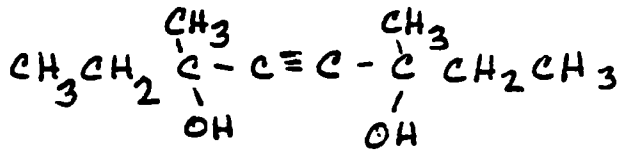
(7-7.5 MOLES ETHYLENE OXIDE)

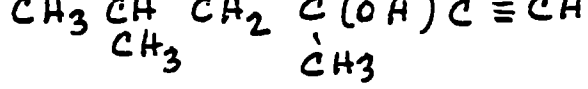
147. 

149. $C_4H_9O(CH_2CH_2O)_n(CH_2CH(CH_3)O)_mH$

150. $HO(CH_2CH_2O)_n(CH_2CH(CH_3)O)_mH$

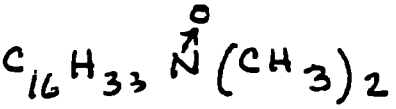
151. 

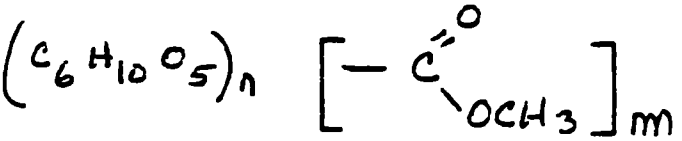
152. 

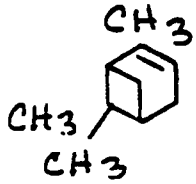
153. 

155. TERT ALKYL (C_{12-13}) $NH-(CH_2CH_2O)_{3\bar{5}}-(CH_2CH(CH_3)O)_{45}H$

156. 

157. 

158. 

166.  POLYMER

168. $CH_2 = C(CH_3) - COO\ CH_3$

169. $CH_2 = C(CH_3) - COO\ C_2H_5$

170. $C_{16}H_{33}NH(CH_2CH_2O)_4CH_2CH_2OH$

171. $C_{18}H_{37}NH(CH_2CH_2O)_4CH_2CH_2OH$

172. $C_8H_{17}CH=CH\ C_7H_{14}CH_2NH(CH_2CH_2O)_4$
CH_2CH_2OH

173. $HO(CH_2CH_2O)_5$ TALLOW AMINE

174. $C_{16}H_{33}NH(CH_2CH_2O)_{19}CH_2CH_2OH$

175. $C_{18}H_{37}NH(CH_2CH_2O)_{19}CH_2CH_2OH$

176. $C_8H_{17}CH=CH\ C_7H_{14}CH_2NH(CH_2CH_2O)_{19}$
CH_2CH_2OH

177. $HO(CH_2CH_2O)_{20}$ TALLOW AMINE

178. $C_8H_{17}CH=CH\ C_7H_{14}CH_2-$

$-N\left[(CH_2CH_2O)_{1.5}CH_2CH_2OH\right]_2$

179. $CH_3CH_2CH_2CH_2CH_2CH_2=CHCH_2CH=CH\ CH_2CH_2CH_2-$
$CH_2CH_2CH_2CH_2CH_2N-$
$\left[(CH_2CH_2O)_{1.5}CH_2CH_2OH\right]_2$

180. $CH_3CH_2CH=CHCH_2CH=CHCH_2CH=CHCH_2CH_2CH_2-$
$CH_2CH_2CH_2CH_2CH_2N-$
$\left[(CH_2CH_2O)_{1.5}CH_2CH_2OH\right]_2$

181. $HO(CH_2CH_2O)_5$ SOYBEAN AMINE

182. $C_8H_{17}CH=CHC_7H_{14}CH_2N-$
$-\left[(CH_2CH_2O)_7CH_2CH_2OH\right]_2$

183. $CH_3CH_3CH_2CH_2CH_2CH_2=CHCH_2CH=CHCH_2CH_2$
$CH_2CH_2CH_2CH_2\dot{C}H_2CH_2N$
$\left[(CH_2CH_2O)_7CH_2CH_2OH\right]_2$

184. $CH_3CH_2CH=CH_2CH_2CH=CH_2CH_2CH=CHCH_2-$
$-CH_2CH_2CH_2CH_2CH_2CH_2CH_2-$
$-N\left[(CH_2CH_2O)_7CH_2CH_2OH\right]_2$

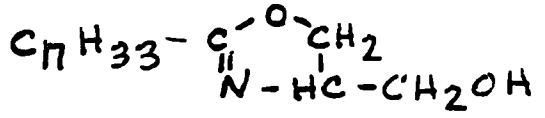
185. $HO(CH_2CH_2O)_{15}$ SOYBEAN AMINE

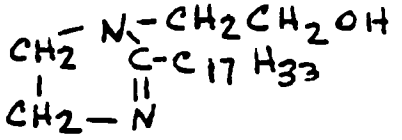
186. $C_{12}H_{25}N\left[(CH_2CH_2O)_7CH_2CH_2OH\right]_2$

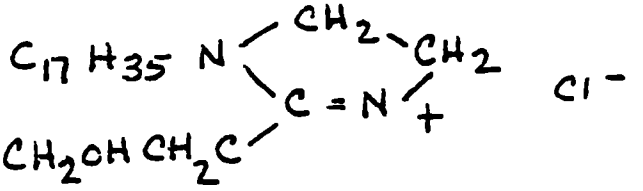
187. $C_{14}H_{29}N\left[(CH_2CH_2O)_7CH_2CH_2OH\right]_2$

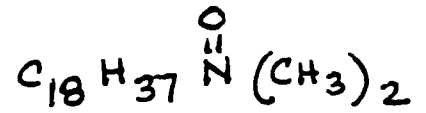
188. $C_{16}H_{33}N\left[(CH_2CH_2O)_7CH_2CH_2OH\right]_2$

189. $C_{18}H_{37}N\left[(CH_2CH_2O)_7CH_2CH_2OH\right]_2$

191. 

192. 

195. 

196. 

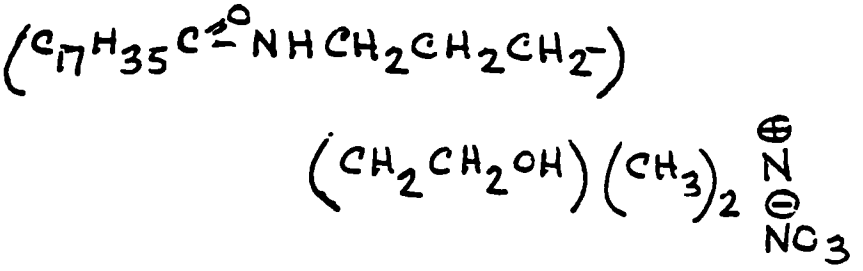
197. $C_{14}H_{29}N(CH_2CH_2OH)_2$

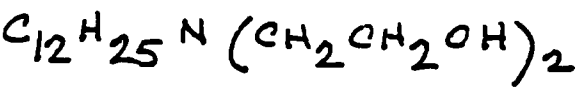
198. $C_{16}H_{33}N(CH_2CH_2OH)_2$

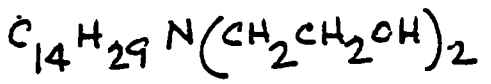
199. $C_{18}H_{37}N(CH_2CH_2OH)_2$

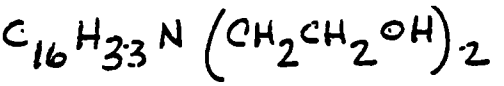
200. $ALKYL\,(C_{14}-C_{18})N(CH_2CH_2OH)_2$

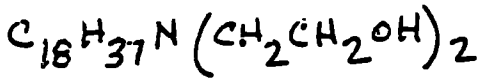
201. $(C_{18}H_{37})_2(CH_3)_2N^+Cl^-$

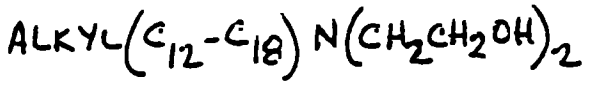
203. 

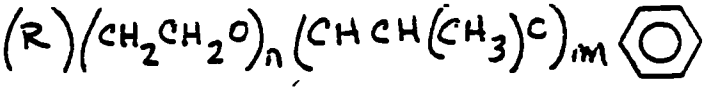
204. 

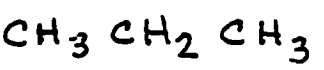
205. 

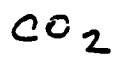
206. 

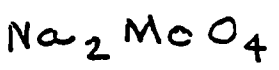
207. 

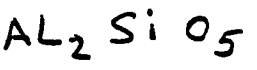
208. 

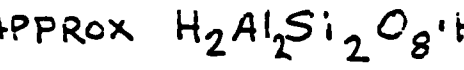
211. 

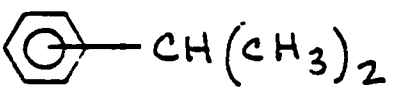
223. 

236. 

237. 

246. 

248. 

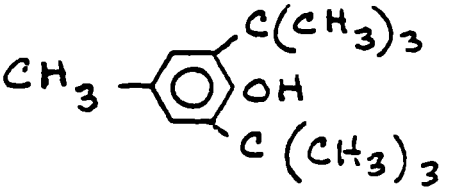
261. 

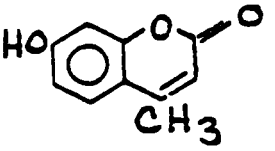
263. $(C_{17}H_{35}COO)_2Ca$

265. AL_2SiO_5

269. $(C_6H_5O_{10})_n(-CH_2CH_2CH_2OH)_m(CH_3^-)_x$

270. TiO_2

271. 

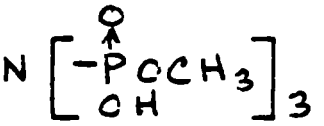
272. 

273. $C_{11}H_{23}COOH$

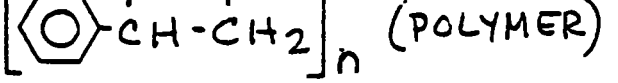
274. $C_{13}H_{27}COOH$

275. $C_{15}H_{31}COOH$

276. $C_{17}H_{35}COOH$

278. 

291. $CH_3CHOHCH_2OCH_3$

293.  (POLYMER)

295. $(C_{17}H_{35}COO)_3AL$

320. $CH_3C(CH_3)=CHCH_2CH_2C(CH_3)=CHC(=O)H$

325. $(CH_3)_2CHNHONO$

329. $\left[-CH_2\dot{C}HCl\right]_n$

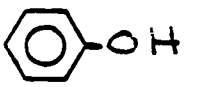
330.
COOH
CHOH
CHOH
COOH

332. $(C_4H_9OCH_2CH_2O)_3PO$

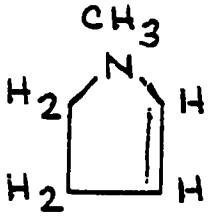
334. K_2SO_3

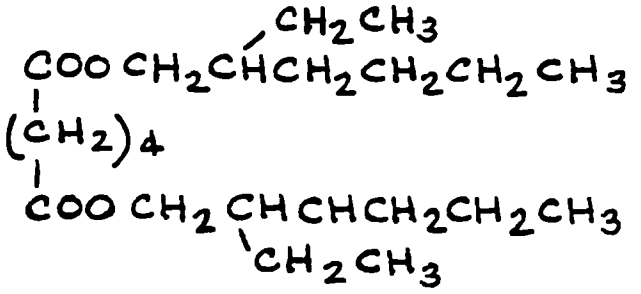
337. $C_{17}H_{33}COOCH_3$

338. $(C_6H_{10}O_5)_n \cdot xH_2O$

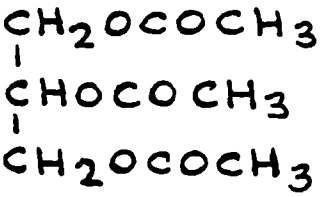
340. 

342.
CCONa
(CHOH)$_4$
CH_2OH

343. 

345. 

346. N_2O

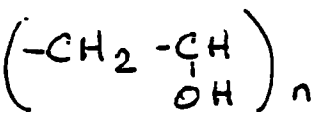
349. 

353. $CaCO_3 \cdot XH_2O$

354. $Ca\ CO_3$

355. $Ca\ SO_4 \cdot 2H_2O$

378. $CH_3CH_2CH_2CH_2OH$

379. 

380. $(CH_3)_2(CH_2)_7CH_2OH$

383. $(CH_3CHOHCH_2)_3N$

402. $K_2B_4O_7$

403. Na 2-B10-H2-016

404. $(CH_3-CH-CH-CH_3)_n$

409. $HOCH_2CH_2OCH_2CH_2OCH_2CH_3$

411. $CH_3CHOHCH_2OCH_3$

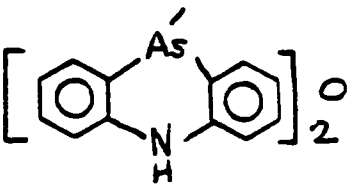
412. $CH_3CHOHCH_2OC_4H_9$

414. $C_4H_9OCH_2CH_2OCH_2CHOHCH_3$

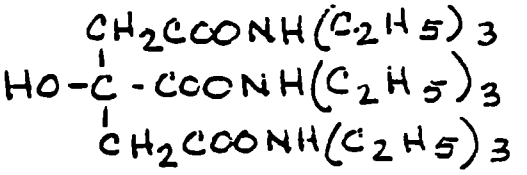
415. $CH_3OCH_2CH_2CH_2OCH_2CH_2CH_2OH$

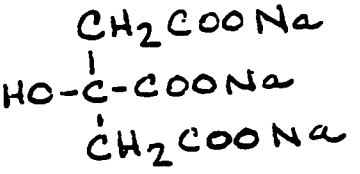
416. $HOCH_2CH_2OCH_2CH_3$

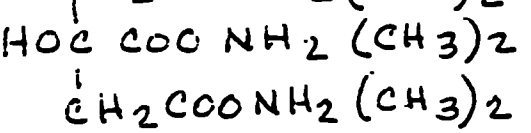
417. $CH_3OCH_2CH_2CH_2OCH_2CH_2CH_2OCH_2$
$-CH_2CH_2OH$

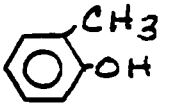
419. 

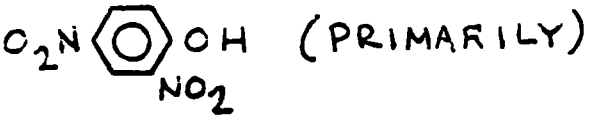
424. $Ca[ClO_4]_2$

433. 

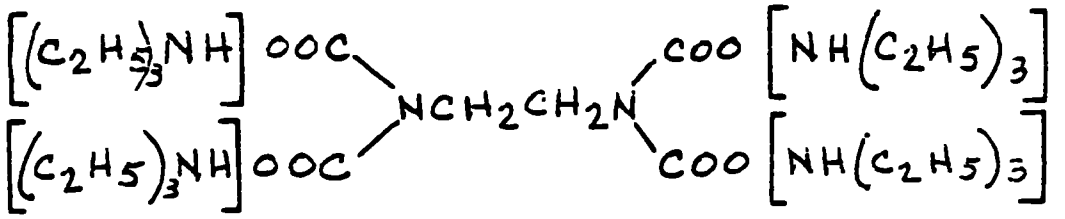
434. 

435. 

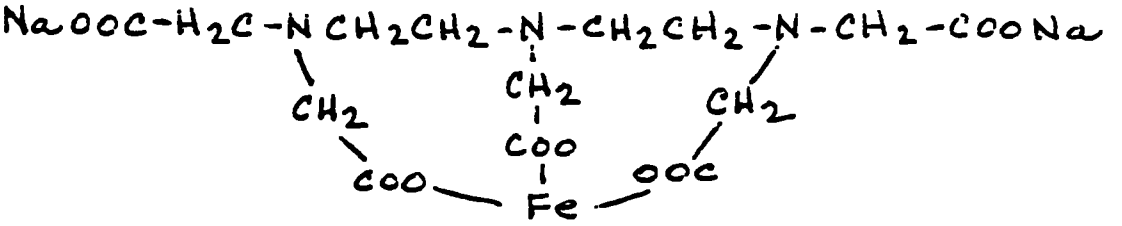
440. 

450. 

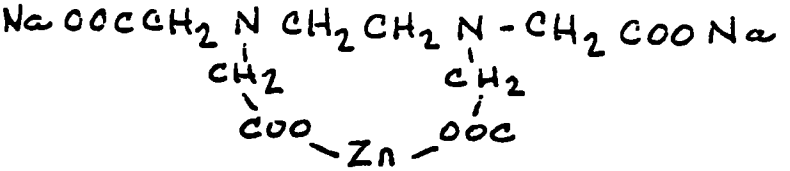
455.



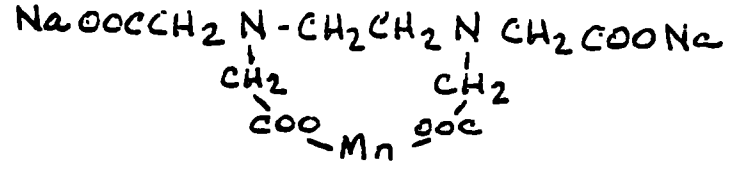
456.



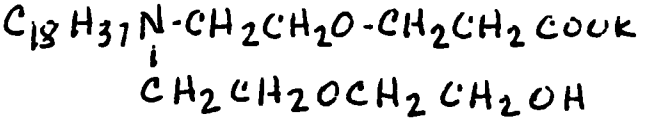
458.



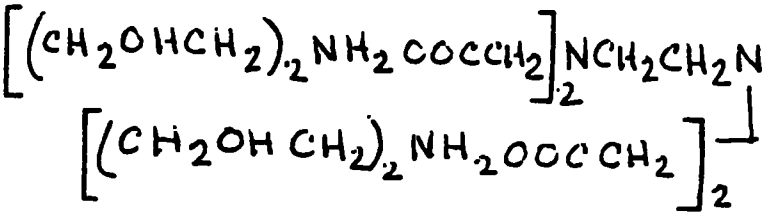
459.

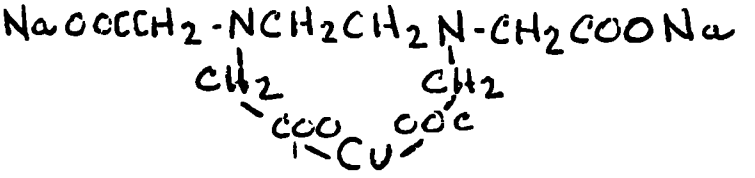


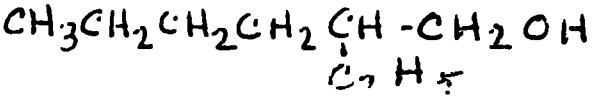
460.

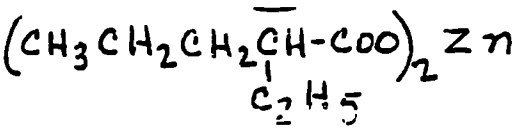


461.



462. 

464. 

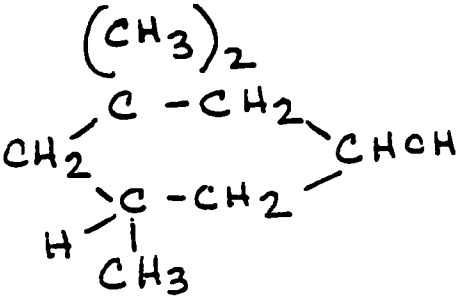
465. 

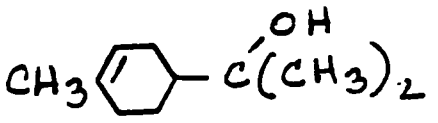
472. $HCOOH$

474. $CH_3COOC_4H_9$

475. CH_3COONH_4

482. $C_{12}H_{25}COC_{12}H_{25}$ AND HIGHER KETONES

489. 

520. 

524. $NaMnO_4$

532. $(C_8H_{17})_3(CH_3)N^{\oplus}Cl^{\ominus}$

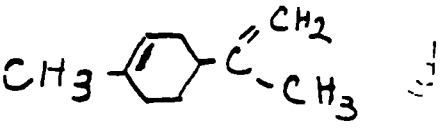
533. $R_2(CH_2OHCH_2)(CH_3)N^{\oplus}Cl^{\ominus}$
R = ALKYL FROM HYDROGENATED TALLOW

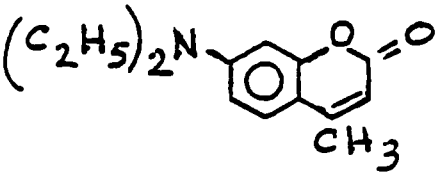
534. $R_2(CH_3)_2N^{\oplus}Cl^{\ominus}$
R = ALKYL FROM TALLOW

548. $NaH(CO_3)_2 \cdot 2H_2O$

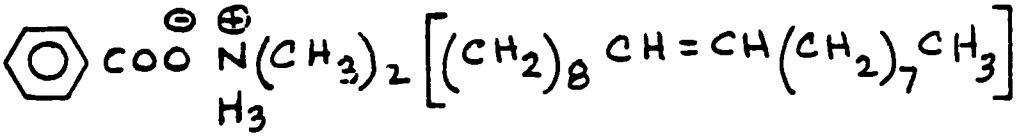
569. $Na_2H_2(P_2O_7)$

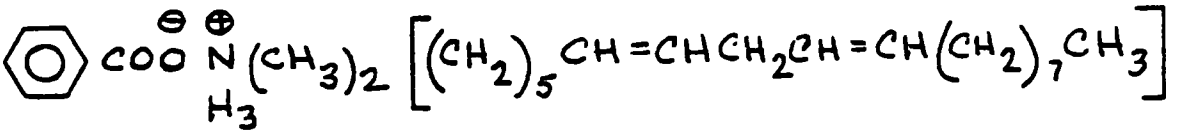
571. $\left[(C_2H_5)_3N\right]_{1\text{-}3} \cdot H_3PO_4$

588. 

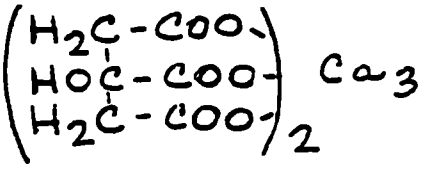
595. 

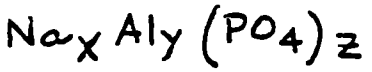
602. 

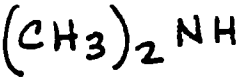
606. 

607. 

611. 

612. 

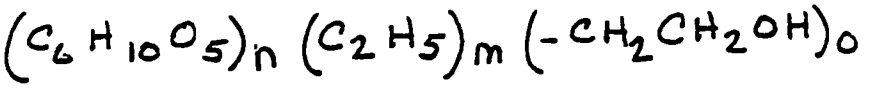
613. 

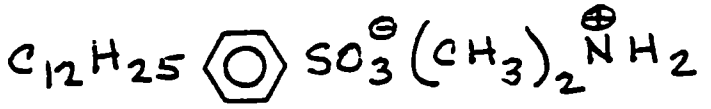
623. 

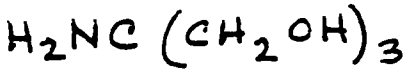
625. 

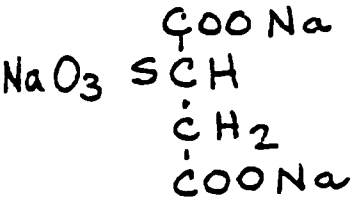
627. 

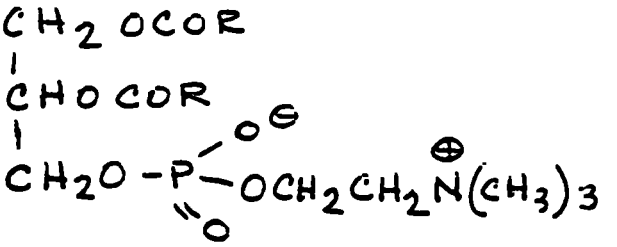
628. 

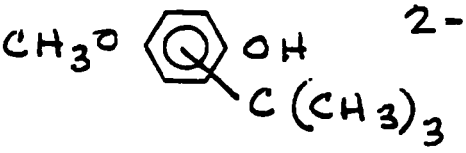
629. 

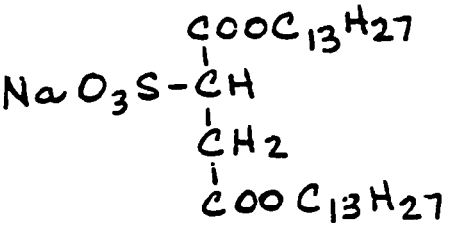
631. 

632. 

633. 

635. 

637.  2- and 3- ISOMERS

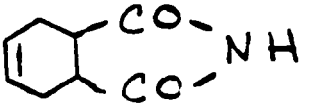
639. 

640. $(C_{18}H_{37})_2(CH_3)_2\overset{\oplus}{N}\,CH_3OSO_3^{\ominus}$

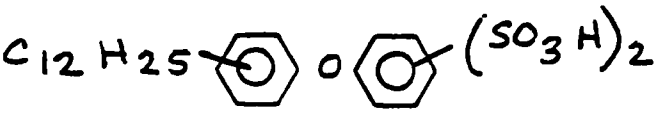
641. $(C_{14}H_{29})_2(CH_3)_2N^{\oplus}CH_3OSO_3^{\ominus}$

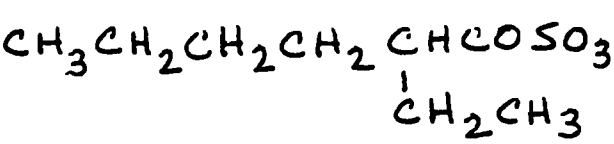
642. $(C_{16}H_{33})_2(CH_3)_2\overset{\oplus}{N}\,CH_3OSO_3^{\ominus}$

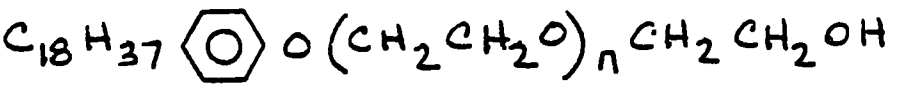
643. $R_2(CH_3)_2N^{\oplus}CH_3OSO_3^{\ominus}$
R = DIHYDROGENATED TALLOW

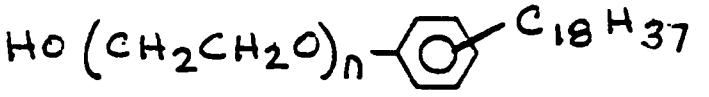
650. 

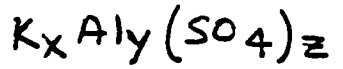
651. $C_{17}H_{35}COOC_4H_9$

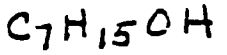
652. 

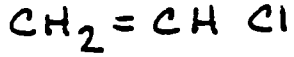
653. 

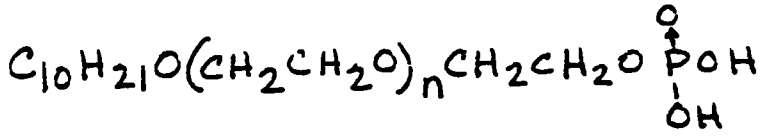
654. 

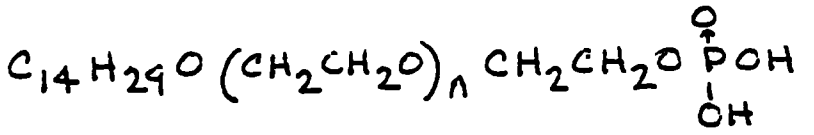
655. 

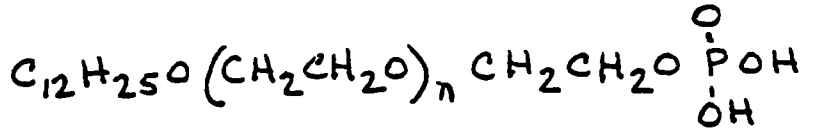
656. 

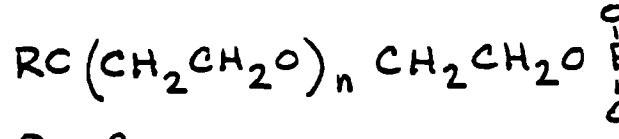
657. 

663. 

667. 

668. 

669. 

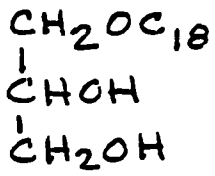
670. 

R = C_{10}-C_{14}

672. 

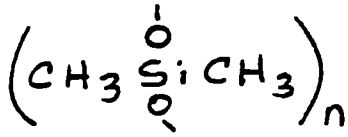
676. 

677.

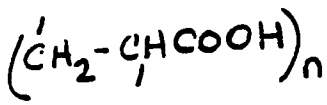


679. $C_{17}H_{33}COOCH_2CH_2OCH_2CH_2OCH_2CH_2OCH_2CH_2OH$
= TETRA ETHYLENE GLYOL OLEATE
NOTE: POSSIBLY TWO OLEYL GROUPS

680.

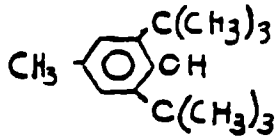


682.



684. $C_{18}H_{37}COOK$

689.

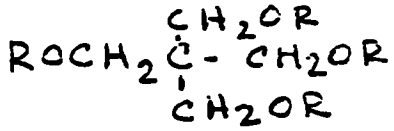


690. $BaSO_4$

691. $Al_2(SO_4)_3$

692. $(NH_2OH)_2 \cdot H_2SO_4$

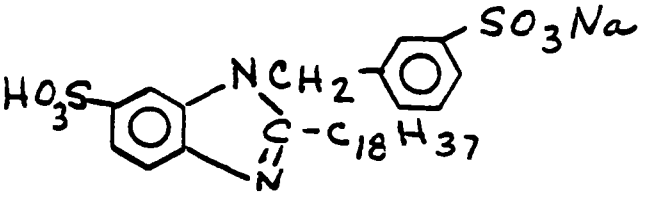
693.



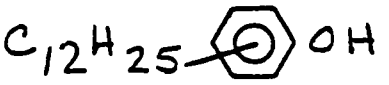
R = TALL OIL ALKYL

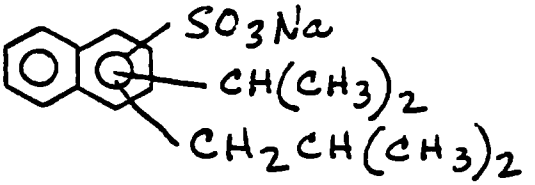
694. $CHCl_2COOH$

696. $CH_2OC_{18}H_{37}$
$CHOH$
CH_2OH

697. 

699. $(NH_4)_3PO_4$

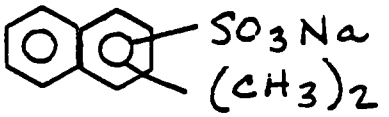
700. 

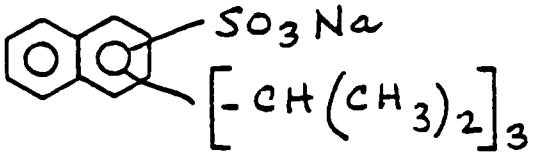
702. 

703. $C_{17}H_{35}COOCH_2CH_2OOCC_{17}H_{35}$

705. $C_{17}H_{35}COOCH_2CH_2OH$

706. $H_2NCH_2CH_2NHCH_2CH_2NH_2$

709. 

710. 

713. $CH_3COOCH_2CH(CH_3)_2$

714. Al_2O_3

715. $(C_2H_5OOCCHCH_2)(HOCH_2CH_2)-$
$-(CH_3)(C_{18}H_{37})\overset{\ominus}{N}CH_3O\overset{\oplus}{S}O_3K$

716. $O(CH_2COOH)_2$

721. $C_{15}H_{31}COOH$

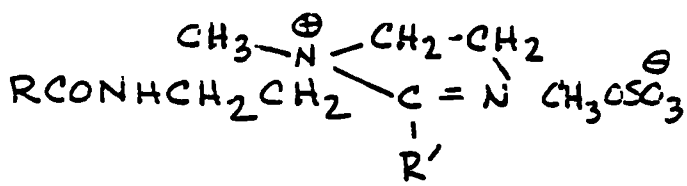
724. $CH_3\underset{\backslash ONO}{C}HCH_2NH_2$

725. $C_{12}H_{25}\underset{\downarrow O}{N}(CH_3)_2$

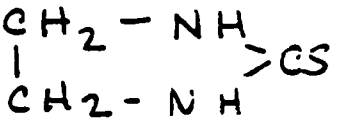
726. $C_{14}H_{29}\underset{\downarrow O}{N}(CH_3)_2$

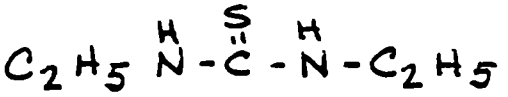
727. $C_{16}H_{33}\underset{\downarrow O}{N}(CH_3)_2$

728. $C_{18}H_{37}\underset{\downarrow O}{N}(CH_3)_2$

730. 

732. $\left[-CH_2-\underset{CH_3}{\overset{|}{C}}COOC_{12}H_{25}\right]_n$

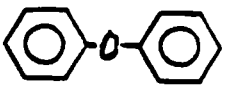
734. 

736. 

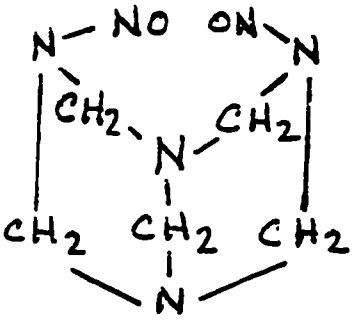
737. $LiOH$

739. 

740.

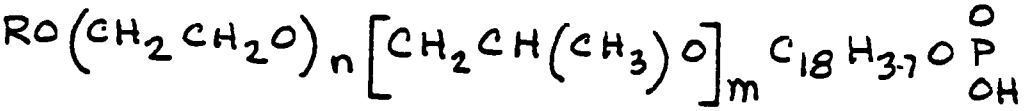
749. 

751. $PbCrO_4$

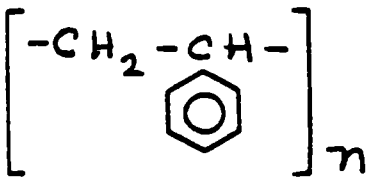
752. 

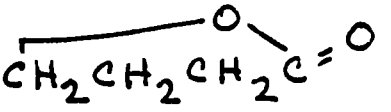
753. 

756. $HOCH_2(CHOH)_5\text{-}COONa \cdot 2H_2O$

757. 

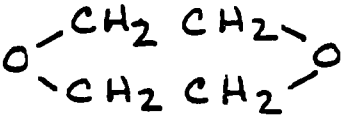
759. $CH_3CH_2CH_2CH_3$

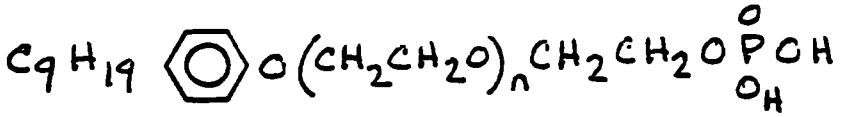
760. 

761. 

762. $(C_{17}H_{35}COO)_3Al$

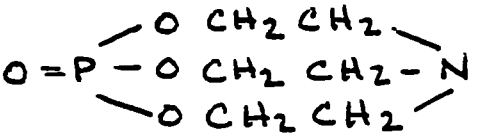
763. $(C_{17}H_{35}COO)_2Mg$

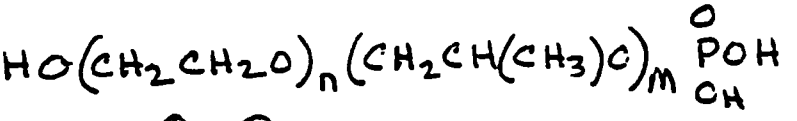
766. 

770. 

771. $NaAlO_2$

772. $(CH_2CH_2)_n(S_m)$ POLYMER

774. 

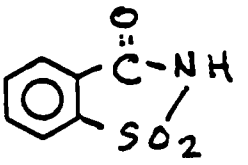
775. 

777. $C_3H_7\overset{\oplus}{N}H_3\ \overset{\ominus}{N}O_2$

778. $CH_3(CH_2)_7CH\overset{CIS}{=}CH(CH_2)_7CON(CH_3)_2$

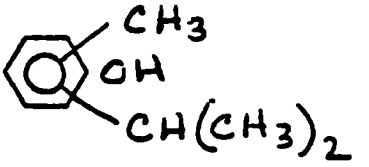
779. $CH_3(CH_2)_4CH\overset{CIS}{=}CHCH_2CH\overset{CIS}{=}CH(CH_2)_7CON(CH_3)_2$

780. $RCON(CH_3)_2$ R = ALKYL FROM TALL OIL

781. 

782. 

783. $(C_6H_{10}O_5)_n(C_2H_5)_m$

789. 

791. $C_{18}H_{35}OP(=O)(OH)OH$

794. $R(CH_3)_2\overset{\oplus}{N}CH_2COO^{\ominus}$

R = ALKYL FROM COCONUT OIL

795. CH_3NO_2

796. $(CH_3)_2SO$

799. $C_7H_{15}COOH$

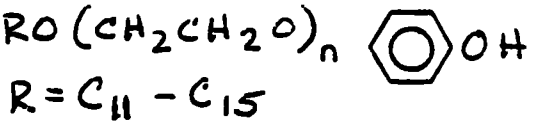
800. $C_{17}H_{33}CONHCH_2CH_2SO_3Na$

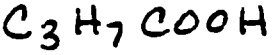
802. $C_{12}H_{23}O(CH_2CH_2O)_nCH_2CH_2OSO_3H$

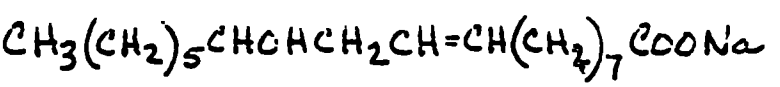
806. $CH_3CH_2OCH_2CH_2CH(SO_3K)NRCH_2CH_2OH$

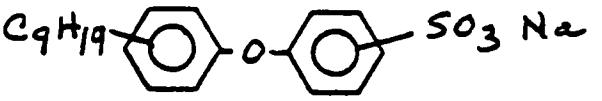
R = ALKYL FROM COCONUT OIL

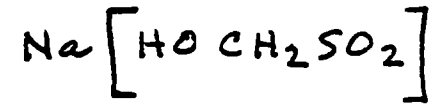
807. $R_2(CH_3)_2\overset{\oplus}{N}\overset{\ominus}{Cl}$ POLYMER

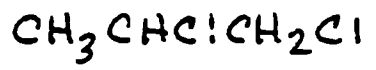
809. 

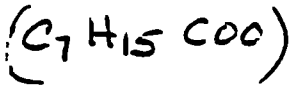
812. 

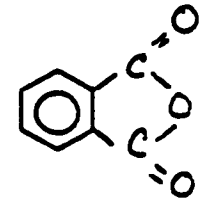
813. 

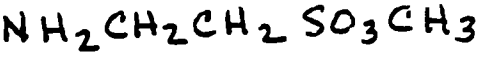
821. 

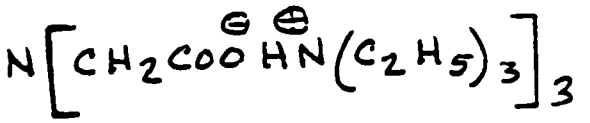
826. 

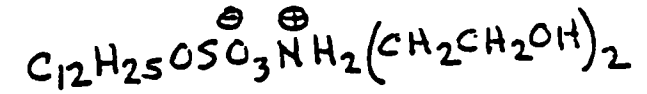
828. 

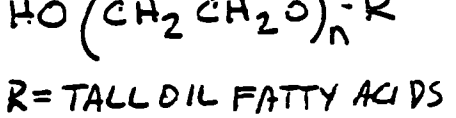
833. 

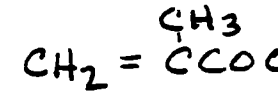
839. 

842. 

843. 

845. 

846. 

847. 

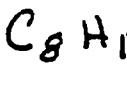
848. $CH_2=CHCOOC_2H_5$

849. $CH_2=\overset{CH_3}{\underset{|}{C}}-COONa$

850. 

851. $C_{17}H_{33}COO(CH_2CH_2O)_n-\overset{O}{\overset{\|}{C}}C_{17}H_{33}$

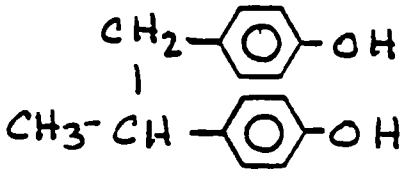
853. $CH_3(CH_2)_7CH^{cis}=CH(CH_2)_7CH_2OH$

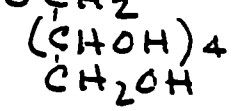
856. iso $C_8H_{17}OP(O$  $)_2$

857. $(C_{11}H_{23}COO)_2Ba$

858 $(C_{11}H_{23}COO)_2Cd$

860. $C(CH_2OH)_4$

861. 

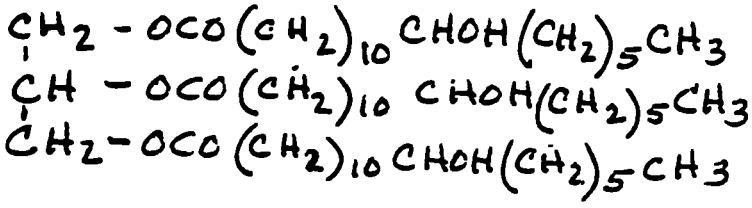
862. $HO(CH_2CHO)_nCH_2CH_2-$ 

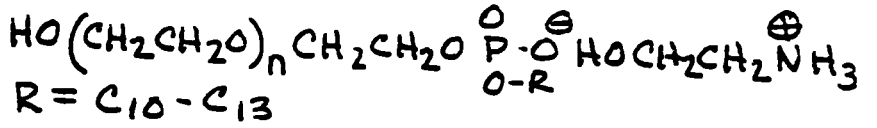
864. $CH_3(CH_2)_7CH^{cis}=CH(CH_2)_7CH_2NHCH_2CH_2CH_2NH_2$

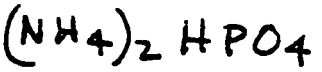
866. C_9H_{19}  $O(CH_2CH_2O)_nCH_2CH_2OSO_3H$

868. $C_3H_7COOC_7H_{15}$

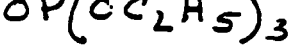
871. $NaO_3S-\underset{\underset{CH_2}{|}}{\overset{COONa}{CH}}-COONa$

872.


875.


876.


880.


882.


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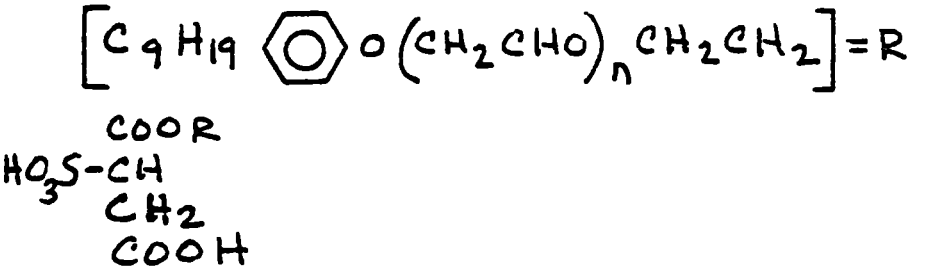

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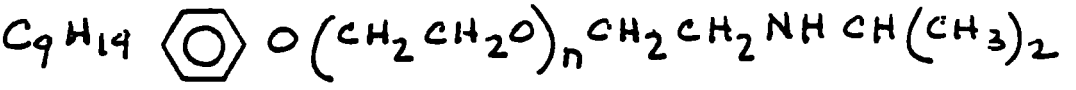

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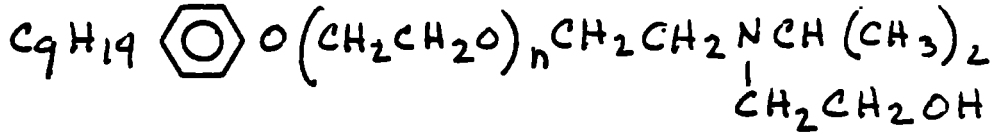

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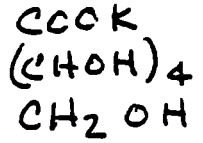
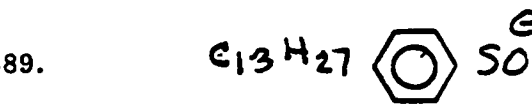
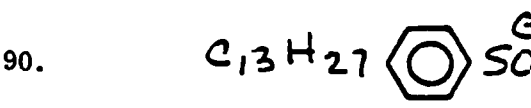
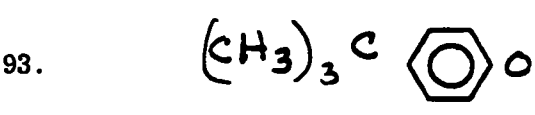
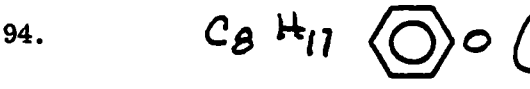
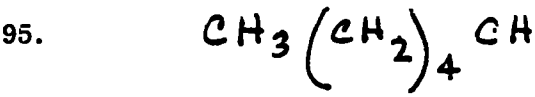


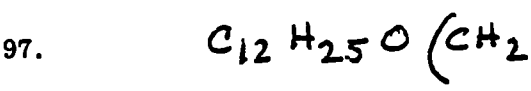
889. 

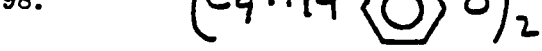
890. 

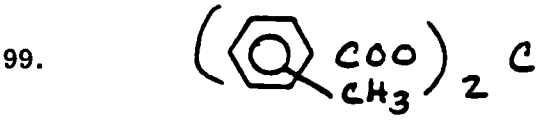
893. 

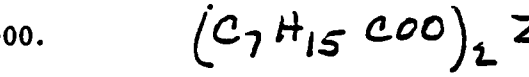
894. 

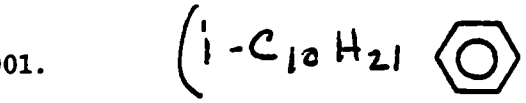
895. 

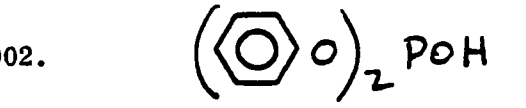
897. 

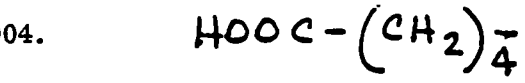
898. 

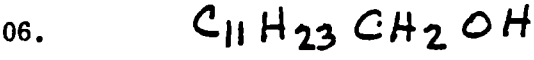
899. 

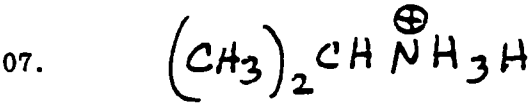
900. 

901. 

902. 

904. 

906. 

907. 

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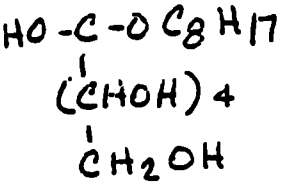

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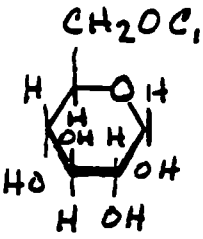

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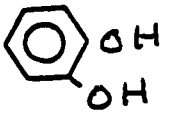

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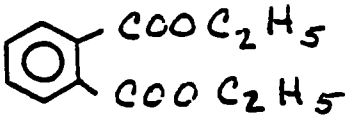

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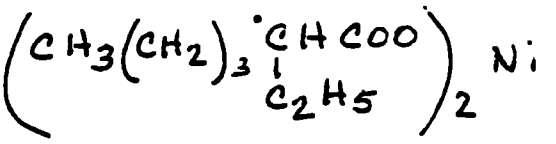

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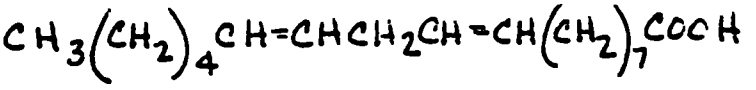

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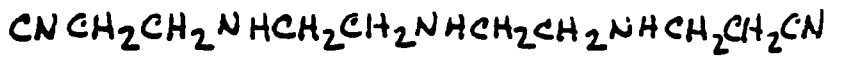

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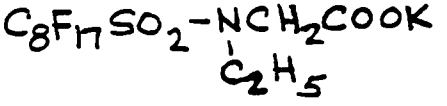
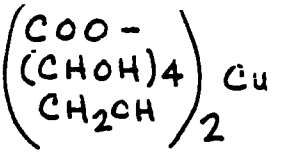
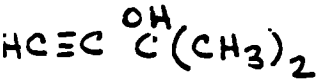
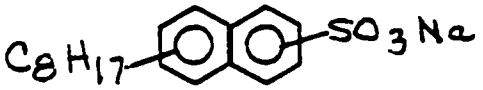


931. 

933. 

934. 

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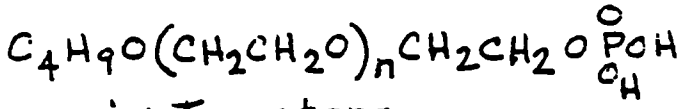
936. 
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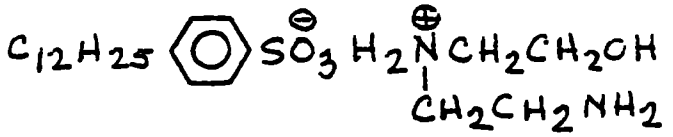
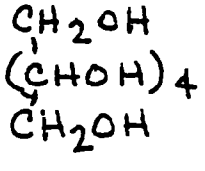
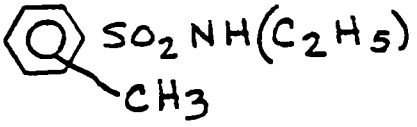
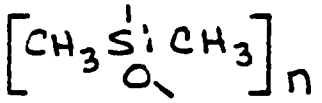
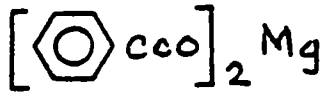
938. 

939. 

941. 

943. 

944. 

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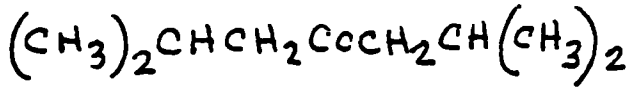
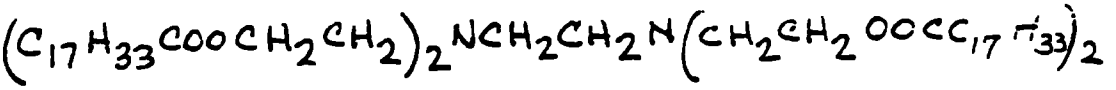
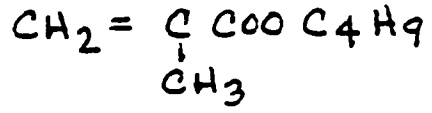
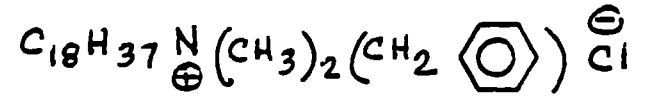
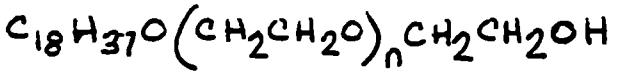
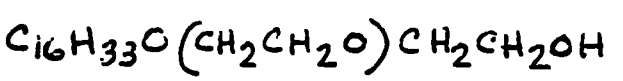
947. 

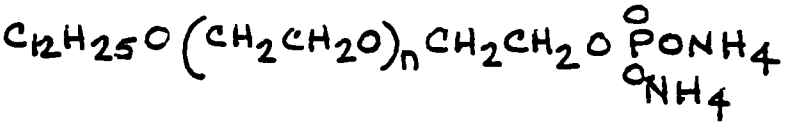
949. 

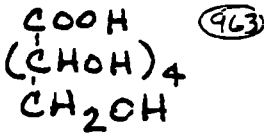
950. 

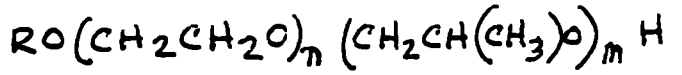
951. 

959. 

960. 

962. 

963. 

964. 

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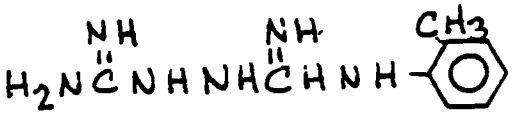
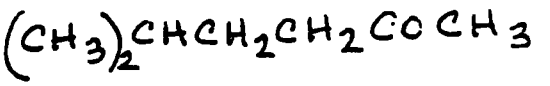
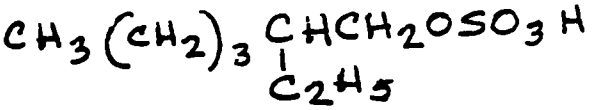
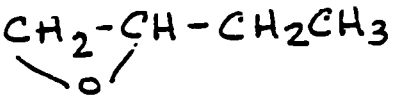
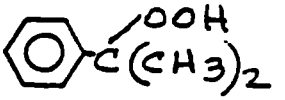
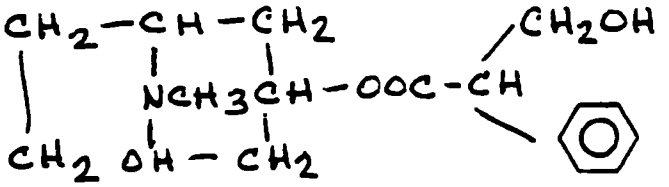
972. 

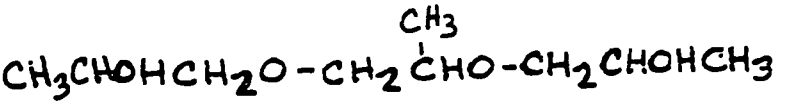
973. 

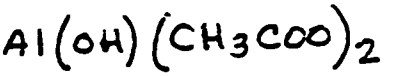
975. 

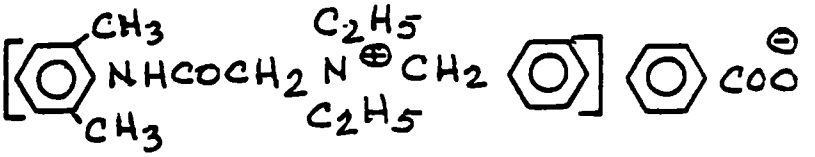
976. 

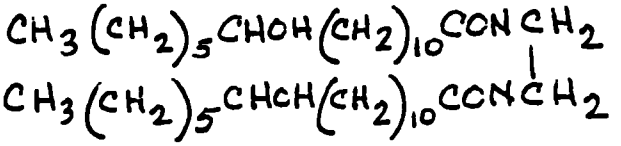
981. 

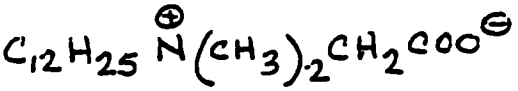
983. 

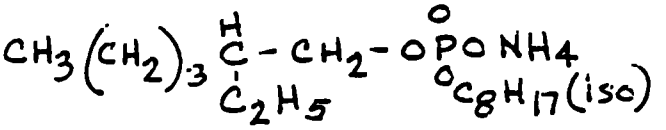
985. 

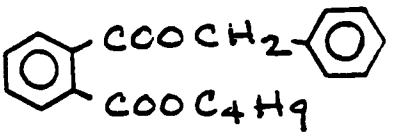
986. 

989. 

990. 

993. 

994. 

995. 

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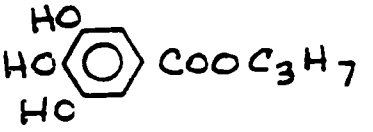
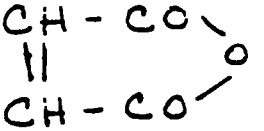
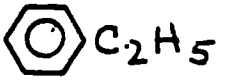
1000. 

1001. 

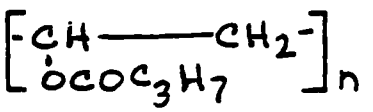
1005. $CH_3(CH_2)_7CH \overset{cis}{=} CH(CH_2)_7CON(CH_3)_2$.

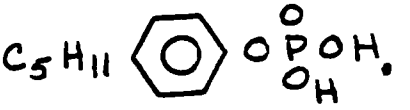
1007. $(CH_3)_2O$

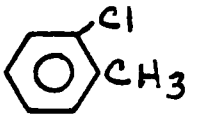
1009. 

1010. 

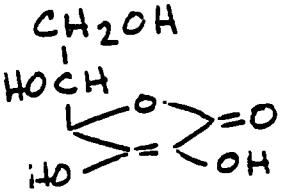
1012. CH_3OSO_2ONa

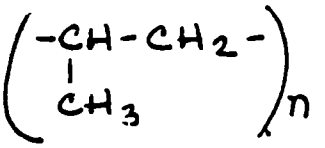
1013. 

1014. 

1016. 

1017. $(C_7H_{15}COO)_4Zr$

1020. 

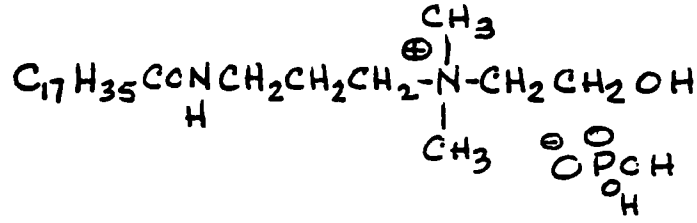
1022. 

1023. $C_9H_{19}OH$

1024. CH_3CHF_2

1025. $CH_3CHOHCH_2CH_2OH$

1026. $HO(-CH_2CH_2O-)_nH$

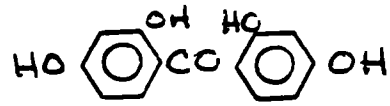
1031. 

1032. $(C_2H_5)_2NH$

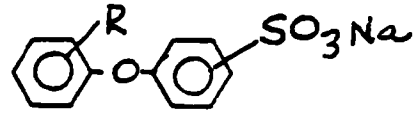
1033. $HOCH_2CH_2NH(C_2H_5)$

1034. $C_2H_5N(CH_2CH_2OH)_2$

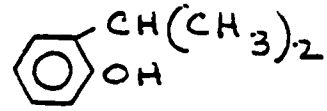
1035. $R_2(CH_3)_2N^{\oplus}Cl^{\ominus}$ R=ALKYL

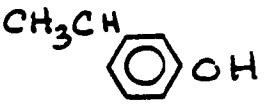
1038. 

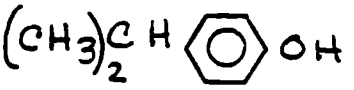
1039. $(CH_3CHOHCH_2)_2NH$

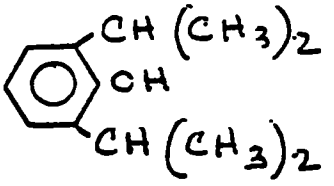
1045. 

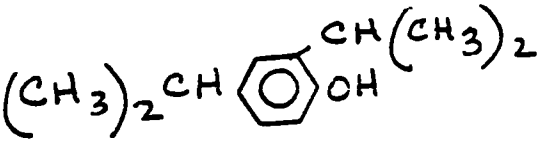
1048. $C_3H_7COOCH_2CH(CH_3)_2$

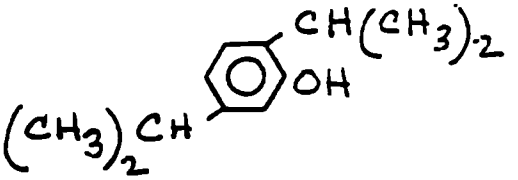
1049. 

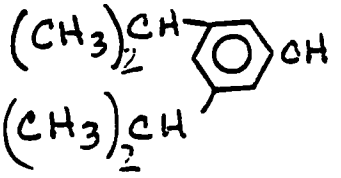
1050. 

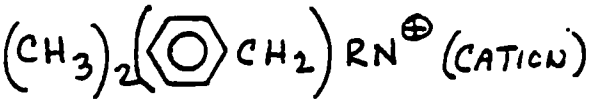
1051. 

1053. 

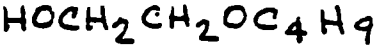
1054. 

1055. 

1056. 

1058. 

R = TALLOW DERIVATIVE

1059. 

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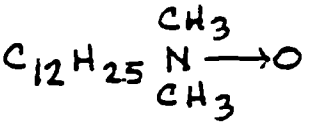
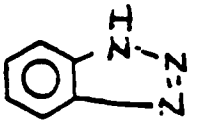
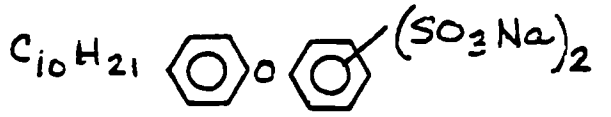
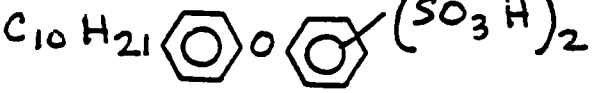
1068. 

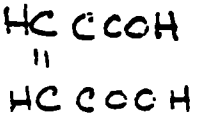
1070. 

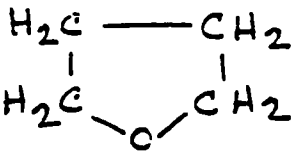
1073. 

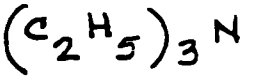
1074. 

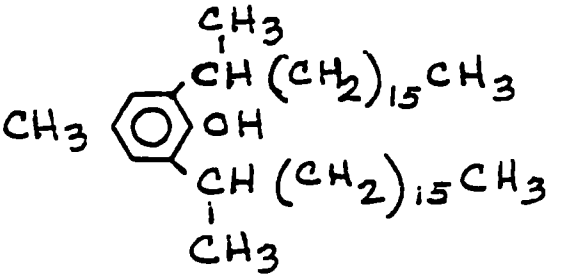
1078. 

1079. 

1080. 

1081. 

1083. 

1087. 

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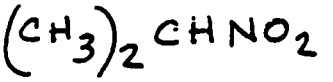
1093. 

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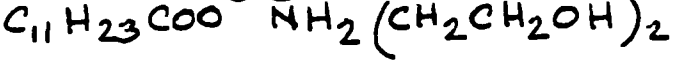
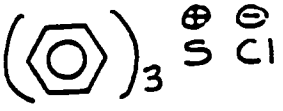
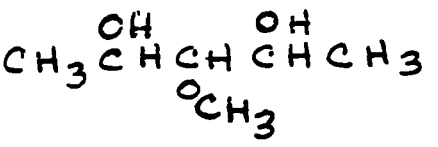
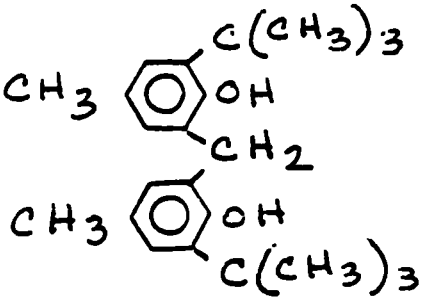
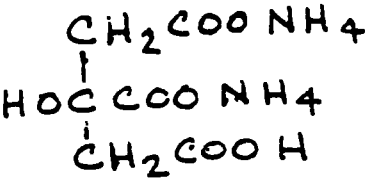
1098. 

1101. 

1105. $C_{15}H_{31}COOCH_3$

1107. 

1108. 

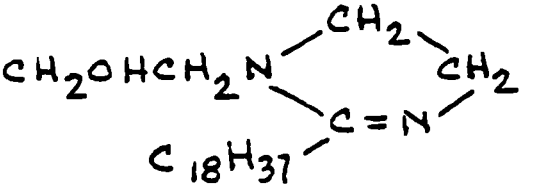
1109. 

1110. $C_{17}H_{35}COOCH_3$

1111. $CH_3(CH_2)_7CH=CH(CH_2)_7CH_2NH_2$

$C_{17}H_{33}COOH$ ESTER

1112. WITH $(CH_2OHCHOHCH_2OH)_n$

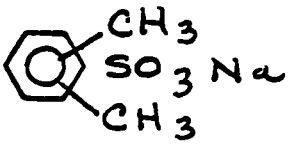
1113. 

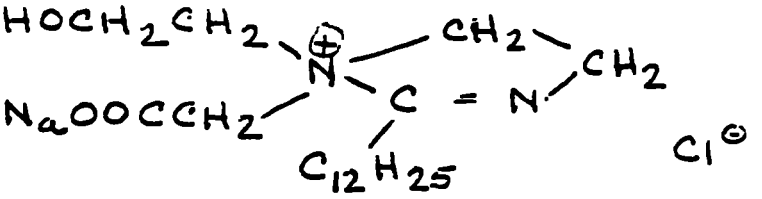
1114. $C_8H_{17}O(CH_2CH_2O)_n\,\overset{O}{\underset{OH}{P}}OH$

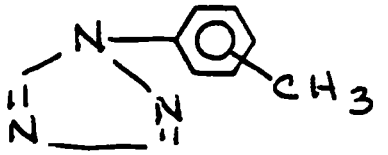
1115. $C_{12}H_{25}O(CH_2CH_2O)_nCH_2CH_2OSO_3Na$

1116. $(C_2H_5)_3\overset{\oplus}{N}H\ \overset{\ominus}{H}SO_4$

1119. $C_{13}H_{27}O(CH_2CH_2O)_nCH_2CH_2OSO_3Na$

1120. 

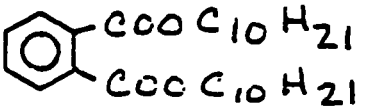
1122. 

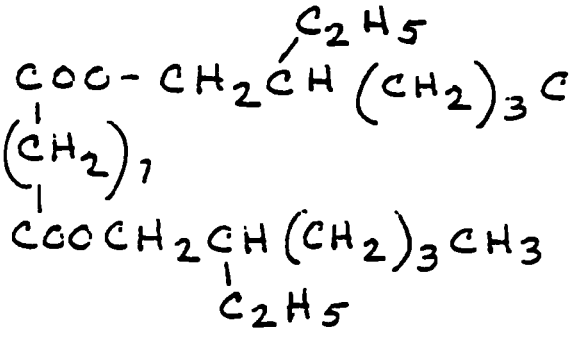
1123. 

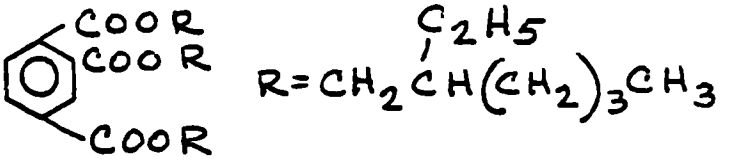
1124. $RO(CH_2CH_2O)_nCH_2CH_2OSO_3Na$

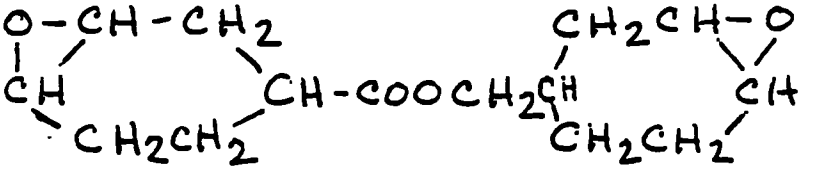
1127. $C_{13}H_{27}O(CH_2CH_2O)_nCH_2CH_2OH$

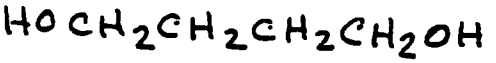
$C_{13}H_{27}$ = TRIMETHYL DECYL. (NOT COMPLETE)

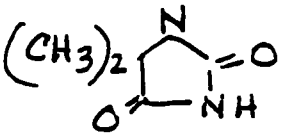
1129.  ($C_{10}H_{21}$ = ISODECYL)

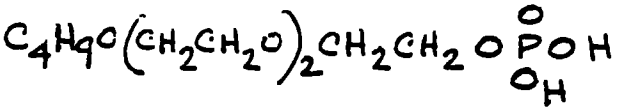
1130. 

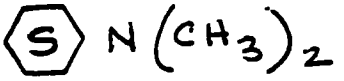
1131. 

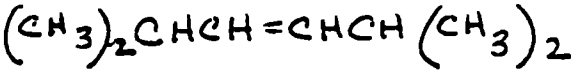
1132. 

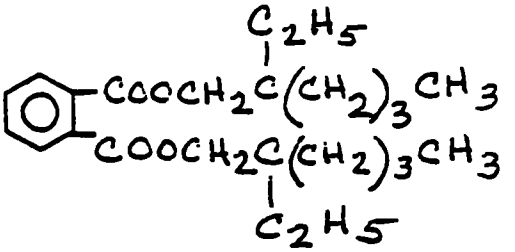
1133. 

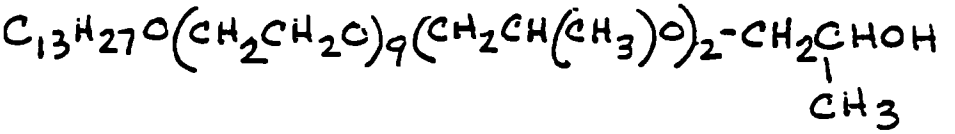
1135. 

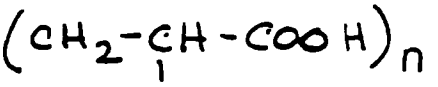
1136. 

1137. 

1138. 

1142. 

1143. 

1144. 

1146. $CH_3CH=CHCH=CH_2$

1147. $C_{11}H_{23}COO(CH_2CH_2O)_nH$

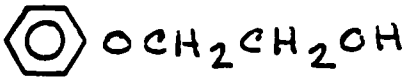
MW = 400 FOR POLYETHYLENE GLYCOL

1150. $C_{10}H_{21}O(CH_2CH_2O)_nH$

1151. $(HOCH(CH_3)-CH_2)_2NCH_2CH_2N(CH_2CH(CH_3)-OH)_2$

1152. $(CH_3(CH_2)_3CH(C_2H_5)COO)_2Mn$

1153. $(C_4H_9O)_3PO$

1156. 

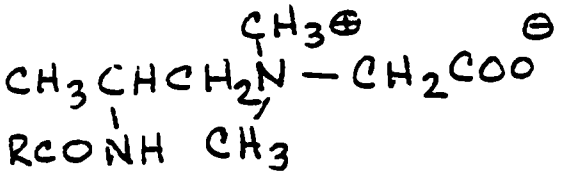
1159. CH_2OOCCH_3
$CHOH$
CH_2OH

1160. $C_{12}H_{25}(CH_3)_2\overset{\oplus}{N}H(CH_3)_2\overset{H}{C}SO_3^{\ominus}$

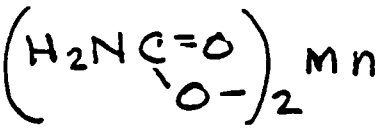
1161. CH_3CH_2CHO

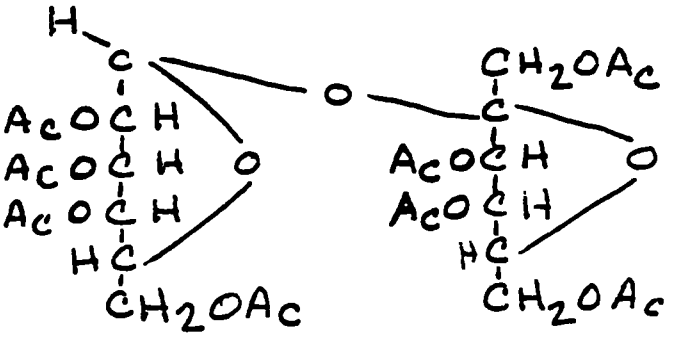
1162. $(C_3H_7)_2O$

1164. $(CH_3)_2CHNHSO_3H$

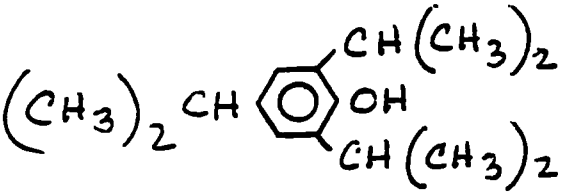
1165. 

R = ALKYL FROM COCONUT OIL FATTY ACIDS

1167. 

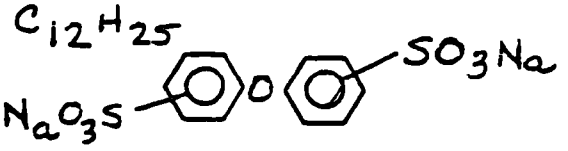
1169. 

$Ac = CH_3C(=O)-$

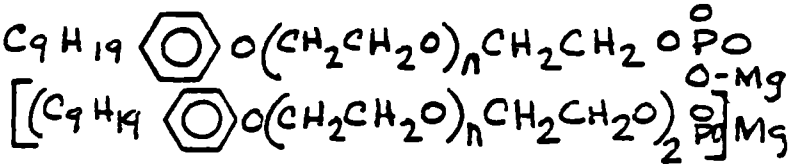
1170. 

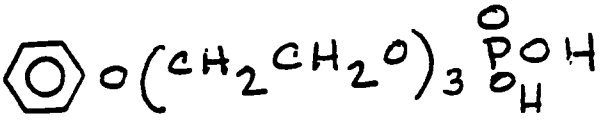
1175. $RO(CH_2CH_2O)_m(CH_2CH(CH_3)O)_nH$

$R = C_8 - C_{15}$

1176. 

1177. $C_{12}H_{25}OCH_2CH_2OSO_3Na$

1179. 

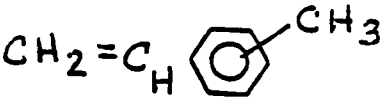
1183. 

1185. $C_{18}H_{37}O(CH_2CH_2O)_nCH_2CH_2OH$

1186. $C_{16}H_{33}O(CH_2CH_2O)_nCH_2CH_2OH$

1188. $H(-CH_2CH_2-)_nH$

1190. $C_{17}H_{35}C\overset{\ominus}{O}O\overset{\oplus}{H}N(CH_2CH_2OH)_3$

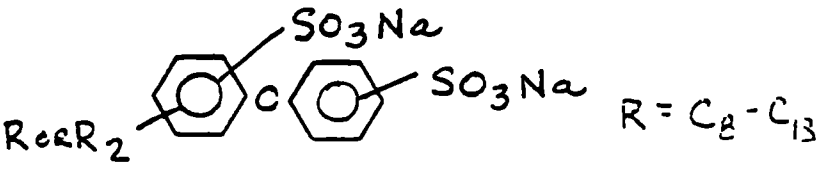
1192. 

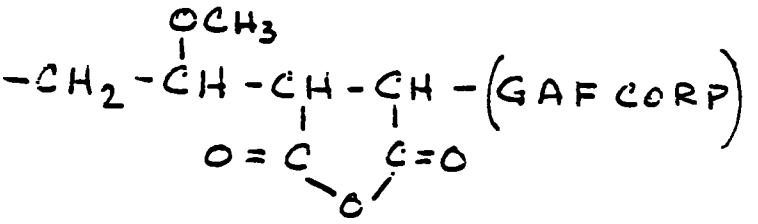
1193. $(CH_3)_3COOC(CH_3)_3$

1202. ACRYLONITRILE $\left[-CH_2\underset{\dot{C}N}{\overset{|}{C}}H\right]_n$;

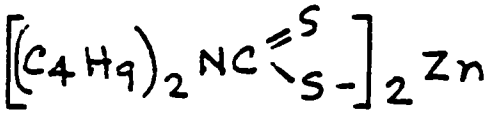
HYDROLYZES TO $\left[-CH_2-\underset{\dot{C}OOH}{\overset{|}{C}}H-\right]$

1203. $(CH_3)_2NSO_3H$

1207. 

1208. 

1209. 

1210. 

1215. $C_{13}H_{27}O(CH_2CH_2O)_nCH_2CH_2OH \quad n=2\text{-}14$

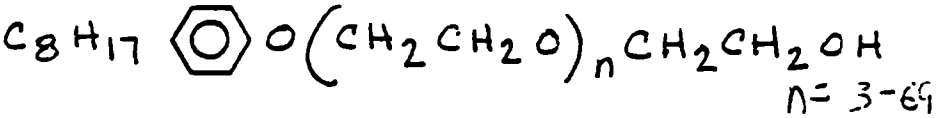
1216. $C_{12}H_{25}O(CH_2CH_2O)_nCH_2CH_2OH \quad n=3\text{-}22$

1217. $CH_3(CH_2)_7CH=CH(CH_2)_8O(CH_2CH_2O)_nCH_2CH_2OH \quad n=19$

1218. $CH_3(CH_2)_7CH=CH(CH_2)_8O(CH_2CH_2O)_nCH_2CH_2O \quad n=1.5$

1219. $C_{16}H_{33}O(CH_2CH_2O)_nCH_2CH_2OH \quad n=1.5$

1220. $C_{12}H_{25}O(CH_2CH_2O)_5CH_2CH_2OH$
$C_{12}H_{25}$ = TRIMETHYLNONYL

1221. 

Appendix 3

Appendix 3
Chemical Classifications

Part 1: Major Classification

ORGANICS

ACIDS

Aliphatic acids:
(C1 - C18), 273, 274, 275, 276, 277, 317, 347, 447, 472, 473, 556, 584, 721, 799, 812, 847, 937

Aliphatic acids, metallic salts, soaps:
215, 263, 295, 326, 335, 465, 496, 574, 576, 577, 626, 684, 733, 762, 763, 764, 813, 833, 849, 857, 858, 859, 900, 916, 986, 1017, 1092, 1066, 1152

Aliphatic acids, ammonium or amine salts:
475, 625, 704, 920, 998, 1190, 83, 84

Aliphatic acids, sorbitan esters: See Sugar alcohols and derivatives.

Aliphatic acids, esters:
319, 337, 356, 357, 474, 651, 705, 713, 848, 868, 950, 1048, 1105, 1110, 697, 1015

Aliphatic acids, hydroxy (salts):
865, 309, 1109

Aliphatic acids, polyethoxy, glycol and polyglycerol esters:
679, 851, 1079, 1112, 87, 88, 89, 90, 91, 92

Aliphatic acids, anhydride:
476, 1001

Aliphatic acids, amides:
292, 583, 1005, 778, 779, 780, 117, 118, 119, 120, 121, 122, 123, 124, 125, 126, 127, 128, 129, 135, 136

Aliphatic acids, chlorinated:
694, 315

Aliphatic acids, amine derivatives:
460, 602, 800

Aliphatic acids, other derivatives:
305, 324, 716, 761 954, 1094, 1098

Aliphatic acids, sulfoethyl ester, (salt):
77, 78, 79, 80, 81, 82

Dicarboxylic acids, aliphatic:
395, 493, 904, 988, 1080

esters - 345, 703, 1130
sulfated, salts - 633, 639, 648, 871, 883, 897, 42, 43, 44, 45

Aromatic acids and esters:
393, 572, 573, 1088, 1131

Aromatic acid amide:
781, 1041, 1126

Aromatic acid salts:
394, 899, 944, 606, 607, 608

Aromatic acid imide:
650

Phthalates:
328, 442, 742, 839, 911, 995, 1129, 1142

Naphthenic acids, salts:
970, 1076, 1065

Naphthenic acids, ester:
1132

Critic acid derivatives:
432 433, 434, 435, 612, 1109

Anthranilic acid derivative:
307

Methacrylic acid derivatives:
168, 169, 849

ALCOHOLS - HYDROXY COMPOUNDS

Aliphatic alcohols:
376, 377, 378, 380, 381, 464, 489, 490, 499, 520, 585, 586,
630, 657, 832, 838, 853, 906, 925, 933, 1023, 1047, 1063, 1100

Cyclic alcohol:
852

Poly alcohol:
860, 961, 1025, 1107, 1133

Alkoxy or Polyalkoxy (usually ethoxy) derivatives:
(alcohols, ethers) 139, 140, 141, 142, 143, 144, 145, 154,
323, 406, 407, 408, 409, 410, 411, 412, 413, 416, 417, 654,
894, 1059, 1127, 1150, 1185, 1186, 1215, 1216, 1217, 1218,
1219, 1220, 1221, 1222, 111, 112, 113, 114, 115, 116

Polyethoxy - polypropoxy derivatives
149, 150, 155, 211, 1141, 1143, 1175

Polyethoxy and polypropoxy compounds:
146, 147, 148, 267, 415, 527, 959, 960, 964, 985, 1026, 1141

Polyethoxy - formaldehyde resins:
137, 138, 145

Sugar alcohols (sorbitol, mannitol) and derivatives:
611, 758, 862, 930, 939, 1169, 97, 98, 99, 100, 101, 102, 103, 104, 105, 106, 107, 108, 109, 110, 1213

Sugar acids and derivatives:
342, 756, 886, 908, 909, 931, 963

Glycols, dihydroxy compounds:
525, 526,

Glycol derivative:
291

Glycerol, esters, (fats):
349, 677, 696, 711, 746, 872, 1159

Peroxide:
1193

AMINES

Amines, aliphatic and salts:
623, 628, 632, 1032, 1033, 1034, 1039, 502, 907, 945, 1075, 1111, 1116, 1085

Amine oxides:
156, 157, 196, 725, 726, 727, 728, 729, 1068

Alicyclic amine:
1137

Aromatic and cycloparaffin amines:
316, 600, 782, 822, 850, 1209

Amine - polyethoxy compounds:
170, 171, 172, 173, 174, 175, 176, 177, 178, 179, 180, 181, 182, 183, 184, 185, 186, 187, 188, 189, 190, 884, 885

QUATERNARY AMMONIUM COMPOUNDS

Alkyl:
530, 531, 532, 533, 534, 640, 641, 642, 643, 715, 794, 807, 993, 1035, 1099, 201, 203

Pyridinium:
193

Imidazolinium:
195, 486

Other:
210, 463, 529, 730, 951, 989, 1031, 1058, 1086, 1165

IMIDAZOLINES - 1113, 1122

IMINO COMPOUNDS, BISETHOXY - 197, 198, 199, 200, 204, 208

OXAZOLINES - 191, 192

TETRAMINE DERIVATIVES - 430, 484, 752

NITRILO COMPOUNDS - 452, 843

ETHYLENE DIAMINE & TRIAMINE DERIVATIVES - 372, 451, 453, 454, 455, 456
457, 458, 459, 461, 462, 706, 743, 864, 949, 990, 1151, 814

AMINE SULFONATE - 1203

ALKYNE DERIVATIVES - 151, 152, 153

ALHEHYDES - 320, 392, 470, 471, 1077, 1161

ARSENIC COMPOUND:
419

CELLULOSE DERIVATIVE:
158

CYANURIC ACID:
591

DICYCLOPENTADIENE DERIVATIVE
167

DITHIOCARBAMATE:
1210

Epoxy compounds:
229, 308, 469, 976

ETHERS

Aromatic
749, 1156, 874

Other:
1007, 1084

Polyethers:
693

Dioxymethylene compound:
601

GUANIDINE DERIVATIVE - 972

HALOGEN COMPOUNDS

Chlorinated hydrocarbons, aliphatic:
214, 426, 466, 467, 468, 580, 590, 663, 672, 720, 747, 790, 828

Fluorocarbons and chlorofluorocarbons:
220, 221, 234, 835, 996, 1024

Brominated hydrocarbons:
498

Aromatic chlorine compounds:
808, 1016

Polychlorinated compounds:
427, 429, 505, 508

HETERONITROGEN - OXYGEN COMPOUND: 609

HETERO-OXYGEN COMPOUNDS - 375, 766

HYDANTOIN - 1135

HYDROCARBONS

Aliphatic:
222, 223, 289, 302, 587, 588, 759, 895, 1138, 1146

Aromatic:
261, 500, 503, 1010, 1192, 597

KETONES - 441, 448, 477, 478, 479, 480, 481, 482, 488, 497, 935, 947, 973

NITRILE - 1069

NITRITE - 325, 724, 777

NITRO COMPOUNDS - 449, 450, 795, 1009, 1093

PEROXIDES - 981

PHENOLIC COMPOUNDS - 271, 340, 397, 439, 440, 483, 494, 501, 506, 507, 509, 510, 518, 589, 689, 700, 744, 861, 898, 910, 1000, 1038, 1049, 1050, 1051, 1052, 1053, 1054, 1055, 1056, 1057, 1087, 1108, 1170, 637

Coumarin derivatives:
272, 595

Aromatic polyhydroxy compound:
810

PHOSPHATES & PHOSPHITES

Esters:
592, 791, 792, 856, 881, 882, 901, 902, 994, 1014, 1153, 332

Polyethoxy and polypropoxide:
667, 668, 669, 670, 757, 770, 775, 875, 893, 936, 962, 76, 72, 73

Salts:
571, 774

Nitrilophosphonate:
278

POLYMERS - 166, 293, 379, 404, 682, 732, 760, 1022, 1144, 1188, 1202

PYRROLIDINES - 313, 343

SILICONES - 311, 680, 869

SULFATES & SULFONATES

Sulfates and salts:
653, 815, 965, 975, 1012, 1177, 51, 52, 56, 57, 58, 59, 60, 61, 62, 70

Sulfate, polyethoxy:
802, 866, 1115, 1119, 1124, 65, 66, 67, 68, 69

Sulfates, amine salt:
63, 676, 845

Sulfonic acids, aliphatic and salts:
806, 842

Sulfonic acid, amine salt:
631, 889, 890, 891, 938, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18

Sulfonic acids, aromatic, and metallic salts:
2, 4, 5, 6, 7, 8, 611, 702, 709, 710, 821, 934, 971, 1120, 21, 22, 23, 1, 20, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39

Lignin sulfonates:
47, 48, 49, 50

Sulfonamide, aromatic:
928, 941

Sulfonated aromatic ether:
581, 582

Sulfonium compound:
1101

Taurines:
53, 54, 55, 800, 842

SULFOXIDE - 796

TERPENES - 425, 740

THIAZOLES - 495

THIOUREA - 718, 734, 736

UREA, UREIDES - 593, 594, 753

INORGANICS

Elements	Oxides	Hydroxides	Carbonates
283	259	385	353
284	359	550	354
331	360	551	543
575	537	552	542
621	270	737	999
665	280		544
695	322		545
825	533		546
	598		547
	714		548
	855		978
	863		1172

Chlorides	Chlorates	Phosphates	Sulfates
219	541	558	355
420	555	562	387
421	1212	563	386
422	424	564	388
485		565	389
554	Bromides	566	491
638		567	492
1171	423	568	517
948	977	569	578
		570	656
Carbamates	Flourides	613	690
		768	691
1167	646	876	692
		1173	836
	Phosphites	1095	952
		723	599
	880	217	
		699	

Sulfites	Borates	Silicates (often hydrated)	Silicoflouride
218	398	246	549
334	399	248	
579	400	251	Azide
681	401	265	
	402	357	969
Thiosulfates	403	358	
		361	
997	Chromates	536	
		538	
Thiocyanate	521	539	
	522	540	
1037	751	671	
	523	683	
Nitrates & Nitrites	Manganates	Aluminate	
559	524	738	
560		771	
561	Molybdates		
	237		

Part 2: Surfactant Classification

1. ALCOHOLS: ABIETYL

144 Polyoxyethylene (16 moles) hydroabietyl alcohol

2. ALCOHOLS; ETHOXYLATED MONOHYDRIC

93 Dodecyloxypoly(ethyleneoxy)ethanol
93S Polyethylene glycol dodecyl ether
116 Octadecyloxypoly(ethyleneoxy)ethanol
116S Polyoxyethylene stearyl alcohol
149 Butoxypoly(ethyleneoxy)poly(propyleneoxy) propanol
149S Butoxypolyethylene polypropylene glycol
150 Polyethylene polypropylene glycol
960 Hexadecyloxypoly(ethyleneoxy)ethanol
960S Polyoxyethylene cetyl alcohol
964 Polyoxyethylene polyoxypropylene fatty alcohols
1127 Trimethyldecyloxypoly(ethyleneoxy)ethanol
1127S Polyoxyethylene trimethyldecyl alcohol
1143 Tridecyloxypoly(ethyleneoxy)poly(propyleneoxy)-2-propanol (9 moles of EO, 3 moles of PO)
1143S Tridecyl polyoxyethylene (9) polyoxypropylene (3) propanol-2
1187 Straight chain blend(14%C20, 32%C18, 51%C16) with 100 moles EO
1215 Tridecyloxypoly(ethyleneoxy)ethanol (3-5 moles of EO)
1215S Polyoxyethylene (3-15 moles) tridecyl alcohol
1216 Dodecyloxypoly(ethyleneoxy)ethanol (4-23 moles of EO)
1216S Polyoxyethylene (4-23 moles) lauryl alcohol
1217 cis-9-Octadecenyloxy(ethyleneoxy)ethanol (20 moles of EO)
1217S Polyoxyethylene (20 moles) oleyl alcohol
1218 cis-9-Octadecenyloxypoly(ethyleneoxy)ethanol (2.5 moles of EO)
1218S Polyoxyethylene (2.5 moles) oleyl alcohol
1219 Hexadecyloxypoly(ethyleneoxy)ethanol (2.5 moles of EO)
1219S Polyoxyethylene (2.5 moles) cetyl alcohol
1220 (1-Isobutyl-3,5-dimethylhexyloxy)poly(ethyleneoxy)ethanol (6 moles of EO)
1220S (Trimethylnonyloxy)poly(ethyleneoxy)ethanol (6 moles of EO)
1220S Polyoxyethylene (6 moles) trimethylnonyl alcohol

3. ALCOHOLS: ETHOXYLATED MONOHYDRIC, SULFATED

65	Dodecyloxypoly(ethyleneoxy)ethyl sulfate, sodium salt of (3-4 moles of EO)
65S	Sodium lauryl polyoxyethylene (3-4 moles) sulfate
68	Dodecyloxypoly(ethyleneoxy)ethyl sulfate, ammonium salt of (6 moles of EO)
68S	Ammonium dodecyl alcohol polyoxyethylene (6 moles) sulfate
644	Ethoxylated linear (C12-15) sec-alcohol sulfate
802	Dodecyloxypoly(ethyleneoxy)ethyl sulfate
802S	Lauryl polyoxyethylene sulfate
1115	Dodecyloxypoly(ethyleneoxy)ethyl sulfate, sodium salt of
1115S	Sodium polyoxyethylene dodecyl alcohol sulfate
1119	Tridecyloxypoly(ethyleneoxy)ethyl sulfate, sodium salt of
1119S	Tridecyl polyoxyethylene sodium salt

4. ALCOHOLS; ETHOXYLATED POLYHYDRIC

140	Polyoxyethylene (3.5-30 moles) 2,4,7,9-tetramethyl-5-decyne-4,7-diol
862	Polyoxyethylene sorbitol
1043	Ethoxylated sorbitan polysorbide

6. ALCOHOLS: SULFATES

56	Sodium octyl sulfate
56S	Octyl sulfate, sodium salt of
58	Sodium tetradecyl sulfate
58S	Tetradecyl sulfate, sodium salt of
59	Sodium cetyl sulfate
59S	Hexadecyl sulfate, sodium salt of
60	Sodium heptadecyl sulfate
60S	Heptadecyl sulfate, sodium salt of
61	Sodium oleyl sulfate
61S	cis-9-Octadecenyl sulfate, sodium salt of
63	N,N-Diethylcyclohexylamine lauryl sulfate
63S	Dodecyl sulfate, N,N-diethylcyclohexyalmine salt of
63S	N,N-Diethylcyclohexylamine salt of lauryl sulfuric acid
653	Sodium 2-ethylhexyl sulfate
845	Dodecyl sulfate, diethanolamine salt of

965	Dodecyl sulfate, potassium salt of
975	2-Ethylhexyl sulfate
1097	Sulfated mixed (C10 and up) oxoalcohols

8. ALKANOL AMIDES

117	N-(2-Hydroxypropyl)octanamide
117S	Monoisopropanolamide of caprylic acid
118	N-(2-Hydroxypropyl)hexanamide
118S	Monoisopropanol amide of capric acid
124	Diethanolamide of oleic acid
124S	N,N-bis(2-Hydroxyethyl)-cis-9-octadecenamide
125	N-(2-_2-(2-Hydroxyethoxy)ethoxy'ethyl)dodecanamide
126	N-(2-_2-(2-Hydroxyethoxy)ethoxy'ethyl)tetradecanamide
127	N-(2-_2-(2-Hydroxyethoxy)ethoxy'ethyl)hexadecanamide
128	N-(2-_2-(2-Hydroxyethoxy)ethoxy'ethyl)octadecanamide
135	N-(2-_2-Hydroxyethoxpoly(ethyleneoxy)poly(propyleneoxy)'propyl) octanamide (5 moles of EO) (10 moles of PO)
135S	Polyoxyethylene(5 moles)polyoxypropylene_10 moles) monoisopropanolamide of caprylic acid
990	N, N'-Ethylenebis(12-hydroxyoctadecanamide)
990S	N, N'-Ethylenebis(12-hydroxystearamide)

10. ALKYL ARYL SULFONATES

6	Calcium dodecylbenzene sulfonic acid
7	Strontium dodecylbenzene sulfonate
7S	Dodecylbenzenesulfonic acid, strontium salt of
8	Zinc dodecylbenzene sulfonate
9	Isopropylamine dodecylbenzene sulfonate
9S	Dodecylbenzenesulfonic acid, isopropylamine salt of
10	Butylamine dodecylbenzene sulfonate
10S	Dodecylbenzenesulfonic acid, butylamine salt of
11	Ethylenediamine dodecylbenzene sulfonate
11S	Dodecylbenzenesulfonic acid, ethylenediamine salt of
12	N-(2-Aminoethyl)ethanolamine dodecylbenzene sulfonate
12S	Dodecylbenzenesulfonic acid, N-(2-aminoethyl)ethanolamine salt of
12S	Dodecylbenzenesulfonic acid, 2-_(2-aminoethyl)amino'ethanol salt of
13	1-(Dimethylamino)-3-aminopropane dodecylbenzene sulfonate
13S	Dodecylbenzenesulfonic acid, 1-(dimethylamino)-3-aminopropane salt of
13S	Dodecylbenzenesulfonic acid, N,N-dimethyl-1,3-propanediamine salt of
13S	3-Dimethylaminopropylamine dodecylbenzene sulfonate
14	1,3-Diaminopropane dodecylbenzene sulfonate

14S Dodecylbenzenesulfonic acid, 1,3-diaminopropane salt of
14S Dodecylbenzenesulfonic acid, 1,3-propanediamine salt of
14S Propylenediamine dodecylbenzene sulfonate
17 Morpholine dodecylbenzene sulfonate
17S Dodecylbenzenesulfonic acid, morpholine salt of
18 tert-Dodecylamine dodecylbenzene sulfonate
18S Dodecylbenzenesulfonic acid, tert-dodecylamine salt of
18S Dodecylbenzenesulfonic acid, 1,1,3,3-tetramethylbutylamine salt of
19 Sodium alkyl(C13.5)benzene sulfonate
22 Sodium decylbenzene sulfonate
22S Decylbenzenesulfonic acid, sodium salt of
24 Sodium dodecylphenoxybenzene disulfonate
631 Dodecylbenzenesulfonic acid, dimethylamine salt of
631S Dimethylamine dodecylbenzenesulfonate
652 Dodecyl diphenyl ether disulfonic acid
652S Dodecyl diphenyl ether of disulfonic acid
821 Sodium n-nonyldiphenyl ether sulfonate
889 Tridecylbenzenesulfonic acid, dimethylamine salt of
890 Tridecylbenzenesulfonic acid, propylamine salt of
890S Propylamine tridecylbenzenesulfonate
891 Dimethylamine propylamine tridecylbenzenesulfonic acid

11. ALKANOL AMINES

155 tert-Alkyl(C12-13)amine (ethylene oxide)35 (propylene oxide)45
170 Hexadecylaminopoly(ethyleneoxy)ethanol (5 moles of EO)
171 Octadecylaminopoly(ethyleneoxy)ethanol (5 moles of EO)
172 cis-9-Octadecenylaminopoly(ethyleneoxy)ethanol (5 moles of EO)
173 Polyethylene (5 moles) tallow amine
174 Hexadecylaminopoly(ethyleneoxy)ethanol (20 moles of EO)
175 Octadecylaminopoly(ethyleneoxy)ethanol (20 moles of EO)
176 cis-9-Octadecenylaminopoly(ethyleneoxy)ethanol (20 moles of EO)
177 Polyoxyethylene (20 moles) tallow amine
178 cis-9-Octadecenyliminodipoly(ethyleneoxy)ethanol (5 moles of EO)
179 9,12-Octadecadienyliminodipoly(ethyleneoxy)ethanol (5 moles of EO)
180 9,12,15-Octadecatrienyliminodipoly(ethyleneoxy)ethanol (5 moles of EO)
181 Polyoxyethylene (5 moles) soybean oil amine
182 cis-9-Octadecenyliminodipoly(ethyleneoxy)ethanol (15 moles of EO)
183 9,12-Octadecadienyliminodipoly(ethyleneoxy)ethanol (15 moles of EO)
184 9,12,15-Octadecadienyliminodipoly(ethyleneoxy)ethanol (15 moles of EO)
185 Polyoxyethylene (15 moles) soybean oil amine
186 Dodecyliminodipoly(ethyleneoxy)ethanol (15 moles of EO)
187 Tetradecyliminodipoly(ethyleneoxy)ethanol (15 moles of EO)
188 Hexadecyliminodipoly(ethyleneoxy)ethanol (15 moles of EO)
189 Octadecyliminodipoly(ethyleneoxy)ethanol (15 moles of EO)
190 Polyoxyethylene (15 moles) coconut oil amines

197	2,2'-Tetradecyliminodiethanol
198	2,2'-Hexadecyliminodiethanol
199	2,2'-Octadecyliminodiethanol
200	Alkyl* N, N-bis(2-hydroxyethyl)amine *(100% C14-C18)
204	2,2'-Dodecyliminodiethanol
208	Alkyl* N,N-bis(2-hydroxyethyl)amine *(100% C12-C18)

12. MONOAMINES

606	Benzoic acid, N,N-dimethyl-cis-9-octadecenylamine salt of
606S	N,N-Dimethyl-cis-9-octadecenylamine benzoate
607	Benzoic acid, N,N-dimethyl-cis-9,12-octadecadienylamine salt of
607S	N,N-Dimethyl-cis,cis-9,12-octadecadienylamine benzoate
608	N,N-Dimethyl oleyl-linoleylamine salt of benzoic acid
625	Acetic acid, dodecylamine salt of
625S	Dodecylamine acetate
1111	cis-9-Octadecenylamine
1111S	Oleylamine

13. POLYAMINES

864	1-(cis-9-Octadecenylamino)-3-aminopropane
864S	N-cis-9-Octadecenyl-1,3-propanediamine
949	Oleic acid ester of 2,2'2",2'''-(ethylenedinitrilo)tetraethanol
949S	Oleic acid ester of tetra(hydroxyethyl)ethylene diamine

14. CARBOXAMIDES

779	N,N-Dimethyl-cis,cis-9,12-octadecadienamide
780	Dimethyl amide of tall oil fatty acids
1005	N,N-Dimethyl-cis-9-octadecenamide

16. AMIDOAMINES

194	Condensation product of sorbitol epichlorohydrin and the tallow diamide of diethylenetriamine

18. AMPHOLYTIC TYPES

460	3-_2-(_2-(2-Hydroxyethoxy)ethyl'octadecylamino)ethoxy'propionic acid potassium salt of
460S	Potassium 3-(2-(2-(2-hydroxyethyl)ethyl octadecyl aminoethoxy propionate

19. ARYL SULFONATES

1	Ammonium xylenesulfonate
1S	Xylenesulfonic acid, ammonium salt of
47	Sodium lignosulfonate
47S	Lignosulfonic acid, sodium salt of
48	Calcium lignosulfonate
48S	Lignosulfonic acid, calcium salt
49	Magnesium lignosulfonate
49S	Lignosulfonic acid, magnesium salt
50	Ammonium lignosulfonate
50S	Lignosulfonic acid, ammonium salt

21. CYCLIC ETHERS: ETHOXYLATED ALKYLPHENOLS

112	Dodecylphenoxypoly(ethyleneoxy)ethanol (6-12 moles of EO)
112S	Polyoxyethylene (6-12 moles) dodecylphenol
113	Dinonylphenoxypoly(ethyleneoxy)ethanol (2-50 moles of EO)
113S	Polyoxyethylene (2-50 moles) dinonylphenol
114	Nonylphenoxypoly(ethyleneoxy)poly(propyleneoxy)propanol (35 to 40 moles of EO)(22 to 35 moles of PO)
114S	Polyoxyethylene (35-40 moles) polyoxypropylene (22-35 moles) nonylphenol
115	Di-sec-butylphenoxypoly(ethyleneoxy)poly(propyleneoxy)propanol (5-12 moles of EO)(4 moles of PO)
115S	Polyoxyethylene (5-12 moles) polyoxypropylene (4 moles) di-sec-butylphenol
137	Polyoxyethylene(10 moles) amylphenol-formaldehyde resin (mol.wt.1500-3000)
141	Polyoxyethylene (12 moles) methylenebis(octylphenol)
142	Polyoxyethylene (18 moles) methylenebis(diamylphenol)
143	Polyoxyethylene (7-7.5 moles) isopropylidenediphenol
145	Polyoxyethylene p-tert-butylphenol-formaldehyde resin
654	Octadecylphenoxypoly(ethyleneoxy)ethanol
654S	Polyoxyethylene octadecyl phenol
894	Benzyl ether of octylphenoxypolyethoxyethanol
1221	Octylphenoxypoly(ethyleneoxy)ethanol (4-70 moles of EO)
1221S	Polyoxyethylene (4-70 moles) octylphenol

22. CYCLIC ETHERS, ALKYL PHENOLS, ETHOXYLATED SULFATES & SULFONATES

66	Nonylphenoxypoly(ethyleneoxy)ethyl sulfate, sodium salt of (4-5 moles of EO)
66S	Sodium nonylphenyl polyoxyethylene (4-5 moles) sulfate
67	Nonylphenoxypoly(ethyleneoxy)ethyl sulfate, ammonium salt of (4-5 moles of EO)
67S	Ammonium nonylphenyl polyoxyethylene (4-5 moles) sulfate
69	Nonylphenoxypoly(ethyleneoxy)ethyl sulfate, triethanolamine salt of (6 moles of EO)
69S	Triethanolamine salt of nonylphenyl polyoxyethylene (6 moles) sulfuric acid
866	Nonylphenoxypoly(ethyleneoxy)ethyl sulfate

24. FATTY ACIDS: ETHOXYLATED

87	Polyoxyethylene (15-200 moles) castor oil
88	Polyoxyethylene tall oil (mol. wt. 700-5000)
89	Polyoxyethylene oleate (mol. wt. 400-1000)
90	Polyoxyethylene stearate (mol wt. 600-2000)
91	Polyoxyethylene soybean oil fatty acid ester (mol. wt. 850)
92	Polyoxyethylene monolaurate (mol. wt. 780)
679	Oleic acid, 2-(2-_2-(2-hydroxyethoxy)ethoxy'ethoxy)ethyl ester of
679S	Tetraglycerol oleate
846	Polyethylene glycol tallate
851	Polyoxyethylene dioleate
1147	Polyethylene glycol 400 monolaurate
1214	Polyoxyethylene (25 moles) glycerol tall oil ester

25. FATTY ACIDS, RESIN AND TALL OIL

74	Abietic acids, sodium salts of
74S	Sodium salt of rosin
75	Sodium salt of hydrocarbon insoluble fraction of rosin

273	Lauric acid
916	Linoleic acid
1098	Lauric acid, diethanolamine salt of
1098S	Diethanolamine laurate
1155	Potassium salt of wood rosin acids
1190	Stearic acid, triethanolamine salt of
1190S	Triethanolamine stearate

26. FATTY ACIDS: SOAPS

658	Sodium tallow soap
684	Stearic acid, potassium salt of
684S	Potassium stearate
813	Ricinoleic acid, sodium salt of
813S	Sodium ricinoleate
833	Octanoic acid, aluminum salt of
833S	Aluminum octanoate
857	Lauric acid, barium salt of
857S	Barium laurate
858	Lauric acid, cadmium salt of
858S	Cadmium laurate
859	Barium-cadmium laurate
900	Octanoic acid, zinc salt of
900S	Zinc octoate
998	Stearic acid, ammonium salt of
998S	Ammonium stearate
1017	Octanoic acid, zirconium salt of
1017S	Zirconium octanoate

28. FATTY ACID ESTERS: GLYCEROL

96	Polyglyceryl phthalate ester of coconut oil fatty acid (mol. wt. 1000-3000)
677	Glyceryl monooleate
677S	Oleic acid, glyceryl ester of
696	Glyceryl monostearate
696S	Stearic acid, glyceryl ester of
711	Glyceryl monoricinoleate
711S	Ricinoleic acid, glyceryl ester of
872	Glyceryl tris(12-hydroxystearate)
872S	12-Hydroxyoctadecanoic acid, glyceryl ester of
903	Diacetyl tartaric acid esters of mono and diglycerides of edible fats

29. FATTY ACID ESTERS: GLYCOL

834	Propylene glycol tall oil ester

30. FATTY ACID ESTERS: OTHERS

106	Mannitan coconut oil ester
693	2,2-bis(Hydroxymethyl)-1,3-propanediol, tall oil ester of
693S	Pentaerythritol ester of tall oil
705	Stearic acid, 2-hydroxyethyl ester of
705S	Ethylene glycol monostearate
1015	Methyl tallate
1105	Palmitic acid, methyl ester of
1105S	Methyl palmitate

1110 Stearic acid, methyl ester of
1110S Methyl stearate

31. FLUORINATED COMPOUNDS

928 N-Ethyl-N-(heptadecafluorooctylsulfonyl)glycine, potassium salt of
928S Potassium salt of N-ethyl perfluorooctanesulfonamido acetic acid
928S N-Ethyl-N-(1,1,2,2,3,3,4,4,5,5,6,6,7,7,8,8,8-heptadecafluorooctyl)-sulfonyl'glycine, potassium salt of

32. HETEROCYCLIC TYPE PRODUCTS: IMIDAZOLINE ETC.

191 2-(8-Heptadecenyl)-4-methyl-2-oxazoline-4-methanol
191S 2-Heptadecenyl-4-(hydroxymethyl)-4-methyl-2-oxazoline

36. NAPHTHALENE AND ALKYL NAPHTHALENE SULFONATES

2 Sodium dodecylnaphthalene sulfonate
2S Dodecylnaphthalenesulfonic acid, sodium salt of
25 Sodium diisopropylnaphthalene sulfonate
25S Diisopropylnaphthalenesulfonic acid, sodium salt of
26 Sodium triisopropylnaphthalene sulfonate
26S Triisopropylnaphthalenesulfonic acid, sodium salt of

27	Sodium isopropylnaphthalene sulfonate (2-3 isopropyl groups)
29	Sodium dibutylnaphthalene sulfonate
29S	Dibutylnaphthalenesulfonic acid, sodium salt of
30	Sodium isobutylnaphthalene sulfonate
30S	Isobutylnaphthalenesulfonic acid, sodium salt of
31	Sodium diisobutylnaphthalene sulfonate
31S	Diisobutylnaphthalenesulfonic acid, sodium salt of
32	Sodium butylnaphthalene sulfonate (1-2 butyl or isobutyl groups)
33	Sodium methylnaphthalene sulfonate
33S	Methylnaphthalenesulfonic acid, sodium salt of
34	Sodium dimethylnaphthalene sulfonate
34S	Dimethylnaphthalenesulfonic acid, sodium salt of
35	Sodium trimethylnaphthalene sulfonate
35S	Trimethylnaphthalenesulfonic acid, sodium salt of
36	Sodium methylnaphthalene sulfonate (1-3 methyl groups)
37	Sodium nonylmethylnaphthalene sulfonate
37S	Nonylmethylnaphthalenesulfonic acid, sodium salt of
38	Isopropylamine methylnaphthalene sulfonate
38S	Methylnaphthalenesulfonic acid, isopropylamine salt of
702	Sodium isopropyl isobutyl naphthalene sulfonate

38. OILS AND FATTY ACIDS: SULFATES AND SULFONATES

70	Sulfonated oleic acid, butyl ester, sodium salt of
70S	9-Hydroxyoctadecanoic acid, butyl ester, hydrogen sulfate, sodium salt of
70S	Sodium salt of sulfated butyl oleate
77	Lauric acid, 2-sulfoethyl ester, sodium salt of
77S	Isethionic acid, laurate, sodium salt of
78	Myristic acid, 2-sulfoethyl ester, sodium salt of
78S	Isethionic acid, myristate, sodium salt of
79	Palmitic acid, 2-sulfoethyl ester, sodium salt of
79S	Isethionic acid, palmitate, sodium salt of
80	Stearic acid, 2-sulfoethyl ester, sodium salt of
80S	Isethionic acid, stearate, sodium salt of

81	Sodium isethionate, coconut fatty acid ester
81S	Isethionic acid, coconut fatty acid ester ,sodium salt of
82	Oleic acid, 2-sulfoethyl ester, sodium salt of
82S	Sodium isethionate, oleic acid ester
82S	Isethionic acid, oleate, sodium salt of

40. PETROLEUM SULFONATES

41	Calcium petroleum sulfonate
41S	Petroleumsulfonic acid, calcium salt of
41S	Calcium salt of petroleum sulfonic acid

41. PHOSPHATE: ALCOHOL ETHOXYLATES

72	Nonylphenoxypoly(ethyleneoxy)ethyl phosphate
72S	Nonylphenyl polyoxyethylene (9-10) phosphoric acid
73	Nonylphenoxypoly(ethyleneoxy)ethyl phosphate, sodium salt of (6 moles of EO)
73S	Sodium nonylphenyl POE (6) phosphate
76	Tridecyloxypoly(ethyleneoxy)ethyl phosphate
76S	Tridecyl polyoxyethylene phosphoric acid
667	Decyloxypoly(ethyleneoxy)ethyl phosphate
668	Tetradecyloxypoly(ethyleneoxy)ethyl phosphate
669	Dodecyloxypoly(ethyleneoxy)ethyl phosphate
670	Polyoxyethylene alkyl(C10-C14)ester of phosphoric acid
893	4-(1,1-Dimethylethyl)phenoxypoly(ethyleneoxy)ethyl phosphate
893S	p-tert-Butylphenoxypolyethoxy ethyl phosphate
936	Butylpolyethoxyethanol esters of phosphoric acid
962	Dodecyloxypoly(ethyleneoxy)ethyl phosphate, ammonium salt of
962S	Ammonium dodecyl alcohol polyoxyethylene phosphate
1114	Octyloxypoly(ethyleneoxy)ethyl phosphate
1114S	Polyoxyethylene octyl ester of phosphoric acid

1136	2-_2-(2-Butoxyethoxy)ethoxy'ethyl phosphate
1136S	Butoxytriethylene glycol phosphate
1179	4-Nonylphenoxypoly(ethyleneoxy)ethyl phosphate, magnesium salt of
1179S	A-(p-Nonylphenyl)-W-hydroxypolyoxyethylene, mixture of mono and di hydrogen phosphate esters, magnesium salt

45. PHOSPHATE: ETHER ETHOXYLATES

770	Nonylphenoxypoly(ethyleneoxy)ethyl phosphate
770S	Ethoxylated nonylphenol phosphate acid ester
775	Polyoxyethylene polyoxypropylene phosphate

46. POLYHYDROXY NONIONICS

151	2,4,7,9-Tetramethyl-5-decyne-4,7-diol
152	3,6-Dimethyl-4-octyne-3,6-diol
908	n-Octyl glucoside
909	n-Decyl glucoside

51. QUATERNARY SURFACTANTS

201	Dimethyl dioctadecyl ammonium chloride
201S	Distearyl dimethyl ammonium chloride
533	Dihydrogenated tallow hydroxyethyl methyl ammonium chloride
534	Ditallow dimethyl ammonium chloride
640	Dimethyl dioctadecyl ammonium methosulfate
641	Dimethyl ditetradecyl ammonium methosulfate
642	Dihexadecyl dimethyl ammonium methosulfate
643	Dihydrogenated tallow dimethyl ammonium methosulfate
715	2-(2-Carboxyethoxy)ethyl 2-hydroxyethyl methyl octadecyl ammonium methyl sulfate, potassium salt of
730	1-Methyl-1-alkylamidoethyl-2-alkyl-imidazolinimethosulfate alkyl = 30% palmitic, 70% stearic
951	Dimethyl octadecyl benzyl ammonium chloride

53. SORBITAN ESTERS

100	Sorbitan coconut oil ester
101	Polyoxyethylene (6-20 moles) sorbitan mono tall oil ester
108	Polyoxyethylene sorbitol hexaoleate
109	Polyoxyethylene sorbitol tetraoleate
110	Polyoxyethylene (40 moles) sorbitol penta tall oil ester
758	Sorbitan trioleate
930	Sorbitan sesquioleate
1004	Sorbide dioleate
1213	Polyoxyethylene (40 moles) sorbitol hexa tall oil ester

54. SUCCINATES: SULFO DERIVATIVES

43	Sodium dinonyl sulfosuccinate
46	Tetrasodium N-(1,2-dicarboxyethyl)-N-octadecyl sulfosuccinamate sodium lignosulfonate
639	Sulfosuccinic acid, ditridecyl ester, sodium salt of
639S	Sodium ditridecyl sulfosuccinate

55. TAURATES AND AMIDE SULFATES

800	N-Oleoyltaurine, sodium salt of
800S	Sodium oleoyl taurine
53	**Sodium N-oleoyl-N-methyltaurine**
53S	**N-Methyl-N-oleoyltaurine, sodium salt of**
54	**Sodium-N-palmitoyl-N-methyltaurine**
54S	**N-Methyl-N-palmitoyltaurine, sodium salt of**
55	**Sodium-N-lauroyl-N-methyltaurine**
55S	**N-Lauroyl-N-methyltaurine, sodium salt of**

56. TERTIARY AMINE OXIDES

156	N,N-Dimethyltetradecylamine oxide
156S	Myristyl dimethylamine oxide
157	N,N-Dimethylhexadecylamine oxide
157S	Cetyl dimethylamine oxide
196	N,N-Dimethyloctadecylamine oxide
196S	Stearyl dimethylamine oxide
729	Dimethylcocoamine oxide
1068	N,N-Dimethyldodecylamine oxide
1068S	Lauryl dimethylamine oxide

57. THIO AND MERCAPTO DERIVATIVES

139	Dodecylthiopoly(ethyleneoxy)ethanol (8-12 moles of EO)
139S	Polyoxyethylene (8-12 moles) dodecylmercaptan

58. VINYL AND OTHER POLYMERIC RESINS, SMA, ETC.

85	Sodium salt of a copolymer of maleic anhydride and diisobutylene
154	Copolymer of castor oil, maleic anhydride, and polyethylene glycol 600
732	Dodecyl 2-methylacrylate polymer
732S	Lauryl methacrylate polymer
1208	Maleic anhydride methyl vinyl ether copolymer

Appendix 4

Appendix 4
Sample Data Collection Formats

"INERT INGREDIENTS OF PESTICIDE FORMULATIONS" (FORMAT FOR IDENTIFICATION AND TOXICOLOGICAL APPRAISAL) — Format I

A. EPA Accession Number and Name:

001069 Acetonitrile

B. American Chemical Society Chemical Abstracts Service (CAS) Name and Registry Number

Acetonitrile

75-05-8

C. Other Names

(S): Cyanomethane; Ethanenitrile; Ethyl nitrile; Methane, cyano-; Methanecarbonitrile; Methyl cyanide

D. Chemical Composition

CH3-CN
(MW) 41.03

E. EPA Chemical Code

F. Molecular Structure

$CH_3-C\equiv N$

G. Chemical and Physical Properties (1,2)

1. solubility - miscible with water, methanol, methyl acetate, ethyl acetate, acetone, ether, acetamide solutions, chloroform, carbon tetrachloride, ethylene chloride and many unsaturated hydrocarbons; immiscible with many saturated hydrocarbons

2. specific gravity (or density) - (d) 15/4: 0.78745 (d) 30/4: 0.77138

3. state, color, odor, etc. - liquid ether-like odor

4. MP, BP, VP - (MP) -45° (BP) 760: 81.6°

5. corrosiveness

6. technical products & impurities

7. stability

H. Use as an Inert - solvent for blended emulsifiers in all pesticides used before crop emerges from soil and in herbicides before or after crop emerges (6)

I. Other Uses Active? Yes ( ) No (X)
in organic synthesis; to remove tars, phenols and coloring matter from petroleum hydrocarbons; as a solvent (2)

J. Government Regulations

1. FDA

2. EPA - 40 CFR 180.1001 - Residues exempt from the requirement of a tolerance when used in accordance with good agricultural practice as an inert ingredient in pesticide formulations applied to growing crops only. Acetonitrile may not comprise more than 0.5% of a pesticide formulation. (6)

3. OSHA - 29 CFR 1910.1000 - U.S. Occupational Standard: 40 ppm or 80 mg/m3 on an eight-hour time weighted average (TWA). (7)

4. NIOSH

5. DOT - 49 CFR 172.101 - Hazard class: Flammable liquid
Label: Flammable liquid (15)

6. Other Federal - ACGIH - TLV 40 ppm or 70 mg/m3 on an eight-hour time weighted average (TWA) (5)

7. State, County

8. Foreign Countries

K. Manufacturer(s) - Conray Products Co.; Eastman Chemical Products, Inc.; Lonza, Inc.; Vistron Corp. (4)

L. Environment

1. Effect - Acetonitrile (1000 mg/l) added to the aquatic environment of fish disrupted blood circulation and protein metabolism and induced hyperemia, hemorrhages, and the appearance of small granules in the heart, brain, liver and gills of the fish. Death apparently resulted from circulatory changes and necrobiotic changes in the cerebral neurons. (14)

2. Conversion Products (Metabolites, Degradation Products)

3. Fate - The breakdown of acetonitrile by a crude bacterial extract was a two-step enzymatic hydrolysis with acetamide as the intermediate and acetic acid and ammonia as the final products. (8)

4. Persistence

5. Bioaccumulation

M. Toxicology

1. Human effects

a. Occupational Studies

b. Epidemiology

c. Metabolic Effects Studies

d. Poisoning Incidents and Case Studies - A 19 year-old laboratory worker died after using acetonitrile and boiling water to clean a floor. Four hours after exposure to the vapors, he began to feel sick and vomited during the night. The next morning he was confused and later comatose, interrupted by convulsions. He died several days later. Autopsy showed HCN in liver, kidneys, spleen, heart, and lungs (13)

e. Others

2. Non-Human Mammalian Effects

a. Acute toxicity - Oral, LD50: rat, 3800 mg/kg; Inhalation, LC50: rat, 8000 ppm/4hr; Intraperitoneal, LD50: mouse, 1920 mg/kg; Subcutaneous, LDLo: mouse, 700 mg/kg (3)
Rats exposed to air containing 25,000 ppm acetonitrile showed severe dyspnea and cyanosis and died within 30 minutes. Rats exposed to 2800 ppm/day showed dyspnea, anuria and diarrhea. After five exposures, the autopsy showed the largest concentration of unchanged acetonitrile in the kidney, liver, intestine, muscle, testes, and heart. Free HCN was evenly distributed throughout the body. (10)

b. Pharmacology - Intraperitoneal administration of acetonitrile at 50 mg, 28 times during six weeks produced effects similar to those of potassium cyanide. (11)

c. Absorption/Excretion

d. Metabolism - About 5% of administered acetonitrile was converted in rats to HCN when administered intraperitoneally at 50 mg/day, 5 days/week for 10 weeks. (12)

e. Subacute - Rats received daily intraperitoneal doses of acetonitrile of 50 mg/day, 5 days/week for 10 weeks. There was no diminution in diuresis. There was diminished growth in the treated rats as compared to the controls. At the autopsy, the most free HCN was found in the spleen, heart and brain. Acetonitrile was probably degraded to HCN rather slowly, otherwise the repeated injections would have been fatal. (9)

f. Sensitization

g. Teratology

h. Mutagenicity

i. Carcinogenicity

j. Other Chronic Effects (Both Reversible and Irreversible)

k. Behavioral Effects

l. Synergism

m. Other

N. Recommendation: Class 2
The unrestricted use of this material as an inert ingredient in pesticide formulations should be discontinued because of its immediate hazard to the health of animals and man. The use of appropriate low levels may be nonhazardous, depending upon the specific use of each individual formulation.

O. Sources used in Search

1. On Line Data Bases
   a. Toxline
   b. Medline
   c. Chemline
   d. Other

2. Major References
   a. The Merck Index
   b. NIOSH Registry of Toxic Substances
   c. Chemical Abstracts
   d. Biological Abstracts
   e. Other

P. References and Review Articles

( ) U.S. Environmental Protection Agency, Office of Pesticide Programs, Acceptable Common Names and Chemical Names for the Ingredient Statement on Pesticide Labels, U.S. G.P.O., Washington, D.C.: 1975.

(1) Chemical Rubber Publishing Co., Handbook of Chemistry and Physics, 57th Ed., Cleveland, Ohio: 1976-1977.

( ) Condensed Chemical Dictionary, 8th Ed., Van Nostrand-Rheinhold Co., New York: 1971.

(2) Merck and Co., The Merck Index, 9th Ed., Rahway, N.J.: 1976.

(3) National Institute of Occupational Safety and Health, Registry of Toxic Effects of Chemical Substances, U.S. G.P.O., Washington, D.C.: 1976.

( ) Association of American Pesticide Control Officials, Inc., Pesticide Chemical Official Compendium, Topeka, Ks.

( ) Farm Chemicals Handbook, Meister Publishing Co., Willoughby, Ohio: 1975.

( ) McCutcheons Detergents and Emulsifiers, Allured Publishing Co., Ridgewood, N.J.: 1973.

( ) U.S. Food and Drug Administration, Department of Health, Education & Welfare, GRAS Monograph Series.

( ) World Health Organization, IARC Monographs on the Evaluation of Carcinogenic Risk of Chemicals to Man, Geneva.

P. References and Review Articles (cont.)

(4) Oil, Paint and Drug Reporter, OPD Chemical Buyers Directory, Schnell Publishing Co., New York: 1974.

(5) American Conference of Governmental and Industrial Hygienists, TLVs-Threshold Limit Values for Chemical Substances and Physical Agents in the Workroom Environment, Cincinnati, Ohio: 1975.

(6) U.S. E.P.A., Code of Federal Regulations; 40, part 180.1001, Washington, D.C.: 1976.

(7) U.S. O.S.H.A., Code of Federal Regulations; 29, part 1910.1000, Washington, D.C.: 1976.

(8) Digeronimo, M.J. and A.D. Antoine, Metabolism of acetonitrile and propionitrile by Nocardia rhodochrous LL100-21, Appl. Environ. Microbiol.; 31(6), pp 900-906, 1976.

(9) Haguenoer, J.M.; J. Dequidt; M.C. Jacquemont, Experimental acetonitrile intoxications: III. medium long-term effects of repeated intraperitoneal injections, Eur. J. Toxicol. Environ. Hyg.; 8(2), pp 107,112, 1975.

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(11) Haguenoer, J.M. et al, Experimental acetonitrile intoxication. 4. Effect of hydroxocobalamin on chronic intoxication, Eur. J. Toxicol. Environ. Hyg.; 8(2), pp 113-121, 1975.

(12) Haguenoer, J.M.; J. Dequidt; M.C. Jacquemont, Experimental acetonitrile intoxication. 3. Chronic intoxication by repeated intraperitoneal injections, Eur. J. Toxicol. Environ. Hyg.; 8(2), pp 107-112, 1975.

(13) Dequidt, J. et al, Intoxication with acetronitrile with a report on a fatal case, Eur. J. Toxicol. Environ. Hyg.; 7(2), pp 91-97, 1974.

(14) Belousov, Y.A., Morphological changes in some fish organs during poisoning, Vliyannie Pestits. Dikikh Zhivotn.; pp 41-45, 1972.

(15) U.S. D.O.T., Code of Federal Regulations; 49, part 172.101, Washington, D.C.: 1976.

"INERT INGREDIENTS OF PESTICIDE FORMULATIONS" Format
(FORMAT FOR IDENTIFICATION AND TOXICOLOGICAL APPRAISAL) II

A. EPA Accession Number and Name:

000358C Fertilizer

B. Description

C. Use as an Inert

D. Problems Encountered

000358C Fertilizer
The occcurrence of this "C" substance in nature is doubtful; number changed to 358T.
000358 Soapstone.
000358S Magnesium silicate, hydrate
000361 Talc
358 and 358S are synonyms of 361; 358 and 358S have both been deleted and changed to 361S.

E. Recommendation: Class 6
000358T is an indefinite compound. We are unable to write a chemical formula or to find information in the literature.

F. Sources Used in Search

1. On Line Data Bases
   a. Toxline
   b. Medline
   c. Chemline

2. Major References
   a. The Merck Index
   b. NIOSH Registry of Toxic Substances
   c. Chemical Abstracts
   d. Biological Abstracts

"INERT INGREDIENTS OF PESTICIDE FORMULATIONS" Format
(FORMAT FOR IDENTIFICATION AND TOXICOLOGICAL APPRAISAL) III

A. EPA Accession Number and Name

001000 3,4,5-Trihydroxybenzoic acid, propyl ester of

B. American Chemical Society Chemical Abstracts Service (CAS) Name and Registry Number

Benzoic acid, 3,4,5-trihydroxy-, propyl ester

121-79-9

C. Other Names

(EPA S): Gallic acid, propyl ester of; Propyl gallate
(S): n-Propyl gallate; Propyl 3,4,5-trihydroxybenzoate; n-Propyl 3,4,5-trihydroxybenzoate
(T): Nipa 49; Nipagallin P; Progallin P; Tenox PG

D. Chemical Composition

C10-H12-O5
(MW) 212.20

E. EPA Chemical Code

F. Molecular Structure

G. Chemical and Physical Properties (2,6)

1. solubility - 0.35g/100ml water 25°; freely soluble in alcohol and ether

2. specific gravity (or density)

3. state, color, odor, etc. - fine white to nearly white odorless powder with a slightly bitter taste

4. MP, BP, VP - (MP) 148°

5. corrosiveness

6. technical products & impurities - Chemical grade: must be between 98%-102% purity, melting point must be 146°-148°; 3 ppm Arsenic max.; 10 ppm heavy metals max.; 0.5% drying loss max. (6)

7. stability - darkens in the presence of iron or iron salts; decomposes when heated

H. Use as an Inert - antioxidant (4)

I. Other Uses Active? Yes ( ) No (X)
antioxidant for foods, fats, oils, ethers, emulsions, waxes, transformer oils (2)

J. Government Regulations - EPA 40 CFR 180.1001 - Residues exempted from the requirement of a tolerance when used in accordance with good agricultural practice as an inert ingredient in pesticide formulations applied to growing crops, raw agricultural commodities after harvest, or animals.
FDA 21 CFR 121.101 - Generally recognized as safe (GRAS) when used as a chemical preservative. The total content of the antioxidants should not exceed 0.02% of the total fat or oil content of the food. (5)

K. Manufacturer(s) - Eastman Chemical Products; Harshaw Chemical Co. (1)

L. Environment

M. Toxicology - Oral LD50: rat, 2.5-4.0 g/kg; cat, 400 mg/kg
Oral LDLo: mouse, 1600 mg/kg; rat, 500 mg/kg (2,3)
Studies in rats show that the major metabolites are gallic acid and 4-O-methyl gallic acid. (6) Rats and mice fed 1/10 and 1/5 of their respective LD50 values showed reduced growth rates and reduced activities of blood catalase, peroxidase and cholinesterase. (7) The lower weight gains and reduced development were confirmed in several other feeding studies. (6) In long term studies of up to 2 years on dogs and guinea pigs, no adverse changes were noted in gross appearance, growth, reproduction, hemoglobin, erythrocytes, leukocytes, renal function and internal organs. The authors concluded that PG caused no detectable toxic effects even in quantities a hundred times greater than needed to serve as an effective antioxidant. (8) A 20% solution of PG caused microinvasion of the epidermis in guinea pigs. (9)

N. Recommendation: Class 4
When used as an inert ingredient in pesticide formulations, Propyl gallate poses no hazard to the health of animals or man. No additional toxicological investigations are indicated.

O. Sources Used In Search:

1. On Line Data Bases
   a. Toxline
   b. Medline
   c. Chemline

2. Major References
   a. The Merck Index
   b. NIOSH Registry of Toxic Substances
   c. Chemical Abstracts
   d. Biological Abstracts

P. References & Review Articles

(1) Oil, Paint and Drug Reporter, OPD Chemical Buyers Directory, Schnell Publishing Co., New York: 1974.
(2) Merck and Co., The Merck Index, Rahway, N.J.: 1976.
(3) National Institute for Occupational Safety and Health, Registry of Toxic Effects of Chemical Substances, Washington, D.C.: 1975.
(4) U.S. E.P.A., Code of Federal Regulations; 40, part 180.1001, Washington, D.C.: 1976.
(5) U.S. F.D.A., Code of Federal Regulations; 21, part 121.101, Washington, D.C.: 1976.
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(7) Karplyuk, I.A., Toxicologic characteristics of phenolic antioxidants of edible fats, Voprosy Pitaniya; 18(4), pp 24-29, 1959.
(8) Orlen, J.M., et al, Studies on the toxicity of propyl gallate and of antioxidant mixtures containing propyl gallate, Food Technology; 2(4), pp 308-316, 1948.
(9) Riley P.A. and P. Seal, Role of substituted anisoles in epidermal microinvasion, Journal of Pathology; 114(1), pp 1-7, 1974.

"INERT INGREDIENTS OF PESTICIDE FORMULATIONS" Format
SURFACE ACTIVE AGENT EVALUATION FORM IV

A. EPA Accession Number and Name

000802 Dodecyloxypoly(ethyleneoxy)ethyl sulfate

B. American Chemical Society Chemical Abstracts Service (CAS) Name and Registry Number

55172-07-1

Poly(oxy-1,2-ethanediyl), alpha-((dodecyloxy)sulfonyl)-omega-hydroxy-

C. Other Names

(EPA S): Lauryl polyoxyethylene sulfate
(S): Polyethylene glycol lauryl sulfate

D. Chemical Composition

(C2-H4-O)n C12-H26-O4-S

E. Molecular Structure

C12-H23-O-(CH2-CH2-O)n CH2-CH2-OSO3H

F. Surfactant Class

Alcohols: Ethoxylated monohydric, sulfated

G. Physical Data

1. Trade name, equivalent chemical name, manufacturer, state, product concentration, H.L.B.

2. Solubility

3. Ionic Character - anionic

4. Other physical data - In 1973 10 million pounds of ethoxylated sulfated salts of lauryl alcohol were produced. (2)

H. Usage

1. In pesticidal formulations - surfactant; related adjuvant of surfactants (1)

2. General

I. Government Regulations - EPA 40 CFR 180.1001 - Exempt from the requirement of a tolerance when used in accordance with good agricultural practice as an inert ingredient in pesticide formulations applied to growing crops or raw agricultural commodities after harvest. (1)

J. Environment - Lauryl polyoxyethylene (3 moles) sulfate was found to degrade 100% in a 7-day die away test. (3) In an activated sludge test, lauryl polyoxyethylene (4 moles) sulfate was degraded 98%-100% in a single 24-hour cycle (2) The title compound with 2.6 moles of EO had a 6-hour LC50 to goldfish of 55.0 mg/l. Biodegradation is slower with increased degree of ethoxylation. (2)

Alcohol ethoxy sulfates are readily biodegraded under both aerobic and anaerobic conditions. Within the range utilized in detergent formulations, neither the length of the alkyl chain nor the number of oxyethylene units in the molecule appear to significantly affect the rate of biodegradation. Alcohol ethoxy sulfates appear to be readily degraded to CO2 and H2O. (2)

K. Toxicology - Unsulfated polyoxyethylene lauryl alcohol had an oral LD50 of 3300 mg/kg when administered to mice. (4) No adverse effects were found in rats fed 0.5% Lauryl polyoxyethylene (3 moles) sulfate for two years. (2)

This class of surfactants exhibits a low order of oral and dermal toxicity in test animals. However, in the undiluted form, the members of this class are moderate to severe dermal irritants and positive eye irritants in rabbits. Excessive dermal exposure to concentrations greater than 1% - 2% should be avoided.

Chronic oral exposure of rats to members of this class of surfactants at 0.5% for two years produced no deleterious effects. No evidence of carcinogenicity was found in chronic oral or cutaneous exposure to alcohol ethoxy sulfates. No teratogenic or other reproductive effects were found in animal studies. No mutagenic effects were found in in vitro or host-mediated mutagensis tests. (2)

L. Recommendation: Class 3
Group 3 Alcohols: Ethoxylated Monohydric, Sulfated

This group of surfactants is essentially nonionic excepting for the sulfate esters and exhibits a low order of biological activity. It is degraded in biological systems at a moderate rate. Members of this group generally exhibit a low order of skin and mucous membrane irritancy. The sulfate esters are not easily absorbed.

As an inert ingredient in pesticide formulations, a member of this group poses no serious hazard to the health of animals or man.

M. Bibliography

(1) U.S. E.P.A., Code of Federal Regulations; 40, part 180.1001, Washington, D.C.: 1976.
(2) Human Safety Factors and Environmental Aspects of Major Surfactants, The Soap and Detergent Association, New York: 1977.
(3) Swisher, R.D., Surfactant Biodegradation; Surfactant Science Series; Vol, 3, Marcel Dekker, Publishing Co., New York: 1970.
(4) National Institute for Occupational Safety and Health, Registry of Toxic Effects of Chemical Substances, Washington, D.C.: 1976.

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703 790-5363

July 20, 1977

Appendix 5
Form Letter to Manufacturers

Attention: Technical Sales

Dear Sir:

For the past nine months we have been under contract to the Environmental Protection Agency to classify inert ingredients in pesticide formulations. The purpose of this study is to provide a thorough review of these substances and to establish a central data base for all inerts.

We are in the final stages of this project and are currently working on the last group of compounds - 250 surface active agents. Since there is little data available on the chemistry, toxicity or safety of these compounds in the general literature, it is necessary for us to appeal directly to the manufacturers for information.

It would be very helpful and greatly appreciated if your organization could send a complete listing of the surface active agents that you manufacture and all technical literature available on the compounds. Please send any other chemical, toxicological or safety related information that you may have in addition to your technical literature.

If you have no information on your products, please send us a complete list of the surface-active agents that you produce.

As this is a short-term contract, your prompt attention to this matter will help immensely. Please feel free to contact us if you have any questions or require further information.

Thank you for your help and cooperation in this matter.

Very truly yours,

Stephen E. Noren

Stephen E. Noren
Project Manager

SEN:klb

Appendix 6
List of Manufacturers Contacted

Aceto Chemical Co., Inc.
126-02 Northern Blvd.
Flushing, N.Y. 11368

Air Products and Chemicals Inc.
Allentown, Pa. 18105

Ajinomoto U.S.A., Inc.
745 Fifth Ave.
New York, N.Y. 10022

Alcolac Inc.
3440 Fairfield Rd.
Baltimore, Md. 21226

Alconox Inc.
215 Park Ave, So.
New York, N.Y. 10003

Alkaril Chemicals Ltd.
3256 Wolfedale Road
Mississauga, Ont., Canada

Allied Colloids Inc.
One Robinson Lane
Ridgewood, N.J. 07450

Alox Corp.
Buffalo Ave. & Iroquios St.
P.O. Box 517
Niagara Falls, N.Y. 14302

Amerchol, a unit of
CPC International Inc.
Talmadge Road
Edison, N.J. 08902

American Can Co.
Chemical Products Dept.
American Lane
Greenwich, Conn. 06830

American Color & Chemical Corp.
11400 Westinghouse Blvd.
Charlotte, N.C. 29210

American Cyanamid Co.
Industrial Chemicals and Plastics Div.
Berdan Ave.
Wayne, N.J. 07470

American Cyanamid Co.
Organic Chemicals Div.
Dyes and Chemicals Dept.
Bound Brook, N.J. 08805

American Hoechst Corp.
Dyes & Pigments Div.
Rt. 202-206 North
Somerville, N.J. 08876

American Lecithin Co. Inc.
32-34 61st Street
Woodside, L.I., N.Y. 11377

ARCO Chemical Co.
Div. Atlantic Richfield Co.
1500 Market St.
Philadelphia, Pa. 19101

Ardmore Chemical Co.
840 Valley Brook Ave.
Lyndhurst, N.J. 07071

Arizona Chemical Co.
Berdan Avenue
Wayne, N.J. 07470

Arkansas Co., Inc.
185 Foundry St.
P.O. Box 210
Newark, N.J. 07101

Armak Chemicals Div.
Akzona Inc.
P.O. Box 1805
Chicago, Ill. 60690

Armour Dial Co.
Industrial Sales
2000 Aucutt Rd.
Montgomery, IL 60638

Armstrong Chemical Co., Inc.
1530 South Jackson St.
Janesville, Wis. 53545

Ashland Chemical Co.
Div. of Ashland Oil, Inc.
5200 Paul G. Blazer Memorial Parkway
Dublin, Ohio 43017

Atlantic Richfield Co.
1500 Market St.
Philadelphia, Pa. 19101

Atlas Chemical
New Murphy Rd. & Concord Pike
Wilmington, Del. 19897

Atlas Refinery, Inc.
142 Lockwood St.
Newark, N.J. 07105

AZS Copr.
660 Frelinghuysen Ave.
Newark, N.J. 07144

Baroid Div.
P.O. Box 1675
2404 Southwest Freeway
Houston, Tx. 77001

BASF Wyandotte Corp.
Colors Division
100 Cherryl Hill Road
Parsippany, N.J. 07054

BASF Wyandotte Corp.
Industrial Chemicals Group
1609 Biddle Ave.
Wyandotte, Mich. 48192

Wm. H. Bertolet's Sons
2600 E. Tioga St.
Philadelphia, Pa. 19134

Beta Chemical Corp.
P.O. Box 42
Haddon Heights, N.J. 08035

Cal Chemical Corp.
616 Washington St.
Coventry, R.I. 02816

Canada Packers Ltd.
Chemical Div.
2200 St. Clair Ave. W.
Toronto, Ontario MGN-1K4, Canada

Canadian Alcolac Ltd.
490 Dufferin Street
Valleyfield, Quebec, Canada

Carson Chemicals, Inc.
2779 East El Presidio
Long Beach, Calif. 90810

Catawaba Charlab
P.O. Box 948
Charlotte, NC 28231

Celanese Coatings & Specialties Co.
Textile Div.
P.O. Box 506
Charlotte, N.C. 28201

Central Soya Co., Inc.
Chemurgy Div.
1825 N. Laramie Ave.
Chicago Ill. 60639

Chemical Developemnts of Canada Ltd.
104 Doyon Ave.
Pointe Claire, Quebec, Canada H9R 3T5

Chemical Products Corp.
125 Main Ave.
E. Paterson, N.J. 07407

Chemithon Corp.
5430 W. Marginal Way S.W.
Seattle, Wash. 98106

Chief Chemical Co., Inc.
100 Van Dyke Street
Brooklyn, N.Y. 11231

Ciba-Geigy Corp.
Dyestuff & Chemicals Div.
P.O. Box 11422
Greensboro, N.C. 27409

Cincinnati Milacron Chemicals Inc.
West Street
Cincinnati, Ohio 45215

Cities Service Co.
ICD, Cities Service Bldg.
3445 Peachtree Rd. N.E.
Atlanta, Georgia 30326

Clintwood Chemical Co.
4342 S. Wolcott Ave.
Chicago, Ill 60609

Commercial Solvents Corp.
1331 S. 1st Street
Terre Haute, Ind. 47808

Consos, Inc.
P.O. Box 973
Charlotte, N.C. 28201

Continental Oil Co.
5 Greenway Plaza East
P.O. Box 2197
Houston, TX 77001

Crest Chemical Corp.
225-235 Emmet St.
Newark, N.J. 07114

Crompton & Knowles Corp.
Dyes & Chemicals Div.
Route 208
Fair Lawn, N.J. 07410

Crown Zellerbach Corp.
Chemical Products Div.
Camas, Wash. 98607

Deering Milliken Inc.
P.O. Box 817
Inman, S.C. 29349

Diamond Shamrock Chemical
350 Mt. Kemble Ave.
Morristown, N.J. 07960

Cindet Chemicals, Inc.
P.O. Box 20926
Greensboro, N.C. 27420

W.A. Cleary Corp.
1049 Somerset Street
Somerset, N.J. 08873

Colloids, Inc.
394 Frelinghuysen Ave.
Newark, N.J. 07114

Continental Oil Co.
5 Greenway Plaza East
P.O. Box 2197
Houston, TX 77001

Continental Chemical Co.
270 Clifton Blvd.
Clifton, N.J. 07015

CPC International, Inc.
Talmadge Road
Edison, N.J. 08902

Croda, Inc.
51 Madison Ave.
New York, N.Y. 10010

Crown-Metro, Inc.
Sub. USM Corp.
P.O. Box 5695
Donaldson Center
Greenville, S.C. 29606

Cyclo Chemicals Corp.
7500 N.W. 66th St.
Miami, Fla. 33166

Dexter Chemical Corp.
845 Edgewater Rd.
Bronx, N.Y. 10474

Dispergent Div.
Robinson Wagner Co.
628 Waverly Ave.
Mamaroneck, N.Y. 10543

Dixo Co., Inc.
158 Central Ave.
Rochelle Park, N.J. 07662

Drew
416 Division St.
Boonton, N.J. 07005

DuPont de Nemours, E.I. & Co.
Dyes & Chemicals Div.
Chambers Works
Deepwater, N.J. 08023

Eastern Color and Chemical Co.
35 Livingston St.
Providence, R.I. 02904

Emery Industries, Inc.
Chemical Specialties Group
P.O. Box 628
Mauldin, S.C. 29662

Essential Chemicals Corp.
28391 Essential Rd.
Merton, Wis. 53056

Eastman Organic Chemicals
Eastman Kodak Company
Rochester, N.Y. 14650

Fike Chemicals, Inc.
P.O. Box 546
Nitro, W. Va 25143

Finetex Inc.
418 Falmouth Ave.
East Paterson, N.J. 07407

General Electric Co.
Silicone Prod. Dept.
Waterford, N.Y. 12188

Georgia-Pacific Corp.
P.O. Box 1236
Bellingham, Wash. 98225

Glvco Chemicals, Inc.
51 Weaver St.
Greenwich, Conn 06830

Dow Corning Corporation
Midland, Mich. 48640

Dryden Chemicals
P.O. Box 2025
Quebec PQ, Canada

Durkee Industrial Foods Group/SCM Corp.
900 Union Commerce Bldg.
Cleveland, Ohio 44115

Eastman Chemical Products, Inc.
DPI Div.
P.O. Box 431
Kingsport, Tenn. 37662

Emkay Chemical Co.
319-325 Second St.
Elizabeth, N.J. 07206

Exxon Company, USA
P.O. Box 2180
Houston, Texas 77001

Fanning Chemical Co., Inc.
625 N. Michigan Ave.
Chicago, Ill 60611

Fine Organics, Inc.
205 Main St.
Lodi, N.J. 07664

GAF Corp., Chemical Products
140 W. 51st St.
New York, N.Y. 10020

General Mills Chemicals, Inc.
4620 W. 77th St.
Minneapolis, Minn. 55435

Glidden-Durkee
900 Union Commerce Bldg.
Cleveland, Ohio 44115

Goldschmidt Chemical Div
3 Science Road
Glenwood, Ill. 60425

B.F. Goodrich Chemical Co.
6100 Oak Tree Blvd.
Cleveland, Ohio 44131

Graden Chemical & Equipment
426 Bryan St.
Harvertown, Pa. 19083

Grindsted Products, Inc.
2701 Rockcreek Pkwy.
North Kansas City, Mo. 64116

C.P. Hall Company
7300 S. Central Ave,
Chicago, Ill. 60638

Hampshire Chemical
Div. of W.R. Grace & Co.
Poisson Ave.
Nashua, N.H. 03060

Hart Products Corp.
173 Sussex St.
Jersey City, N.J. 07302

Henkel Inc.
Chemical Specialties Div.
1301 Jefferson Street
Hoboken, N.J. 07030

Heterene Chemical Co., Inc.
792 Twenty First Ave.
Paterson, N.J. 07513

High Point Chemical Corp.
609 Taylor St.
P.O. Box 2316
High Point, N.C. 27261

Hodag Chemical Corp.
7247 N. Central Park Ave.
Skokie, Ill. 60076

Humko Sheffield Chemical
Div. Kraftco
P.O. Box 398
Memphis, TN 38101

WR Grace & Co., Organic Chemicals Div.
55 Hauden Ave.
Lexington, MA 02140

Grant Chemical Div.
Ferro Corp.
P.O. Box 263
Baton Rouge, La. 70821

A. Gross & Co., Div. of Millmaster Onyx Corp.
P.O. Box 818
Newark, N.J. 07101

Hamblet & Hayes Co.
P.O. Box 730
Colonial Road
Salem, Mass. 01970

A. Harrison & Co., Inc.
P.O. Box 494
Pawtucket, R.I. 02862

Henkel Chemicals (Canada) Ltd.
6205 Airport Road
Mississauga (Toronto) Ontario, Canada

Hercules Incorporated, Organics Dept.
Hercules Tower
910 Market St.
Wilmington, Del. 19898

Hexcel-Fine Organics Div.
205 Main St.
Lodi, N.J. 07664

Hilton-Davis Chemical Co.
2235 Langdon Farm Rd.
Cincinnati, Ohio 45237

E.F. Houghton & Co.
303 W. Lehigh Ave.
Philadelphia, Pa 19133

Philip A. Hunt Chemical Corp.
Organic Div.
P.O. Box 4249
Massasoit Ave.
East Providence, R.I. 02914

ICI United States Inc.
Atlas Chemicals Div.
New Murphy Rd. & Concord Pike
Wilmington, Del. 19897

Inolex Personal Care Corp.
3 Science Road
Glenwood, Ill. 60425

Intracolor Corp
Route 208
Fair Lawn, N.J. 07410

ITT Rayonier Inc.
605 3rd Ave.
New York, N.Y. 10016

Jefferson Chemical Co., Inc.
P.O. Box 4128
Austin, Texas 78765

Jetco Chemicals, Inc.
P.O. Box 1278
Corsicana, Texas 75110

Lakeway Chemicals, Inc.
5025 Evanston Ave.
Muskegon, Mich. 49443

Laurel Products Corp.
2600 E. Tioga St.
Philadelphia, Pa. 19134

Lipo Chemicals, Inc.
114 E. 32nd St.
New York, N.Y. 10016

Malmstrom Chemicals
Emery Industries
1501 W. Elizabeth Ave.
Linden, N.J. 07036

Marathon Morco Co.
4401 Park Ave.
Dickinson, Texas 77539

Industrial Chemicals Div.
40 Ave. A
Bayonne, N.J. 07002

Intex Products, Inc.
P.O. Box 6648
Greenville, S.C. 29606

Isochem Corp.
99 Cook St.
Lincoln, R.I. 02865

IMC Chemical Group, Inc.
P.O. Box 207
Terre Haute, Ind. 47808

Jersey State Chemical, sub of Sybron Corp.
59 Lee Avenue
Haledon, N.J. 07058

Knapp Products, Inc.
Lodi, N.J. 07644

Lancaster Chemical Co.
Div. of AZS Corp.
660 Frelinghuysen Ave.
Newark, N.J. 07144

Lignosol Chemicals
P.O. Box 2025
Quebec PQ, Canada

Lonza Inc.
22-10 Route 208
Fair Lawn, N.J. 07410

Magnolia Industries
P.O. Box 817
Inman, S.C. 29349

Manostat
20 N. Moore St.
New York, N.Y. 10013

Marlowe-Van Loan Corp.
P.O. Box 1851
High Point, N.C. 27261

Mazer Chemicals, Inc.
3938 Porett Dr.
Gurnee, Ill. 60031

M. Michel & Company, Inc.
90 Broad St.
New York, N.Y. 10004

Millmaster Onyx Corp.
P.O. Box 818
Newark, N.J. 07101

Miranol Chemical Co., Inc.
277 Coit St.
Irvington, N.J. 07111

Monsanto Co.
800 N. Lindbergh Blvd.
St. Louis, Mo. 63166

The Murphy-Phoenix Company
9505 Cassius Ave.
Cleveland, Ohio 44105

National Starch and Chemical Corp.
10 Finderne Ave.
Bridgewater, N.J. 08807

N L Industries, Baroid Div.
P.O. Box 1675
2404 Southwest Freeway
Houston, Tx. 77001

Nopco Div.
350 Mt. Kemble Ave.
Morristown, N.J. 07960

Nyanza, Inc.
49 Blanchard St.
200 Sutton St.
P.O. Box 145
N. Andover, MA 08145

Olin Corp., Chemicals Div.
120 Long Ridge Rd.
Stamford, Conn. 06904

McIntyre Chemical Co. Ltd.
736 Estes Ave.
Schaumburg, IL 60172

Milliken Chemical
Div. of Deering Milliken, INc.
P.O. Box 817
Inman, S.C. 29349

Minnesota Mining & Manufacturing Co.
3-M Center
Commercial Chemical Division
St. Paul, Minn. 55101

Mona Industries, Inc.
65 E. 23rd St.
Paterson, N.J. 07542

Morton Chemical Co.
Div. of Morton-Norwich Products, Inc.
110 N. Wacker Dr.
Chicago, Ill. 60606

Nalco Chemical Company
Specialty Chemicals Group
1800 Esperson Building
Houston, Texas 77002

Nease Chemical Co., Inc.
Box 221
State College, Pa. 16801

N L Industries, Industrial Chemicals Div.
40 Ave. A
Bayonne, N.J. 07002

Nostrip Chemical Works, Inc.
Box 160
Pedricktown, N.J. 08067

Ogo Products Corp.
175 Main St.
White Plains, N.Y. 10601

Onyx Chemical Co.
Div. of Millmaster Onyx Corp.
190 Warren St.
Jersey City, N.J. 07302

PATCO Products
Div. of C. J. Patterson
3947 Broadway
Kansas City, Mo. 64111

Penreco Div. of Pennzoil Co.
106 South Main St.
Butler, Pa. 16001

Pilot Chemical Co.
P.O. Box 22130
Los Angeles, Calif. 90022

Procter & Gamble Co.
Sharonwood Technical Center
Cincinnati, Ohio 45217

PVO International Inc.
416 Division St.
Boonton, N.J. 07005

Reed Ltd., Chemical Dir.
Ligmin Products
P.O. Box 2025
Quebec PQ, Canada

Reilly-Whiteman Inc.
Washington & Righter Sts.
Conshohocken, Pa. 19428

Rewo Chemicals, Inc.
107-B Allen Blvd.
East Farmingdale, N.Y. 11735

R.I.T.A. Chemical Corp.
P.O. Box 556
Crystal Lake, Ill. 60014

Robinson-Wagner Co., Inc.
628 Waverly Ave.
Mamaroneck, N.Y. 10543

Ryco, Inc.
Conshohocken, Pa. 19428

Sandoz Colors & Chemicals
Hanover, N.J. 07936

Scholler Bros., Inc.
Collins & Westmoreland Sts.
Philadelphia, Pa. 19134

Pennsylvania Refining Co.
106 South Main St.
Butler, Pa. 16001

Petrochemicals Co., Inc.
P.O. Box 2199
Fort Worth, Texas 76101

Plex Chemical Corp.
1205 Atlantic St.
Union City, Calif. 94587

Proctor Chemical Co., Inc.
P.O. Box 399
Salisbury, N.C. 28144

Quaker Chemical Corp.
Conshohocken, Pa. 19428

Refined-Onyx Div.
Millmaster Onyx Corp.
624 Schuyler Ave.
Lyndhurst, N.J. 07071

Retzloff Chemical Co.
277 Park Ave.
New York, N.Y. 10017

The Richardson Co.
Organic Chemicals Div.
2400 E. Devon Ave.
Des Plaines, Ill. 60018

Robeco chemicals, Inc.
51 Madison Ave.
New York, N.Y. 10010

Rohm and Hass Co.
Independence Mall West
Philadelphia, Pa. 19105

St. Regis, Lake States Division
Rhinelander, Wis. 54501

Scher Chemicals
P.O. Box 538
Allwood Sta.
Clifton, N.J. 07012

SCM Corp.
900 Union Commerce Bldg.
Cleveland, Ohio 44115

Seaboard Chemicals, Inc.
30 Foster St.
Salem, Mass. 01970

Werner G. Smith, Inc.
1730 Train Ave.
Cleveland, Ohio 44114

Soluol Chemical Co., Inc.
Green Hill & Market Sts.
West Warwick, R.I. 02893

A. E. Staley Mfg. Co.
Textile Div.
P.O. Box 948
Charlotte, N.C. 28231

Stauffer Chemical Co.
Westport, Conn. 06880

Surfact-Co Inc.
14010 S. Seeley Ave.
Box 117
Blue Island, Ill. 60406

Sylvan Chemical Co
P.O. Box 817
Inman, S.C. 29349

Ten-Chem Co., Inc.
20-21 Wagaraw Rd.
Fair Lawn, N.J. 07410

Texo Corp.
2801 Highland Ave.
Cincinnati, Ohio 45212

The Theobald Industries
P.O. Box 72
Harrison, N.J. 07029

Scott Paper Co.
Forest Chemical Products
2600 Federal Ave.
Everett, Wash. 98201

Shell Chemical Co.
One Shell Plaza
Houston, Texas 77002

Sole Chemical Corp
Div. of Hodag Chemical Corp.
7247 N. Central Park Ave.
Skokie, Ill. 60076

Southern Chemical Products Co.
430 Lower Boundary St.
P.O. Box 205
Macon, Ga. 31202

Standard Chemical Products, Inc.
1301 Jefferson Street
Hoboken, N.J. 07030

Stepan Chemical Co.
Edens & Winnetka Roads
Northfield, Ill. 60093

Swift Chemical Co.
383 Orenda Road
Bramalea, Ontario Canada

Tanatex Chemical Co.
Div. of Sybron Corp.
P.O. Box 388
Page & Schuyler Ave.
Lyndhurst, N.J. 07071

Texize Chemicals
P.O. Box 6648
Greenville, S.C. 29606

Textilana Corp.
12607 Cerise Ave.
Hawthorne, Calif. 90250

Thompson-Hayward Chemical Co.
5200 Speaker Rd.
Kansas City, Kansas 66106