



# Chemical Emergency Preparedness Program

## Interim Guidance

- Chemical Profiles



## NOTICE

This document has been reviewed in accordance with the U.S. Environmental Protection Agency's peer and administrative review policies and approved for publication. Mention of trade names or commercial products does not constitute endorsement or recommendation for use.

## EPA CHEMICAL PROFILES

### INTRODUCTION AND COMMENT

The U.S. Environmental Protection Agency has developed a set of chemical profile reference documents for use in the Chemical Emergency Preparedness Program. These EPA profiles contain a summary of publicly available documented information for chemicals on the EPA list of acutely toxic chemicals. The information is presented in a format similar to the Occupational Safety and Health Administration's (OSHA) recommended format for a Material Safety Data Sheet (MSDS).

The profiles have been reviewed for accuracy and completeness. However, an exhaustive literature search was not performed for each chemical, and a review of original citations has not been made. The profiles have been marked as INTERIM and comments and additional data are invited from the users. It is anticipated that the profiles will be reviewed and revised as additional information is made available.

A profile is provided for each chemical on the list of acutely toxic chemicals. Profiles are presented in ascending order of Chemical Abstract Service (CAS) registry numbers. One chemical is identified by a premanufacture review notice (PMN) number and appears last.

The CAS number was used to search the automated Toxicology Data Base (TDB) or Hazardous Substance Data Base (HSDB) from the National Library of Medicine (NLM). If available, TDB/HSDB files were retrieved. Approximately 65 percent of the chemicals were listed in the TDB/HSDB files. For these chemicals, the TDB/HSDB files provided the main source of information for the profiles. All data obtained from the TDB/HSDB were indicated by an asterisk (\*) followed by a reference to the TDB/HSDB citation, (e.g., (\*Merck 1976)). For those chemicals without a TDB/HSDB file, a limited number of standard reference materials were searched. Such references are cited by author, year, and page number. A master list of references, including the secondary references cited in TDB/HSDB, has been prepared and may be found in the Reference Section of this document. The abbreviations used in the profiles have been defined in a master list and may be found in the Abbreviation Section. Medical terms not commonly used have been included in a Glossary Section. Dorland's Medical Dictionary (1974) was used to provide most of the definitions in the Glossary.

If information was not available for a specific compound but the chemical could be categorized, then general information about the chemical category was included. Such information is indicated, for example, by the notation "Non-Specific -- Organophosphorus Pesticide" or "Non-Specific -- Poisonous Solid, n.o.s.".

The following comments are specific to various sections of the profile format:

- **Chemical Identity** -- The name stated is the name used on the list of acutely toxic chemicals and is one of the most used common names.
- **CAS Registry Number** -- The number is identical to the number listed in RTECS associated with the toxicity data used to identify the chemical for the list.
- **Synonyms** -- Synonyms from TDB/HSDB files are listed without citation. Synonyms from NIOSH/RTECS (1983) or SANSS (1983), or other sources are referenced. The 9th Collective Index (CI) name from the SANSS 1983 database was added to each profile when the 9th CI name was different from the 8th CI name.
- **Chemical Formula and Molecular Weight** -- Data from TDB/HSDB or NIOSH/RTECS (1983) are not cited. Formulas or molecular weights found in other sources are cited.
- **Section I -- Hazardous Ingredients/Identity Information** -- Wherever possible, specific exposure limits are given for each chemical, as cited by the sources. Data found for recommended occupational standards or for categories of chemicals are provided under the heading "Other Limits Recommended." If no value for the category Immediately Dangerous to Life and Health (IDLH) is available for the chemical, the toxicity information needed to calculate a "level of concern," as described in Appendix D of the Chemical Emergency Preparedness Program guidance document, is provided under "Other Limits Recommended". Toxicity values used as the basis for listing the chemical are provided if the IDLH calculation values are not as toxic as the listing values. These toxicity data were obtained from a screen of the NIOSH/RTECS on-line computer file and are also cited with an asterisk (\*) (e.g., \*NIOSH/RTECS 1985). In addition, human carcinogens or suspect carcinogens listed by the American Council of Government Industrial Hygienists (ACGIH) are indicated in this section. Other citations regarding carcinogens may be found in Section V.
- **Section II -- Physical/Chemical Characteristics** -- Boiling points and melting points are provided in both degrees Fahrenheit and degrees Centigrade. Conversions by EPA were performed as needed.



- **Section III -- Fire and Explosion Hazard Data** -- In the absence of chemical-specific information, generic information is provided whenever the chemical could be categorized.
- **Section IV -- Reactivity Data** -- In the absence of chemical-specific information, generic information is provided whenever the chemical could be categorized.
- **Section V -- Health Hazard Data** -- Generally, only human data are reported in the Health Hazard Data section. Information on the route of exposure, health hazards, and signs and symptoms were often not available or only partially available for specific chemicals. Health hazard data and signs and symptoms often were not found specific to dose, route of entry or exposure type (acute, delayed, or chronic). The emergency and first aid procedures are intended for a non-medical personnel. No information on invasive medical procedures are provided. Generic information on the chemical category was provided, wherever possible, in the absence of information on the specific chemical.
- **Section VI -- Use Information** -- The EPA status of a pesticide is provided if the status would limit the use.
- **Section VII -- Precautions for Safe Handling and Use** -- Chemical-specific information often was not found in this section. Generic information for the chemical category often is presented.
- **Comments** -- This section is provided, in some cases, to document the lack of data available for a specific chemical by denoting the sources that were checked for information. In general, this section pertains to chemicals without TDB/HSDB files.

The following comments are specific to various entries on the profiles:

- **Not Found** -- This statement on the profile can mean that:
  - the value or information was not found in the references used,
  - the value or information probably does not exist for this chemical, or
  - the value is meaningless or not applicable for this chemical.

- **Suspect** -- This statement following the value or information on the profile means that the information is correctly copied from the cited reference but is suspected to be in error based on deductions made by a critical examination of all data presented on the profile.

The following comments are specific to certain profiles:

<u>Chemical CAS Number</u>	<u>Comment on Suspect Items</u>
65-86-1	The LD <sub>50</sub> oral (mouse) is unexpectedly low in comparison to the intraperitoneal (mouse) LD <sub>50</sub> of 600 mg for the 1:1 compound with 5 (or 4)-aminoimidazole-4-carboxamide.
75-18-3	The LC <sub>50</sub> inhalation (rat) is reported as 40250 ppm -- roughly 1000X the LC <sub>50</sub> inhalation (mouse).
75-74-1	Ideal gas law calculations predict a higher vapor density.
78-00-2	Ideal gas law calculations predict a higher vapor density.
97-18-7	LD <sub>50</sub> oral (mouse) is 900 mg/kg; also classified as "slightly toxic" in Health Hazard section.
106-96-7	Ideal gas law calculations predict a lower vapor density.
108-67-8	1980 RTECS reports an LC <sub>50</sub> inhalation (rat) of 2240 ppm. This is consistent with a TWA of 25 ppm but not with the LC <sub>50</sub> of 24 mg/m <sup>3</sup> .
109-19-3	1978 and 1980 RTECS report an LD <sub>50</sub> of 8.2 g/kg; 1983 and 1985 RTECS report 8,200 µg/kg. The latter value is anomalously low for compounds of this class.

## EPA CHEMICAL PROFILES

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\* Chemical Abstracts Service Registry Number.

<u>Chemical CAS Number</u>	<u>Comment on Suspect Items</u>
117-84-0	RTECS 1985 value for LC <sub>50</sub> inhalation (mouse) is anomalously low. RTECS also uses the same CAS number for both di-n-octyl phthalate and di-2-ethylhexyl phthalate, thus rendering doubtful which effects should be associated with which chemical. Ideal gas law calculations predict a different vapor density.
128-56-3	LD <sub>50</sub> oral (rabbit) of 14 mg/kg appears low by comparison with that for the 2-substituted sulfonate.
129-00-0	Reported boiling point is anomalously higher for compounds of this class.  Low volatility renders improbable a concentration of pyrene in air as high as 170 mg/m <sup>3</sup> except as a dust. Therefore, the inhalation toxicity values are suspect.
131-11-3	Widely differing values of IDLH as well as other RTECS data render this suspect.
149-74-6	Flash point of 28°C is not consistent with boiling point of 205°C.
287-92-3	Note conflict between 1983 and 1985 RTECS LC <sub>low</sub> data.
624-92-0	LC <sub>50</sub> inhalation (mouse) very much lower than LC <sub>50</sub> inhalation (rat).
625-55-8	Other formate esters are about 1000X less toxic than isopropyl formate is reported to be.
646-06-0	LC <sub>low</sub> inhalation (rat) is 96.6 mg/L; LC <sub>50</sub> inhalation (mouse) is 104 µg/m <sup>3</sup> or 0.0001 mg/L; million-fold difference suggests a conversion error.
1331-17-5	100-fold difference in LD <sub>50</sub> between rat and mouse is suspect.

<u>Chemical CAS Number</u>	<u>Comment on Suspect Items</u>
1335-87-1	Widely different melting points reported for this compound in references.
2238-07-5	Ideal gas law calculations predict a higher vapor density.
2244-16-8	LD <sub>50</sub> oral (rat) value is roughly 1000-fold lower than carvone of unspecified absolute configuration.
5281-13-0	Farm Chemicals Handbook (1984), p. C-236, reports the LD <sub>50</sub> oral (rat) as above 4400 mg/kg.
7637-07-2	Values of boiling point in references vary widely, and none of these are in agreement with reported vapor pressure.
10049-07-7	Boiling point given as "800°C, sublimes" is inconsistent with a melting point with decomposition of 450-500°C.

## EPA CHEMICAL PROFILES

### ABBREVIATIONS

ACGIH -- American Conference of Government and Industrial Hygienists

ADI -- Acceptable Daily Intake

AIHA -- American Industrial Health Association

BAL -- Dimercaprol (British anti-lewisite)

CAS -- Chemical Abstracts Service

CC -- Closed cup

CNS -- Central Nervous System

EEG -- Electroencephalogram

EKG -- Electrocardiogram

EPA -- Environmental Protection Agency

IARC -- International Agency for Research on Cancer

IDLH -- Immediately Dangerous to Life and Health

im -- intramuscularly

LCLO -- Lethal Concentration Low; the lowest concentration at which death occurred

LC50 -- Lethal Concentration 50; the concentration at which 50% of the animals died; a calculated value

LDLO -- Lethal Dose Low; the lowest dose at which death occurred

LD50 -- Lethal Dose 50; the dose at which 50% of the animals died; a calculated value

LEL -- Lower Explosive Limit

m<sup>3</sup> -- Cubic meter

mg/Kg -- milligrams per kilogram

**ABBREVIATIONS**  
**(Continued)**

mmHg -- millimeters of Mercury; a measure of pressure

NIOSH -- National Institute of Occupational Safety and Health

n.o.s. -- Not otherwise specified

NRC -- National Research Council, National Academy of Sciences

NTP -- National Toxicology Program

OC -- open cup

OSHA -- Occupational Safety and Health Administration

PEL -- Permissible Exposure Level

ppb -- parts per billion

ppm -- parts per million

RBC -- Red blood cell(s)

RTECS -- Registry of Toxic Effects of Chemical Substances

STEL -- Short-term exposure limit

TCC -- Tagliabue Closed Cup, a standard method of determining flash point

TOC -- Tagliabue Open Cup, a standard method of determining flash point

TDLO -- Toxic Dose Low; the lowest dose at which toxicity occurred

TLV -- Threshold Limit Value

TWA -- Time Weighted Average

UEL -- Upper Explosive Limit

µg -- microgram

2-PAM -- pralidoxime

## EPA CHEMICAL PROFILES

### GLOSSARY

**Acaricide** -- an agent that destroys mites

**Acidosis** -- pathologic condition resulting from accumulation of acid in, or loss of base from, the blood or body tissues

**Acneform** -- resembling acne

**Albuminuria** -- presence of serum albumin in the urine

**Alopecia** -- baldness; absence of hair from skin areas where it is usually present

**Amorphous** -- without definite form, not crystallized

**Anaphylactoid** -- resembling an unusual or exaggerated allergic reaction to foreign protein or other substances

**Anorexia** -- lack or loss of appetite for food

**Anoxia** -- absence or lack of oxygen; reduction of oxygen in the body tissues below physiologic levels

**Anthelmintic** -- an agent that is destructive to worms especially of the intestine

**Anticoagulant** -- an agent that prevents blood clotting

**Antilewisite** -- dimercaprol; also called British anti-lewisite, or BAL

**Antimetabolite** -- a substance that interferes with utilization of an essential metabolite

**Antipyretic** -- an agent that relieves or reduces fever

**Aphasia** -- defect or loss of power of expression by or comprehension of speech, writing, or signs

**Aplasia** -- lack of development of an organ or tissue, or the cellular products from an organ or tissue; germinal aplasia -- complete failure of gonad development

**Argyrosis** -- poisoning by silver or a silver salt, evidenced by ashen-gray discoloration of skin



**GLOSSARY  
(Continued)**

**Arrhythmia** -- any variation from the normal rhythm of the heart beat

**Arteriosclerosis** -- hardening and thickening of the walls of the smaller arteries

**Asthenia** -- lack or loss of strength; weakness

**Astringent** -- causing contraction, usually locally after surface application

**Ataxia** -- failure of muscular coordination; irregularity of muscular action

**Avicide** -- an agent that kills birds

**Bioaccumulation** -- increased concentrations of a chemical in an organism compared to the surrounding environment

**Bradycardia** -- slowness of the heart beat, as evidenced by slowing of pulse rate to less than 60

**Bronchoconstriction** -- narrowing of the air passages of the lungs

**Calcification** -- process by which organic tissue becomes hardened by a deposit of calcium salts within its substance

**Carcinogenic** -- producing or inciting cancer

**Cardiac** -- pertaining to the heart

**Cathartic** -- causing evacuation of the bowels; laxative

**Cheyne-Stokes respiration** -- respiratory distress related to posture (especially reclining at night) that occurs in association with heart disease

**Chloracne** -- acne-like eruption caused by exposure to chlorine compounds

**Clonic** -- pertaining to alternate muscular contraction and relaxation in rapid succession

**Conjunctivitis** -- inflammation of the lining of the eyelids

**Contraindication** -- any condition which renders some particular line of treatment improper or undesirable

**Cryogenic** -- pertaining to or causing the production of low temperatures

**GLOSSARY  
(Continued)**

**Cyanosis** -- bluish discoloration, especially of the skin and mucous membranes and fingernail beds

**Decoction** -- substance prepared by boiling

**Demulcent** -- soothing

**Dermal** -- pertaining to the skin

**Dermatitis** -- inflammation of the skin

**Desiccant** -- a drying agent

**Diluent** -- a diluting agent

**Diuresis** -- increased secretion of urine

**Diuretic** -- agent that increases urine production

**DS2** -- standard decontaminant for chemical agents; highly corrosive and highly toxic

**Ductile** -- capable of being drawn out or hammered thin

**Dyspnea** -- difficult or labored breathing

**Ectoparasiticide** -- an agent that kills parasites living on the exterior of its host

**Edema** -- presence of abnormally large amounts of fluid in intercellular spaces of body tissues

**Emesis** -- vomiting

**Enteritis** -- inflammation of the intestine

**Epigastric** -- pertaining to the upper-middle region of the abdomen

**Epileptiform** -- occurring in severe or sudden spasms

**Epithelium** -- cells covering the internal and external surfaces of the body

**Erythema** -- redness of the skin produced by congestion of the capillaries

**Exothermic** -- characterized by or formed with evolution of heat

**GLOSSARY**  
**(Continued)**

**Explosive** -- characterized by or relating to bursting forth with sudden violence or noise from internal energy; relating to a rapid reaction with production of noise, heat, and violent expansion of gases

**Flammable** -- capable of being easily ignited and supporting combustion

**Gastrointestinal** -- pertaining to the stomach and intestine

**Germinalaplasia** -- lack of development of egg and sperm cells

**Glomerular** -- pertaining to a tuft or cluster, as of blood vessels or nerve fibers

**Half-life** -- the time in which the concentration of a substance will be reduced by half

**Halon** -- halogenated hydrocarbon (e.g., carbon tetrachloride)

**Health Hazard** --

**Acute** -- immediate toxic effects

**Chronic** -- persistent or prolonged injury

**Delayed** -- toxic effect occurring after a lapse of time

**Hematoma** -- localized collection of blood, usually clotted, in an organ, space, or tissue, due to a break in the wall of the blood vessel

**Hematuria** -- blood in the urine

**Hemoglobinuria** -- presence of free hemoglobin in the urine

**Hemolysis** -- separation of hemoglobin from red blood cells and its appearance in the plasma

**Hemolytic** -- pertaining to or characterized by hemolysis

**Hepatic** -- pertaining to the liver

**Humectant** -- moistening or diluent substance

**Hydrolysis** -- double decomposition reaction involving the splitting of water into its ions and the formation of a weak acid and/or a weak base

**Hygroscopic** -- readily taking up and retaining moisture (water)

**Hyperactivity** -- abnormally increased activity

**GLOSSARY  
(Continued)**

**Hyperalimentation** -- ingestion or administration of a greater than optimal amount of nutrients

**Hyperbilirubinemia** -- an excess of bilirubin in the blood

**Hypercalcemia** -- excess of calcium in the blood

**Hyperparathyroidism** -- abnormally increased activity of the parathyroid glands which affects and is affected by serum calcium levels

**Hyperpyrexia** -- a highly elevated body temperature

**Hyperreflexia** -- exaggeration of reflexes

**Hypersalivation** -- excessive secretion of saliva

**Hypertension** -- persistently high arterial blood pressure

**Hypervitaminosis** -- condition due to ingestion of an excess of one or more vitamins

**Hypobilirubinemia** -- abnormally low levels of bilirubin in the blood

**Hypocalcemia** -- abnormal reduction of blood calcium levels

**Hypovolemic** -- pertaining to an abnormally decreased volume of circulating fluid (plasma) in the body

**Hypoxemia** -- deficient oxygenation of the blood

**Hypoxia** -- low oxygen content or tension; deficiency of oxygen in the inspired air

**Interstitial Pneumonia** -- a chronic form of pneumonia with increase of the interstitial tissue and decrease of the proper lung tissue

**Isotonic** -- a solution having the same effective osmotic pressure as the body fluid to which it is compared

**Jaundice** -- syndrome characterized by hyperbilirubinemia and deposition of bile pigment in the skin, resulting in yellow appearance of the patient

**GLOSSARY  
(Continued)**

**Lachrymator (or lacrimator)** -- a substance which increases the flow of tears

**Lacrimation** -- secretion and discharge of tears

**Laryngospasm** -- spasmodic closure of the larynx

**Larynx** -- the muscular and cartilage structure situated at the top of the trachea (windpipe) and below the root of the tongue, functioning as sphincter into the trachea and as the organ of voice

**Lassitude** -- weakness; exhaustion

**Latency** -- a state of seeming inactivity

**Lesion** -- a pathological or traumatic discontinuity of tissue or loss of function of a part

**Lethal** -- deadly; fatal

**Leukopenia** -- reduction in the number of leukocytes in the blood

**Lewisite** -- a lethal war gas which is a vesicant, lacrimator and lung irritant

**Malaise** -- a vague feeling of bodily discomfort

**Mania** -- a phase of mental disorder characterized by an expansive emotional state, elation, overtalkativeness, and increased motor activity

**Metastatic** -- pertaining to the transfer of disease from one organ or part to another not directly connected with it

**Methemoglobinemia** -- presence of methemoglobin (oxidized hemoglobin) in the blood

**Miosis (or myosis)** -- contraction of the pupil

**Miscible** -- capable of mixing in any ratio without separation of two phases

**Mordant** -- a chemical that fixes a dye in or on a substance by combining with the dye to form an insoluble compound

**Mutagenic** -- inducing genetic mutation

**Mydriasis** -- extreme dilation of the pupil

**GLOSSARY**  
**(Continued)**

**Myelosuppression** -- suppression of the formation of bone marrow.

**Narcotic** -- an agent that produces insensibility or stupor

**Necrosis** -- death of tissue, usually as individual cells, group of cells, or in localized areas

**Nephritis** -- inflammation of the kidney

**Neural** -- pertaining to a nerve or to the nerves

**Neuropathy** -- functional disturbances and/or pathological changes in the peripheral nervous system

**Neurotoxicity** -- exerting a destructive or poisonous effect on nerve tissue

**Nocturia** -- excessive urination at night

**Ocular** -- pertaining to or affecting the eye

**Oliguria** -- secretion of a diminished amount of urine in relation to fluid intake

**Ophthalmic** -- pertaining to the eye

**Osteosclerosis** -- hardening or abnormal density of bone

**Palpitation** -- unduly rapid heart beat which is noted by the patient; it may be regular or irregular

**Parasympathomimetic** -- producing effects resembling time of stimulation of the parasympathetic nerve supply to a part; called also cholinergic

**Parenteral** -- not through the alimentary canal but rather by injection through some other route, such as subcutaneous, intramuscular, intravenous, etc.

**Paresthesia** -- an abnormal sensation, as burning or prickling

**Perfusion** -- liquid poured over or through an organ or tissue

**Pharynx** -- the muscular membrane sac between the mouth and nostrils and the esophagus

**Photophobia** -- abnormal visual intolerance of light

**GLOSSARY**  
**(Continued)**

**Photosensitize** -- to induce a state of abnormal responsiveness to the influence of light

**Phytotoxic** -- poisonous to plants; inhibiting plant growth

**Polydipsia** -- excessive thirst persisting for long periods of time

**Precordial** -- pertaining to the region over the heart and lower part of the thorax

**Proteinuria** -- an excess of serum proteins in the urine; also called albuminuria

**Psychosis** -- any major mental disorder characterized by derangement of the personality and loss of contact with reality

**Psychotropic** -- exerting an effect upon the mind; capable of modifying mental activity

**Pulmonary** -- pertaining to the lungs

**Rales** -- abnormal respiratory sound heard when listening for sounds within the body

**Recumbent** -- lying down

**Renal** -- pertaining to the kidney

**Scotoma** -- an area of depressed vision within the visual field, surrounded by an area of less depressed or normal vision

**Supertropical Bleach** -- bleaching agent containing calcium hypochlorite (a powerful oxidizer) and calcium oxide (a corrosive material)

**Systemic** -- pertaining to or affecting the body or organism as a whole

**Tachycardia** -- excessively rapid heart beat

**Tepid** -- moderately warm; lukewarm

**Teratogenic** -- tending to produce anomalies of formation or development

**Tetanic** -- pertaining to or of the nature of tetanus, a disease characterized by muscle spasm

**GLOSSARY  
(Continued)**

**Thrombocytopenia** -- decrease in the number of blood platelets

**Tidal volume** -- amount of gas that is inhaled and exhaled during one respiratory cycle

**Tinnitus** -- a noise in the ears, such as ringing, buzzing, roaring, clicking

**Toxic** -- pertaining to, due to, or of the nature of a poison

**Triglyceridemia** -- excess of triglycerides in the blood

**Urticaria** -- a vascular reaction of the skin marked by the transient appearance of smooth, slightly elevated patches (wheals) which are redder or paler than the surrounding skin and often attended by severe itching

**Vasodilation** -- dilation (expansion) of a vessel, especially of arterioles leading to increased blood flow to a part

**Ventricular fibrillation** -- irregular heart beat characterized by uncoordinated contractions of the ventricle

**Vertigo** -- dizziness; an illusion of movement as if the external world were revolving around an individual or as if the individual were revolving in space

**Vesicant** -- causing blisters

**Volatile** -- readily vaporizable at a relatively low temperature



## EPA CHEMICAL PROFILES

### REFERENCES

- \* Cited in TDB/HSDB file
- \*/- Cited in TDB/HSDB file and as a primary source
- /- Cited as a primary source

- /- ACGIH. 1985. American Conference of Governmental Industrial Hygienists. TLV threshold limit values for chemical substances and physical agents in the work environment and biological exposure indices with intended changes for 1985-86. Cincinnati, Ohio: ACGIH.
- \*/- ACGIH. 1984. American Conference of Governmental Industrial Hygienists. TLV threshold limit values for chemical substances and physical agents in the work environment and biological exposure indices with intended changes for 1984-85. Cincinnati, Ohio: ACGIH.
- \*/- ACGIH. 1983. American Conference of Governmental Industrial Hygienists. TLV threshold limit values for chemical substances and physical agents in the work environment with intended changes for 1983-1984. Cincinnati, Ohio: ACGIH.
- \* ACGIH. 1982. American Conference of Governmental Industrial Hygienists. TLV threshold limit values for chemical substances and physical agents in the work environment with intended changes for 1982. Cincinnati, Ohio: ACGIH.
- \* ACGIH. 1981. American Conference of Governmental Industrial Hygienists. TLV threshold limit values for chemical substances in workroom air adopted by ACGIH for 1981. Cincinnati, Ohio: ACGIH.
- \*/- ACGIH. 1980a. American Conference of Governmental Industrial Hygienists, Inc. Documentation of the threshold limit values, 4th ed., 1980. Cincinnati, Ohio: ACGIH.
- \* ACGIH. 1980b. American Conference of Governmental Industrial Hygienists. TLVs threshold limit values for chemical substances in workroom air adopted by ACGIH for 1980. Cincinnati, Ohio: ACGIH.
- \* ACGIH. 1979. American Conference of Governmental Industrial Hygienists. TLVs threshold limit values for chemical substances in workroom air adopted by ACGIH for 1979. Cincinnati, Ohio: ACGIH.
- \* ACGIH. 1971-1979. American Conference of Governmental Industrial Hygienists. Documentation of the threshold limit values for substances in workroom air. Third edition, 1971. Cincinnati, Ohio: ACGIH. (Including supplements to 1979.)

## REFERENCES (Continued)

- \* Agrochem Dept. Info. Service. 1971. Anthio33 insecticide, Sandoz Ltd. Basle, AGRO DOK E-4028/DG.
- \* American College of Neuropsychopharmacology. 1968. Psychopharmacology: review of progress, 1957-1967. Proceedings of the sixth annual meeting, Puerto Rico, December 12 to December 15, 1967. Washington, D.C.: U.S. Government Printing Office. Public Health Service Publication No. 1836.
- \* AHFS. 1984. American hospital formulary service. Vols. I and II. Washington, D.C.: American Society of Hospital Pharmacists, to 1984.
- \* AHFS. 1985. American hospital formulary service-drug information 85. Bethesda, MD: American Society Hospital Pharmacists. (Tentative listing)
- \* American Industrial Hygiene Association Journal. 1964. Vol. 25.
- \* AMA. 1983. American Medical Association. AMA Department of Drugs. AMA drug evaluations. 5th edition. Chicago: American Medical Association.
- \* AMA. 1980. American Medical Association. AMA Department of Drugs. AMA drug evaluations. 4th edition. Chicago: American Medical Association.
- \* AMA. 1977. American Medical Association. AMA Department of Drugs. AMA drug evaluations. 3rd edition. Littleton, Massachusetts: PSG Publishing Co., Inc.
- \* AMA. 1973. American Medical Association. Council on Drugs. AMA drug Evaluations. 2nd edition. Acton, Massachusetts: Publishing Sciences Group, Inc.
- \* AOAC. 1965. Association of Official Analytical Chemists. 1965-1982. Official methods of analysis. 10th ed. and supplements; Washington, D.C.: AOAC. New editions through 13th ed. including supplements.
- \* APA. 1976, 1978. American Pharmaceutical Association. Evaluations of drug interactions. 2nd edition and supplements. Washington, D.C.: APA.
- \* APA. 1973, 1974. American Pharmaceutical Association. Evaluations of drug interactions. 1st edition and supplements. Washington, D.C.: APA.
- \* ASHP. American Society of Hospital Pharmacists. Data supplied on contract from American Hospital Formulary Service and other current ASHP sources.
- \* Arena JM. 1974. Poisoning: toxicology, symptoms, treatments. 4th ed. Springfield, Illinois: Charles C. Thomas.

## REFERENCES (Continued)

- \*/- Arena JM. 1979. Poisoning: toxicology, symptoms, treatments. 3rd ed. Springfield, IL: Charles C. Thomas.
- \* Aronson CE, ed. 1983. Veterinary pharmaceuticals and biologicals, 1982-1983. Edwardsville, KS: Veterinary Medical Publishing Co.
- \* Aronson CE, ed. 1980. Veterinary pharmaceuticals and biologicals, 1980-1981. Media, PA: Harwal Publishing Co.
- \* Ash M and Ash I. 1984. Encyclopedia of industrial chemical additions. Vol. 1. New York, NY: Chemical Publishing Co.
- /- Beardsley T. 1984. Ways of death. Nature 312:581.
- /- Beilstein. 1954. Beilstein's handbuch der organischen chemie, 3rd Supplement Series. Berlin: Springer-Verlag.
- \* Bergmeyer HW, ed. 1974. Methods of enzymatic analysis, 2nd English ed. New York City: Academic Press.
- \* Blacow NW, ed. 1972. Martindale: The extra pharmacopoeia, 26th ed. London: The Pharmaceutical Press.
- \* Booth NH, McDonald LE, eds. 1982. Veterinary pharmacology and therapeutics, 5th ed. Ames, IA: Iowa State University Press.
- \* Bowman BT, Saub WW. 1979. Environmental Science Health B14:625-631.
- \* Bretherick L. 1979. Handbook of reactive chemical hazards. 2nd ed. Woburn, MA: Butterworth.
- \* Brooke LT, Call DJ, Geiger DT, Northcott CE, eds. 1984. Acute toxicities of organic chemicals to fathead minnows (Pimephales Promelas). Superior, WI: Center for Lake Superior Environmental Studies, Univ. of Wisconsin -- Superior.
- \* Brown KW, Evans GB, Jr., Frentrop BD, eds. 1983. Hazardous waste land treatment. Boston, MA: Butterworth Publishers.
- \* Browning E. 1969. Toxicity of industrial metals. 2nd ed. New York: Appleton-Century-Crofts.
- \* Browning E. 1965. Toxicity and metabolism of industrial solvents. New York: American Elsevier.
- \* Brzozowski. 1985. J. Med. Pract 5:89.

## REFERENCES (Continued)

- /- Buchel KH. 1983. Chemistry of pesticides. New York: John Wiley and Sons.
- \* Carmichael WW, ed. 1981. Environmental science research. Vol. 20. The water environment-algal toxins and health. New York/London: Plenum Press.
- \* Casarett LJ, Doull J. 1975. Toxicology: the basic science of poisons. New York: MacMillan Publishing Co.
- \* Castegnaro M, Grimmer G, Hutzinger G, et al., eds. 1983. Laboratory decontamination and destruction of carcinogens in laboratory wastes: some polycyclic aromatic hydrocarbons. IARC Publication No. 49. Lyon, France: International Agency for Research on Cancer.
- \* Castegnaro M, Eisenbrand G, Ellen G, et al., eds. 1982. Laboratory decontamination and destruction of carcinogens in laboratory wastes: some N-nitrosamines. International Agency for Research on Cancer Publication No. 43.
- \* Castegnaro M, Hunt DC, Sansone EB, et al., eds. 1980. Laboratory decontamination and destruction of aflatoxins B1, B2, G1, G2 in laboratory wastes. Lyon, France: International Agency for Research on Cancer. IARC Publication No. 37.
- \* The Chemical Society. 1981. Foreign compound metabolism in mammals. Vol. 6: A review of the literature published during 1978 and 1979. London: The Royal Society of Chemistry.
- \* The Chemical Society. 1979. Foreign compound metabolism in mammals. Vol. 5: A review of the literature published during 1976 and 1977. London: The Chemical Society.
- \* The Chemical Society. 1977. Foreign compound metabolism in mammals. Vol. 4: A review of the literature published during 1974 and 1975. London: The Chemical Society.
- \* The Chemical Society. 1975. Foreign compound metabolism in mammals. Vol. 3. London: The Chemical Society.
- \* The Chemical Society. 1972. Foreign compound metabolism in mammals. Vol. 2: A review of the literature published between 1970 and 1971. London: The Chemical Society.
- \* The Chemical Society. 1970. Foreign compound metabolism in mammals. Vol. 1: A review of the literature published between 1960 and 1969. London: The Chemical Society.

## REFERENCES (Continued)

- \*/- CHRIS. 1978. U.S. Coast Guard, Department of Transportation. CHRIS -- Hazardous chemical data. Manual Two. Washington, D.C.: U.S. Government Printing Office.
- \* Clarke ML, Harvey DG, Humphreys DJ. 1981. Veterinary toxicology. 2nd ed. London: Bailliere Tindall.
- \* Clarke EG, Clarke ML. 1975. Veterinary toxicology. Baltimore, Maryland: The Williams and Wilkins Company.
- \* Clarke EG, Clarke ML. 1967. Garner's veterinary toxicology. 3rd ed. Baltimore: Williams and Wilkins.
- \*/- Clayton GD, Clayton FE, eds. 1981, 1982. Patty's industrial hygiene and toxicology: Vol. 2A, 2B, 2C: Toxicology. 3rd ed. New York: John Wiley & Sons.
- \* Cole RJ, Cox RH. 1981. Handbook of toxic fungal metabolites. New York: Academic Press, Inc.
- /- Dagani R. 1985. Data on MIC's toxicity are scant, leave much to be learned. Chem Eng News 63(6):37-40.
- /- DASE. 1980. Dutch Association of Safety Experts. Handling chemicals safely 1980. 2nd ed. The Netherlands: The Dutch Chemical Industry Association and the Dutch Safety Institute.
- \* Deichman WB, Gerarde HW. 1969. Toxicology of drugs and chemicals. 4th ed. New York: Academic Press.
- \* DeReuch et al. 1979. Clin Neurol Neurosurg 81(4):247.
- \* Desktop analysis tool for common data base. 1968. Report to the National Science Foundation by Chemical Abstract Services and American Chemical Society.
- \* Diehl, KH et al. 1983. Behavior of tetraalkyleads in the soil and their uptake by plants. Z Pflanzeneruehr Bodenkd. 146(5):551-9.
- \* Di Palma J, ed. 1971. Drill's pharmacology in medicine. 4th ed. New York: McGraw Hill.
- /- Dorland's Illustrated Medical Dictionary 1974. 25th ed. Philadelphia: W.B. Saunders.
- \*/- DOT. 1984. Department of Transportation. 1984 Emergency response guidebook, guidebook for hazardous materials incidents. DOT Publication No. P5800.3.

## REFERENCES (Continued)

- \*/- Doull J, Klassen CD, Amdur MD, eds. 1980. Casarett and Doull's toxicology; the basic science of poisons. 2nd ed. New York: Macmillan Publishing Co.
- \* Dreisbach RH. 1977. Handbook of poisoning. 9th ed. Los Altos, CA: Lange Medical Publications.
- \* Duffy, JI, ed. 1983. Treatment, recovery, and disposal processes for radioactive wastes-recent advances. Park Ridge, NJ: Noyes Data Corporation.
- \*/- Encyc Occupat Health and Safety. 1983. Encyclopedia of occupational health and safety. Vols I and II. Geneva, Switzerland: International Labour Office.
- \* Encyc Occupat Health and Safety. 1971. Encyclopedia of occupational health and safety. Vols I and II. Geneva, Switzerland: International Labour Office.
- \* Environment Canada. 1982, 1983. Technical information for problem spills.
- \*/- Farm Chemicals Handbook. 1984. Willoughby, OH: Meister.
- \* Farm Chemicals Handbook. 1983. Willoughby, OH: Meister.
- \* Farm Chemicals Handbook. 1981. Willoughby, OH: Meister.
- \* Farm Chemicals Handbook. 1980. Willoughby, OH: Meister.
- \* Farm Chemicals Handbook. 1979. Willoughby, OH: Meister.
- \* Farm Chemicals Handbook. 1977. Willoughby, OH: Meister.
- \* Farm Chemicals Handbook. 1975. Willoughby, OH: Meister.
- \* Farm Chemicals Handbook. 1974. Willoughby, OH: Meister.
- \* Fazzalari FA, ed. 1978. Compilation of odor and taste threshold values data. Philadelphia, PA: American Society for Testing and Materials. ASTM Data Series DS 48A (Committee E-18).
- \* Friberg L, Nordberg GR, Vouk VB. 1979. Handbook on the toxicology of metals. New York: Elsevier North Holland.
- /- Friel JP, ed. 1974. Dorland's illustrated medical dictionary, 25th ed. Philadelphia: W.B. Saunders.

REFERENCES  
(Continued)

- \* Furia TE, ed. 1980. CRC handbook of food additives. 2nd ed. Vol 2. Boca Raton, FL: CRC Press Inc.
- \* Furia TE, Bellanca N, eds. 1975. Fenaroli's handbook of flavor ingredients. Vol. 1, Vol. 2. 2nd ed. Cleveland: The Chemical Rubber Co.
- \* Furia TE, ed. 1972. CRC handbook of food additives. 2nd ed. Cleveland: The Chemical Rubber Co.
- \* Furia TE, Bellanca N, eds. 1971. Fenaroli's handbook of flavor ingredients. Cleveland: The Chemical Rubber Co.
- \* Fuscaldo A, Erlick BJ, Hindman B, eds. 1980. Laboratory safety-theory and practice. New York: Academic Press.
- \* Gardner W, Cooke EI, Cooke RWI, eds. 1978. Handbook of chemical synonyms and trade names. 8th ed. Boca Raton, FL: CRC Press, Inc.
- \* General Electric Co. 1978. MSDS (Material Safety Data Sheets). Schenectady, NY: GE Material Information Services.
- \* General Electric Co. 1979. MSDS (Material Safety Data sheets). Schenectady, NY: GE Material Information Services.
- \* GENE-TOX Program: Current Status of Bioassay in Genetic Toxicology. U.S. Environmental Protection Agency, Washington, D.C. Office of Toxic Substances and Pesticides. Information Center, Oak Ridge National Laboratory, Post Office Box Y, Oak Ridge, TN 37830. Telephone (615) 574-7871.
- /- Gilman AG, Goodman LS, Rall TW, Murad F, eds. 1985. Goodman and Gilman's the pharmacological basis of therapeutics, 7th ed. New York: Macmillan.
- \* Gilman AG, Goodman LS, Gilman A, eds. 1980. Goodman and Gilman's the pharmacological basis of therapeutics. 6th ed. New York: Macmillan Publishing Co.
- \* Gleason MN, Gosselin RE, Hodge HC, Smith RP. 1969. Clinical toxicology of commercial products. 3rd ed. Baltimore: Williams and Wilkins.
- \* Goodman LS, Gilman A, eds. 1975. The pharmacological basis of therapeutics. 5th ed. New York: Macmillan Publishing Co.

REFERENCES  
(Continued)

- \* Goodman LS, Gilman AG, eds. 1970. The pharmacological basis of therapeutics. 4th ed. New York: Macmillan Publishing Co.
- \* Goodwin BL. 1976. Handbook of intermediary metabolism of aromatic compounds. New York: Wiley.
- \*/- Gosselin RE, Smith RP, Hodge MC. 1984. Clinical toxicology of commercial products. 5th ed. Baltimore: Williams and Wilkins.
- \*/- Gosselin RE, Smith RP, Hodge MC. 1976. Clinical toxicology of commercial products. 4th ed. Baltimore: Williams and Wilkins.
- \* Grant WM. 1974. Toxicology of the eye. 2nd ed. Springfield, IL: Charles C. Thomas.
- \* Hamilton A, Hardy HL. 1974. Industrial toxicology. 3rd ed. Acton, Massachusetts: Publishing Sciences Group.
- \* Hansch C, Leo A. 1984. The log p database. Claremont, CA: Pomona College.
- \* Hansten PD. 1979. Drug interactions. 4th ed. Philadelphia: Lea and Febiger.
- \* Hansten PD. 1971. Drug interactions. Philadelphia: Lea and Febiger.
- \* Hartley D, Kidd H, eds. 1983. The agrochemicals handbook. Old Woking, Surrey, United Kingdom: Royal Society of Chemistry/Unwin Brothers Ltd.
- \*/- Hawley GG. 1981. The condensed chemical dictionary. 10th ed. New York: Van Nostrand Reinhold Company.
- \* Hawley GG. 1977. The condensed chemical dictionary. 9th ed. New York: Van Nostrand Reinhold.
- \*/- Hayes WJ, Jr. 1982. Pesticides studied in man. Baltimore/London: Williams and Wilkins.
- \* Hayes WJ, Jr. 1975. Toxicology of pesticides. Baltimore: Williams and Wilkins.
- \* IARC. 1972-1985. International Agency for Research on Cancer. IARC monographs on the evaluation of the carcinogenic risk of chemicals to man. (Multivolume work.) Geneva: World Health Organization, International Agency for Research on Cancer.



## REFERENCES (Continued)

- \* Ismagilova AK, Gilvev VG. 1971. Evaluation of the toxicity of benzenesulfonyl chloride during chronic inhalation poisoning. Tr Ufim Nauch-Issled Institute Gig Prof Zabol 6:151.
- \*/- ITI and ITII. 1982. The International Technical Information Institute. Toxic and Hazardous Industrial Chemicals Safety Manual. Tokyo, Japan: The International Technical Information Institute.
- \*/- ITI and ITII. 1976. The International Technical Information Institute. Toxic and Hazardous Industrial Chemicals Safety Manual. Tokyo, Japan: The International Technical Information Institute.
- \* Izgaronyan ZP, Amatuni VA. 1980. Electrical activity of the heart in individuals producing vinyl acetate and its derivatives. Krovoobrashchenie 13 volume 4.
- \* Jones LM, et al. 1977. Veterinary pharmacology and therapeutics. 4th ed. Ames: Iowa State University Press.
- \* Kearney PC, Kaufman DD, eds. 1975. Herbicides: chemistry, degradation, and mode of action. Vols. 1 and 2. 2nd ed. New York: Marcel Dekker.
- \* Kearney PC, Kaufman DD. 1969. Degradation of herbicides. New York: Marcel Dekker.
- \* Keeler RF, Tu AT, eds. 1983. Handbook of natural toxins. Vol. 1. Plant and fungal toxins. New York: Marcel Dekker.
- \* Khan, et al. 1970. Ecological and health effects of the photolysis products of chlorinated hydrocarbon pesticide. In dynamics, exposure, and health assessment of toxic chemicals. Haque R, ed. Ann Arbor: Ann Arbor Science Pub.
- \* Kirk-Othmer. 1978. Kirk-Othmer encyclopedia of chemical technology, 1978-1984. 3rd, vols. 1-26. New York: John Wiley and Sons.
- \* LaDu BN, Mandel HG, Way EL. 1971. Fundamentals of drug metabolism and disposition. Baltimore: Williams and Wilkins.
- \* Landrock AH. 1983. Handbook of plastics flammability and combustion toxicology. Park Ridge, NJ: Noyes Publications.
- \* Lefaux R. 1968. Practical toxicology of plastics. Cleveland: CRC Press Inc.
- \* Luckey TD, Venugopal B. 1977. Metal toxicity in mammals, 1. New York: Plenum Press.

## REFERENCES (Continued)

- \* Mackay D, Shiu WY. 1977. Aqueous solubility of polynuclear aromatic hydrocarbons. Journal of Chemical Engineering Data. Volume 22.
- \* Marmion DM. 1984. Handbook of U.S. colorants for foods, drugs, and cosmetics. 2nd ed. New York: John Wiley and Sons.
- \* Martin EW, ed. 1978. Hazards of medication. 2nd ed. Philadelphia: J.B. Lippincott Co.
- \* Martin E. 1971. Hazards of medication: a manual on drug interactions, incompatibilities, contraindications and adverse effects. Philadelphia: J.B. Lippincott Co.
- \* Martin H, Worthing CR, eds. 1979. Pesticide manual. 5th ed. Worcestershire, England: British Crop Protection Council.
- \* Martin H, Worthing CR, eds. 1974. Pesticide manual. 4th ed. Worcestershire, England: British Crop Protection Council.
- \* Martin H, ed. 1972. Pesticide manual: basic information on the chemicals used as active components of pesticides. 3rd ed. Worcester, England: British Crop Protection Council.
- \* Menzie CM. 1978. Metabolism of pesticides, an update II. U.S. Department of the Interior, Fish and Wildlife Service, Special Scientific Report -- Wildlife No. 212, Washington, D.C.: U.S. Government Printing Office.
- \* Menzie CM. 1974. Metabolism of pesticides, an update. U.S. Department of the Interior, Fish and Wildlife Service, Special Scientific Report -- Wildlife No. 184, Washington, D.C.: U.S. Government Printing Office.
- \* Menzie CM. 1969. Metabolism of pesticides. U.S. Department of the Interior, Fish and Wildlife Service, Special Scientific Report -- Wildlife No. 127, Washington, D.C.: U.S. Government Printing Office.
- \*/- Merck Index. 1983. An encyclopedia of chemicals, drugs, and biologicals, 10th ed. Rahway, NJ: Merck & Co., Inc.
- \* Merck Index. 1976. An encyclopedia of chemicals, drugs, and biologicals, 9th ed. Rahway, NJ: Merck & Co., Inc.
- \* Merck Index. 1968. An encyclopedia of chemicals and drugs, 8th ed. Rahway, NJ: Merck & Co., Inc.
- \* Merory J. 1968. Food flavorings: composition, manufacture, and use. 2nd ed. Westport, CT: Avi Publishing Co.

## REFERENCES (Continued)

- \* Meyers FH, Jaetz E, Golfien A. 1972. Review of medical pharmacology, Los Altos, CA: Lange Medical Publications.
- \* Meyler L, Herxheimer A, eds. 1955-1971. Side effects of drugs. Vols 1-7. Amsterdam: Excerpta Medica.
- \* Miller RR, Greenblatt DJ. 1979. Handbook of drug therapy. New York: Elsevier North Holland.
- \* Montesano R, Bartsch H, Boyland E, et al., eds. 1979. Handling chemical carcinogens in the laboratory: problems of safety. Lyon, France: International Agency for Research on Cancer. IARC Scientific Publications No. 33.
- \* Morgan DP. 1982. Recognition and management of pesticide poisonings. Washington, D.C.: U.S. Government Printing Office. United States Environmental Protection Agency. EPA 540/9-80-005.
- \* Morgan DP. 1976. Recognition and management of pesticide poisonings. Washington, D.C.: U.S. Government Printing Office. United States Environmental Protection Agency. EPA 540/9-76-011.
- \* Mule SJ, Brill H, eds. 1972. Chemical and biological aspects of drug dependence. Cleveland: The Chemical Rubber Company.
- \*/- NFPA. 1984. National Fire Protection Association. Fire protection guide on hazardous materials, 8th ed. Quincy, Massachusetts: NFPA.
- \* NFPA. 1978. National Fire Protection Association, Fire protection guide on hazardous materials. 7th ed. Boston, Massachusetts: NFPA.
- \* NFPA. 1975. National Fire Protection Association, Fire protection guide on hazardous materials. 6th ed. Boston, Massachusetts: NFPA.
- \* NIH EPA, OHM/TADS. 1984. National Institutes of Health, Environmental Protection Agency. Database. Oil and Hazardous Materials Technical Assistance Data Systems.
- \* NIH. 1979. National Institutes of Health. Toxicology and carcinogenesis studies of aldicarb. Report #136, NIH Pub. #79-1391, p. 5.
- \* NIOSH. 1977-Present. National Institute for Occupational Safety and Health, U.S. Department of Health, Education and Welfare, Public Health Service, Center for Disease Control. NIOSH manual of analytical methods. 2nd ed. Vols. 1-7. Washington, D.C.: U.S. Government Printing Office.

## REFERENCES (Continued)

- \* NIOSH. 1980. National Institute for Occupational Safety and Health, U.S. Department of Health and Human Services, Public Health Service, Center for Disease Control. Registry of toxic effects of chemical substances. 1979 ed. Vols 1 and 2. Washington, D.C.: U.S. Government Printing Office.
- \* NIOSH. 1979. National Institute for Occupational Safety and Health, U.S. Department of Health, Education and Welfare, Public Health Service, Center for Disease Control. Registry of toxic effects of chemical substances. 1978 ed. Washington, D.C.: U.S. Government Printing Office.
- \* NIOSH. 1977. National Institute for Occupational Safety and Health, U.S. Department of Health, Education and Welfare. Occupational diseases -- a guide to their recognition. Washington, D.C.: Superintendent of Documents. DHEW(NIOSH) Publication No. 77-181.
- \* NIOSH. 1977. National Institute for Occupational Safety and Health, U.S. Department of Health, Education and Welfare, Public Health Service, Center for Disease Control. Registry of toxic effects of chemical substances. 1977 ed. Washington, D.C.: U.S. Government Printing Office.
- \* NIOSH. 1976. National Institute for Occupational Safety and Health, U.S. Department of Health, Education and Welfare, Public Health Service, Center for Disease Control. Registry of toxic effects of chemical substances. 1976 ed. Washington, D.C.: U.S. Government Printing Office.
- \* NIOSH. 1975. National Institute for Occupational Safety and Health, U.S. Department of Health, Education and Welfare, Public Health Service, Center for Disease Control. Registry of toxic effects of chemical substances. 1975 ed. Washington, D.C.: U.S. Government Printing Office.
- \* NIOSH. 1974. National Institute for Occupational Safety and Health, U.S. Department of Health, Education and Welfare. The toxic substances list. Washington, D.C.: U.S. Government Printing Office.
- \* NIOSH. 1973. National Institute for Occupational Safety and Health, U.S. Department of Health, Education and Welfare. The toxic substances list. Washington, D.C.: U.S. Government Printing Office.
- \* NIOSH/OSHA. 1981. National Institute for Occupational Safety and Health/Occupational Safety and Health Administration. Mackison FW, Stricoff RS, Partridge LJ, Jr., eds. NIOSH/OSHA -- occupational health guidelines for chemical hazards. Washington, D.C.: U.S. Government Printing Office, DHHS(NIOSH) Publication No. 81-123.

## REFERENCES (Continued)

- \* NIOSH/OSHA. 1981. National Institute for Occupational Safety and Health/Occupational Safety and Health Administration, U.S. Department of Health and Human Services Public Health Service. Occupational health guide for chemical hazards: dimethylphthalate, p. 1. NIOSH 81-123.
- \* NIOSH/OSHA. 1980. National Institute for Occupational Safety and Health/Occupational Safety and Health Administration. Mackison FW, Stricoff RS, Partridge LJ, Jr., eds. NIOSH/OSHA pocket guide to chemical hazards. Washington, D.C.: U.S. Government Printing Office, DHHS(NIOSH) Publication No. 78-210.
- /- NIOSH/OSHA. 1978. National Institute for Occupational Safety and Health/Occupational Safety and Health Administration, U.S. Department of Health, Education and Welfare, U.S. Department of Labor. NIOSH/OSHA pocket guide to chemical hazards. DHEW(NIOSH) Publication No. 78-210.
- \* NIOSH/RTECS. 1985. National Institute for Occupational Safety and Health/Occupational Safety and Health Administration, U.S. Department of Health and Human Services, Public Health Service, Center for Disease Control. Registry of toxic effects of chemical substances (RTECS). National Library of Medicine's current MEDLINE file.
- /- NIOSH/RTECS. 1983. National Institute for Occupational Safety and Health. Registry of toxic effects of chemical substances, 1981-82 ed, Vols 1-3. Cincinnati, OH: DHHS(NIOSH) Publication No. 83-107.
- \* NRC. 1983. National Research Council. Drinking water and health, Vol. 5. Washington, D.C.: National Academy Press.
- \* NRC. 1982. National Research Council. Drinking water and health, Vol. 4. Washington, D.C.: National Academy Press.
- \* NRC. 1983. National Research Council. Polycyclic aromatic hydrocarbons: evaluation of sources and effects. Washington, D.C.: National Academy Press.
- \* NRC. 1981. National Research Council. Prudent practices for handling hazardous chemicals in laboratories. Washington, D.C.: National Academy Press.
- \* NRC. 1980a. National Research Council. Drinking water and health, Vol. 3. Washington, D.C.: National Academy Press.
- \* NRC. 1980b. National Research Council. Drinking water and health, Vol. 2. Washington, D.C.: National Academy Press.
- \* NRC. 1977. National Research Council. Drinking water and health, Vol. 1. Washington, D.C.: National Academy Press.

## REFERENCES (Continued)

- \* NRC. 1972. National Research Council. Specifications and criteria for biochemical compounds. 3rd ed. Washington, D.C.: National Academy of Sciences.
- \* Opavsky W, MacPherson E. 1976. Ger Offen Patent Number 2430193, January 1, 1976.
- \* Opdyke DLJ, Letizia C, eds. 1982. Monographs on fragrance and raw materials. Special Issue VI. New York: Pergamon Press.
- \* Opdyke DLJ, ed. 1979. Monographs on fragrance and raw materials. New York: Pergamon Press.
- \*/- OSHA. 1984. Occupational Safety and Health Administration, U.S. Department of Labor. Occupational safety and health standards. Subpart Z. Toxic and hazardous substances. (29 CFR 1910.1000). pp. 660-665.
- \* Osol A, ed. 1980. Remington's pharmaceutical sciences. 16th ed. Easton, PA: Mack Publishing Co.
- \* Osol A, Hoover JE, et al., eds. 1975. Remington's pharmaceutical sciences. 15th ed. Easton, PA: Mack Publishing Co.
- \* Osol A, Pratt R, eds. 1973. The United States dispensatory. 27th ed. Philadelphia: J.B. Lippincott.
- \* Parke DV. 1968. The biochemistry of foreign compounds. Oxford: Pergamon Press.
- \* Parr JF, Marsh PB, Kla JM, eds. 1983. Land treatment of hazardous wastes. Park Ridge, NJ: Noyes Data Corporation.
- \* Patty F, ed. 1963. Industrial hygiene and toxicology: Vol II: toxicology. 2nd ed. New York: Interscience Publishers.
- \* Peer Review Committee. Updated 1985. Expert opinion on Data Base. National Library of Medicine.
- \*/- Physicians' Desk Reference. 1980, 1985. 34th ed. and 39th ed. Oradell, NJ: Medical Economics Company (Litton).
- \* Physicians' Desk Reference. 1974. 28th ed. Oradell, NJ: Medical Economics Co.
- \*/- Proctor NH, Hughes JP. 1978. Chemical hazards of the workplace. Philadelphia: J.B. Lippincott Co.

# REFERENCES (Continued)

- \* Roberts NJ. 1983. South Med. J. 76(1)45-48.
- \* Rodricks JV, Hesselstine CW, Mehlman MA, eds. 1977. Mycotoxins in human and animal health, proceedings of conference .... University of Maryland October 4-8, 1976. Park Forest South, IL: Pathotox Publishers, Inc.
- \* Rossoff IS. 1974. Handbook of veterinary drugs. New York: Springer Publishing Company.
- \* Rumack BH, ed. 1975-Present. Poisindex. Microfiche ed. Denver, CO: Micromedex, Inc., in association with the National Center for Poison Information, with updates.
- /- SANSS. 1983. Structure and Nomenclature Search System. Chemical Information Systems, Inc. 7215 York Road, Baltimore, MD. 21212. Last update November 1983.
- /- Sax NI. 1984. Dangerous properties of industrial materials. 6th ed. New York: Van Nostrand Reinhold.
- \* Sax NI. 1979. Dangerous properties of industrial materials. 5th ed. New York: Van Nostrand Reinhold.
- \* Sax NI. 1975. Dangerous properties of industrial materials. 4th ed. New York: Van Nostrand Reinhold.
- \* Sax NI. 1968. Dangerous properties of industrial materials. 3rd ed. New York: Van Nostrand Reinhold.
- \* Schuckmann, F. 1972. Zentralarbeitsmed Arbeitsschutz 22(3):74.
- \* Searle CE, ed. 1976. Chemical carcinogens. Washington, D.C.: American Chemical Society. ACS Monograph 173.
- \* Shepard, TH. 1980. Catalog of teratogenic agents. 3rd ed. Baltimore, MD: Johns Hopkins University Press.
- \* Soliman et al. 1979. J. Environ Sci Health, Part B B14(1)27.
- \* Sorahan T. et al. 1983. Ann Occup Hyg 27(2):173-182.
- \* Spencer EY. 1973. Guide to the chemicals used in crop protection, 6th ed. Research Institute, Agriculture Canada. Ottawa, Canada: Information Canada. Publication No. 1093.
- \* Spencer EY. 1982. Guide to the chemicals used in crop protection 7th ed. Research Institute, Agriculture Canada. Ottawa, Canada: Information Canada. Publication No. 1093.

## REFERENCES (Continued)

- \* SRI. 1983. Standard Research Institute International. 1983 Directory of chemical producers. Menlo Park, CA: SRI International.
- \* Stasik, NJ. 1975. Clinical Experience with benzene sulfonyl chloride. Arch. Toxicol. 33(2)123.
- \* Stockley, IH. 1981. Drug interactions. Boston: Blackwell Scientific Publications.
- /- Student, PJ. 1981. Emergency handling of hazardous materials in surface transportation. Washington, D.C.: Bureau of Explosives.
- \* Sunshine I, ed. 1969. CRC handbook of analytical toxicology. Cleveland: The Chemical Rubber Company.
- \* Sunshine I, ed. 1975. Methodology for analytical toxicology. Cleveland: CRC Press, Inc.
- \* Talakina, ET et al. 1977. Protection of the health of pregnant women working in the production of acetylene-vinyl acetate. Gig tr Prof Zabol volume 3.
- \* Testa B, Jenner P. 1976. Drug metabolism: chemical and biochemical aspects. New York: Marcel Dekker, Inc.
- \* Thienes C, Haley TJ. 1972. Clinical toxicology. 5th ed. Philadelphia: Lea and Febiger.
- \* Transdermal Indomethacin Pharamaceuticals. 1983 (May 13). Nitto Electric Industrial Co., Ltd. JPN Kokai Tokkyo Koho Patent Number 83 79918.
- \* Tsubura Y, Kato Y (inventors), Kanesho Company, Limited (assignee). 1974 (August 15). Japan Kokai Patent Number 85233.
- /- U.S. Army. 1975. Headquarters, Department of the Army. Military chemistry and chemical compounds. Washington, D.C.: Departments of the Army and the Air Force. U.S. Army Field Manual No. 3-9/Air Force Regulation No. 355-7.
- \* Usdin E, Efron DH. 1972. Psychotropic drugs and related compounds. 2nd ed. Washington, D.C.: U.S. Government Printing Office, Department of Health, Education, and Welfare. Publication (HSM) 72-9094.
- \* USEPA. 1983. U.S. Environmental Protection Agency. Tolerances for pesticide chemicals in or on raw agricultural commodities; certain pesticide chemicals. (48 FR 44205-6).



## REFERENCES (Continued)

- \* USEPA. 1980. U.S. Environmental Protection Agency. Ambient Water Quality Document: Endrin (EPA 440/4-80-047); Chloroform (EPA 44015-80-033).
- \* USEPA/ECAO. 1980. U.S. Environmental Protection Agency/Environmental Criteria and Assessment Office. Atlas document for phthalate.
- \* USEPA/ODW. 1983. U.S. Environmental Protection Agency. Office of Drinking Water. Criteria document (draft): vinyl chloride p. III-1.
- /- USEPA/Pesticide Index. 1985. U.S. Environmental Protection Agency. EPA Index to Pesticide Chemicals: Use and Limitations. Current file; updated daily. Washington, D.C.: Office of Pesticide Programs, USEPA.
- /- USEPA/Active Ingredients. 1985. U.S. Environmental Protection Agency. EPA Chemical Index File: Active Ingredients. Current file; updated as needed. Washington, D.C.: Office of Pesticide Programs, USEPA.
- \* USFWS. 1984. U.S. Fish and Wildlife Service, Department of the Interior. Handbook of toxicity of pesticides to wildlife. Washington, D.C.: U.S. Government Printing Office. Resource Publication 153.
- \* USFWS. 1980. U.S. Fish and Wildlife Service, Department of the Interior. Handbook of acute toxicity of chemicals to fish and aquatic invertebrates. Washington, D.C.: U.S. Government Printing Office. Resource Publication 137.
- \* USFWS. 1975. U.S. Fish and Wildlife Service, Department of the Interior, Bureau of Sports Fisheries and Wildlife. Lethal dietary toxicities of environmental pollutants to birds. Washington, D.C.: U.S. Government Printing Office. Special Scientific Report -- Wildlife No. 191.
- \* USFWS. 1972. U.S. Fish and Wildlife Service, Department of the Interior, Bureau of Sports Fisheries and Wildlife. Comparative dietary toxicities of pesticides to birds. Washington, D.C.: U.S. Government Printing Office. Special Scientific Report -- Wildlife No. 152.
- \* USFWS. 1970. U.S. Fish and Wildlife Service, Department of the Interior. Handbook of toxicity of pesticides to wildlife. Washington, D.C.: U.S. Government Printing Office.
- \* Venugopal B, Luckey TD. 1978. Metal toxicity in mammals, 2. New York: Plenum Press.
- \*/- Verschueren K. 1983. Handbook of environmental data on organic chemicals. 2nd ed. New York, NY: Van Nostrand Reinhold Company.

# REFERENCES (Continued)

- \* Wagoner, JK. 1983. Environ health perspect 52.
- \* Weast, RC, ed. 1984. Handbook of chemistry and physics. 65th ed. Boca Raton, FL: CRC Press, Inc.
- \*/- Weast, RC, ed. 1983. Handbook of chemistry and physics. 64th ed. Boca Raton, FL: CRC Press, Inc.
- \*/- Weast, RC, ed. 1980. Handbook of chemistry and physics. 60th ed. Boca Raton, FL: CRC Press, Inc.
- \*/- Weast, RC, ed. 1979. Handbook of chemistry and physics. 60th ed. Boca Raton, FL: CRC Press, Inc.
- \* Weast, RC, ed. 1976. Handbook of chemistry and physics. 57th ed. Boca Raton, FL: CRC Press, Inc.
- \* Weast, RC, ed. 1974. Handbook of chemistry and physics. 55th ed. Boca Raton, FL: CRC Press, Inc.
- \* Weast, RC, ed. 1972. Handbook of chemistry and physics. 53th ed. Boca Raton, FL: CRC Press, Inc.
- \* Weed Science Society of America. 1979. Herbicide handbook. 4th ed. Champaign, IL: Weed Science Society of America.
- \* Weed Science Society of America. 1974. Herbicide handbook. 3rd ed. Champaign, IL: Weed Science Society of America.
- /- Weiss G, ed. 1980. Hazardous chemicals data book. Park Ridge, NJ: Noyes Data Corporation.
- \* Weiss, RB and FM Muggia. 1980. American Journal of Medicine 68(2):259.
- \* White-Stevens R, ed. 1976a. Pesticides in the environment: Vol 3. New York: Marcel Dekker.
- \* White-Stevens R, ed. 1976b. Pesticides in the environment: Vol 2. New York: Marcel Dekker.
- \* White-Stevens R, ed. 1971. Pesticides in the environment: Vol 1. Part 1, Part 2. New York: Marcel Dekker.
- \*/- Worthing CR, Walker SB, eds. 1983. The pesticide manual -- a world compendium. 7th ed. Lavenham, Suffolk, Great Britain: The Lavenham Press Limited.

REFERENCES  
(Continued)

- \* Worthing CR, ed. 1979. Pesticide manual. 6th ed. Worcestershire, England: British Crop Protection Council.
- /- Worthy W. 1985. Methyl isocyanate: the chemistry of a hazard. Chem Eng News 63(6):27-33.

EPA CHEMICAL PROFILE

INTERIM

Date: October 31, 1985

Revision: \_\_\_\_\_

CHEMICAL IDENTITY -- FORMALDEHYDE

CAS Registry Number: 50-00-0

**Synonyms:** BFV; FA; Fannoform; Formaldehyde solution; Formaldehyde, as Formalin solution (DOT); Formaldehyde, gas; Formalin; Formalin 40; Formalith; Formic Aldehyde; Formol; Fyde; Hoch; Ivalon; Karsan; Lysoform; Methanal; Methyl Aldehyde; Methylene Glycol; Methylene Oxide; Morbacid; NCI-C02799; Oxomethane; Oxymethylene; Superlysoform

**Chemical Formula:** CH<sub>2</sub>O

**Molecular Weight:** 30.03

SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

**OSHA PEL:** TWA 3 ppm; Ceiling Concentration 5 ppm; Peak Concentration 10 ppm/30 minutes/8 hours (\*NIOSH/RTECS 1985)

**ACGIH TLV:** Ceiling limit 1 ppm (1.5 mg/m<sup>3</sup>) (\*ACGIH 1980); STEL (ceiling) 2 ppm (3 mg/m<sup>3</sup>) at 8 hours (\*ACGIH 1983)

**IDLH:** 100 ppm (NIOSH/OSHA 1978, p. 104)

**Other Limits Recommended:** Occupational exposure to formaldehyde recommended standard -- air ceiling concentration 1.2 mg/m<sup>3</sup>/30 minutes (\*NIOSH/RTECS 1985). Industrial substance suspect of carcinogenic potential for humans recommended standard 1 ppm (ACGIH 1984, p. 42)

SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

**Boiling Point:** -3.1°F, -19.5°C at 760 mmHg (\*Merck 1976); commercial aqueous formaldehyde boils at 205°F, 96°C (Merck 1983, p. 604)

**Specific Gravity (H<sub>2</sub>O=1):** 1.067 (\*Merck 1976); 0.815 at -20°C/4°C for anhydrous form (Merck 1983, p. 604)

**Vapor Pressure (mmHg):** 10 at -88°C (\*Patty 1963), for anhydrous form

**Melting Point:** -134°F, -92°C (\*Merck 1976), for anhydrous form

## FORMALDEHYDE

### SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS (Continued)

**Vapor Density (AIR=1):** 1.03 for aqueous solution; 1.075 for gas (\*Environment Canada 1982), 1.067 for gas (Merck 1983, p. 604)

**Evaporation Rate (Butyl acetate=1):** Not Found

**Solubility in Water:** Very soluble in water, up to 55% (\*Merck 1976)

**Appearance and Odor:** Gas or liquid, strong, pungent odor, clear, water-white (Sax 1984, p. 145).

### SECTION III -- FIRE AND EXPLOSION HAZARD DATA

**Flash Point (Method Used):** 60°C/40% solution (\*Merck 1976)

**Flammable Limits:**

LEL: 7% (\*Sax 1975)

UEL: 73% (\*Sax 1975)

**Extinguishing Methods:** Small fires: dry chemical, carbon dioxide, water spray or foam. Large fires: water spray, fog or foam. Move container from fire area if you can do so without risk. Do not get water inside container. Spray cooling water on containers exposed to flames until well after fire is out. Withdraw immediately in case of rising sound from venting safety device or any discoloration of tank due to fire (DOT 1984, Guide 29).

**Special Fire Fighting Procedures:** Keep unnecessary people away; stay upwind; keep out of low areas. Isolate for 1/2 mile in all directions if tank car or truck is involved in fire (\*DOT 1984). Wear self-contained breathing apparatus; wear goggles if eye protection not provided. Shut off flow of gas or liquid and keep cooling water streams on exposed tanks or containers. Use water spray carefully in vicinity of dusts so as not to create dust clouds (\*NFPA 1978).

**Unusual Fire and Explosion Hazards:** Toxic vapors such as carbon dioxide and carbon monoxide are generated during combustion (\*Environment Canada 1982). Explosion hazard: when aqueous formaldehyde solutions are heated above their flash points, a potential for explosion hazard exists. High formaldehyde concentration or methanol content lowers flash point. Reacts with nitrogen oxides at about 180°; the reaction becomes explosive. Also reacts violently with perchloric acid-aniline, performic acid, nitromethane, magnesium carbonate, and hydrogen peroxide (Sax 1984, p. 1452).

## FORMALDEHYDE

### SECTION IV -- REACTIVITY DATA

**Stability:** **Unstable:** Yes, aqueous solutions (\*Lefaux 1968)  
**Stable:** Yes, commercial formaldehyde-alcohol solutions (\*Kirk-Othmer 1978); gas is stable in absence of water (\*Health and Safety Executive Monograph 1981)

**Conditions to Avoid:** Oxidizing and alkaline materials (\*NFPA 1978)

**Incompatibility (Materials to Avoid):** Reacts with peroxide, nitrogen oxide, and performic acid causing explosions (\*Environment Canada 1982). Can react with hydrogen chloride or other inorganic chlorides to form bis-chloromethylether (BCME), a known carcinogen (\*General Electric Co. 1981, MSDS 360). Very reactive, combines readily with many substances, 40% solution is powerful reducing agent (\*Merck 1976). Incompatible with amines, azo compounds, dithiocarbamates, alkali and alkaline earth metals, nitrides, nitro compounds, unsaturated aliphatics and sulfides, organic peroxides, oxidizing agents, and reducing agents (\*Environment Canada 1982).

**Hazardous Decomposition or Byproducts:** When heated, irritant formaldehyde gas evolved from solution (Sax 1984, p. 1452). The main products of decomposition are carbon monoxide and hydrogen. Metals such as platinum, copper, chromia, and alumina also catalyze the formation of methanol, methylformate, formic acid, carbon dioxide, and methane (\*Kirk-Othmer 1978).

**Hazardous Polymerization:** **May Occur:** Yes (\*Environment Canada 1982)  
**May Not Occur:**

**Conditions to Avoid:** Compound will polymerize with active organic materials such as phenol (\*General Electric Co. 1981, MSDS 360). Will polymerize violently in the presence of caustics and nitrides; (amines) exothermic reaction, (Azo compound) exothermic reaction giving off nitrogen gas, (caustics) heat generation and violent polymerization, (dithiocarbamates) formation of flammable gases and toxic fumes, formation of carbon disulfide may result, (alkali and alkaline earth metals) heat generation and formation of a flammable hydrogen gas (\*Environment Canada 1982).

### SECTION V -- HEALTH HAZARD DATA

**Routes of Entry:** **Inhalation:** Yes (Proctor and Hughes 1978, pp. 272-273)  
**Skin:** Yes (Environment Canada 1982)  
**Ingestion:** Yes (\*Gosselin 1976)

## FORMALDEHYDE

### SECTION V -- HEALTH HAZARD DATA

**Health Hazards** (Acute, Delayed, and Chronic): The probable oral lethal dose for humans is 0.5-5 g/kg, or between 1 ounce and 1 pint for a 150 pound person (\*Gosselin 1976). Acute -- below 1 ppm, odor perceptible to most. 2-3 ppm, mild tingling of eyes. 4-5 ppm, increased discomfort, mild lacrimation. 10 ppm, profuse lacrimation; can be withstood only for few minutes. 10-20 ppm, breathing difficult, cough, severe burning of nose and throat. 50-100 ppm, acute irritation of respiratory tract, very serious injury likely. Skin -- primary irritation from strong solutions, gas. Delayed -- sensitization dermatitis (Proctor and Hughes 1978, pp. 272-273). Suspected carcinogen (\*Kirk-Othmer 1978). Effects in women include menstrual disorders and secondary sterility (\*IARC 1972-1985). Solutions splashed in eyes have caused injuries ranging from severe, permanent corneal opacification and loss of vision to minor discomfort (\*Grant 1974).

**Signs and Symptoms of Exposure:** Irritation of eyes, nose and throat, tearing, cough, bronchospasm, pulmonary irritation, dermatitis (Proctor and Hughes 1978, p. 273). Severe pain, vomiting and diarrhea result from ingestion. After absorption, formaldehyde depresses the central nervous system and symptoms similar to alcohol intoxication (i.e., vertigo, depression and coma) result. It can also cause a reduction in body temperature (\*Environment Canada 1982).

**Medical Conditions Generally Aggravated by Exposure:** In people sensitized to formaldehyde, late asthmatic reactions may be provoked by brief exposures at approximately 3 ppm (\*Hendrick 1982).

**Emergency and First Aid Procedures:** Remove victim from exposure. In case of contact with eyes or skin flush with water for at least 15 minutes (Proctor and Hughes 1978, p. 273). If not breathing give artificial respiration; if breathing is difficult, give oxygen. Remove and isolate contaminated clothing. Keep victim quiet and maintain normal body temperature (\*DOT 1984).

### SECTION VI -- USE INFORMATION

Urea and melamine resins; polyacetal resins; phenolic resins; ethylene glycol; pentaerythritol; hexamethylenetetramine; fertilizer; dyes, medicine (disinfectant, germicide); embalming fluids; preservative; hardening agent; reducing agent, as in recovery of gold and silver; corrosion inhibitor in oil wells; durable-press treatment of textile fabrics; possible condensation to sugars and other carbohydrates for food use (experimental); industrial sterilant; treatment of grain smut (Hawley 1977, p. 395).

## FORMALDEHYDE

### SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE

(Steps to be Taken in Case Material is Released or Spilled)

Shut off ignition sources; no flares, smoking or flames in hazard area. Do not touch spilled material; stop leak if you can do so without risk. Use water spray to reduce vapors; do not get water inside container. Small spills: absorb with sand or other noncombustible absorbent material and place into containers for later disposal. Large spills: dike far ahead of spill for later disposal (DOT 1984, Guide 29). Use fluorocarbon water spray, Cellosize, and Hycar to diminish vapors. Use sodium carbonate, ammonium hydroxide or sodium sulfite to neutralize spill. Use universal gel, fly/ash, universal sorbent material, or cement powder to absorb the spill (\*Environment Canada 1982).



## EPA CHEMICAL PROFILE

### INTERIM

Date: October 31, 1985

Revision: \_\_\_\_\_

### CHEMICAL IDENTITY -- MITOMYCIN C

CAS Registry Number: 50-07-7

**Synonyms:** Ametycine; Mutamycin; NSC-26980; Azirino[2',3':3,4]pyrrolo [1,2-a]indole-4,7-dione, 6-amino-8-[[ (aminocarbonyl)oxy]methyl]-1,1a,2,8,8a,8b-hexahydro-8a-methoxy-5-methyl-, [1aR-(1a.alpha.,8.beta.,8a.alpha.,8b.alpha.)]-

**Chemical Formula:**  $C_{15}H_{18}N_4O_5$

**Molecular Weight:** 334.37

### SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

**OSHA PEL:** Not Found

**ACGIH TLV:** Not Found

**IDLH:** Not Found

**Other Limits Recommended:** Toxicity information: LD<sub>50</sub> oral (rat) 14 mg/kg (\*NIOSH/RTECS 1985)

### SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

**Boiling Point:** Not Found

**Specific Gravity (H<sub>2</sub>O=1):** Not Found

**Vapor Pressure (mmHg):** Not Found

**Melting Point:** Above 680°F, 360°C (\*Merck 1983)

**Vapor Density (AIR=1):** Not Found

**Evaporation Rate (Butyl acetate=1):** Not Found

**Solubility in Water:** Soluble (\*Merck 1983)

**Appearance and Odor:** Blue-violet crystals (\*Merck 1983)

**MITOMYCIN C**

**SECTION III -- FIRE AND EXPLOSION HAZARD DATA**

**Flash Point** (Method Used): Not Found

**Flammable Limits:**

LEL: Not Found

UEL: Not Found

**Extinguishing Methods:** Not Found

**Special Fire Fighting Procedures:** Not Found

**Unusual Fire and Explosion Hazards:** Not Found

**SECTION IV -- REACTIVITY DATA**

**Stability:** Unstable: Not Found

Stable: Not Found

**Conditions to Avoid:** Not Found

**Incompatibility** (Materials to Avoid): Not Found

**Hazardous Decomposition or Byproducts:** Not Found

**Hazardous Polymerization:** May Occur: Not Found

May Not Occur: Not Found

**Conditions to Avoid:** Not Found

**SECTION V -- HEALTH HAZARD DATA**

**Routes of Entry:** Inhalation: Not Found

Skin: Not Found

Ingestion: Not Found

**Health Hazards** (Acute, Delayed, and Chronic): Toxic doses as low as 750 µg/kg have been reported in humans (\*NIOSH 1979). The major toxic effect is myelosuppression, characterized by marked leukopenia and thrombocytopenia; this may be delayed and cumulative. Interstitial pneumonia and glomerular damage resulting in kidney failure are unusual but well documented complications (Gilman 1985, p. 1289).

**MITOMYCIN C****SECTION V -- HEALTH HAZARD DATA (Continued)**

**Signs and Symptoms of Exposure:** Headaches, blurred vision, confusion, drowsiness, fatigue, diarrhea, and pain have been occasionally noted. These do not appear to be dose related by intravenous administration. Fever and anorexia occur in 15 percent of patients. Hair loss, sloughing of skin, and loss of feeling occur in approximately 4 percent of patients. Labored breathing, cough and pneumonia occur in some cases. Renal toxicity is sometimes observed (\*AMA 1977).

**Medical Conditions Generally Aggravated by Exposure:** Lung conditions -- administration of mitomycin has been recognized as causing pneumonitis, alveolitis and pulmonary fibrosis (\*Weiss 1980). Kidney conditions -- administration of mitomycin can cause kidney damage (Gilman 1985, p. 1289). Kidney toxicity was observed in 1-5 percent of patients. Depressed immune conditions (\*AMA 1977).

**Emergency and First Aid Procedures:** Seek immediate medical care. Skin decontamination should be thorough, with water and soap. Eye exposure can be followed by irrigation of eyes with plain tap water (\*Rumack 1975 to Present). (Non-Specific -- Medicines, n.o.s.) If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Remove and isolate contaminated clothing and shoes at the site. Keep victim quiet and maintain normal body temperature (DOT 1984, Guide 11).

**SECTION VI -- USE INFORMATION**

Anti-tumor antibiotic complex (\*Merck 1976). This drug is usually injected intravenously (\*AMA 1977).

**SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE**  
(Steps to be Taken in Case Material is Released or Spilled)

Avoid inhalation and skin contact (see Section V above).

## EPA CHEMICAL PROFILE

### INTERIM

Date: October 31, 1985

Revision: \_\_\_\_\_

### CHEMICAL IDENTITY -- ERGOCALCIFEROL

CAS Registry Number: 50-14-6

**Synonyms:** 9,10-Secoergosta-5,7,10(19),22-Tetraen-3-beta-ol;  
9,10-Secoergosta-5,7,10(19),22-Tetraen-3-ol,(3-beta,5Z,7E,22E)-; Activated  
Ergosterol; Buco-D; Calciferol; Calciferon 2; Condacaps; Condocaps; Condol;  
Crtron; Crystallina; D-Arthin; D-Tracetten; Daral; Davitamon D; Davitin;  
De-Rat Concentrate; Decaps; Dee-Osterol; Dee-Ron; Dee-Ronal; Dee-Roual;  
Deltalin; Deratol; Detalup; Diactol; Divit Urto; Doral; Drisdol;  
Ergocalciferol; Ergorone; Ergosterol Activated; Ergosterol, Irradiated;  
Ertron; Fortodyl; Geltabs; Hi-Deratol; Infron; Irradiated Ergosta-5,7,22-Trien-  
3-Beta-ol; Irradiated Ergosterol; Metadee; Mina D2; Mulsiferol; Mykostin;  
Oleovitamin D; Oleovitamin D2; Ostelin; Radiostol; Radsterin; Shock-Ferol;  
Vitamin D<sub>2</sub>

**Chemical Formula:** C<sub>28</sub>H<sub>44</sub>O

**Molecular Weight:** 396.63

### SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

**OSHA PEL:** Not Found

**ACGIH TLV:** Not Found

**IDLH:** Not Found

**Other Limits Recommended:** Toxicity information: LD<sub>low</sub> oral (dog)  
4 mg/kg (\*NIOSH/RTECS 1985)

### SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

**Boiling Point:** Not Found

**Specific Gravity (H<sub>2</sub>O=1):** Not Found

**Vapor Pressure (mmHg):** Not Found

**Melting Point:** 239-244°F, 115-118°C (\*Merck 1976)

**Vapor Density (AIR=1):** Not Found

## ERGOCALCIFEROL

### SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS (Continued)

**Evaporation Rate** (Butyl acetate=1): Not Found

**Solubility in Water:** Insoluble in water (\*Merck 1976)

**Appearance and Odor:** White crystals, odorless (\*Osol 1975)

### SECTION III -- FIRE AND EXPLOSION HAZARD DATA

**Flash Point** (Method Used): Not Found

**Flammable Limits:**

LEL: Not Found

UEL: Not Found

**Extinguishing Methods:** (Non-Specific -- Medicines, n.o.s.) Extinguish with dry chemical, carbon dioxide, water spray, fog, or foam (DOT 1984, Guide 11).

**Special Fire Fighting Procedures:** (Non-Specific -- Medicines, n.o.s.) Move container from fire area if you can do so without risk. Spray cooling water on containers that are exposed to flames until well after fire is out (DOT 1984, Guide 11).

**Unusual Fire and Explosion Hazards:** Not Found

### SECTION IV -- REACTIVITY DATA

**Stability:** Unstable: Yes (\*Furia 1972)

Stable:

**Conditions to Avoid:** Shows signs of decomposition when stored for a few days at room temperature (\*Furia 1972).

**Incompatibility** (Materials to Avoid): Not Found

**Hazardous Decomposition or Byproducts:** Not Found

**Hazardous Polymerization:** May Occur: Not Found

May Not Occur: Not Found

**Conditions to Avoid:** Not Found

## ERGOCALCIFEROL

### SECTION V -- HEALTH HAZARD DATA

**Routes of Entry:** Inhalation: Not Found  
Skin: Not Found  
Ingestion: Yes (\*Rumack 1975 to Present)

**Health Hazards** (Acute, Delayed, and Chronic): Ergocalciferol poisoning disturbs calcium metabolism and causes kidney damage (Buchel 1983, p. 224). Ergocalciferol in a single acute ingestion presents no toxic hazards. Daily ingestion in excess of 5000 units/day in children or 7500 units/day in adults will produce toxic symptoms associated with hypervitaminosis D (\*Rumack 1975 to Present).

**Signs and Symptoms of Exposure:** Initial symptoms of ergocalciferol poisoning include anorexia, nausea and vomiting. It often mimics hyperparathyroidism with thirst, muscular weakness, nervousness, kidney impairment, hypertension (\*Gosselin 1976), and excessive urination (\*Gilman 1980).

**Medical Conditions Generally Aggravated by Exposure:** Those with hypercalcemia are at a greater risk (Physicians' Desk Reference 1985, p. 1748)

**Emergency and First Aid Procedures:** (Non-Specific -- Medicines, n.o.s.) Move victim to fresh air; call emergency medical care. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In case of contact with material, immediately flush skin or eyes with running water for at least 15 minutes. Remove and isolate contaminated clothing and shoes at the site. Keep victim quiet and maintain normal body temperature (DOT 1984, Guide 11).

### SECTION VI -- USE INFORMATION

Nutrient and/or dietary supplement food additive (\*Sax 1975).

### SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE

(Steps to be Taken in Case Material is Released or Spilled)

(Non-Specific -- Medicines, n.o.s.) Keep unnecessary people away; isolate hazard area and deny entry. Stay upwind; keep out of low areas. Wear self-contained (positive pressure if available) breathing apparatus and full protective clothing. Shut off ignition sources; no flares, smoking or flames in hazard area. Keep combustibles (wood, paper, oil, etc.) away from spilled material. Do not touch spilled material. Small spills: absorb with sand or other noncombustible absorbent material and place into containers for later disposal. Large spills: dike far ahead of spill for later disposal (DOT 1984, Guide 11).

EPA CHEMICAL PROFILE

INTERIM

Date: October 31, 1985

Revision: \_\_\_\_\_

CHEMICAL IDENTITY -- FLUOROURACIL

CAS Registry Number: 51-21-8

**Synonyms:** Uracil, 5-Fluoro-; 5-Fluorouracil; Efudex; Fluoroplex; 2,4-Dioxo-5-Fluoropyrimidine; 5-Fluoro-2,4(1H,3H)-Pyrimidinedione; 5-Fluoro-2,4-Pyrimidinedione; 5-Fluoropyrimidine-2,4-Dione; 5-Fluoropyrimidine-2,4-Dione; Fluoro Uracil; Fluracil; Fluril; FU; 5-FU; NSC 19893; RO 2-9757; U-8953; 2,4(1H,3H)-Pyrimidinedione, 5-Fluoro-

**Chemical Formula:**  $C_4H_3FN_2O_2$

**Molecular Weight:** 130.08

SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

OSHA PEL: Not Found

ACGIH TLV: Not Found

IDLH: Not Found

**Other Limits Recommended:** Toxicity information: LD<sub>50</sub> oral (rabbit)  
18.9 mg/kg (\*NIOSH/RTECS 1985)

SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

**Boiling Point:** Not Found

**Specific Gravity (H<sub>2</sub>O=1):** Not Found

**Vapor Pressure (mmHg):** Not Found

**Melting Point:** Decomposes at 540-541°F, 282-283°C (\*Merck 1976)

**Vapor Density (AIR=1):** Not Found

**Evaporation Rate (Butyl acetate=1):** Not Found

**Solubility in Water:** 1 g in 80 mL of water (\*Osol 1975)

**Appearance and Odor:** White to practically white crystalline powder; practically odorless (\*Osol 1975)

## FLUOROURACIL

### SECTION III -- FIRE AND EXPLOSION HAZARD DATA

**Flash Point** (Method Used): Not Found

**Flammable Limits:**

LEL: Not Found

UEL: Not Found

**Extinguishing Methods:** (Non-Specific -- Drugs or Medicines, n.o.s. (Solid) Poison B) Extinguish fire using agent suitable for type of surrounding fire (material itself burns with difficulty). Use water in flooding quantities as fog. Use "alcohol" foam, carbon dioxide or dry chemical (Student 1981, p. 215).

**Special Fire Fighting Procedures:** (Non-Specific -- Drugs or Medicines, n.o.s. (Solid) Poison B) Avoid breathing dusts, and fumes from burning material. Keep upwind. Avoid bodily contact with the material. Wear boots, protective gloves, and goggles. Wear self-contained breathing apparatus (Student 1981, p. 215).

**Unusual Fire and Explosion Hazards:** Not Found

### SECTION IV -- REACTIVITY DATA

**Stability:** Unstable:

Stable: Yes (\*Osol 1975)

**Conditions to Avoid:** Decomposing heat (\*Merck 1976)

**Incompatibility** (Materials to Avoid): Not Found

**Hazardous Decomposition or Byproducts:** Emits very toxic fumes of fluorides and nitrogen oxides when heated to decomposition (Sax 1984, p. 1450).

**Hazardous Polymerization:** May Occur: Not Found

May Not Occur: Not Found

**Conditions to Avoid:** Not Found

### SECTION V -- HEALTH HAZARD DATA

**Routes of Entry:** Inhalation: Not Found

Skin: Yes (Physicians' Desk Reference 1980, p. 1452)

Ingestion: Yes (\*Goodman 1975)



**FLUOROURACIL****SECTION V -- HEALTH HAZARD DATA (Continued)**

**Health Hazards** (Acute, Delayed, and Chronic): Minimum toxic dose in humans is approximately 450 mg/kg (total dose) over 30 days for the ingested drug. Intravenous minimum toxic dose in humans is a total dose of 6 mg/kg over three days. Depression of white blood cells occurred after intravenous administration of a total dose of 480 mg/kg over 32 days (\*NIOSH/RTECS 1978).

**Signs and Symptoms of Exposure:** Loss of appetite and nausea are earliest symptoms, with other symptoms of diarrhea, inflammation or sores in the mouth, gastric burning, and intestinal discomfort. More serious symptoms are due to the suppression of bone marrow, with decrease of white cell count and blood platelets, and anemia. Hair loss, nail changes, dermatitis, and pigmentation and atrophy of skin also occur (\*Goodman 1975).

**Medical Conditions Generally Aggravated by Exposure:** Occasional neuropathy and cardiac toxicity have been reported (Gilman 1985, pp. 1270-1271). Do not use during pregnancy (Physicians' Desk Reference 1980, p. 1455). Patients with impaired hepatic or renal function, with a history of high-dose pelvic irradiation or previous use of alkylating agents should be treated with extreme caution (Physicians' Desk Reference 1980, p. 1455). Patients with nutritional deficiencies and protein depletion have a reduced tolerance to fluorouracil (Gilman 1985, p. 1270).

**Emergency and First Aid Procedures:** (Non-Specific -- Drugs) Move victim to fresh air; call emergency medical care. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In case of contact with material, immediately flush skin or eyes with running water for at least 15 minutes. Remove and isolate contaminated clothing and shoes at the site. Keep victim quiet and maintain normal body temperature (DOT 1984, Guide 11).

**SECTION VI -- USE INFORMATION**

Antineoplastic drug (\*Merck 1976); chemosterilant for insects (\*White-Stevens 1976).

## FLUOROURACIL

### SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE

(Steps to be Taken in Case Material is Released or Spilled)

(Non-Specific -- Drugs) Keep unnecessary people away; isolate hazard area and deny entry. Stay upwind; keep out of low areas. Wear self-contained (positive pressure if available) breathing apparatus and full protective clothing. If water pollution occurs, notify appropriate authorities. Spill or leak: shut off ignition sources; no flares, smoking or flames in hazard area. Keep combustibles (wood, paper, oil etc.) away from spilled material. Do not touch spilled material. Small spills: absorb with sand or other noncombustible absorbent material and place into containers for later disposal. Large spills: dike far ahead of spill for later disposal (DOT 1984, Guide 11).

## EPA CHEMICAL PROFILE

## INTERIM

Date: October 31, 1985

Revision: \_\_\_\_\_

## CHEMICAL IDENTITY -- MECHLORETHAMINE

CAS Registry Number: 51-75-2

**Synonyms:** 2,2'-Dichloro-N-Methyldiethylamine; 2-Chloro-N-(2-Chloroethyl)-N-Methylethanamine; Beta,Beta'-Dichlorodiethyl-N-Methylamine; Bis(2-Chloroethyl)Methylamine; Bis(Beta-Chloroethyl)Methylamine; Caryolysin; Chloramine (the nitrogen mustard); Chlorethazine; Chlormethine; Di(2-Chloroethyl)Methylamine; Dichlor Amine; Diethylamine, 2,2'-Dichloro-N-Methyl-; Embichin; ENT-25294; Ethanamine, 2-Chloro-N-(2-Chloroethyl)-N-Methyl-; HN2; MBA; Methylbis(2-Chloroethyl)Amine; Methylbis(Beta-Chloroethyl)Amine; Methylbis(Chloroethylamine); Methyldi(2-Chloroethyl)Amine; Mustargen; Mustine; N,N-Bis(2-Chloroethyl)methylamine; N,N-Di(Chloroethyl)Methylamine; N-Methyl-2,2'-Dichlorodiethylamine; N-Methyl-bis(2-Chloroethyl)Amine; N-Methyl-Bis(Beta-Chloroethyl)Amine; N-Methylbis(2-Chloroethyl)Amine; N-Methylbis(Beta-Chloroethyl)Amine; Nitrogen Mustard; NSC 762; TL 146

Chemical Formula:  $C_5H_{11}Cl_2N$ 

Molecular Weight: 156.07

## SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

OSHA PEL: Not Found

ACGIH TLV: Not Found

IDLH: Not Found

**Other Limits Recommended:** Toxicity information:  $LC_{low}$  inhalation  
(dog) 0.29 mg/liter/10 minutes (\*NIOSH/RTECS 1985)

## SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

Boiling Point: 189°F, 87°C at 18 mmHg (\*Merck 1976)

Specific Gravity ( $H_2O=1$ ): 1.118 at 25°C/4°C (\*Merck 1976)

Vapor Pressure (mmHg): Not Found

Melting Point: -76°F, -60°C (\*Merck 1976)

MECHLORETHAMINE

SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS (Continued)

Vapor Density (AIR=1): Not Found

Evaporation Rate (Butyl acetate=1): Not Found

Solubility in Water: Very slightly soluble (\*Merck 1976)

Appearance and Odor: Mobile liquid; faint odor of herring (\*Merck 1976).

SECTION III -- FIRE AND EXPLOSION HAZARD DATA

Flash Point (Method Used): Not Found

Flammable Limits:

LEL: Not Found

UEL: Not Found

Extinguishing Methods: (Non-Specific -- Poisonous Liquid, n.o.s.)

Small fires: dry chemical, carbon dioxide, water spray, or foam. Large fires: water spray, fog, or foam (DOT 1984, Guide 55).

Special Fire Fighting Procedures: (Non-Specific -- Poisonous Liquid, n.o.s.) Stay upwind; keep out of low areas. Ventilate closed spaces before entering them. Wear positive pressure breathing apparatus and special protective clothing. Move container from fire area if you can do so without risk. Fight fire from maximum distance. Dike fire control water for later disposal; do not scatter the material (DOT 1984, Guide 55).

Unusual Fire and Explosion Hazards: Not Found

SECTION IV -- REACTIVITY DATA

Stability: Unstable: Yes (\*Merck 1976)

Stable:

Conditions to Avoid: Undiluted liquid decomposes on standing (\*Merck 1976)

Incompatibility (Materials to Avoid): Not Found

Hazardous Decomposition or Byproducts: Not Found

Hazardous Polymerization: May Occur: Not Found

May Not Occur: Not Found

Conditions to Avoid: Not Found

**MECHLORETHAMINE****SECTION V -- HEALTH HAZARD DATA**

**Routes of Entry:** **Inhalation:** Yes (\*Gilman 1980)  
**Skin:** Yes (\*Gilman 1980)  
**Ingestion:** Yes (\*Gilman 1980)

**Health Hazards** (Acute, Delayed, and Chronic): Toxic doses as low as 400 µg/kg have been reported in humans (\*NIOSH/RTECS 1985). Blood clots may occur at site of intravenous injection and tissue damage if outside vein. Powerful vesicant (causes blisters) when it contacts skin, mucous membranes, or eyes. Delayed toxicity -- missed menstrual periods, alopecia (hair loss), hearing loss, tinnitus (ringing in ears), jaundice, impaired spermatogenesis and germinal aplasia, swelling, and hypersensitivity (\*Gilman 1980).

**Signs and Symptoms of Exposure:** Nausea and vomiting; bleeding; skin lesions; menstrual irregularities (\*Gilman 1980).

**Medical Conditions Generally Aggravated by Exposure:** May damage fetus in pregnant women (\*Gilman 1980).

**Emergency and First Aid Procedures:** Treat symptoms using procedures for a general poison (\*Rumack 1975 to Present). (Non-Specific -- Poisonous Liquid, n.o.s.) Move victim to fresh air; call emergency medical care. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In case of contact with material, immediately flush skin or eyes with running water for at least 15 minutes. Speed in removing material from skin is of extreme importance. Remove and isolate contaminated clothing and shoes at the site. Keep victim quiet and maintain normal body temperature. Effects may be delayed; keep victim under observation (DOT 1984, Guide 55).

**SECTION VI -- USE INFORMATION**

Drug used in treatment of cancer (\*Gilman 1980). Formerly used as a gas warfare agent (\*Merck 1976).

**MECHLORETHAMINE**

**SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE**

(Steps to be Taken in Case Material is Released or Spilled)

(Non-Specific -- Poisonous Liquid, n.o.s.) Keep unnecessary people away; isolate hazard area and deny entry. Stay upwind; keep out of low areas. Ventilate closed spaces before entering them. Wear positive pressure breathing apparatus and special protective clothing. Remove and isolate contaminated clothing at the site. Do not touch spilled material; stop leak if you can do so without risk. Use water spray to reduce vapors. Small spills: absorb with sand or other noncombustible absorbent material and place into containers for later disposal. Large spills: dike far ahead of spill for later disposal (DOT 1984, Guide 55).

## EPA CHEMICAL PROFILE

## INTERIM

Date: October 31, 1985

Revision: \_\_\_\_\_

## CHEMICAL IDENTITY -- CARBACHOL CHLORIDE

CAS Registry Number: 51-83-2

**Synonyms:** (NIOSH/RTECS 1983 Synonyms, Volume 1, p. 917) Choline, Chloride, Carbamate; Carbachol; Carbacholin; Carbacholine; Carbacholine Chloride; Carbacolina; Carbamic Acid, Ester with Choline Chloride; Carbaminocholine Chloride; Carbaminoylcholine Chloride; Carbamiotin; Carbamoylcholine Chloride; gamma-Carbamoyl Choline Chloride; Carbamoylcholine-Hydrochloride; Carbamylcholine Chloride; Carbochol; Carbocholin; Carbocholine; Carbyl; Carcholin; Choline Carbamate Chloride; Choline, Chloride Carbamate(Ester); Choline Chloride, Carbamoyl-; Choline Chlorine Carbamate; Coletyl; Doryl; Doryl (Pharmaceutical); Ethanaminium, 2-((Aminocarbonyl)oxy)-N,N,N-Trimethyl-, Chloride; (2-Hydroxyethyl)Trimethyl Ammonium Chloride Carbamate; Isopto Carbachol; Jestril; Lentin; Miostat; Mistura C; Moryl; P.V. Carbachol; TL 457; Vasoperif

**Chemical Formula:**  $C_6H_{15}N_2O_2Cl$ **Molecular Weight:** 182.68

## SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

**OSHA PEL:** Not Found**ACGIH TLV:** Not Found**IDLH:** Not Found

**Other Limits Recommended:** Toxicity information: LD<sub>low</sub> oral (dog)  
3 mg/kg (\*NIOSH/RTECS 1985)

## SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

**Boiling Point:** Not Found**Specific Gravity (H<sub>2</sub>O=1):** Not Found**Vapor Pressure (mmHg):** Not Found**Melting Point:** 392-401°F, 200-205°C (Merck 1983, p. 245)**Vapor Density (AIR=1):** Not Found

**CARBACHOL CHLORIDE**

**SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS (Continued)**

**Evaporation Rate** (Butyl acetate=1): Not Found

**Solubility in Water:** 1 g/mL (Merck 1983, p. 245)

**Appearance and Odor:** Crystalline, odorless, but on standing in an open container, develops a faint odor resembling that of an aliphatic amine (Merck 1983, p. 245); hygroscopic prisms or powder (Weast 1979, p. C-246)

**SECTION III -- FIRE AND EXPLOSION HAZARD DATA**

**Flash Point** (Method Used): Not Found

**Flammable Limits:**

LEL: Not Found

UEL: Not Found

**Extinguishing Methods:** Not Found

**Special Fire Fighting Procedures:** Not Found

**Unusual Fire and Explosion Hazards:** Not Found

**SECTION IV -- REACTIVITY DATA**

**Stability:** Unstable:

**Stable:** The aqueous solution is stable even when heated (Merck 1983, p. 245).

**Conditions to Avoid:** Not Found

**Incompatibility** (Materials to Avoid): Not Found

**Hazardous Decomposition or Byproducts:** When heated to decomposition, it emits very toxic fumes of chloride and nitrogen oxides (Sax 1984, p. 631).

**Hazardous Polymerization:** May Occur: Not Found

May Not Occur: Not Found

**Conditions to Avoid:** Not Found



**CARBACHOL CHLORIDE**

**SECTION V -- HEALTH HAZARD DATA**

**Routes of Entry:** Inhalation: Not Found  
Skin: Yes (Sax 1984, p. 631)  
Ingestion: Yes (Sax 1984, p. 631)

**Health Hazards** (Acute, Delayed, and Chronic): Highly toxic by mouth (Sax 1984, p. 631).

**Signs and Symptoms of Exposure:** Not Found

**Medical Conditions Generally Aggravated by Exposure:** Not Found

**Emergency and First Aid Procedures:** Not Found

**SECTION VI -- USE INFORMATION**

Cholinergic; parasympathomimetic, used chiefly in large animals, especially for colic in the horse (Merck 1983, p. 245)

**SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE**

(Steps to be Taken in Case Material is Released or Spilled)

Avoid skin contact (see Section V above).

**COMMENTS**

Sources searched but no information found:

DOT 1984  
Farm Chemicals Handbook 1984  
Gilman 1985  
Hayes 1982  
Gosselin 1984  
Buchel 1983  
Clayton and Clayton 1981-82  
Hawley 1981

## EPA CHEMICAL PROFILE

### INTERIM

Date: October 31, 1985

Revision: \_\_\_\_\_

## CHEMICAL IDENTITY -- TRICHLOROPHON

CAS Registry Number: 52-68-6

**Synonyms:** Phosphonic Acid, (2,2,2-Trichloro-1-Hydroxyethyl)-, Dimethyl Ester; O,O-Dimethyl 2,2,2-Trichloro-1-Hydroxyethylphosphonate; Phoschlor; Proxol; Soldep; Trichlorophene; Trinex; Tugon; Vermicide Bayer 2349; Wotexit

**Chemical Formula:**  $C_4H_8Cl_3O_4P$

**Molecular Weight:** 257.45

## SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

**OSHA PEL:** Not Found

**ACGIH TLV:** Not Found

**IDLH:** Not Found

**Other Limits Recommended:** Toxicity information: LD<sub>low</sub> oral (guinea pig) 420 mg/kg; LC<sub>50</sub> inhalation (rat) 0.0013 mg/liter (\*NIOSH/RTECS 1985)

## SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

**Boiling Point:** 212°F, 100°C at 1 mmHg (\*Hawley 1977)

**Specific Gravity (H<sub>2</sub>O=1):** 1.73 at 20°C/4°C (\*Merck 1983)

**Vapor Pressure (mmHg):**  $7.8 \times 10^{-6}$  at 20°C (\*Merck 1983)

**Melting Point:** 181-183°F, 83-84°C (\*Merck 1983)

**Vapor Density (AIR=1):** Not Found

**Evaporation Rate (Butyl acetate=1):** Not Found

**Solubility in Water:** 15.4 g/100 mL at 25°C (\*Merck 1983)

## TRICHLOROPHON

### SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS (Continued)

**Appearance and Odor:** Crystals, either white (\*Merck 1983), pale yellow (\*Clayton and Clayton 1981-82), or colorless (\*IARC 1972-85)

### SECTION III -- FIRE AND EXPLOSION HAZARD DATA

**Flash Point (Method Used):** Practically nonflammable (\*Clayton and Clayton 1981-82)

**Flammable Limits:**

LEL: Not Found

UEL: Not Found

**Extinguishing Methods:** Trichlorofon is an organophosphorus pesticide (\*Encycl Occupat Health and Safety 1983, p. 1627). This material may burn, but does not ignite readily. For small fires, use dry chemical, carbon dioxide, water spray, or foam. For large fires, use water spray, fog, or foam (DOT 1984, Guide 55).

**Special Fire Fighting Procedures:** As for other organophosphorus pesticides (Encycl Occupat Health and Safety 1983, p. 1627) stay upwind; keep out of low areas. Move containers from fire area if you can do so without risk. Fight fire from maximum distance. Dike fire control water for later disposal; do not scatter the material (DOT 1984, Guide 55).

**Unusual Fire and Explosion Hazards:** As for other organophosphorus pesticides (Encycl Occupat Health and Safety 1983, p. 1627) container may explode in heat of fire (DOT 1984, Guide 55). Heat may cause decomposition and evolution of highly toxic fumes of phosphorus oxides and chlorides (\*Sax 1975).

### SECTION IV -- REACTIVITY DATA

**Stability:** Unstable:

Stable: Yes (\*IARC 1972-85)

**Conditions to Avoid:** Decomposes in water at elevated temperatures and at pH less than 5.5 (\*IARC 1972-85).

**Incompatibility (Materials to Avoid):** Not Found

**Hazardous Decomposition or Byproducts:** Decomposes to form dichlorvos (\*IARC 1972-85)

## TRICHLOROPHON

### SECTION IV -- REACTIVITY DATA (Continued)

Hazardous Polymerization: May Occur: Not Found  
May Not Occur: Not Found

Conditions to Avoid: Not Found

### SECTION V -- HEALTH HAZARD DATA

Routes of Entry: Inhalation: Yes (Student 1981, pp. 507-508)  
Skin: Yes (Hayes 1982, p. 301)  
Ingestion: Yes (\*Gosselin 1976)

Health Hazards (Acute, Delayed, and Chronic): Very toxic: probable oral lethal dose (human) 50-500 mg/kg, between 1 teaspoon and 1 ounce for 150 lb. (70 kg) person. Toxicity relatively low among organic phosphate insecticides, although a potent cholinesterase inhibitor (\*Gosselin 1976). Skin sensitivity has been reported (\*Rossoff 1974).

Signs and Symptoms of Exposure: Muscle weakness, twitching, respiratory depression, sweating, vomiting, diarrhea, chest and abdominal distress sometimes pulmonary edema, excessive salivation, headache, giddiness, vertigo and weakness, runny nose and sensation of tightness in chest (inhalation), blurring of vision, tearing, ocular pain, loss of muscle coordination, and slurring of speech (\*Gosselin 1976, \*Morgan 1982). Skin sensitivity (\*Rossoff 1974).

Medical Conditions Generally Aggravated by Exposure: Not Found

Emergency and First Aid Procedures: As for other organophosphorus pesticides (Encycl Occupat Health and Safety 1983, p. 1627) move victim to fresh air; call emergency medical care. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In case of contact with material, immediately flush skin or eyes with running water for at least 15 minutes. Speed in removing material from skin is of extreme importance. Remove and isolate contaminated clothing and shoes at the site. Keep victim quiet and maintain normal body temperature. Effects may be delayed; keep victim under observation (DOT 1984, Guide 55).

### SECTION VI -- USE INFORMATION

Insecticide for non-agricultural uses -- e.g., forests. Insecticide for vegetables, cotton, alfalfa, corn, deciduous fruits and nuts; livestock, animal buildings, outdoor and aquatic areas and ornamentals; non-food fishery uses, domestic dwellings; anthelmintic agent for horses (\*SRI).

## TRICHLOROPHON

### SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE

(Steps to be Taken in Case Material is Released or Spilled)

As for other organophosphorus pesticides (Encyc Occupat Health and Safety 1983, p. 1627), stay upwind; keep out of low areas. Ventilate closed spaces before entering them. Wear positive pressure breathing apparatus and special protective clothing. Do not touch spilled material; stop leak if you can do so without risk. Use water spray to reduce vapors. Small spills: absorb with sand or other non-combustible absorbent material and place into containers for later disposal. Small dry spills: with clean shovel place material into clean dry containers and cover; move containers from spill area. Large spills: dike far ahead of spill for later disposal (DOT 1984, Guide 55).

EPA CHEMICAL PROFILE

INTERIM

Date: October 31, 1985

Revision: \_\_\_\_\_

CHEMICAL IDENTITY -- INDOMETHACIN

CAS Registry Number: 53-86-1

**Synonyms:** Indole-3-Acetic Acid, 1-(p-Chlorobenzoyl)-5-Methoxy-2-Methyl-; 1-(p-Chlorobenzoyl)-2-Methyl-5-Methoxy-3-Indole-Acetic Acid; 1-(p-Chlorobenzoyl)-5-Methoxy-2-Methyl-3-Indolylacetic Acid; 1-(p-Chlorobenzoyl)-5-Methoxy-2-Methylindole-3-Acetic Acid; 1H-Indole-3-Acetic Acid, 1-(4-Chlorobenzoyl)-5-Methoxy-2-Methyl-; alpha-(1-(p-Chlorobenzoyl)-2-Methyl-5-Methoxy-3-Indolyl)Acetic Acid; Amuno; Artrinovo; Artrivia; Confortid; Dolovin; Idomethine; Inacid; Indacin; Indo-Rectolmin; Indocid; Indocin; Indole-3-Acetic Acid, 1-(p-Chlorobenzoyl)-5-Methoxy-2-Methyl-; Indomecol; Indomed; Indomee; Indometacin; Indometacine; Indomethacine; Indomethazine; Infrocin; Inteban SP; Metacen; Metartril; Methazine; Metindol; Mezolin; N-p-Chlorobenzoyl-5-Methoxy-2-Methylindole-3-Acetic Acid; NCI-C56144; Reumacide; Sadoreum

**Chemical Formula:**  $C_{19}H_{16}ClNO_4$

**Molecular Weight:** 357.81

SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

OSHA PEL: Not Found

ACGIH TLV: Not Found

IDLH: Not Found

**Other Limits Recommended:** Toxicity information: LD<sub>50</sub> oral (rat) 12 mg/kg (\*NIOSH/RTECS 1985)

SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

Boiling Point: Not Found

Specific Gravity (H<sub>2</sub>O=1): Not Found

Vapor Pressure (mmHg): Not Found

## INDOMETHACIN

### SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS (Continued)

**Melting Point:** 311 or 324°F, 155 or 162°C (depending on the polymorphic type of crystal) (\*Merck 1976)

**Vapor Density (AIR=1):** Not Found

**Evaporation Rate (Butyl acetate=1):** Not Found

**Solubility in Water:** Practically insoluble (\*Merck 1976)

**Appearance and Odor:** Pale-yellow to yellow-tan crystalline powder; odorless to slight odor (\*Osol 1980)

### SECTION III -- FIRE AND EXPLOSION HAZARD DATA

**Flash Point (Method Used):** Not Found

**Flammable Limits:**

LEL: Not Found

UEL: Not Found

**Extinguishing Methods:** (Non-Specific -- Medicines, (Solid) Poison B, n.o.s.) Extinguish fire using agent suitable for type of surrounding fire (material itself burns with difficulty). Use water in flooding quantities as fog. Use "alcohol" foam, carbon dioxide or dry chemical (Student 1981, p. 322).

**Special Fire Fighting Procedures:** (Non-Specific -- Medicines, (Solid) Poison B, n.o.s.) Wear self-contained breathing apparatus (Student 1981, p. 322).

**Unusual Fire and Explosion Hazards:** When heated to decomposition, it emits very toxic fumes of chlorine and nitrogen oxides (Sax 1984, p. 1615).

### SECTION IV -- REACTIVITY DATA

**Stability:** Unstable:

Stable: Yes (\*Osol 1980)

**Conditions to Avoid:** Light (\*Sunshine 1969); decomposing heat (Sax 1984, p. 1615)

**Incompatibility (Materials to Avoid):** Decomposed by strong alkali (Merck 1983, p. 4842)

## INDOMETHACIN

### SECTION IV -- REACTIVITY DATA (Continued)

**Hazardous Decomposition or Byproducts:** When heated to decomposition, it emits very toxic fumes of chlorides and nitrogen oxides (Sax 1984, p. 1615).

**Hazardous Polymerization:** May Occur: Not Found  
May Not Occur: Not Found

**Conditions to Avoid:** Not Found

### SECTION V -- HEALTH HAZARD DATA

**Routes of Entry:** Inhalation: Not Found  
Skin: Yes (\*Transdermal Indomethacin  
Pharmaceuticals 1983)  
Ingestion: Yes (\*Gilman 1980)

**Health Hazards** (Acute, Delayed, and Chronic): This is classified as very toxic. Probable oral lethal dose in humans is 50-500 mg/kg or between one teaspoon and one ounce for a 70 kg (150 lb.) person (\*Gosselin 1976).

**Signs and Symptoms of Exposure:** Gastrointestinal complaints (loss of appetite, nausea, abdominal pain, ulcers, diarrhea); dizziness; lightheadedness; mental confusion; severe depression; psychosis; hypersensitivity reactions (e.g. rashes, asthma, urticaria, etc.); ringing in the ears; coma and convulsions (\*Gilman 1980, \*Osol 1980, \*Grant 1974). Acute pancreatitis, neutropenia, and thrombocytopenia have also been reported (Gilman 1985, p. 696).

**Medical Conditions Generally Aggravated by Exposure:** Persons with renal disease or ulcerative lesions of stomach or intestines are at risk (\*Gilman 1980). Pregnant women and nursing mothers should be removed from any possible exposure to this material. Use cautiously for elderly patients (\*AMA 1980).

**Emergency and First Aid Procedures:** (Non-Specific -- Medicines, n.o.s.) Move victim to fresh air, call emergency medical care. Remove and isolate contaminated clothing and shoes at the site. In case of contact with material, immediately flush skin or eyes with running water for at least 15 minutes (DOT 1984, Guide 11).



## INDOMETHACIN

### SECTION VI -- USE INFORMATION

Material is used as an anti-inflammatory, antipyretic, analgesic medication (\*Merck 1976).

### SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE (Steps to be Taken in Case Material is Released or Spilled)

(Non-Specific -- Medicines, (Solid) Poison B, n.o.s.) Avoid breathing dusts, and fumes from burning materials. Keep upwind. Wear self-contained breathing apparatus. Avoid bodily contact with the material. Wear full protective clothing. Wash away any material which may have contacted the body with copious amounts of water or soap and water (Student 1981, p. 322).

EPA CHEMICAL PROFILE

INTERIM

Date: October 31, 1985

Revision: \_\_\_\_\_

CHEMICAL IDENTITY -- NICOTINE

CAS Registry Number: 54-11-5

**Synonyms:** (-)-3-(1-Methyl-2-Pyrrolidyl)Pyridine; 1-Methyl-2-(3-Pyridyl)Pyrrolidine; beta-Pyridyl-alpha-N-Methylpyrrolidine; Destruxol Orchid Spray; EMO-NIK; ENT 3,424; Flux Maag; Fumetobac; L-3-(1-Methyl-2-Pyrrolidyl)Pyridine; L-Nicotine; Mach-Nic; Niagara PA Dust; Nic-Sal; Nico-Dust; Nico-Fume; Nicocide; Nicotin; Nicotine Alkaloid; Ortho N-4 Dust; Ortho N-5 Dust; Pyridine, 3-(1-Methyl-2-Pyrrolidinyl)-, (S)-; Pyridine, 3-(Tetrahydro-1-Methylpyrrol-2-yl); Pyrrolidine, 1-Methyl-2-(3-Pyridyl)-; Tendust; Tetrahydronicotyrine, DL-

**Chemical Formula:**  $C_{10}H_{14}N_2$

**Molecular Weight:** 162.23

SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

**OSHA PEL:** TWA 0.5 mg/m<sup>3</sup> (\*NIOSH/RTECS 1985)

**ACGIH TLV:** TWA 0.5 mg/m<sup>3</sup> (skin) (\*ACGIH 1983)

**IDLH:** 35 mg/m<sup>3</sup> (NIOSH/OSHA 1978, p. 138-139)

**Other Limits Recommended:** Not Found

SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

**Boiling Point:** 476.1°F, 246.7°C at 745 mmHg (\*Weast 1979)

**Specific Gravity (H<sub>2</sub>O=1):** 1.0097 at 20°C/4°C (\*Merck 1983)

**Vapor Pressure (mmHg):** 1 at 61.8°C (Sax 1984, p. 1997)

**Melting Point:** -110°F, -79°C (\*Weast 1979)

**Vapor Density (AIR=1):** 5.61 (Sax 1984, p. 1997)

**Evaporation Rate (Butyl acetate=1):** Not Found

## NICOTINE

## SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS (Continued)

**Solubility in Water:** Miscible below 60°C (\*Merck 1983)

**Appearance and Odor:** Colorless to pale yellow, oily liquid (\*Merck 1983). Slight, fishy odor when warm (NIOSH/OSHA 1978, pp. 138-139).

## SECTION III -- FIRE AND EXPLOSION HAZARD DATA

**Flash Point (Method Used):** Not Found

**Flammable Limits:** Low fire hazard when exposed to heat or flame (Sax 1984, p. 1997)

LEL: 0.75% (Sax 1984, p. 1997)

UEL: 4.0% (Sax 1984, p. 1997)

**Extinguishing Methods:** Extinguish with alcohol foam, dry chemical, or carbon dioxide (Sax 1984, p. 1997). Water may cause frothing if it gets below surface of liquid and turns to steam. However, water fog gently applied to surface will cause frothing which will extinguish the fire (\*NFPA 1978).

**Special Fire Fighting Procedures:** Material too dangerous to health to expose firefighters. A few whiffs of the vapor could cause death; vapor or liquid could be fatal on penetrating firefighter's normal full protective clothing. Normal full protective clothing and breathing apparatus available to the average fire department will not provide adequate protection against inhalation or skin contact (\*NFPA 1978).

**Unusual Fire and Explosion Hazards:** There is a moderate explosion hazard when exposed to heat or flame (Sax 1984, p. 1997).

## SECTION IV -- REACTIVITY DATA

**Stability:** Unstable:

Stable: Yes (normal conditions) (\*NFPA 1978)

**Conditions to Avoid:** Heat or flames (\*Sax 1975)

**Incompatibility (Materials to Avoid):** Avoid oxidizing materials (Sax 1984, p. 1997).

**Hazardous Decomposition or Byproducts:** When heated to decomposition, it emits nitrogen oxides, carbon monoxide and other highly toxic fumes (Sax 1984, p. 1997).

## NICOTINE

### SECTION IV -- REACTIVITY DATA (Continued)

Hazardous Polymerization: May Occur: Not Found  
May Not Occur: Not Found

Conditions to Avoid: Not Found

### SECTION V -- HEALTH HAZARD DATA

Routes of Entry: Inhalation: Yes (Sax 1984, p. 1997)  
Skin: Yes (Merck 1983, p. 935)  
Ingestion: Yes (Sax 1984, p. 1997)

**Health Hazards** (Acute, Delayed, and Chronic): It is classified as super toxic. Probable oral lethal dose in humans is less than 5 mg/kg or a taste (less than 7 drops) for a 70 kg (150 lbs.) person (\*Gosselin 1976). It may be assumed that ingestion of 40-60 mg of nicotine is lethal to humans. There is fundamental difference between acute toxicity from use of nicotine as insecticide or from ingestion, and chronic toxicity that may be caused by prolonged exposure to small doses as occurs in smoking (\*Encyc Occupat Health and Safety 1983). Maternal smoking during pregnancy is associated with increased risk of spontaneous abortion, low birth weight and still-birth (\*The Chemical Society 1975). Nicotine was found as a co-carcinogen in animals (\*NRC 1977).

**Signs and Symptoms of Exposure:** Symptoms include extreme nausea, vomiting, evacuation of bowel and bladder, mental confusion, twitching, convulsions (Merck 1983, p. 935); burning sensation in mouth and throat, salivation, abdominal pain, and diarrhea. Gastrointestinal reactions are less severe and do not occur after skin and respiratory exposure. Systemic effects include headache, sweating, dizziness, auditory and visual disturbances, confusion, weakness, and incoordination (\*Gosselin 1976).

**Medical Conditions Generally Aggravated by Exposure:** Not Found

**Emergency and First Aid Procedures:** Move victim to fresh air; call emergency medical care; if not breathing give artificial respiration; if breathing is difficult, give oxygen; upon eye and skin contact wash with running water for 15 minutes; immediately remove contaminated clothing and shoes (DOT 1984, Guide 55).

## NICOTINE

### SECTION VI -- USE INFORMATION

It is used as an insecticide, fumigant and in veterinary matters as an ectoparasiticide and anthelmintic (\*Merck 1983). Also, used in tanning (\*NRC 1977).

### SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE

(Steps to be Taken in Case Material is Released or Spilled)

The normal full protective clothing and breathing apparatus available to the average fire department will not provide adequate protection against inhalation or skin contact with this material (\*NFPA 1978). Do not touch spilled material; stop leak; reduce vapors with water spray. Small Spills: take up with sand or other noncombustible absorbent material and place into containers for later disposal. Small Dry Spills: with clean shovel place material into clean, dry container and cover; move containers from spill area. Large Spills: dike far ahead of spill for later disposal (DOT 1984, Guide 55).

EPA CHEMICAL PROFILE

INTERIM

Date: October 31, 1985

Revision: \_\_\_\_\_

CHEMICAL IDENTITY -- AMINOPTERIN

CAS Registry Number: 54-62-6

Synonyms: (NIOSH/RTECS 1983, Synonyms, Volume 2, p. 375) Glutamic Acid, N-(p-(((2,4-Diamino-6-Pteridiny1)Methyl)Amino)Benzoyl)-, L-; 4-Amino-4-Deoxypteroylglutamate; 4-Amino-PGA; Aminopteridine; 4-Aminopteroylglutamic Acid; A-Ninopterin; APGA; N-(4-((2,4-Diamino-6-Pteridiny1)Methyl)Amino)Benzoyl)-L-Glutamic Acid; ENT-26079; Folic Acid, 4-Amino-; NSC 739; L-Glutamic Acid, N-[4-[(Diamino-6-Pteridiny1)Methyl]Amino]Benzoyl]-

Chemical Formula:  $C_{19}H_{20}N_8O_5$

Molecular Weight: 440.47

SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

OSHA PEL: Not Found

ACGIH TLV: Not Found

IDLH: Not Found

Other Limits Recommended: Toxicity information:  $LD_{low}$  oral (rat)  
2.5 mg/kg (\*NIOSH/RTECS 1985)

SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

Boiling Point: Not Found

Specific Gravity ( $H_2O=1$ ): Not Found

Vapor Pressure (mmHg): Not Found

Melting Point: Not Found

Vapor Density (AIR=1): Not Found

Evaporation Rate (Butyl acetate=1): Not Found

Solubility in Water: Not Found

**AMINOPTERIN**

**SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS (Continued)**

**Appearance and Odor:** Clusters of yellow needles (Hawley 1981, p. 55)

**SECTION III -- FIRE AND EXPLOSION HAZARD DATA**

**Flash Point** (Method Used): Not Found

**Flammable Limits:**

LEL: Not Found

UEL: Not Found

**Extinguishing Methods:** Not Found

**Special Fire Fighting Procedures:** Not Found

**Unusual Fire and Explosion Hazards:** Not Found

**SECTION IV -- REACTIVITY DATA**

**Stability: Unstable:** Not Found

**Stable:** Not Found

**Conditions to Avoid:** Not Found

**Incompatibility** (Materials to Avoid): Not Found

**Hazardous Decomposition or Byproducts:** Not Found

**Hazardous Polymerization: May Occur:** Not Found

**May Not Occur:** Not Found

**Conditions to Avoid:** Not Found

**SECTION V -- HEALTH HAZARD DATA**

**Routes of Entry: Inhalation:** Not Found

**Skin:** Not Found

**Ingestion:** Yes (Hawley 1981, p. 55)

**Health Hazards** (Acute, Delayed, and Chronic): An antimetabolite; antagonizes the utilization of folic acid by the body. Highly toxic by ingestion (Hawley 1981, p. 55).

## AMINOPTERIN

### SECTION V -- HEALTH HAZARD DATA (Continued)

**Signs and Symptoms of Exposure:** Not Found

**Medical Conditions Generally Aggravated by Exposure:** Not Found

**Emergency and First Aid Procedures:** (Non-Specific -- Pesticide, Solid, n.o.s.) Move victim to fresh air; call emergency medical care. Remove and isolate contaminated clothing and shoes at the site. In case of contact with material, immediately flush eyes with running water for at least 15 minutes (DOT 1984, Guide 53).

### SECTION VI -- USE INFORMATION

Rodenticide (Merck 1983, pp. 70-71); medicine and rodenticide (Hawley 1981, p. 55). Not registered as a rodenticide in the U.S. (USEPA/Active Ingredients 1985).

### SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE

(Steps to be Taken in Case Material is Released or Spilled)

(Non-Specific -- Pesticide, Solid, n.o.s.) Do not touch spilled material; stop leak if you can do so without risk. Use water spray to reduce vapors. Small spills: absorb with sand or other noncombustible absorbent material and place into containers for later disposal. Small dry spills: with clean shovel place material into clean, dry container and cover; move containers from spill area. Large spills: dike far ahead of spill for later disposal (DOT 1984, Guide 55).



EPA CHEMICAL PROFILE

INTERIM

Date: October 31, 1985

Revision: \_\_\_\_\_

CHEMICAL IDENTITY -- ISOFLUORPHATE

CAS Registry Number: 55-91-4

**Synonyms:** Diisopropyl Fluorophosphate; DFP; Diflupyl; Diflurphate; Diisopropoxyphosphoryl Fluoride; Diisopropyl Fluorophosphonate; Diisopropyl Phosphofluoridate; Diisopropyl Phosphorofluoridate; Diisopropylfluorophosphate; Diisopropylfluorophosphoric Acid Ester; Diisopropylphosphorofluoridate; Dyflos; Dyphlos; Floropryl; Fluophosphoric Acid, Diisopropyl Ester; Fluorodiisopropyl Phosphate; Fluostigmine; Fluopryl; Isoflurophosphate; Isopropyl Fluophosphate; Isopropyl Phosphorofluoridate; Neoglaucit; O,O'-Diisopropyl Phosphoryl Fluoride; O,O,-Diisopropyl Fluorophosphate; PF-3; Phosphorofluoridic Acid, Bis(1-Methylethyl) Ester; Phosphorofluoridic Acid, Diisopropyl Ester; T-1703; TL 466; Fluorophosphoric Acid, Diisopropyl Ester; Fluoropryl; Isofluorophate; Isofluorophate

**Chemical Formula:**  $C_6H_{14}FO_3P$

**Molecular Weight:** 184.15

SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

OSHA PEL: Not Found

ACGIH TLV: Not Found

IDLH: Not Found

**Other Limits Recommended:** Toxicity information:  $LC_{50}$  inhalation (rat) 0.36 mg/liter/10 minutes (\*NIOSH/RTECS 1985)

SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

**Boiling Point:** 144°F, 62°C at 9 mmHg (\*Merck 1983)

**Specific Gravity ( $H_2O=1$ ):** 1.055 (\*Merck 1983)

**Vapor Pressure (mmHg):** 0.579 at 20°C (\*Merck 1983)

**Melting Point:** -116°F, -82°C (\*Merck 1983)

**Vapor Density (AIR=1):** Not Found

## ISOFLUORPHATE

### SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS (Continued)

**Evaporation Rate** (Butyl acetate=1): Not Found

**Solubility in Water:** 1.54% by weight at 25°C (\*Merck 1983)

**Appearance and Odor:** Oily liquid (\*Hawley 1981). Clear, colorless or faintly yellow liquid (\*Osol 1980).

### SECTION III -- FIRE AND EXPLOSION HAZARD DATA

**Flash Point** (Method Used): Not Found

**Flammable Limits:**

LEL: Not Found

UEL: Not Found

**Extinguishing Methods:** (Non-Specific -- Organophosphorous Pesticide, n.o.s.) Dry chemical, carbon dioxide, water spray, or foam. For large fires, water spray, fog, or foam. Fight fire from maximum distance. Dike fire control water for later disposal (DOT 1984, Guide 55).

**Special Fire Fighting Procedures:** Stay upwind; keep out of low areas. Wear positive pressure breathing apparatus and special protective clothing (DOT 1984, Guide 55).

**Unusual Fire and Explosion Hazards:** May burn but will not ignite readily. Container may explode in heat of fire. Fire and runoff from fire control water may produce irritating or poisonous gases (DOT 1984, Guide 55).

### SECTION IV -- REACTIVITY DATA

**Stability:** Unstable:

Stable: Yes (\*Merck 1983)

**Conditions to Avoid:** Forms hydrofluoric acid in presence of moisture (\*Merck 1983). Keep away from sources of heat (\*Farm Chemicals Handbook 1984). Anhydrous compounds or oil solutions are stable in glass containers at room temperature (\*Merck 1983).

**Incompatibility** (Materials to Avoid): Not Found

**Hazardous Decomposition or Byproducts:** Forms hydrogen fluoride in presence of moisture; decomposes in water at pH about 2.5 (\*Merck 1983).

## ISOFLUORPHATE

## SECTION IV -- REACTIVITY DATA (Continued)

Hazardous Polymerization: May Occur: Not Found  
May Not Occur: Not Found

Conditions to Avoid: Not Found

## SECTION V -- HEALTH HAZARD DATA

Routes of Entry: Inhalation: Yes (\*Merck 1983)  
Skin: Yes (Sax 1984, p. 1667)  
Ingestion: Yes (\*Gosselin 1984)

**Health Hazards** (Acute, Delayed, and Chronic): This is an organophosphate pesticide (\*Morgan 1982). Extremely toxic: probable oral lethal dose in humans is 5-50 mg/kg, between 7 drops and 1 teaspoonful for 70 kg person (150 lb.) (\*Gosselin 1984). The material is a cholinesterase inactivator. Even traces of the vapor cause pinpoint pupils (\*Merck 1983).

**Signs and Symptoms of Exposure:** Respiration depression, muscle weakness, twitching, and convulsions. Sweating, visual disturbances, vomiting, diarrhea, chest and abdominal distress, and sometimes pulmonary edema (\*Morgan 1982).

**Medical Conditions Generally Aggravated by Exposure:** Not Found

**Emergency and First Aid Procedures:** Do not inhale vapors; avoid contact with skin (\*Merck 1983). (Non-Specific -- Organophosphorous Pesticide, n.o.s.) Move victim to fresh air; call emergency medical care. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In case of contact with material, immediately flush skin or eyes with running water for at least 15 minutes. Speed in removing material from skin is of extreme importance. Remove and isolate contaminated clothing and shoes at the site. Keep victim quiet and maintain normal body temperature. Effects may be delayed; keep victim under observation (DOT 1984, Guide 55).

## SECTION VI -- USE INFORMATION

Research tool in neuroscience for its ability to inhibit cholinesterase (by phosphorylation) on an acute/sub-acute basis and to produce a delayed neuropathy (\*Peer Review Committee). An insecticide. Used in Germany as a basis for "nerve gases" (Sax 1984, p. 1667).

## ISOFLUORPHATE

### SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE

(Steps to be Taken in Case Material is Released or Spilled)

When handling in open containers, protect the eyes, nose, and mouth with a suitable mask, and avoid contact with skin (\*Osol 1980).

(Non-Specific -- Organophosphorus Pesticide, n.o.s.) Stay upwind; keep out of low areas. Ventilate closed spaces before entering them. Wear positive pressure breathing apparatus and special protective clothing. Remove and isolate contaminated clothing at the site. Do not touch spilled material.. Use water spray to reduce vapors. Take up small spills with sand or other noncombustible absorbent material and place in containers for later disposal. Dike far ahead of large spills for later disposal (DOT 1984, Guide 55).

EPA CHEMICAL PROFILE

INTERIM

Date: October 31, 1985

Revision: \_\_\_\_\_

CHEMICAL IDENTITY -- CANTHARIDIN

CAS Registry Number: 56-25-7

**Synonyms:** 7-Oxabicyclo[2.2.1]Heptane-2,3-Dicarboxylic Anhydride, 2,3-Dimethyl-; 1,2-Dimethyl-3,6-Epoxyperhydrophthalic Anhydride; 4,7-Epoxyisobenzofuran-1,3-Dione, Hexahydro-3a,7a-Dimethyl-, (3a alpha, 4 beta, 7 beta, 7a alpha)-; 2,3-Dimethyl-7-Oxabicyclo[2.2.1]Heptane-2,3-Dicarboxylic Anhydride; CAN; Cantharides Camphor; Cantharidine; Cantharone; Exo-1,2-cis-Dimethyl-3,6-Epoxyhexahydrophthalic Anhydride; Hexahydro-3a alpha, 7a alpha-Dimethyl-4 beta, 7 beta-Epoxyisobenzofuran-1,3-dione; Kantaridin

**Chemical Formula:**  $C_{10}H_{12}O_4$

**Molecular Weight:** 196.21

SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

OSHA PEL: Not Found

ACGIH TLV: Not Found

IDLH: Not Found

**Other Limits Recommended:** Toxicity information:  $LD_{low}$  oral (human)  
0.428 mg/kg (\*NIOSH/RTECS 1985)

SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

**Boiling Point:** Sublimes at 230°F, 110°C (Merck 1983, p. 242)

**Specific Gravity ( $H_2O=1$ ):** Not Found

**Vapor Pressure (mmHg):** Not Found

**Melting Point:** 424°F, 218°C (\*Weast 1979)

**Vapor Density (AIR=1):** Not Found

**Evaporation Rate (Butyl acetate=1):** Not Found

**CANTHARIDIN**

**SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS (Continued)**

**Solubility in Water:** Insoluble in cold water (\*Merck 1976); somewhat soluble in hot water (\*Merck 1976).

**Appearance and Odor:** Brown to black powder (Sax 1984, p. 627); orthorhombic plates, scales (Merck 1983, p. 242).

**SECTION III -- FIRE AND EXPLOSION HAZARD DATA**

**Flash Point (Method Used):** Not Found

**Flammable Limits:**

LEL: Not Found

UEL: Not Found

**Extinguishing Methods:** Not Found

**Special Fire Fighting Procedures:** Not Found

**Unusual Fire and Explosion Hazards:** Not Found

**SECTION IV -- REACTIVITY DATA**

**Stability: Unstable:** Not Found

**Stable:** Not Found

**Conditions to Avoid:** Not Found

**Incompatibility (Materials to Avoid):** Not Found

**Hazardous Decomposition or Byproducts:** When heated to decomposition it emits acrid smoke and irritating fumes (\*Sax 1979).

**Hazardous Polymerization: May Occur:** Not Found

**May Not Occur:** Not Found

**Conditions to Avoid:** Not Found

**SECTION V -- HEALTH HAZARD DATA**

**Routes of Entry: Inhalation:** Yes (\*Sax 1979)

**Skin:** Yes (\*Rumack 1975 to Present)

**Ingestion:** Yes (\*Arena 1979)

## CANTHARIDIN

### SECTION V -- HEALTH HAZARD DATA (Continued)

**Health Hazards** (Acute, Delayed, and Chronic): It is classified as super toxic. Probable oral lethal dose in humans is less than 5 mg/kg or a taste of less than 7 drops for a 70 kg (150 lb.) person (\*Gosselin 1976). It is very toxic by absorption through skin (\*Merck 1976).

**Signs and Symptoms of Exposure:** Symptoms from ingestion include vomiting, abdominal pain, shock, bloody diarrhea, pain in throat and stomach, swelling and blistering of tongue, difficulty swallowing, salivation, slow and painful urination, and thirst. There may be delirium, fainting, and tetanic convulsions (\*Goodman 1975, \*Rumack 1975 to Present, \*Arena 1979, \*Gosselin 1976). Eye contact results in irritation with much swelling of the lids (\*Grant 1974). Initial tissue reaction upon contact with the skin is swelling followed by blister formation within 24 hours (\*Doull 1980).

**Medical Conditions Generally Aggravated by Exposure:** Not Found

**Emergency and First Aid Procedures:** For ingestion, induce vomiting with syrup of ipecac. For skin contact thoroughly wash contaminated area with soap and water. Eyes should be irrigated with plain tap water (\*Rumack 1975 to Present).

### SECTION VI -- USE INFORMATION

Formerly used as a counter-irritant and vesicant (\*IARC 1972-1985). Also used for the removal of benign epithelial growth, e.g., warts (\*Gilman 1980). Used as an experimental antitumor agent. Active ingredient in spanish fly, a reputed aphrodisiac (\*Peer Review Committee).

### SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE (Steps to be Taken in Case Material is Released or Spilled)

Avoid inhalation and skin contact (see Section V above).

EPA CHEMICAL PROFILE

INTERIM

Date: October 31, 1985

Revision: \_\_\_\_\_

CHEMICAL IDENTITY -- PARATHION

CAS Registry Number: 56-38-2

**Synonyms:** Phosphorothioic Acid, O,O-Diethyl O-(p-Nitrophenyl) Ester (Liquid Mixture); Parathion liquid; Alkron; Alleron; American Cyanamid 3422; Aphamite; Bayer E-605; Bladan; Diethyl 4-Nitrophenyl Phosphorothionate; Diethyl p-Nitrophenyl Thionophosphate; Diethyl Parathion; Diethyl-p-Nitrophenyl Monothiophosphate; DNTP; E 605; ENT 15,108; Ethyl Parathion; Etilon; Folidol; Fosferno; Fostox; Genithion; NA 2783 (DOT); NCI-C00226; Niran; Nitrostigmine; O,O-Diethyl O-(p-Nitrophenyl) Phosphorothioate; O,O-Diethyl O-(p-nitrophenyl) Thionophosphate; O,O-Diethyl O-4-Nitrophenyl Thiophosphate; O,O-Diethyl O-p-Nitrophenyl Phosphorothioate; Oleoparathion; Panthion; Paraflow; Paramar; Paraphos; Parawet; Phenphos; Phoskil; Phosphenol; Phosphorothioic Acid; O,O-Diethyl O-(4-Nitrophenyl) Ester; Rhodiattox; SNP; Stathion; Sulphos; Thiophos; Vapophos

**Chemical Formula:**  $C_{10}H_{14}NO_5PS$

**Molecular Weight:** 291.27

SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

**OSHA PEL:** TWA 0.1 mg/m<sup>3</sup> (skin) (NIOSH 1978, p. 148); ceiling 20 mg/m<sup>3</sup> (\*IARC 1972-1985)

**ACGIH TLV:** TWA 0.1 mg/m<sup>3</sup> (skin); STEL 0.3 mg/m<sup>3</sup> (skin) (ACGIH 1985, p. 26)

**IDLH:** 20 mg/m<sup>3</sup> (\*Encyc of Occupat Health and Safety 1983)

**Other Limits Recommended:** Occupational exposure recommended standard: Air 0.05 mg/m<sup>3</sup> (NIOSH/OSHA 1978, p. 143)

SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

**Boiling Point:** 707°F, 375°C (\*Merck 1983)

**Specific Gravity (H<sub>2</sub>O=1):** 1.26 (\*Merck 1983)

**Vapor Pressure (mmHg):**  $3.78 \times 10^{-5}$  at 20°C (\*Worthing 1979)



## PARATHION

### SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

**Melting Point:** 43°F, 6°C (\*Merck 1983)

**Vapor Density (AIR=1):** Not Found

**Evaporation Rate (Butyl acetate=1):** Not Found

**Solubility in Water:** Practically insoluble; 12.4 mg/liter at 20°C  
(\*Bowman 1979)

**Appearance and Odor:** Pale yellow liquid; technical grade is brown and has a garlic-like odor (\*Worthing 1979).

### SECTION III -- FIRE AND EXPLOSION HAZARD DATA

**Flash Point (Method Used):** 248-320°F, 120-160°C (Method not given)  
(\*Clayton and Clayton 1981-82)

**Flammable Limits:** Not highly flammable (\*Encyc Occupat Health and Safety 1971)

LEL: Not Found

UEL: Not Found

**Extinguishing Methods:** Use water spray, dry chemical, foam, or carbon dioxide (\*NFPA 1978).

**Special Fire Fighting Procedures:** Use water spray to keep fire-exposed containers cool. If a leak or spill has not ignited, use water spray to disperse vapors and to provide protection for firefighters. Water spray may be used to flush spills away from exposures. Fight advanced or massive fires from a safe distance or from a protected location. Special protective clothing should be worn; normal protective clothing may be penetrated (\*NFPA 1978).

**Unusual Fire and Explosion Hazards:** When heated to decomposition, it can emit toxic fumes of oxides of nitrogen, phosphorus, and sulfur. High pressure hoses may scatter material from broken containers (\*NFPA 1978). Containers may explode when heated (\*CHRIS 1978).

## PARATHION

### SECTION IV -- REACTIVITY DATA

**Stability:** Unstable:

**Stable:** Yes, in distilled water and in acid solution  
(\*Hawley 1981)

**Conditions to Avoid:** Store below 25-30°C (\*Farm Chemicals Handbook 1983). It slowly decomposes in air and hydrolyzes in the presence of alkaline material (\*Hawley 1981). Containers may explode when heated (\*CHRIS 1978).

**Incompatibility (Materials to Avoid):** Not Found

**Hazardous Decomposition or Byproducts:** When heated to decomposition, the material can emit toxic fumes of oxides of nitrogen, phosphorus, and sulfur (\*NFPA 1978).

**Hazardous Polymerization:** May Occur: Not Found  
May Not Occur: Not Found

**Conditions to Avoid:** Not Found

### SECTION V -- HEALTH HAZARD DATA

**Routes of Entry:** Inhalation: Yes (\*Gosselin 1976)  
Skin: Yes (\*Gosselin 1976)  
Ingestion: Yes (\*Gosselin 1976)

**Health Hazards (Acute, Delayed, and Chronic):** This material is extremely toxic; the probable oral lethal dose is 5-50 mg/kg, or between 7 drops and 1 teaspoonful for a 150-lb. person. As little as 1 drop can endanger life if splashed in the eye. Toxicity is highest by inhalation (\*Gosselin 1976).

**Signs and Symptoms of Exposure:** Symptoms may include nausea, vomiting, abdominal cramps, diarrhea, excessive salivation, headache, giddiness, weakness, muscle twitching, difficult breathing, blurring or dimness of vision, and loss of muscle coordination. Death may occur from failure of the respiratory center, paralysis of the respiratory muscles, intense bronchoconstriction, or all three (\*Gosselin 1976).

**Medical Conditions Generally Aggravated by Exposure:** People at special risk are those with a history of glaucoma, cardiovascular disease, hepatic disease, renal disease, or central nervous system abnormalities (\*Encyc Occupat Health and Safety 1983).

## PARATHION

### SECTION V -- HEALTH HAZARD DATA (Continued)

**Emergency and First Aid Procedures:** Move victim to fresh air; call emergency medical care. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In case of contact with material, immediately flush skin or eyes with running water for at least 15 minutes. Speed in removing material from skin is of extreme importance. Remove and isolate contaminated clothing and shoes at the site. Keep victim quiet and maintain normal body temperature. Effects may be delayed; keep victim under observation (DOT 1984, Guide 55).

### SECTION VI -- USE INFORMATION

This material is used as an insecticide (\*SRI) and is used almost exclusively in agriculture (Hayes 1982, p. 379).

### SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE (Steps to be Taken in Case Material is Released or Spilled)

In case of leaks or spills, special protective clothing should be worn. Use water spray to disperse vapors and flush spills away (\*NFPA 1978). Ventilate area of spill or leak. Spills may be absorbed in vermiculite, dry sand, earth, or a similar material (\*NIOSH/OSHA 1981).

EPA CHEMICAL PROFILE

INTERIM

Date: October 31, 1985

Revision: \_\_\_\_\_

CHEMICAL IDENTITY -- COUMAPHOS

CAS Registry Number: 56-72-4

**Synonyms:** 3-Chloro-4-Methyl-7-Coumarinyl Diethyl Phosphorothioate; 3-Chloro-4-Methyl-7-Hydroxycoumarin Diethyl Thiophosphoric Acid Ester; 3-Chloro-4-Methylumbelliferone O-Ester with O,O-Diethyl Phosphorothioate; 3-Chloro-7-Hydroxy-4-Methyl-Coumarin O,O-Diethyl Phosphorothioate; 3-Chloro-7-Hydroxy-4-Methyl-Coumarin O-Ester with O,O-Diethyl Phosphorothioate; Agridip; Asunthol; Asuntol; Azunthol; Bay 21/199; Bayer 21/199; Baymix; Baymix 50; Co-Ral; Coumafes; Coumarin, 3-Chloro-7-Hydroxy-4-Methyl-, O-Ester with O,O-Diethyl Phosphorothioate; Diethyl 3-Chloro-4-Methylumbelliferyl Thionophosphate; Diethyl Thiophosphoric Acid Ester of 3-Chloro-4-Methyl-7-Hydroxycoumarin; Diolice; ENT 17,957; Meldane, Meldone, Muscatox, NCI-C08662; O,O-Diethyl 3-Chloro-4-Methyl-7-Umbelliferone Thiophosphate; O,O-Diethyl O-(3-Chloro-4-Methyl-2-Oxo-2H-Benzopyran-7-yl) Phosphorothioate; O,O-Diethyl O-(3-Chloro-4-Methyl-7-Coumarinyl) Phosphorothioate; O,O-Diethyl O-(3-Chloro-4-Methylcoumarinyl-7) Thiophosphate; O,O-Diethyl O-(3-Chloro-4-Methylumbelliferone) Thiophosphate; O,O-Diethyl O-(3-Chloro-4-Methylumbelliferyl) Phosphorothioate; O-3-Chloro-4-Methyl-7-Coumarinyl O,O-Diethyl Phosphorothioate; Phosphorothioic Acid, O,O-Diethyl Ester, O-Ester with 3-Chloro-7-Hydroxy-4-Methylcoumarin; Phosphorothioic Acid, O-(3-Chloro-4-Methyl-2-Oxo-2H-1-Benzopyran-7-yl) O,O-Diethyl Ester; Resistox; Resitox; Suntol; Umbethion

**Chemical Formula:**  $C_{14}H_{16}ClO_5PS$

**Molecular Weight:** 362.78

SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

**OSHA PEL:** Not Found

**ACGIH TLV:** Not Found

**IDLH:** Not Found

**Other Limits Recommended:** Toxicity information:  $LC_{50}$  inhalation (rat) 0.303 mg/liter (\*NIOSH/RTECS 1985)

COUMAPHOS

SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

Boiling Point: Not Found

Specific Gravity ( $H_2O=1$ ): 1.31 at 25°C (\*Spencer 1973)

Vapor Pressure (mmHg):  $10^{-7}$  at 20°C (\*Spencer 1973)

Melting Point: 196°F; 91°C (\*Merck 1983)

Vapor Density (AIR=1): Not Found

Evaporation Rate (Butyl acetate=1): Not Found

Solubility in Water: Insoluble (\*Merck 1983)

Appearance and Odor: Slightly brownish crystals (\*Merck 1983). Slight odor of sulfur compound (\*CHRIS 1978)

SECTION III -- FIRE AND EXPLOSION HAZARD DATA

Flash Point (Method Used): Not Found

Flammable Limits:

LEL: Not Found

UEL: Not Found

Extinguishing Methods: This material may burn but does not ignite easily (\*DOT 1984). Extinguish with water, foam, carbon dioxide, or dry chemicals (\*CHRIS 1978)

Special Fire Fighting Procedures: Use organic vapor respirator, rubber gloves, and goggles (\*CHRIS 1978). Dike fire control water for disposal later (\*DOT 1984).

Unusual Fire and Explosion Hazards: Toxic and irritating oxides of sulfur and phosphorus may form in fire (\*CHRIS 1978).

SECTION IV -- REACTIVITY DATA

Stability: Unstable:

Stable: Stable in water (\*Merck 1983)

Conditions to Avoid: Not Found

Incompatibility (Materials to Avoid): Incompatible with piperonyl butoxide (\*Farm Chemicals Handbook 1983)

## COUMAPHOS

### SECTION IV -- REACTIVITY DATA (Continued)

**Hazardous Decomposition or Byproducts:** When heated to decomposition, it emits very toxic fumes of sulfur oxides, phosphorus oxides, and chlorides (Sax 1984, p. 726)

**Hazardous Polymerization:** May Occur: Not Found  
May Not Occur: Not Found

**Conditions to Avoid:** Not Found

### SECTION V -- HEALTH HAZARD DATA

**Routes of Entry:** Inhalation: Yes (\*DOT 1984)  
Skin: Yes (\*DOT 1984)  
Ingestion: Yes (\*Gosselin 1976)

**Health Hazards (Acute, Delayed, and Chronic):** Very toxic, probable oral lethal dose is 50-500 mg/kg, or between 1 teaspoonful and 1 oz. for a 70 kg (150 lb.) person (\*Gosselin 1976). May be fatal if inhaled, swallowed, or absorbed through skin. Contact may cause burns to skin and eyes (\*DOT 1984).

**Signs and Symptoms of Exposure:** Symptoms consistent with organophosphate poisoning: nausea, diarrhea, salivation, difficult breathing, stiffness of legs, blurring of vision, followed by loss of muscle coordination, convulsions, coma, and death (\*Gosselin 1976).

**Medical Conditions Generally Aggravated by Exposure:** Not Found

**Emergency and First Aid Procedures:** Move victim to fresh air; call emergency medical care. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In case of contact with material, immediately flush skin or eyes with running water for at least 15 minutes. Speed in removing material from skin is of extreme importance. Remove and isolate contaminated clothing and shoes at the site. Keep victim quiet and maintain normal body temperature. Effects may be delayed. Keep victim under observation. (\*DOT 1984).

### SECTION VI -- USE INFORMATION

For control of a wide variety of livestock insects including cattle grubs, lice, scabies, flies, and ticks; the common ectoparasites of sheep, goats, horse, swine, and poultry as well as for screwworms in all these animals (Farm Chemicals Handbook 1983, p. C61).

## COUMAPHOS

### SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE

(Steps to be Taken in Case Material is Released or Spilled)

Do not touch spilled material; stop leak if you can do it without risk. Use water spray to reduce vapors. Small spills: take up with sand or other noncombustible absorbent material and place into containers for later disposal. Small dry spills: with clean shovel, place material into clean, dry container and cover; move containers from spill area. Large spills: dike far ahead of spill for later disposal (\*DOT 1984).

## EPA CHEMICAL PROFILE

### INTERIM

Date: October 31, 1985

Revision: \_\_\_\_\_

## CHEMICAL IDENTITY -- DIMETHYLHYDRAZINE

CAS Registry Number: 57-14-7

**Synonyms:** As-Dimethylhydrazine; Asym Dimethylhydrazine; Asymmetric Dimethylhydrazine; Dimazin; Dimazine; 1,1-Dimethylhydrazine; Dimethylhydrazine Unsymmetrical; DMH; Hydrazine, 1,1-Dimethyl; N,N-Dimethylhydrazine; U-Dimethylhydrazine; UDMH; Uns-Dimethylhydrazine; Unsym-Dimethylhydrazine; Unsymmetrical-Dimethylhydrazine

**Chemical Formula:**  $C_2H_8N_2$

**Molecular Weight:** 60.10

## SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

**OSHA PEL:** TWA 1 mg/m<sup>3</sup> (skin) (\*NIOSH/RTECS 1985)

**ACGIH TLV:** TWA 0.5 ppm, 1 mg/m<sup>3</sup>; STEL 1.0 ppm, 2 mg/m<sup>3</sup> (skin) (\*ACGIH 1984)

**IDLH:** 50 ppm (NIOSH/OSHA 1978, p. 88)

**Other Limits Recommended:** NIOSH Recommended standard for exposure to hydrazines: 0.15 mg/m<sup>3</sup>/2 hrs., ceiling concentration (\*NIOSH/RTECS 1985). Industrial substance suspect of carcinogenic potential for humans (ACGIH 1983, p. 43)

## SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

**Boiling Point:** 147°F, 63.9°C at 760 mmHg (\*Merck 1983)

**Specific Gravity** (H<sub>2</sub>O=1): 0.7914 at 22°C/4°C (\*IARC 1972-1985)

**Vapor Pressure** (mmHg): 10 at -22°C (\*IARC 1972-1985)

**Melting Point:** -72°F, -58°C (\*Merck 1983)

**Vapor Density** (AIR=1): 1.94 (\*Sax 1979)

**Evaporation Rate** (Butyl acetate=1): Not Found



## DIMETHYLHYDRAZINE

## SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS (Continued)

**Solubility in Water:** Very soluble (\*Encyc Occupat Health and Safety 1983)

**Appearance and Odor:** Clear, colorless liquid with characteristic ammonia-like fish odor (\*IARC 1972-1985).

## SECTION III -- FIRE AND EXPLOSION HAZARD DATA

**Flash Point (Method Used):** 5°F, -15°C (CC) (\*NFPA 1978)

**Flammable Limits:**

LEL: 2% (\*Sax 1979)

UEL: 95% (\*Sax 1979)

**Extinguishing Methods:** Use dry chemical, carbon dioxide, water spray, or foam for small fires (\*DOT 1984). In large fires water fog, carbon dioxide, and bicarbonate agents may allow flashback and explosive re-ignition (\*CHRIS 1978).

**Special Fire Fighting Procedures:** Move containers from fire area if it can be done without risk. Dike fire control water for later disposal, do not scatter the material. Cool containers that are exposed to flames with water until well after fire is out, wear positive pressure breathing apparatus and special protective clothing. Isolate for one-half mile in all directions if tank car or truck is involved in fire (\*DOT 1984).

**Unusual Fire and Explosion Hazards:** Vapor may explode if ignited in an enclosed area (\*CHRIS 1978). Vapors may travel to a source of ignition and flashback. Runoff to sewer may create fire or explosion hazard (\*DOT 1984).

## SECTION IV -- REACTIVITY DATA

**Stability: Unstable:**

**Stable:** Yes (NFPA 1984, p. 325M-43)

**Conditions to Avoid:** Dangerous when exposed to heat, flame, or oxidizers (\*Sax 1979).

**Incompatibility (Materials to Avoid):** Dissolves, swells, and disintegrates many plastics (\*CHRIS 1978).

**Hazardous Decomposition or Byproducts:** When it decomposes, 1,1-dimethylhydrazine gives off toxic nitrogen compound fumes (\*Rumack 1975 to Present).

## DIMETHYLHYDRAZINE

### SECTION IV -- REACTIVITY DATA (Continued)

Hazardous Polymerization: May Occur:  
May Not Occur: Yes (Weiss 1980, p. 364)

Conditions to Avoid: Not Found

### SECTION V -- HEALTH HAZARD DATA

Routes of Entry: Inhalation: Yes (\*Sax 1975)  
Skin: Yes (\*Sax 1975)  
Ingestion: Yes (\*Sax 1975)

**Health Hazards** (Acute, Delayed, and Chronic): This compound exhibits high acute toxicity as a result of exposure by all routes. Death or permanent injury may result after very short exposure to small quantities (\*Sax 1975). Chronic exposure may cause pneumonia, liver damage, and kidney damage (\*Rumack 1975 to Present).

**Signs and Symptoms of Exposure:** Acute exposures may produce eye, nose and throat irritation, respiratory distress, nausea, and vomiting (\*Clayton and Clayton 1981-82). Other effects include headache, facial numbness, twitching, pulmonary edema, blood changes, seizures, and coma. Contact with skin and eyes may cause thermal burns (\*Rumack 1975 to Present).

**Medical Conditions Generally Aggravated by Exposure:** Not Found

**Emergency and First Aid Procedures:** Move victim to fresh air and call emergency medical care. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Remove and isolate contaminated clothing. In case of contact with this material, immediately flush skin or eyes with running water for at least 15 minutes. Keep victim quiet and maintain normal body temperatures. Keep victim under observation since effects may be delayed (\*DOT 1984).

### SECTION VI -- USE INFORMATION

Major uses include: chemical synthesis; stabilizer for organic peroxide fuel additives; absorbent for acid gases; photography (\*Hawley 1977); base in rocket fuel formulations (\*Merck 1983); stabilizer for plant growth regulator (\*Clayton and Clayton 1981-82).

## DIMETHYLHYDRAZINE

### SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE

(Steps to be Taken in Case Material is Released or Spilled)

Shut off ignition sources. Do not touch spilled material. Stop leak if this can be done without risk. Use water spray to reduce vapors. Take up small spills with sand or other non-combustible absorbent material and place into containers for later disposal. Dike far ahead of large spills for later disposal (\*DOT 1984). Spills also may be removed with an aspirator. Transfer to glass container and neutralize with dilute sulfuric acid. Drain with copious amounts of water (\*Rumack 1975 to Present). When working with small quantities wear vinyl-coated hand protection, natural or reclaimed rubber protection, and plastic eye and face protection. Where possibility of gross splashing exists, wear full protective clothing (\*Encyc Occupat Health and Safety 1971). A gas mask with an ammonia (GMD) canister protects for 30 minutes against a 1 percent concentration in air. For longer periods or higher concentrations, use self-contained breathing apparatus (\*CHRIS 1978).

EPA CHEMICAL PROFILE

INTERIM

Date: October 31, 1985

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**CHEMICAL IDENTITY -- STRYCHNINE**

**CAS Registry Number:** 57-24-9

**Synonyms:** Certox; Dolco Mouse Cereal; Kwik-Kil; Mole Death; Mouse-Nots; Mouse-Rid; Mouse-Tox; Pied Piper Mouse Seed; Ro-Dex; Sanaseed; Strychnos; Strychnidin-10-one; Strychnin

**Chemical Formula:**  $C_{21}H_{22}N_2O_2$

**Molecular Weight:** 334.40

**SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION**

**OSHA PEL:** 150  $\mu\text{g}/\text{m}^3$  (\*NIOSH/RTECS 1985)

**ACGIH TLV:** TWA 0.15  $\text{mg}/\text{m}^3$ ; STEL 0.45  $\text{mg}/\text{m}^3$  (\*ACGIH 1983)

**IDLH:** 3  $\text{mg}/\text{m}^3$  (NIOSH/OSHA 1978, p. 168)

**Other Limits Recommended:** Not Found

**SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS**

**Boiling Point:** 518°F, 270°C at 5mmHg (\*Merck 1983)

**Specific Gravity ( $H_2O=1$ ):** 1.36 at 20°C/4°C (\*Merck 1983)

**Vapor Pressure (mmHg):** Not Found

**Melting Point:** 514-554°F, 268-290°C (\*Merck 1983)

**Vapor Density (AIR=1):** Not Found

**Evaporation Rate (Butyl acetate=1):** Not Found

**Solubility in Water:** 1 g in 6400 ml (\*Merck 1983).

**Appearance and Odor:** Colorless, transparent crystals or white crystalline powder; odorless (\*Osol 1980).

STRYCHNINE

SECTION III -- FIRE AND EXPLOSION HAZARD DATA

Flash Point (Method Used): Not Found

Flammable Limits: Material may burn but does not ignite readily (\*DOT 1984).

LEL: Not Found

UEL: Not Found

Extinguishing Methods: Extinguish fire using agent suitable for type of surrounding fire; material itself does not burn or burns with difficulty. Use water in flooding quantities as fog. Use alcohol foam, carbon dioxide, or dry chemical (Student 1981, p. 482).

Special Fire Fighting Procedures: Not Found

Unusual Fire and Explosion Hazards: When heated, emits highly toxic fumes (\*Sax 1979). Fire may produce irritating or poisonous gases. Runoff from fire control or dilution water may cause pollution (\*DOT 1984).

SECTION IV -- REACTIVITY DATA

Stability: Unstable:

Stable: Yes (\*Oso1 1980)

Conditions to Avoid: Protect from light (\*Merck 1983)

Incompatibility (Materials to Avoid): Not Found

Hazardous Decomposition or Byproducts: Not Found

Hazardous Polymerization: May Occur: Not Found  
May Not Occur: Not Found

Conditions to Avoid: Not Found

SECTION V -- HEALTH HAZARD DATA

Routes of Entry: Inhalation: Yes (\*DOT 1984)

Skin: Not Found

Ingestion: Yes (\*Gosselin 1976)

## STRYCHNINE

### SECTION V -- HEALTH HAZARD DATA (Continued)

**Health Hazards** (Acute, Delayed, and Chronic): Super toxic; probable oral lethal dose in humans is less than 5 mg/kg, a taste (less than 7 drops) for a 70 kg (150 lb.) person. It causes violent generalized convulsions. Death results from respiratory arrest as the respiratory muscles are in sustained spasm (\*Gosselin 1976). The lowest lethal oral dose reported for humans is 30 mg/kg (\*NIOSH/RTECS 1985).

**Signs and Symptoms of Exposure:** Within 15 to 30 minutes after ingestion, violent convulsions, restlessness, apprehension, heightened acuity of perception, abrupt movements, hyperreflexia, and muscular stiffness of the face and legs. Minor sensory stimulus may trigger a violent generalized convulsion lasting 0.5 to 2 minutes (\*Gosselin 1976).

**Medical Conditions Generally Aggravated by Exposure:** Not Found

**Emergency and First Aid Procedures:** Move victim to fresh air; call emergency medical care. In case of contact with material, immediately flush skin or eyes with running water for at least 15 minutes. Remove and isolate contaminated clothing and shoes at the site (DOT 1984, Guide 53).

### SECTION VI -- USE INFORMATION

Material (and its salts) is used for destroying rodents and predatory animals and for trapping fur-bearing animals (\*Merck 1983).

### SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE (Steps to be Taken in Case Material is Released or Spilled)

Do not touch spilled material; stop leak if you can do so without risk. Small spills: absorb with sand or other noncombustible absorbent material and place into containers for later disposal. Small dry spills: with clean shovel place material into clean, dry container and cover; move containers from spill area. Large spills: dike far ahead of spill for later disposal (DOT 1984, Guide 53). Avoid breathing dusts, and fumes from burning materials. Keep upwind. Wear self-contained breathing apparatus. Avoid bodily contact with the material. Do not handle broken packages without protective equipment. Wash away any material which may have contacted the body with copious amounts of water or soap and water (Student 1981, p. 482).

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INTERIM

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CHEMICAL IDENTITY -- PHYSOSTIGMINE

CAS Registry Number: 57-47-6

**Synonyms:** Calabarine; Carbamic Acid, Methyl-, Ester with Eseroline; Erserine; Eserine; Eserolein, Methylcarbamate (Ester); Esromiotin; Ezerin; Physostol; Pyrrolo(2,3-b)indol-5-ol, 1,2,3,3a,8,8a-Hexahydro-1,3a,8-Trimethyl-, Methylcarbamate (Ester), (3aS-cis)-

**Chemical Formula:**  $C_{15}H_{21}N_3O_2$

**Molecular Weight:** 275.34

SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

OSHA PEL: Not Found

ACGIH TLV: Not Found

IDLH: Not Found

**Other Limits Recommended:** Toxicity information: LD<sub>50</sub> oral (mice)  
4.5 mg/kg (\*NIOSH/RTECS 1985)

SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

**Boiling Point:** Not Found

**Specific Gravity** (H<sub>2</sub>O=1): Not Found

**Vapor Pressure** (mmHg): Not Found

**Melting Point:** 221-223°F, 105-106°C (\*Merck 1976)

**Vapor Density** (AIR=1): Not Found

**Evaporation Rate** (Butyl acetate=1): Not Found

**Solubility in Water:** Slightly soluble (\*Merck 1976)

**Appearance and Odor:** White, odorless, microcrystalline powder (\*Osol 1980)

## PHYSOSTIGMINE

### SECTION III -- FIRE AND EXPLOSION HAZARD DATA

**Flash Point** (Method Used): Not Found

**Flammable Limits:**

LEL: Not Found

UEL: Not Found

**Extinguishing Methods:** This is a carbamate pesticide (Hayes 1982, p. 436). As for carbamate pesticides, extinguish fire using agent suitable for type of surrounding fire (material itself burns with difficulty). Use water in flooding quantities as fog. Use alcohol foam, carbon dioxide or dry chemical (Student 1981, p. 104).

**Special Fire Fighting Procedures:** This is a carbamate pesticide (Hayes 1982, p. 436). As for carbamate pesticides, wear self-contained breathing apparatus when fighting fires (Student 1981, p. 104).

**Unusual Fire and Explosion Hazards:** It is a slight fire hazard (Sax 1984, p. 2228).

### SECTION IV -- REACTIVITY DATA

**Stability:** Unstable: Not Found

Stable: Not Found

**Conditions to Avoid:** Not Found

**Incompatibility** (Materials to Avoid): Keep from light and heat (\*Merck 1976).

**Hazardous Decomposition or Byproducts:** When heated to decomposition it emits toxic fumes of nitrogen oxides (Sax 1984, p. 2228).

**Hazardous Polymerization:** May Occur: Not Found  
May Not Occur: Not Found

**Conditions to Avoid:** Not Found

### SECTION V -- HEALTH HAZARD DATA

**Routes of Entry:** Inhalation: Yes (\*Gilman 1980)  
Skin: Yes (\*Gilman 1980)  
Ingestion: Yes (\*Gilman 1980)



## PHYSOSTIGMINE

### SECTION V -- HEALTH HAZARD DATA (Continued)

**Health Hazards** (Acute, Delayed, and Chronic): Super toxic. Probable oral lethal dose is less than 5 mg/kg for a 70 kg (150 lb.) person (\*Gosselin 1984). Material is a cholinesterase inhibitor. Effects of exposure may involve the respiratory, gastrointestinal, cardiovascular and central nervous systems. Death occurs due to respiratory paralysis or impaired cardiac function. Time to death may vary from 5 minutes to 24 hours, in severely poisoned patients, depending on factors such as the dose and route (\*Goodman 1980).

**Signs and Symptoms of Exposure:** General symptoms include: increased secretions, fatigability and generalized weakness, involuntary twitching, severe weakness of skeletal muscles. Symptoms of exposure to material by major organ system: gastrointestinal: lack of appetite, nausea and vomiting, abdominal cramps and diarrhea. Central nervous system: confusion, uncoordination, slurred speech, loss of reflexes, rapid, irregular breathing, generalized convulsions, and coma. Cardiovascular: slowed heart beat resulting in hypotension and fall in cardiac output (\*Goodman 1980).

**Medical Conditions Generally Aggravated by Exposure:** Persons with asthma and/or persons that require drugs containing choline esters are at risk (\*Osol 1975).

**Emergency and First Aid Procedures:** Administer artificial respiration and oxygen if needed (Sax 1984, p. 2228). If the victim's skin and hair are contaminated, bathe with soap and water. If the material was ingested, the stomach must be emptied (\*Morgan 1976).

### SECTION VI -- USE INFORMATION

Physostigmine is a carbamate pesticide (Hayes 1982, p. 436). Material is used as a cholinergic (anticholinesterase) agent and as a veterinary medication (\*Merck 1976). Listed as a carbamate pesticide in Sections III and VII, however, physostigmine is not registered in the U.S. as such (USEPA/Pesticide Index 1985).

### SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE (Steps to be Taken in Case Material is Released or Spilled)

This is a carbamate pesticide (Hayes 1982, p. 436). As for other carbamate pesticides, avoid breathing dusts, and fumes from burning materials. Keep upwind. Wear self-contained breathing apparatus. Avoid bodily contact with the material. Wear full protective clothing. Wash away any material which may have contacted the body with copious amounts of water or soap and water (\*Student 1981).

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CHEMICAL IDENTITY -- PROPIOLACTONE, beta-

CAS Registry Number: 57-57-8

**Synonyms:** beta-Propiolactone; 2-Oxetanone; 3-Hydroxypropionic Acid Lactone; 3-Hydroxypropionic Acid, beta-Lactone; 3-Propanolide; 3-Propiolactone; beta-Propionolactone; beta-Propiolactone; Betaprone; BPL; Hydracrylic Acid Beta-Lactone; Hydracrylic Acid, beta Lactone; Propanoic Acid, 3-Hydroxy-, beta-Lactone; Propanolide; Propiolactone; Propionic Acid 3-Hydroxy-beta-Lactone; Propionic Acid, 3-Hydroxy-, beta-Lactone

**Chemical Formula:**  $C_3H_4O_2$

**Molecular Weight:** 72.06

SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

**OSHA PEL:** Not Found

**ACGIH TLV:** TWA 0.5 ppm, 1.5 mg/m<sup>3</sup>; STEL 1 ppm, 3 mg/m<sup>3</sup> (ACGIH, 1983, p. 30)

**IDLH:** Not Found

**Other Limits Recommended:** Industrial substance suspect of carcinogenic potential for humans (ACGIH 1984, p. 41). Toxicity information: LC<sub>50</sub> inhalation (rat) 0.074 mg/liter (\*NIOSH/RTECS 1985).

SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

**Boiling Point:** 324°F, 162°C, decomposes (\*Merck 1976)

**Specific Gravity (H<sub>2</sub>O=1):** 1.146 at 20°C/4°C (\*Merck 1976)

**Vapor Pressure (mmHg):** 3.4 at 25°C (\*IARC 1972-1985)

**Melting Point:** -27°F, -33°C (\*Merck 1976)

**Vapor Density (AIR=1):** Not Found

**Evaporation Rate (Butyl acetate=1):** Not Found

**PROPIOLACTONE, beta-**

**SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS (Continued)**

**Solubility in Water:** 37% by volume (\*Merck 1976)

**Appearance and Odor:** A colorless liquid with a slightly sweetish, pungent odor (\*Encyc Occupat Health and Safety 1971; \*IARC 1972-1985)

**SECTION III -- FIRE AND EXPLOSION HAZARD DATA**

**Flash Point (Method Used):** 70°C (158°F) (no method given) (\*Merck 1976)

**Flammable Limits:**

**LEL:** 2.9% (\*NFPA 1979)

**UEL:** Not Found

**Extinguishing Methods:** Alcohol foam (\*Sax 1979). Extinguish with water, dry chemical, foam, or carbon dioxide (Weiss 1980, p. 776).

**Special Fire Fighting Procedures:** Wear air mask, goggles or face shield, rubber gloves, and protective clothing to prevent all skin contact. Cool exposed containers with water (Weiss 1980, p. 776).

**Unusual Fire and Explosion Hazards:** Containers may explode (Weiss 1980, p. 776). When heated to decomposition, it emits acrid smoke and fumes (Sax 1984, p. 2102).

**SECTION IV -- REACTIVITY DATA**

**Stability:** Unstable:

**Stable:** Yes, stable when stored at 5°C (\*Merck 1983)

**Conditions to Avoid:** Avoid storing in areas of exposure to the direct rays of the sun and in areas of high fire hazard (\*Sax 1968). Tends to polymerize on storage (\*IARC 1972-1985).

**Incompatibility (Materials to Avoid):** Not Found

**Hazardous Decomposition or Byproducts:** When heated to decomposition, it emits acrid smoke and fumes (Sax 1984, p. 2102).

**Hazardous Polymerization:** May Occur: Not Found  
May Not Occur: Not Found

**Conditions to Avoid:** Avoid elevated temperatures (Weiss 1980, p. 776).

**PROPIOLACTONE, beta-**

**SECTION V -- HEALTH HAZARD DATA**

**Routes of Entry:** Inhalation: Yes (\*Sax 1968)  
Skin: Yes (Weiss 1980, p. 776)  
Ingestion: Yes (\*Sax 1968)

**Health Hazards** (Acute, Delayed, and Chronic): The toxicity potential of this material via inhalation or ingestion is high; may cause death or permanent injury after very short exposures to small quantities (\*Sax 1968). It is a carcinogen (Weiss 1980, p. 776).

**Signs and Symptoms of Exposure:** Inhalation causes irritation of nose, throat, and respiratory tract. Contact of liquid with eyes causes irritation and tears. Contact with skin causes irritation and blistering; fluid from blisters may cause additional blistering of adjacent skin. Ingestion causes burns of mouth and stomach (Weiss 1980, p. 776).

**Medical Conditions Generally Aggravated by Exposure:** Not Found

**Emergency and First Aid Procedures:** Get medical attention following all exposures to this compound. In case of inhalation, move victim to fresh air; if breathing has stopped, give artificial respiration. If there has been eye contact, flush eyes with water for at least 15 minutes. In case of skin contact, flush with water (Weiss 1980, p. 776).

**SECTION VI -- USE INFORMATION**

Intermediate in organic synthesis; disinfectant (\*Merck 1976); sterilant for blood plasma, tissue grafts, vaccines, enzymes and surgical instruments (\*SRI).

**SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE**  
(Steps to be Taken in Case Material is Released or Spilled)

Avoid contact with liquid. Keep people away. Wear rubber overclothing. Stop discharge (Weiss 1980, p. 776). Avoid inhalation (see Section V above).

EPA CHEMICAL PROFILE

INTERIM

Date: October 31, 1985

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CHEMICAL IDENTITY -- PHYSOSTIGMINE, SALICYLATE (1:1)

CAS Registry Number: 57-64-7

Synonyms: (SANSS 1983 Synonyms): Eserine Salicylate; Physostol Salicylate; Salicylic Acid, compound with Physostigmine; Benzoic Acid, 2-Hydroxy-, compound with (3aS-cis)-1,2,3,3a,8,8a-Hexahydro-1,3a,8-Trimethylpyrrolo[2,3-b]indol-5-yl Methylcarbamate (1:1)

Chemical Formula:  $C_{15}H_{21}N_3O_2 \cdot C_7H_6O_3$

Molecular Weight: 413.52

SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

OSHA PEL: Not Found

ACGIH TLV: Not Found

IDLH: Not Found

Other Limits Recommended: Toxicity information: LD<sub>50</sub> oral (mouse)  
2.5 mg/kg (\*NIOSH/RTECS 1985)

SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

Boiling Point: Not Found

Specific Gravity (H<sub>2</sub>O=1): Not Found

Vapor Pressure (mmHg): Not Found

Melting Point: 365-369°F, 185-187°C (Merck 1983, p. 1065)

Vapor Density (AIR=1): Not Found

Evaporation Rate (Butyl acetate=1): Not Found

Solubility in Water: 1 gram/75 mL at 25°C (Merck 1983, p. 1065)

Appearance and Odor: Crystal form that turns red on exposure to heat or light (Merck 1983, p. 1065); odor not found.

**PHYSOSTIGMINE, SALICYLATE (1:1)**

**SECTION III -- FIRE AND EXPLOSION HAZARD DATA**

**Flash Point** (Method Used): Not Found

**Flammable Limits:**

LEL: Not Found

UEL: Not Found

**Extinguishing Methods:** Not Found

**Special Fire Fighting Procedures:** Not Found

**Unusual Fire and Explosion Hazards:** Not Found

**SECTION IV -- REACTIVITY DATA**

**Stability: Unstable:** Not Found

**Stable:** Not Found

**Conditions to Avoid:** Not Found

**Incompatibility** (Materials to Avoid): Not Found

**Hazardous Decomposition or Byproducts:** When heated to decomposition, it emits toxic fumes of nitrogen oxides (Sax 1984, p. 2228).

**Hazardous Polymerization: May Occur:** Not Found

**May Not Occur:** Not Found

**Conditions to Avoid:** Not Found

**SECTION V -- HEALTH HAZARD DATA**

**Routes of Entry: Inhalation:** Not Found

**Skin:** Not Found

**Ingestion:** Yes (Sax 1984, p. 2228)

**Health Hazards** (Acute, Delayed, and Chronic): This compound is similar to physostigmine. It is classified as super toxic. The probable oral lethal dose (humans) is less than 5 mg/kg or a taste for a 150 lb. person. It is a cholinesterase inhibitor (Gosselin 1984, p. II-245).

PHYSOSTIGMINE, SALICYLATE (1:1)

SECTION V -- HEALTH HAZARD DATA (Continued)

**Signs and Symptoms of Exposure:** This compound is similar to physostigmine (Gosselin 1984, p. II-245). Symptoms include nausea, vomiting, abdominal cramps, diarrhea, excessive salivation, sweating, lassitude, weakness, tightness in chest, vision disorders, tearing, ciliary muscle spasm, loss of muscle coordination, slurring of speech, twitching of muscle, difficulty in breathing, bluing of skin, convulsions, coma and death (Gosselin 1984, p. III-89).

**Medical Conditions Generally Aggravated by Exposure:** Not Found

**Emergency and First Aid Procedures:** This compound is similar to physostigmine (Gosselin 1984, p. II-245). Give oxygen and artificial respiration as needed. Wash contaminated areas of the skin with soap and water. Irrigate the eyes with water or saline. Keep patient under constant observation for at least 24 hours (Gosselin 1984, p. III-89).

SECTION VI -- USE INFORMATION

Not Found

SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE  
(Steps to be Taken in Case Material is Released or Spilled)

Not Found

COMMENTS

Sources searched but no information found:

Doull 1980

Clayton and Clayton 1981-82

NFPA 1984

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Date: October 31, 1985

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CHEMICAL IDENTITY -- CHLORDANE

CAS Registry Number: 57-74-9

**Synonyms:** 1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-Hexahydro-4,7-Methanoindene; 1,2,4,5,6,7,8,8-Octachloro-3a,4,7,7a-Hexahydro-4,7-Methylene Indane; 4,7-Methano-1H-Indene, 1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-Hexahydro-; 4,7-Methanoindane, 1,2,4,5,6,7,8,8-Octachloro-3a,4,7,7a-Tetrahydro-; 1068; Aspon-Chlordane; CD 68; Chlor Kil; Chlordane; Liquid (DOT); Chlorindan; Corodan; Dowchlor; ENT 9,932; ENT-9932; HCS 3260; Kypchlor; M 140; M 410; NCI-C00099; Niran; Octa-Klor; Octachloro-4,7-Methanohydroindane; Octachloro-4,7-Methanotetrahydroindane; Octachlorodihydrodicyclopentadiene; Oktaterr; Ortho-Klor; Synklor; TAT Chlor 4; Topiclor; Toxichlor; Velsicol 1068; Belt

**Chemical Formula:**  $C_{10}H_6Cl_8$

**Molecular Weight:** 409.80

SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

OSHA PEL: Air: TWA 500  $\mu\text{g}/\text{m}^3$  (skin) (\*NIOSH/RTECS 1985)

ACGIH TLV: 0.5  $\text{mg}/\text{m}^3$ ; STEL 2  $\text{mg}/\text{m}^3$ , skin (\*ACGIH 1983)

IDLH: 500  $\text{mg}/\text{m}^3$  (\*Clayton and Clayton 1981-82)

Other Limits Recommended: Not Found

SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

Boiling Point: 347°F, 175°C at 2 mmHg (\*Sunshine 1969)

Specific Gravity ( $H_2O=1$ ): 1.56-1.57 at 25°C/0°C (\*Merck 1983)

Vapor Pressure (mmHg):  $1 \times 10^{-5}$  at 25°C (\*Sunshine 1969)

Melting Point: Not Found

Vapor Density (AIR=1): Not Found



## CHLORDANE

### SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS (Continued)

**Evaporation Rate** (Butyl acetate=1): Not Found

**Solubility in Water:** Insoluble (\*Merck 1983)

**Appearance and Odor:** Amber viscous liquid with an aromatic, slightly pungent odor (\*Merck 1983, \*CHRIS 1978)

### SECTION III -- FIRE AND EXPLOSION HAZARD DATA

**Flash Point** (Method Used): Not Found

**Flammable Limits:** Flammable/combustible (\*DOT 1984)

LEL: Not Found

UEL: Not Found

**Extinguishing Methods:** Small fires: dry chemical, carbon dioxide, water spray, and foam. Large fires: water spray, fog, or foam. Move containers from fire area if it can be done without risk. Cool containers that are exposed to flames with water from the side until well after fire is out (\*DOT 1984).

**Special Fire Fighting Procedures:** Isolate hazard area and deny entry. Stay upwind. Wear positive pressure breathing apparatus and special protective clothing. Isolate for 1/2-mile in all directions if tank car or truck is involved in the fire (\*DOT 1984).

**Unusual Fire and Explosion Hazards:** Flammable/combustible material; may be ignited by heat, sparks or flames. Vapors may travel to a source of ignition and flash back. Run-off to sewers may create fire or explosion hazard. Containers may explode in heat of fire. Vapors are toxic indoors and outdoors (\*DOT 1984).

### SECTION IV -- REACTIVITY DATA

**Stability:** Unstable:

Stable: Yes (Verschuieren 1983, pp. 380-381)

**Conditions to Avoid:** Not Found

**Incompatibility** (Materials to Avoid): Loses chlorine in presence of alkaline reagents; should not be formulated with any solvent, carrier, diluent or emulsifier which has alkaline reaction (\*Merck 1983).

## CHLORDANE

### SECTION IV -- REACTIVITY DATA (Continued)

**Hazardous Decomposition or Byproducts:** Chlordane degrades under natural environmental conditions to photoisomers, such as photo-cis-chlordane, which are more toxic to certain animals than chlordane and also showed higher bioaccumulation (\*Khan et al. 1970).

**Hazardous Polymerization:** May Occur: Not Found  
May Not Occur: Not Found

**Conditions to Avoid:** Not Found

### SECTION V -- HEALTH HAZARD DATA

**Routes of Entry:** Inhalation: Yes (Gosselin 1984, pp. III-108-109)  
Skin: Yes -- More toxic to humans than by oral administration (Gosselin 1984, pp. III-108-109)  
Ingestion: Yes (Gosselin 1984, pp. III-108-109)

**Health Hazards (Acute, Delayed, and Chronic):** Fatal oral dose to adult humans is between 6 and 60 g with onset of symptoms within 45 minutes to several hours after ingestion, although symptoms have occurred following very small doses either orally or by skin exposure. Some reports of delayed development of liver disease, blood disorders and upset stomach. Chlordane is considered to be borderline between a moderately and highly toxic substance (Gosselin 1984, pp. III-108-109).

**Signs and Symptoms of Exposure:** Increased sensitivity to stimuli, tremors, muscular incoordination, and convulsions with or without coma (Gosselin 1984, pp. III-108-109).

**Medical Conditions Generally Aggravated by Exposure:** Not Found

**Emergency and First Aid Procedures:** Move victim to fresh air and give artificial respiration if indicated. Remove and isolate contaminated clothing and shoes at site. If exposure to skin or eyes, flush with running water for at least 15 minutes. Try to keep victim quiet. Effects may be delayed so keep victim under observation (\*DOT 1984).

### SECTION VI -- USE INFORMATION

As of 1983, the only use in USA is for termite control (\*IARC 1972-1985). Previously used as agricultural home and garden pesticide or insecticide (\*SRI).

## CHLORDANE

### SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE

(Steps to be Taken in Case Material is Released or Spilled)

Avoid breathing vapors (see Section V above). Shut off ignition sources. Eliminate all smoking or flames in hazard area. Do not touch spilled material. Use water spray to reduce vapors. Stay upwind. Wear positive-pressure breathing apparatus and full protective clothing. Small spills: take up with sand or other noncombustible absorbent material, place into containers for later disposal. Large spills: dike far ahead of spill for later disposal (\*DOT 1984).

EPA CHEMICAL PROFILE

INTERIM

Date: October 31, 1985

Revision: \_\_\_\_\_

CHEMICAL IDENTITY -- PHENOXARSINE, 10,10'-OXYDI-

CAS Registry Number: 58-36-6

Synonyms: (SANSS 1983 Synonyms) 10H-Phenoxarsine, 10,10'-oxybis;  
Bis(Phenoxarsin-10-yl)Ether; Bis(10-Phenoxarsinyl) Oxide; Bis(10-Phenoxarsyl)  
Oxide; Estabex ABF; OBPA; SA 546; DID 47

Chemical Formula:  $C_{24}H_{16}As_2O_3$  (Merck 1983, p. 998)

Molecular Weight: 502.23 (Merck 1983, p. 998)

SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

OSHA PEL: 0.5 mg/m<sup>3</sup> (Organic Arsenic Compounds) (OSHA 1984, p. 661)

ACGIH TLV: Air: TWA 0.2 mg (Arsenic)/m<sup>3</sup> (ACGIH 1984, p. 10)

IDLH: Not Found

Other Limits Recommended: Toxicity information: LC<sub>low</sub> inhalation  
(guinea pig) 12.8 mg/liter; LD<sub>50</sub> oral (guinea pig) 24 mg/kg  
(\*NIOSH/RTECS 1985)

SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

Boiling Point: Not Found

Specific Gravity (H<sub>2</sub>O=1): Not Found

Vapor Pressure (mmHg): Not Found

Melting Point: 363-365°F, 184-185°C (Merck 1983, p. 998)

Vapor Density (AIR=1): Not Found

Evaporation Rate (Butyl acetate=1): Not Found

**PHENOXARSINE, 10,10'-OXYDI-**

**SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS (Continued)**

**Solubility in Water:** Practically insoluble (5 ppm at 20°) (Merck 1983, p. 998)

**Appearance and Odor:** Colorless crystals (Merck 1983, p. 998)

**SECTION III -- FIRE AND EXPLOSION HAZARD DATA**

**Flash Point (Method Used):** Not Found

**Flammable Limits:**

LEL: Not Found

UEL: Not Found

**Extinguishing Methods:** (Non-Specific -- Arsenic Compound, Solid, n.o.s.) Small fires: dry chemical, carbon dioxide, water spray, or foam. Large fires: water spray, fog, or foam. Move container from fire area if you can do so without risk (DOT 1984, Guide 53).

**Special Fire Fighting Procedures:** (Non-Specific -- Arsenic Compound, Solid, n.o.s.) Stay upwind; keep out of low areas. Wear self-contained (positive pressure if available) breathing apparatus and full protective clothing (DOT 1984, Guide 53).

**Unusual Fire and Explosion Hazards:** (Non-Specific -- Arsenic Compounds) When heated to decomposition, it emits highly toxic fumes of arsenic (Sax 1984, p. 320).

**SECTION IV -- REACTIVITY DATA**

**Stability: Unstable:** Not Found

**Stable:** Not Found

**Conditions to Avoid:** Not Found

**Incompatibility (Materials to Avoid):** Not Found

**Hazardous Decomposition or Byproducts:** Not Found

**Hazardous Polymerization: May Occur:** Not Found

**May Not Occur:** Not Found

**Conditions to Avoid:** Not Found

**PHENOXARSINE, 10,10'-OXYDI-**

**SECTION V -- HEALTH HAZARD DATA**

**Routes of Entry:** **Inhalation:** Yes (Non-Specific -- Arsenic Compounds)  
(Sax 1984, p. 320)  
**Skin:** Yes (Non-Specific -- Arsenic Compounds)  
(Sax 1984, p. 320)  
**Ingestion:** Yes (Non-Specific -- Arsenic Compounds)  
(Sax 1984, p. 320)

**Health Hazards** (Acute, Delayed, and Chronic): (Non-Specific -- Arsenic Compounds) Arsenic compounds are acutely poisonous by ingestion. Ingestion or inhalation may result in chronic poisoning. Arsenic compounds are recognized carcinogens of the skin, lungs, and liver (Sax 1984, p. 320).

**Signs and Symptoms of Exposure:** (Non-Specific -- Arsenic Compounds) Ingestion causes nausea, vomiting, and diarrhea. In severe cases, there may be bloody vomitus and stools and the victim may suffer collapse and shock with weak, rapid pulse, cold sweats, coma, and death. Symptoms of chronic poisoning may include loss of appetite, cramps, nausea, constipation or diarrhea, jaundice, itching and pigmentation of the skin (Sax 1984, p. 320).

**Medical Conditions Generally Aggravated by Exposure:** Not Found

**Emergency and First Aid Procedures:** (Non-Specific -- Arsenic Compound, Solid, n.o.s.) Move victim to fresh air; call emergency medical care. Remove and isolate contaminated clothing and shoes at the site. In case of contact with material, immediately flush skin or eyes with running water for at least 15 minutes (DOT 1984, Guide 53).

**SECTION VI -- USE INFORMATION**

This material is used primarily for fungicidal and bactericidal protection of plastics (Merck 1983, p. 998).

**SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE**

(Steps to be Taken in Case Material is Released or Spilled)

(Non-Specific -- Arsenic Compound, Solid, n.o.s.) Keep unnecessary people away; isolate hazard area and deny entry. Stay upwind; keep out of low areas. Wear self-contained (positive pressure if available) breathing apparatus and full protective clothing. Do not touch spilled material; stop leak if you can do so without risk. Small spills: absorb with sand or other noncombustible absorbent material and place into containers for later disposal. Small dry spills: with clean shovel place material into clean, dry container and cover; move containers from spill area. Large spills: dike far ahead of spill for later disposal (DOT 1984, Guide 53).

PHENOXARSINE, 10,10'-OXYDI-

COMMENTS

Sources searched but no information found:

ACGIH 1983  
NIOSH/OSHA 1978  
Hawley 1981  
Weast 1979  
NFPA 1984  
Student 1981  
Weiss 1980  
CHRIS 1978  
Doull 1980  
Clayton and Clayton 1981-82  
Arena 1979  
Gosselin 1984  
Encyc Occupat Health and Safety 1983  
Buchel 1983  
Farm Chemicals Handbook 1984  
Hayes 1982  
Physicians' Desk Reference 1985  
Gilman 1985

EPA CHEMICAL PROFILE

INTERIM

Date: October 31, 1985

Revision: \_\_\_\_\_

CHEMICAL IDENTITY -- LINDANE

CAS Registry Number: 58-89-9

**Synonyms (NIOSH/RTECS 1983 Synonyms, Volume 1, p. 1,000):** Cyclohexane, 1,2,3,4,5,6-Hexachloro-, Gamma-Isomer; Aalindan; Aficide; Agrisol G-20; Agrocide; Agrocide 2; Agrocide 7; Agrocide 6G; Agrocide III; Agrocide WP; Agronexit; Ameisenatod; Ameisenmittel Merck; Aparasin; Aphtiria; Aplidal; Arbitex; BBH; Ben-Hex; Bentox 10; Benzene Hexachloride-gamma-isomer; gamma-Benzene Hexachloride; Bexol; BHC; gamma-BHC; Celanex; Chloresene; Codechine; DBH; Detmol-Extrakt; Detox 25; Devoran; Dol Granule; Drill Tox-Spezial Aglukon; Ent 7,796; Entomoxan; Exagama; Forlin; Gallogama; Gamacid; Gamaphex; Gamene; Gammahexa; Gammahexane; Gammalin; Gammalin 20; Gammater; Gammex; Gammexane; Gammopaz; Gexane; HCCH; HCH; gamma-HCH; Heclotox; Hexa; Hexachloran; gamma-Hexachloran; Hexachlorane; gamma-Hexachlorane; gamma-Hexachlorobenzene; 1-alpha,2-alpha,3-beta,4-alpha,5-alpha,6-beta-Hexachlorocyclohexane; gamma-Hexachlorocyclohexane; gamma-1,2,3,4,5,6-Hexachlorocyclohexane; Hexachlorocyclohexane, gamma-Isomer; 1,2,3,4,5,6-Hexachlorocyclohexane, gamma-Isomer; Hexatox; Hexaverm; Hexicide; Hexyclan; HGI; Hortex; Inexit; Isotox; Jacutin; Kokotine; Kwell; Lendine; Lentox; Lidenal; Lindafor; Lindagam; Lindagrain; Lindagranox; gamma-Lindane; Lindane (DOT); Lindapoudre; Lindatox; Lindosep; Lintox; Lorexane; Milbol 49; Mszychol; NCI-C00204; NEO-Scabacidol; Nexen FB; Nexit; Nexit-Stark; Nexol-E; Nicochloran; Novigam; Omnitox; Ovadziak; Owadzlak; Pedraczak; Pflanzol; Quellada; Sang gamma; Silvanol; Spritz-Rapidin; Spruehpflanzol; Streunex; Tap 85; TRI-6; Viton

**Chemical Formula:**  $C_6H_6Cl_6$  (Weast 1979, p. C-262)

**Molecular Weight:** 290.83 (Weast 1979, p. C-262)

SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

**OSHA PEL:** 0.5 mg/m<sup>3</sup> (NIOSH/OSHA 1978, p. 120)

**ACGIH TLV:** TWA 0.5 mg/m<sup>3</sup>; STEL 1.5 mg/m<sup>3</sup> (skin) (ACGIH 1983, p. 23)

**IDLH:** 1,000 mg/m<sup>3</sup> (NIOSH/OSHA 1978, p. 120)

**Other Limits Recommended:** Not Found



## LINDANE

### SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

**Boiling Point:** 614°F, 323.4°C (Weast 1979, p. C-262); Decomposes (NIOSH/OSHA 1978, p. 120)

**Specific Gravity** ( $H_2O=1$ ): 1.9 (DASE 1980, p. 529)

**Vapor Pressure** (mmHg):  $9.4 \times 10^{-6}$  at 20°C (Merck 1983, p. 789)

**Melting Point:** 234.5°F, 112.5°C (Weast 1979, p. C-262)

**Vapor Density** (AIR=1): Not Found

**Evaporation Rate** (Butyl acetate=1): Not Found

**Solubility in Water:** Insoluble (Weast 1979, p. C-262)

**Appearance and Odor:** Colorless solid with a musty odor; pure material is odorless (NIOSH/OSHA 1978, p. 120).

### SECTION III -- FIRE AND EXPLOSION HAZARD DATA

**Flash Point** (Method Used): Not Found

**Flammable Limits:**

LEL: Not Found

UEL: Not Found

**Extinguishing Methods:** Use dry chemical, carbon dioxide, water spray, or foam for small fires. Use water spray, fog, or foam for large fires. Move container from fire area if this can be done without risk. Use water to keep fire-exposed containers cool (DOT 1984, Guide 55).

**Special Fire Fighting Procedures:** Isolate hazard area and deny entry. Stay upwind and keep out of low areas. Ventilate closed spaces before entering. Wear positive pressure breathing apparatus and special protective clothing. Fight fire from maximum distance, dike fire control water for later disposal (DOT 1984, Guide 55).

**Unusual Fire and Explosion Hazards:** When heated to decomposition, this compound emits toxic fumes of chlorine, hydrochloric acid, and phosgene (Sax 1984, p. 366).

## LINDANE

### SECTION IV -- REACTIVITY DATA

**Stability:** Unstable: Not Found  
Stable: Not Found

**Conditions to Avoid:** Not Found

**Incompatibility (Materials to Avoid):** Not Found

**Hazardous Decomposition or Byproducts:** Thermal decomposition products may include chlorine, hydrochloric acid, and phosgene (Sax 1984, p. 366).

**Hazardous Polymerization:** May Occur: Not Found  
May Not Occur: Not Found

**Conditions to Avoid:** Not Found

### SECTION V -- HEALTH HAZARD DATA

**Routes of Entry:** Inhalation: Yes (Gosselin 1984, p. III-240)  
Skin: Yes (Gosselin 1984, p. III-240)  
Ingestion: Yes (Gosselin 1984, p. III-240)

**Health Hazards (Acute, Delayed, and Chronic):** Lindane is a stimulant of the nervous system, causing violent convulsions that are rapid in onset and generally followed by death or recovery with 24 hours (Hayes 1982, p. 218). The probable human oral lethal dose is 50-500 mg/kg, or between 1 teaspoon and 1 ounce for a 150-lb (70 kg) person (Gosselin 1984, p. II-286).

**Signs and Symptoms of Exposure:** Contact with eyes or skin may produce irritation (DASE 1980, p. 529). Vomiting, faintness, tremor, restlessness, muscle spasms, unsteady gait, and convulsions may occur as a result of exposure. Elevated body temperature and pulmonary edema have been reported in children. Coma, respiratory failure and death can result. Exposure to vapors of this compound or its thermal decomposition products may lead to headache, nausea, vomiting, and irritation of the eyes, nose, and throat (Gosselin 1984, pp. III-240, 241).

**Medical Conditions Generally Aggravated by Exposure:** Not Found

## LINDANE

### SECTION V -- HEALTH HAZARD DATA (Continued)

**Emergency and First Aid Procedures:** Move victim to fresh air and call emergency medical care. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In case of contact with material, immediately flush skin or eyes with running water for at least 15 minutes, speed in removing material from the skin is of extreme importance. Remove and isolate contaminated clothing and shoes at the site. Keep victim quiet and maintain normal body temperature. Effect may be delayed; keep victim under observation (DOT 1984, Guide 55).

### SECTION VI -- USE INFORMATION

Pesticide (Hawley 1981, p. 617) and scabicide (Hayes 1982, p. 221).

### SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE (Steps to be Taken in Case Material is Released or Spilled)

Do not touch spilled material. Sweep or shovel material into a clean, dry container. Carefully collect remainder. Use protective gloves, eye protection, breathing protection, and special protective clothing (DASE 1980, p. 529; DOT 1984, Guide 55).

## EPA CHEMICAL PROFILE

INTERIM

Date: October 31, 1985

Revision: \_\_\_\_\_

### CHEMICAL IDENTITY -- PHENYLHYDRAZINE HYDROCHLORIDE

CAS Registry Number: 59-88-1

**Synonyms (NIOSH/RTECS 1983 Synonyms, Volume 2, p. 457):** Hydrazine, Phenyl-, Hydrochloride; Hydrazine, Phenyl-, Monohydrochloride; Phenylhydrazine Monohydrochloride; Phenylhydrazinium Chloride

**Chemical Formula:**  $C_6H_8N_2 \cdot HCl$

**Molecular Weight:** 144.62

### SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

**OSHA PEL:** Not Found

**ACGIH TLV:** Not Found

**IDLH:** Not Found

**Other Limits Recommended:** Occupational exposure to hydrazines recommended standard: ceiling 0.6 mg/m<sup>3</sup>/2 hours (Air) (Sax 1984, p. 2190). Toxicity information: LD<sub>low</sub> oral (rabbit) 25 mg/kg (\*NIOSH/RTECS 1985).

### SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

**Boiling Point:** Not pertinent; it decomposes (Weiss 1980, p. 744)

**Specific Gravity (H<sub>2</sub>O=1):** Greater than 1 at 20°C (Weiss 1980, p. 744)

**Vapor Pressure (mmHg):** Not Found

**Melting Point:** 469-475°F, 243-246°C (Merck 1983, p. 1051)

**Vapor Density (AIR=1):** Not Found

**Evaporation Rate (Butyl acetate=1):** Not Found

**Solubility in Water:** Freely soluble (Merck 1983, p. 1051)

**Appearance and Odor:** White to tan solid; weak aromatic odor (Weiss 1980, p. 744).

## PHENYLHYDRAZINE HYDROCHLORIDE

### SECTION III -- FIRE AND EXPLOSION HAZARD DATA

**Flash Point** (Method Used): Not Found

**Flammable Limits:** Combustible (Weiss 1980, p. 744)

LEL: Not Found

UEL: Not Found

**Extinguishing Methods:** Use water, foam, dry chemical, or carbon dioxide (Weiss 1980, p. 744).

**Special Fire Fighting Procedures:** Wear goggles and self-contained breathing apparatus (Weiss 1980, p. 744).

**Unusual Fire and Explosion Hazards:** Toxic and irritating hydrogen chloride and oxides of nitrogen may be produced in fire (Weiss 1980, p. 744).

### SECTION IV -- REACTIVITY DATA

**Stability:** Unstable:

Stable: Yes (Weiss 1980, p. 744)

**Conditions to Avoid:** Not Found

**Incompatibility** (Materials to Avoid): May be corrosive to metals (Weiss 1980, p. 744).

**Hazardous Decomposition or Byproducts:** Hydrogen chloride and oxides of nitrogen (Weiss 1980, p. 744).

**Hazardous Polymerization:** May Occur:

May Not Occur: Yes (Weiss 1980, p. 744)

**Conditions to Avoid:** Not Found

### SECTION V -- HEALTH HAZARD DATA

**Routes of Entry:** Inhalation: Yes (Weiss 1980, p. 744)

Skin: Yes (Weiss 1980, p. 744)

Ingestion: Yes (Weiss 1980, p. 744)

**Health Hazards** (Acute, Delayed, and Chronic): This material is poisonous if swallowed or if fumes are inhaled. Dust is irritating to eyes, nose, and throat. Phenylhydrazine is a chronic poison (Weiss 1980, p. 744). Phenylhydrazine is an industrial substance suspect of carcinogenic potential for humans (ACGIH 1983, p. 43).

## PHENYLHYDRAZINE HYDROCHLORIDE

### SECTION V -- HEALTH HAZARD DATA (Continued)

**Signs and Symptoms of Exposure:** Ingestion or inhalation of fumes can cause nausea, jaundice, anorexia, and blood clots. It may also cause anemia and liver injury. Contact with eyes causes irritation. Contact with skin causes irritation and dermatitis. Inhalation of dust can cause coughing and difficult breathing (Weiss 1980, p. 744).

**Medical Conditions Generally Aggravated by Exposure:** Not Found

**Emergency and First Aid Procedures:** Move victim to fresh air. Remove contaminated clothing and shoes. For ingestion, give a large amount of water; induce vomiting. If eyes are exposed, flush with water for at least 15 minutes. If skin is exposed, flush with water (Weiss 1980, p. 744).

### SECTION VI -- USE INFORMATION

Hemolytic (Merck 1983, p. 1051).

### SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE (Steps to be Taken in Case Material is Released or Spilled)

Wear rubber overclothing, including gloves. Avoid contact with solid and dust. Restrict access. Disperse and flush (Weiss 1980, p. 744).  
(Non-Specific -- Phenylhydrazine) Keep unnecessary people away; isolate hazard area and deny entry. Stay upwind; keep out of low areas. Wear self-contained (positive pressure if available) breathing apparatus and full protective clothing. Do not touch spilled material; stop leak if you can do it without risk. Small spills: take up with sand or other noncombustible absorbent material and place into containers for later disposal. Small dry spills: with clean shovel place material into clean, dry container and cover; move containers from spill area. Large spills: dike far ahead of spill for later disposal (DOT 1984, Guide 53).

## EPA CHEMICAL PROFILE

### INTERIM

Date: October 31, 1985

Revision: \_\_\_\_\_

### CHEMICAL IDENTITY -- METHYLHYDRAZINE

CAS Registry Number: 60-34-4

Synonyms: 1-Methylhydrazine; Hydrazine, Methyl-; Hydrazomethane; MMH; Monomethylhydrazine; UN 1244

Chemical Formula:  $\text{CH}_6\text{N}_2$

Molecular Weight: 46.07

### SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

OSHA PEL: Ceiling 0.35 mg/m<sup>3</sup> (skin) (\*NIOSH/RTECS 1985)

ACGIH TLV: Ceiling 0.35 mg/m<sup>3</sup> (skin) (\*ACGIH 1983)

IDLH: 5 ppm (\*Encyc Occupat Safety and Health 1983)

**Other Limits Recommended:** Methylhydrazine is a suspected human carcinogen with a NIOSH recommended ceiling concentration of 0.08 mg/m<sup>3</sup>/2 hour (\*ACGIH 1984 and \*NIOSH 1985).

### SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

Boiling Point: 190°F, 87.5°C (\*Merck 1983)

Specific Gravity (H<sub>2</sub>O=1): 0.874 at 25°C (\*Merck 1983)

Vapor Pressure (mmHg): 49.6 at 25°C (\*Sunshine 1969)

Melting Point: -62.3°F, -52.4°C (\*Merck 1983)

Vapor Density (AIR=1): 1.6 (\*Sax 1979)

Evaporation Rate (Butyl acetate=1): Not Found

Solubility in Water: Miscible with water (\*Merck 1983)

**Appearance and Odor:** It is a colorless liquid (\*Sax 1979) with an odor characteristic of short-chain, organic amines, or ammonia-like (\*Merck 1983, \*Clayton and Clayton 1981-82).

## METHYLHYDRAZINE

### SECTION III -- FIRE AND EXPLOSION HAZARD DATA

**Flash Point** (Method Used): 70°C (OC) (\*Merck 1983)

**Flammable Limits:**

LEL: 2.5% (Sax 1984, p. 1858)

UEL: 97% (Sax 1984, p. 1858)

**Extinguishing Methods:** For small fires, use dry chemical, carbon dioxide, water spray, and foam. For large fires, use water spray, fog, or foam. Keep unnecessary people away and isolate the hazardous area. Stay upwind and keep out of low-lying areas (DOT 1984, Guide 28). Fire exposed containers should be kept cool with water. Use water spray to disperse vapors and protect men attempting to stop a leak which has not ignited (\*NFPA 1978). Move container from fire area if it can be done without risk (\*DOT 1984).

**Special Fire Fighting Procedures:** Wear positive pressure breathing apparatus and special (full) protective clothing. No skin surface should be exposed (\*NFPA 1978). Isolate area for 1/2-mile in all directions if a tank car or truck is involved in a fire (DOT 1984, Guide 28).

**Unusual Fire and Explosion Hazards:** Extremely flammable; ignites spontaneously under almost all normal temperature conditions (\*NFPA 1978). Water used to extinguish a fire may cause pollution and should be diked for later disposal (DOT 1984, Guide 28). Water may be ineffective in extinguishing fires due to the chemical's low flash point. Because of the wide flammability limits, low flash point, and reignition hazard, dry chemicals, carbon dioxide, water spray, and foam may not be as effective as water dilution of fire area. The vapor is heavier than air; thus it may accumulate sufficiently to flash back (\*NFPA 1978).

### SECTION IV -- REACTIVITY DATA

**Stability:** Unstable: Yes (\*NFPA 1978)

Stable:

**Conditions to Avoid:** Heat or flame should be avoided because chemical is extremely flammable and explosive (\*Sax 1979).

**Incompatibility** (Materials to Avoid): Ignites spontaneously in air when in contact with porous materials (e.g., earth, asbestos, wood, or cloth) (\*NFPA 1978). Also ignites spontaneously on contact with strong oxidizing agents (e.g., fluorine, chlorine trifluoride, fuming nitric acid, and nitrogen tetroxide) (\*Merck 1983).



## METHYLHYDRAZINE

### SECTION IV -- REACTIVITY DATA (Continued)

**Hazardous Decomposition or Byproducts:** Methylhydrazine fires produce irritating nitrogen oxides (\*NFPA 1978).

**Hazardous Polymerization:** May Occur: Not Found  
May Not Occur: Not Found

**Conditions to Avoid:** Not Found

### SECTION V -- HEALTH HAZARD DATA

**Routes of Entry:** Inhalation: Yes (\*Clayton and Clayton 1981-82)  
Skin: Yes (\*Clayton and Clayton 1981-82)  
Ingestion: Yes (\*Clayton and Clayton 1981-82)

**Health Hazards (Acute, Delayed, and Chronic):** Methylhydrazine vapors are extremely toxic and the liquid is corrosive to skin. Methylhydrazine is the strongest convulsant and the most toxic of methyl-substituted hydrazine derivatives (\*Clayton and Clayton 1981-82). It is more toxic than hydrazine (\*NFPA 1978). At high doses, it is a strong central nervous system poison that can lead to convulsions and death (\*Encyc Occupat Health and Safety 1971)

**Signs and Symptoms of Exposure:** Contact may cause burns to skin and eyes. Vapors promptly attack eyes and the respiratory system. Exposure may also lead to central nervous system effects, such as tremors, excitability and, at sufficiently high doses, convulsions and death (\*Encyc Occupat Health and Safety 1971).

**Medical Conditions Generally Aggravated by Exposure:** Skin rash may be aggravated by skin exposure (\*Encyc Occupat Health and Safety 1971).

**Emergency and First Aid Procedures:** Move victim to fresh air and call emergency medical care. If the victim is not breathing, give artificial respiration. If breathing is difficult, give oxygen. In addition, remove and isolate contaminated clothing and shoes at the site. In case of contact with the material, immediately flush skin or eyes with running water for at least 15 minutes. Keep victim quiet and maintain normal body temperature. Keep careful watch on victim as effects may be delayed (DOT 1984, Guide 28).

## METHYLHYDRAZINE

### SECTION VI -- USE INFORMATION

Used as a chemical intermediate and solvent (\*ACGIH 1980). Also used as a component of rocket propellants (\*SRI).

### SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE

(Steps to be Taken in Case Material is Released or Spilled)

In the case of a spill or leak, shut off ignition sources, and extinguish or disallow flares, smoking, or flames in the hazard area. Do not touch the spilled material, and stop leak if it can be done without risk. Use water spray to reduce vapors. For small spills, take up the chemical with sand or other noncombustible absorbent material and place it in containers for later disposal. For large spills, dike far ahead for later disposal (\*DOT 1984).

EPA CHEMICAL PROFILE

INTERIM

Date: October 31, 1985

Revision: \_\_\_\_\_

CHEMICAL IDENTITY -- STRYCHNINE, SULFATE

CAS Registry Number: 60-41-3

Synonyms: (NIOSH/RTECS Synonyms 1983, Volume 3, p. 650) Strychnine, Sulfate (2:1); Strychnine Sulfate; Strychnidin-10-one, Sulfate (2:1)

Chemical Formula:  $C_{21}H_{22}N_2O_2 \cdot 1/2 H_2O_4S$

Molecular Weight: 383.49

SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

OSHA PEL: Not Found

ACGIH TLV: Not Found

IDLH: Not Found

Other Limits Recommended: TWA for strychnine is 150  $\mu\text{g}/\text{m}^3$  (ACGIH 1984, p. 29). Toxicity information:  $LD_{50}$  oral (rat) 5 mg/kg

(\*NIOSH/RTECS 1985).

SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

Boiling Point: Not Found

Specific Gravity ( $H_2O=1$ ): Not Found

Vapor Pressure (mmHg): Not Found

Melting Point: 392°F, 200°C with decomposition (Merck 1983, p. 1269)

Vapor Density (AIR=1): Not Found

Evaporation Rate (Butyl acetate=1): Not Found

Solubility in Water: 1 g dissolves in 35 mL, 7 mL boiling water (Merck 1983, p. 1269)

Appearance and Odor: Colorless, odorless, very bitter crystals; white crystalline powder (Merck 1983, p. 1269).

**STRYCHNINE, SULFATE****SECTION III -- FIRE AND EXPLOSION HAZARD DATA**

**Flash Point** (Method Used): Not Found

**Flammable Limits:**

LEL: Not Found

UEL: Not Found

**Extinguishing Methods:** (Non-Specific -- Strychnine and Salts) Small fires: dry chemical, carbon dioxide, water spray, or foam. Large fires: water spray, fog, or foam. Move container from fire area if you can do it without risk (DOT 1984, Guide 53).

**Special Fire Fighting Procedures:** (Non-Specific -- Strychnine and Salts) Keep unnecessary people away; isolate hazard area and deny entry. Stay upwind; keep out of low areas. Wear self-contained (positive pressure if available) breathing apparatus and full protective clothing (DOT 1984, Guide 53).

**Unusual Fire and Explosion Hazards:** When heated to decomposition, it emits very toxic fumes of sulfur oxides and nitrogen oxides (Sax 1984, p. 2473).

**SECTION IV -- REACTIVITY DATA**

**Stability:** Unstable: Not Found

Stable: Not Found

**Conditions to Avoid:** Protect from light (Merck 1983, p. 1269).

**Incompatibility** (Materials to Avoid): Alkalies, alkali carbonates and bicarbonates, benzoates, dichromates, bromides, iodides, tannic and picric acids, salicylates, borax, gold chloride and other alkaloid precipitants, piperazine, potassium-mercuric iodide (Merck 1983, p. 1269).

**Hazardous Decomposition or Byproducts:** Emits very toxic fumes of sulfur oxides and nitrogen oxides when heated to decomposition (Sax 1984, p. 2473).

**Hazardous Polymerization:** May Occur: Not Found

May Not Occur: Not Found

**Conditions to Avoid:** Not Found

## STRYCHNINE, SULFATE

### SECTION V -- HEALTH HAZARD DATA

**Routes of Entry:** **Inhalation:** Yes (Weiss 1980, p. 1156)  
**Skin:** Not Found  
**Ingestion:** Yes (Sax 1984, p. 2473)

**Health Hazards** (Acute, Delayed, and Chronic): Violent poison! (Merck 1983, p. 1269). Lowest published lethal dose orally in humans is 30 mg/kg (Weiss 1980, p. 1156).

**Signs and Symptoms of Exposure:** (Non-Specific -- Strychnine) First signs of poisoning are nervousness, restlessness, and twitching of muscles, especially those in the face and neck. As condition progresses muscular twitching becomes more pronounced and convulsions suddenly appear. All skeletal muscles contract antagonistically; limbs are extended and neck is curved backwards. The pupil is widely dilated. Death results from asphyxia during a seizure or from exhaustion (Hayes 1982, p. 100).

**Medical Conditions Generally Aggravated by Exposure:** Not Found

**Emergency and First Aid Procedures:** (Non-Specific Strychnine) Keep victim in a comfortably warm, quiet, and darkened room; a minor sensory stimulus may trigger a convulsion (Gosselin 1984, p. III-377). (Non-Specific -- Strychnine and Salts) Call emergency medical care. Remove and isolate contaminated clothing and shoes at the site. In case of contact with material, immediately flush skin or eyes with running water for at least 15 minutes (DOT 1984, Guide 53).

### SECTION VI -- USE INFORMATION

Has been used as a tonic and stimulant in veterinary medicine (Merck 1983, p. 1269). Registered as a rodenticide in the U.S. (USEPA/Pesticide Index 1985).

### SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE

(Steps to be Taken in Case Material is Released or Spilled)

(Non-Specific -- Strychnine and Salts) Wear self-contained (positive pressure if available) breathing apparatus and full protective clothing. Do not touch spilled material; stop leak if you can do it without risk. Small spills: take up with sand or other noncombustible absorbent material and place into containers for later disposal. Small dry spills: with clean shovel place material into clean, dry container and cover; move containers from spill area. Large spills: dike far ahead of spill for later disposal (DOT 1984, Guide 53).

EPA CHEMICAL PROFILE

INTERIM

Date: October 31, 1985

Revision: \_\_\_\_\_

CHEMICAL IDENTITY -- DIMETHOATE

CAS Registry Number: 60-51-5

**Synonyms:** 8014 Bis HC; Acetic Acid, O,O-Dimethyldithiophosphoryl-, N-Monomethylamide Salt; American Cyanamid 12,880; BI 58; CL 12880; Cygon; Cygon 4E; Cygon Insecticide; Daphene; De-Fend; Demos-L40; Dimethogen; Dimeton; Dimevur; ENT 24650; Experimental Insecticide 12,880; FIP; Fosfotox; Fosfotox R; Fosfotox R 35; Fostion MM; Lurgo; NCI-C00135; O,O-Dimethyl S-(N-Methylcarbamoylmethyl) Dithiophosphate; O,O-Dimethyl S-(N-Methylcarbamoylmethyl) Phosphorodithioate; O,O-Dimethyl S-Methylcarbamoylmethyl Phosphorodithioate; O,O-Dimethyldithiophosphorylacetic Acid, N-Monomethylamide Salt; PEI 75; Perfecthion; Perfekthion; Phosphamid; Phosphamide; Phosphorodithioic Acid O,O-Dimethyl Ester, Ester With 2-Mercapto-N-Methylacetamide; Phosphorodithioic Acid, O,O-Dimethyl S-(2-(Methylamino)-2-Oxoethyl) Ester; Racusan; Rogor; Rogor 20L; Rogor 40; Rogor L; Rogor P; Roxion; S-Methylcarbamoylmethyl O,O-Dimethyl Phosphorodithioate; Sinoratox; Systoate

**Chemical Formula:**  $C_5H_{12}NO_3PS_2$

**Molecular Weight:** 229.28

SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

OSHA PEL: Not Found

ACGIH TLV: Not Found

IDLH: Not Found

**Other Limits Recommended:** ADI 0.02 mg/kg (\*Hayes 1975). Toxicity information: LD<sub>50</sub> oral (mammal) 15 mg/kg (\*NIOSH/RTECS 1985)

SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

Boiling Point: Not Found

Specific Gravity (H<sub>2</sub>O=1): 1.277 at 65°C (\*Merck 1983)

Vapor Pressure (mmHg):  $8.5 \times 10^{-6}$  at 77°F (\*Worthing 1979)

## DIMETHOATE

### SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS (Continued)

**Melting Point:** 125°F, 52°C (\*Merck 1983), 113-117°F, 45-47°C for technical product (Worthing 1983)

**Vapor Density (AIR=1):** Not Found

**Evaporation Rate (Butyl acetate=1):** Not Found

**Solubility in Water:** 2-3 g/100 ml (\*Spencer 1982)

**Appearance and Odor:** A white crystalline solid (\*Spencer 1982) with a camphor-like odor (\*Worthing 1979); white to greyish crystals for technical product (Worthing 1983)

### SECTION III -- FIRE AND EXPLOSION HAZARD DATA

**Flash Point (Method Used):** 124°F (CC) (\*NFPA 1978)

**Flammable Limits:**

LEL: Not Found

UEL: Not Found

**Extinguishing Methods:** This material is an organophosphate insecticide (\*White-Stevens 1971; \*Worthing 1979). Methods for organophosphorus pesticides are as follows. Small fires: dry chemical, carbon dioxide, water spray, and foam. Large fires: water spray, fog, or foam (DOT 1984, Guide 55).

**Special Fire Fighting Procedures:** Procedures for organophosphorus pesticides are as follows. Dike fire control water for later disposal, do not scatter the material. Wear positive pressure breathing apparatus and protective clothing. Fight fire from maximum distance (DOT 1984, Guide 55).

**Unusual Fire and Explosion Hazards:** As with other organophosphorus pesticides, container may explode in heat of fire (DOT 1984, Guide 55).

## DIMETHOATE

### SECTION IV -- REACTIVITY DATA

**Stability:** Unstable:

**Stable:** Yes (\*Spencer 1973)

**Conditions to Avoid:** The temperature of storage should not exceed 70-80°F. Keep away from sources of heat, flames, or spark-generating equipment (\*Farm Chemicals Handbook 1983). Unstable in alkaline solution. Hydrolyzed by aqueous alkali. Stable in aqueous solutions. The compound is stable for 2 years under environmental conditions if stored in undamaged, original containers (\*Spencer 1973).

**Incompatibility (Materials to Avoid):** Not Found

**Hazardous Decomposition or Byproducts:** Not Found

**Hazardous Polymerization:** May Occur: Not Found

May Not Occur: Not Found

**Conditions to Avoid:** Not Found

### SECTION V -- HEALTH HAZARD DATA

**Routes of Entry:** Inhalation: Yes (\*Encyc Occupat Health and Safety 1983)

Skin: Yes (\*Encyc Occupat Health and Safety 1983)

Ingestion: Yes (\*Encyc Occupat Health and Safety 1983)

**Health Hazards (Acute, Delayed, and Chronic):** Very toxic; the probable oral lethal dose in humans is between 50-500 mg/kg, or between 1 teaspoon and 1 ounce for a 70 kg (150 lb.) person. Dimethoate is a cholinesterase inhibitor, meaning it affects the central nervous system. Death is due to respiratory arrest arising from failure of respiratory center, paralysis of respiratory muscles, intense bronchoconstriction or all three (\*Gosselin 1976).

**Signs and Symptoms of Exposure:** Nausea, excessive salivation, sweating, visual disturbances, headache and fatigue are common symptoms. A running nose and sensation of tightness in the chest are common in inhalation exposures. In severe poisonings, loss of muscular coordination and convulsions can occur (\*Gosselin 1976; \*Morgan 1982). Difficulty in breathing, frothing of the mouth and nose, and mental confusion may also be noted (\*Gosselin 1976). Symptoms from dimethoate poisoning are similar to other organophosphorus insecticides, but may develop more slowly (\*Encyc Occupat Health and Safety 1983).



**DIMETHOATE****SECTION V -- HEALTH HAZARD DATA (Continued)**

**Medical Conditions Generally Aggravated by Exposure:** Not Found

**Emergency and First Aid Procedures:** Bathe and shampoo with soap and water if there is any chance that skin and hair is contaminated (\*Morgan 1982). This is an organophosphate insecticide (\*White-Stevens 1971; \*Worthing 1979). First aid procedures for organophosphorus pesticides are as follows. Move victim to fresh air; call emergency medical care. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In case of contact with material, immediately flush skin or eyes with running water for at least 15 minutes. Speed in removing material from skin is of extreme importance. Remove and isolate contaminated clothing and shoes at the site. Keep victim quiet and maintain normal body temperature. Effects may be delayed; keep victim under observation (DOT 1984, Guide 55).

**SECTION VI -- USE INFORMATION**

Dimethoate is a contact and systemic organophosphate insecticide effective against a broad range of insects and mites when applied on a wide range of crops (\*Worthing 1979; \*SRI; \*White-Stevens 1971). It has not been produced in the U.S. since 1982 (\*SRI).

**SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE**

(Steps to be Taken in Case Material is Released or Spilled)

Wear rubber gloves, and to be safe, a respirator certified against toxic vapors (\*Rumack 1975 to Present). Dimethoate is an organophosphate insecticide (\*White-Stevens 1971; \*Worthing 1979). Precautions for organophosphorus pesticides include the following. Keep unnecessary people away; isolate hazard area and deny entry. Stay upwind; keep out of low areas. Ventilate closed spaces before entering them. Wear positive pressure breathing apparatus and special protective clothing. Remove and isolate contaminated clothing at the site. Do not touch spilled material; stop leak if you can do so without risk. Use water spray to reduce vapors. Small spills: absorb with sand or other noncombustible absorbent material and place into containers for later disposal. Small dry spills: with clean shovel place material into clean, dry container and cover; move containers from spill area. Large spills: dike far ahead of spill for later disposal (DOT 1984, Guide 55).

## EPA CHEMICAL PROFILE

## INTERIM

Date: October 31, 1985

Revision: \_\_\_\_\_

## CHEMICAL IDENTITY -- PHENYLMERCURY ACETATE

CAS Registry Number: 62-38-4

**Synonyms:** (Acetoxymcuri)Benzene; Acetic Acid, Phenylmercury Deriv; Acetoxyphenylmercury; Agrosan GN 5; Algimycin; Antimucin WDR; Bufen; Ceresan Universal; Contra Creme; Dyanacide; Femma; FMA; Fungitox OR; Gallotox; HL-331; Hostaquick; Kwixsan; Leytosan; Liquiphene; Mercury(II) Acetate, Phenyl-; Mercury, (Acetato)Phenyl-; Mersolite; Mersolite 8; Metasol 30; Norforms; Phenmad; Phenomercuric Acetate; Phenylmercuriacetate; Phenylmercuric Acetate; Phix; PMA; PMAC; PMacetate; PMAL; PMAS; Programin; Purasan-SC-10; Puraturf 10; Quicksan 20; Sanitized SPG; SC-110; Shimmerex; Spor-Kil; TAG; Trigosan; Ziarnik; Mercury, (Acetato-O)Phenyl-

Chemical Formula:  $C_8H_8HgO_2$ 

Molecular Weight: 336.75

## SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

OSHA PEL: Not Found

ACGIH TLV: TWA 0.1 mg/m<sup>3</sup> (skin) (\*ACGIH 1983)

IDLH: Not Found

**Other Limits Recommended:** TWA air 0.05 mg (Hg)/m<sup>3</sup>. Toxicity information: LD<sub>50</sub> oral (rat) 22 mg/kg (\*NIOSH/RTECS 1985)

## SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

Boiling Point: Not Found

Specific Gravity (H<sub>2</sub>O=1): Not FoundVapor Pressure (mmHg):  $9 \times 10^{-6}$  at 35°C (\*Worthing 1979)

Melting Point: 300°F, 149°C (\*Merck 1983)

Vapor Density (AIR=1): Not Found

Evaporation Rate (Butyl acetate=1): Not Found

## PHENYLMERCURY ACETATE

### SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS (Continued)

**Solubility in Water:** 1 g/180 ml (\*Osol 1980); soluble in about 600 parts water (Merck 1983, p. 1052)

**Appearance and Odor:** White to creamy white crystalline powder or small white prisms or leaflets. Odorless (\*Osol 1980).

### SECTION III -- FIRE AND EXPLOSION HAZARD DATA

**Flash Point (Method Used):** Above 100°F (OC) (\*NFPA 1978)

**Flammable Limits:**

LEL: Not Found

UEL: Not Found

**Extinguishing Methods:** Use dry chemical, foam, or carbon dioxide on solution. Use water as necessary, but run-off should be limited and controlled to prevent it from entering streams or water supplies (\*NFPA 1978).

**Special Fire Fighting Procedures:** Materials are extremely hazardous to health, but areas may be entered with extreme care. Full protective clothing, including self-contained breathing apparatus, rubber gloves, boots and bands around legs, arms, and waist should be provided. No skin should be exposed (\*NFPA 1978).

**Unusual Fire and Explosion Hazards:** Fire may produce irritating or poisonous gases (\*DOT 1984).

### SECTION IV -- REACTIVITY DATA

**Stability:** Unstable:

Stable: Yes (\*NFPA 1978)

**Conditions to Avoid:** Not Found

**Incompatibility (Materials to Avoid):** Phenylmercuric ion is incompatible with halides, with which precipitates are formed (\*Osol 1980).

**Hazardous Decomposition or Byproducts:** When heated to decomposition, very toxic mercuric fumes may be given off (Sax 1984, p. 100).

**Hazardous Polymerization:** May Occur: Not Found

May Not Occur: Not Found

**Conditions to Avoid:** Not Found

## PHENYLMERCURY ACETATE

### SECTION V -- HEALTH HAZARD DATA

**Routes of Entry:** Inhalation: Yes (\*Hawley 1977)  
Skin: Yes (\*Hawley 1977)  
Ingestion: Yes (\*Hawley 1977)

**Health Hazards (Acute, Delayed, and Chronic):** Extremely toxic. The probable oral lethal dose for humans is 5-50 mg/kg, between 7 drops and 1 teaspoonful for a 70 kg (150 lb.) person (Gosselin 1984, p. II-137).

**Signs and Symptoms of Exposure:** Symptoms arising from acute exposure may occur at varying intervals up to several weeks following exposure. Ingestion of mercurial fungicide treated grain resulted in gastrointestinal irritation with nausea, vomiting, abdominal pain, and diarrhea. Alkylmercurials produce severe neurologic toxicity, such as loss of feeling in lips, tongue, and extremities, confusion, hallucinations, irritability, sleep disturbances, staggering walk, memory loss, slurred speech, auditory defects, emotional instability, and inability to concentrate. It is also a strong skin irritant; erythema and blistering may result 6-12 hours after exposure (\*Rumack 1975 to Present). Phenylmercury acetate, at sufficient concentration, is expected to be injurious to the eye externally (\*Grant 1974).

**Medical Conditions Generally Aggravated by Exposure:** Not Found

**Emergency and First Aid Procedures:** Move victim to fresh air; call emergency medical care. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In case of contact with material, immediately flush skin and eyes with running water for at least 15 minutes. Speed in removing material from the skin is of extreme importance. Remove and isolate contaminated clothing and shoes at the site. Keep victim quiet and maintain normal body temperature. Effects may be delayed; keep victim under observation (DOT 1984, Guide 55).

### SECTION VI -- USE INFORMATION

Used as an antiseptic, fungicide, herbicide; mildewcide for paints; slimicide in paper mills (\*Hawley 1977). It was also used in contraceptive gels and foams (\*Osol 1980).

PHENYLMERCURY ACETATE

SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE

(Steps to be Taken in Case Material is Released or Spilled)

Wear protective clothing and positive pressure breathing apparatus (see Section III). Do not touch spilled material; stop leak if you can do it without risk. Use water spray to reduce vapors. Small spills: take up with sand or other noncombustible absorbent material and place into containers for later disposal. Small dry spills: with clean shovel place material into clean, dry container and cover; move containers from spill area. Large spills: dike far ahead of spill for later disposal (\*DOT 1984).

EPA CHEMICAL PROFILE

INTERIM

Date: October 31, 1985

Revision: \_\_\_\_\_

CHEMICAL IDENTITY -- ANILINE

CAS Registry Number: 62-53-3

**Synonyms:** Aminobenzene; Aminophen; Aniline Oil; Anyvim; Benzenamine; Benzene, Amino-; Benzidam; Blue Oil; CI 76000; CI Oxidation Base 1; Cyanol; Krystallin; Kyanol; NCI-C03736; Phenylamine

**Chemical Formula:**  $C_6H_7N$

**Molecular Weight:** 93.12

SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

**OSHA PEL:** Air: TWA 5 ppm (19 mg/m<sup>3</sup>) (skin) (\*NIOSH/RTECS 1985)

**ACGIH TLV:** TWA 2 ppm (10 mg/m<sup>3</sup>) (skin); STEL 5 ppm (20 mg/m<sup>3</sup>) (skin) (\*ACGIH 1982)

**IDLH:** 100 ppm (NIOSH/OSHA 1978, p. 46)

**Other Limits Recommended:** Not Found

SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

**Boiling Point:** 363-367°F, 184-186°C (\*Merck 1976)

**Specific Gravity (H<sub>2</sub>O=1):** 1.022 at 20°C/20°C (\*Merck 1976)

**Vapor Pressure (mmHg):** 0.67 at 25°C (\*IARC 1972-85)

**Melting Point:** 21°F, -6.3°C (\*Weast 1979)

**Vapor Density (AIR=1):** 3.22 (\*Clayton and Clayton 1981-82)

**Evaporation Rate (Butyl acetate=1):** Not Found

**Solubility in Water:** 1 gram in 28.6 mL water (\*Merck 1976)

**Appearance and Odor:** Brown oily liquid (\*Student 1981) with an aromatic amine-like odor (\*CHRIS 1978); colorless when freshly distilled (Merck 1983, p. 96)

## ANILINE

### SECTION III -- FIRE AND EXPLOSION HAZARD DATA

**Flash Point** (Method Used): 158°F, 70°C (CC) (\*NFPA 1978)

**Flammable Limits:**

LEL: 1.3% (\*NFPA 1978)

UEL: 20-25% (\*Sax 1975)

**Extinguishing Methods:** Use water spray, dry chemical, foam or carbon dioxide. Use water to keep fire-exposed containers cool (\*NFPA 1984).

**Special Fire Fighting Procedures:** Fight fire from maximum distance. Dike fire control water for later disposal and do not scatter material (\*DOT 1984). If a leak or spill has not ignited, use water spray to control vapors (\*NFPA 1978). Wear self-contained breathing apparatus with a full face piece operated in pressure-demand or other positive pressure mode (\*NIOSH/OSHA 1981) and special protective clothing (\*DOT 1984).

**Unusual Fire and Explosion Hazards:** Combustion can produce toxic fumes including nitrogen oxides and carbon monoxide (\*General Electric Co. 1978, MSDS #407). Aniline vapor forms explosive mixtures with air (\*ITI 1982).

### SECTION IV -- REACTIVITY DATA

**Stability:** Unstable:

Stable: Yes (\*NFPA 1978)

**Conditions to Avoid:** Heating (\*Sax 1975)

**Incompatibility** (Materials to Avoid): It is incompatible with strong oxidizers and strong acids (NIOSH/OSHA 1978, p. 46) and a number of other materials (\*Bretherick 1979; \*ITI 1982; \*Sax 1984).

**Hazardous Decomposition or Byproducts:** When heated to decomposition, it emits highly toxic fumes (\*Sax 1975). These fumes may include nitrogen oxides and carbon monoxide (General Electric Co. 1978, MSDS #407).

**Hazardous Polymerization:** May Occur: Yes (\*IARC 1972-85)  
May Not Occur:

**Conditions to Avoid:** Polymerizes to a resinous mass (\*IARC 1972-85).

### SECTION V -- HEALTH HAZARD DATA

**Routes of Entry:** Inhalation: Yes (\*Merck 1976)

Skin: Yes (\*Merck 1976)

Ingestion: Yes (\*Merck 1976)

## ANILINE

### SECTION V -- HEALTH HAZARD DATA (Continued)

**Health Hazards (Acute, Delayed, and Chronic):** It is classified as very toxic. Probable oral lethal dose in humans is 50-500 mg/kg for a 150 lb. person. Aniline poisoning is characterized by methemoglobin formation in the blood and resulting cyanosis or blue skin (\*Gosselin 1976). The formation of methemoglobin interferes with the oxygen-carrying capacity of the blood (Doull 1980, p. 319). The approximate minimum lethal dose for a 150 lb. human is 10 grams (\*Arena 1979). Serious poisoning may result from ingestion of 0.25 mL (\*Merck 1976).

**Signs and Symptoms of Exposure:** Symptoms include grayish blue skin, headache, nausea, sometimes vomiting, dryness of throat, confusion, vertigo, lack of muscle coordination, ringing in the ears, weakness, disorientation, lethargy, drowsiness and coma. Urinary signs include painful urinating, blood in the urine, the presence of hemoglobin in the urine, and diminished amounts of urine (\*Gosselin 1976). Chronic exposure can cause anemia, anorexia, weight loss, and skin lesions (\*Merck 1976).

**Medical Conditions Generally Aggravated by Exposure:** People at special risk include individuals with glucose-6-phosphate-dehydrogenase deficiency (\*Arena 1979) and those with liver and kidney disorders, blood diseases, or a history of alcoholism (\*General Electric Co. 1978, MSDS #407).

**Emergency and First Aid Procedures:** Move victim to fresh air and call emergency medical care. If not breathing, give artificial respiration. If breathing is difficult give oxygen. In case of contact with material, immediately flush skin or eyes with running water for at least 15 minutes. Speed in removing material is of extreme importance. Remove and isolate contaminated clothing. Keep victim quiet and maintain normal body temperature. Effects may be delayed, keep victim under observation (\*DOT 1984).

### SECTION VI -- USE INFORMATION

Manufacture of dyes, resins, varnishes, perfumes, shoe blacks, vulcanizing rubber; solvent (\*Merck 1976); inks, paint removers (\*Dreisbach 1977); herbicides, fungicides, explosives, photographic chemicals (\*Hawley 1977); isocyanates (\*SRI); and rigid polyurethanes (\*NIOSH/OSHA 1981). It is a chemical intermediate for dyes and pigments and a number of other materials (\*SRI).



## ANILINE

### SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE

(Steps to be Taken in Case Material is Released or Spilled)

Keep unnecessary people away; isolate hazard area and deny entry. Stay upwind; keep out of low areas. Ventilate closed spaces before entering them. Wear positive pressure breathing apparatus and special protective clothing. Shut off ignition sources; no flares, smoking or flames in hazard area. Do not touch spilled material; stop leak if you can do it without risk. Use water spray to reduce vapors. Small spills: take up with sand or other non-combustible absorbent material and place into containers for later disposal. Large spills: dike far ahead of spill for later disposal (\*DOT 1984).

## EPA CHEMICAL PROFILE

## INTERIM

Date: October 31, 1985

Revision: \_\_\_\_\_

## CHEMICAL IDENTITY -- DICHLORVOS

CAS Registry Number: 62-73-7

**Synonyms:** O,O-Dimethyl O-2,2-Dichlorovinyl Phosphate; 2,2-Dichloroethenyl Phosphoric Acid Dimethyl Ester; 2,2-Dichlorovinyl Dimethyl Phosphate; Atgard; Bay-19149; Bibesol; Brevinyl; Brevinyl E50; Canogard; Cekusan; Chlorvinphos; Cyanophos; DDVF; DDVP; DEDEVAP; Deriban; Derribante; Dichlorman; Dichlorovas; Dichlorovos; Dichlorphos; Dimethyl 2,2-Dichloroethenyl Phosphate; Dimethyl 2,2-Dichlorovinyl Phosphate; Divipan; ENT 20738; Equigard; Equigel; Estrosel; Ethenol, 2,2-Dichloro-, Dimethyl Phosphate; Fecama; Herkal; Herkol; Krecalvin; Mafu; Marvex; NCI-C00113; Nerkol; No-Pest Strip; Nogos; Nuva; O,O-Dimethyl Dichlorovinyl Phosphate; OMS 14; Phosphoric Acid, 2,2-Dichlorovinyl Dimethyl Ester; Phosphoric Acid, 2,2-Dichloroethenyl Dimethyl Ester; Phosvit; Szklarniak; Task; Vapona; Vaponite; 2,2-Dichloroethenyl phosphate; Atgard V; Brevinyl Weedat 0002; Celcusan; Dichlorophos; Dimethyl dichlorovinyl phosphate; Nuvan 100 EC; Unifos; Vapona insecticide; Astrobot; Estrosol; Nuvan; SD1750; Fly fighter; Fly-die; Mopari UN NA 2783; Nogos 50; Nogos G; NSC-6738; OKO; Tap 9vp; Task Tabs; Tenac; UDVF; Unifos 50 EC; Vapona II; Verdican; Verdipor; Vinyl alcohol, 2,2-Dichloro-, Dimethyl Phosphate; Vinylophos

**Chemical Formula:**  $C_4H_7Cl_2O_4P$ **Molecular Weight:** 220.98

## SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

**OSHA PEL:** TWA 1 mg/m<sup>3</sup> (skin) (NIOSH/OSHA 1978, p. 84)**ACGIH TLV:** TWA 0.1 ppm, 1 mg/m<sup>3</sup>; STEL 0.3 ppm, 3 mg/m<sup>3</sup> (\*ACGIH 1980)**IDLH:** 200 mg/m<sup>3</sup> (NIOSH/OSHA 1978, p. 84)**Other Limits Recommended:** Not Found

## DICHLORVOS

### SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

**Boiling Point:** 284°F, 140°C at 20 mmHg (\*Merck 1976)

**Specific Gravity** (H<sub>2</sub>O=1): 1.415 at 25°C/4°C (\*Merck 1976)

**Vapor Pressure** (mmHg): 0.01 at 30°C (\*Sunshine 1969)

**Melting Point:** Not Found

**Vapor Density** (AIR=1): Not Found

**Evaporation Rate** (Butyl acetate=1): Not Found

**Solubility in Water:** Approximately 1 g/100 ml (\*Merck 1976)

**Appearance and Odor:** Oily colorless to amber liquid with an aromatic chemical odor (\*Patty 1963; \*NIOSH/OSHA 1981)

### SECTION III -- FIRE AND EXPLOSION HAZARD DATA

**Flash Point** (Method Used): Greater than 175°F (no method given) (\*NFPA 1978)

**Flammable Limits:** Moderately flammable (NIOSH/OSHA 1978, p. 84); will not ignite easily (\*DOT 1984)

**LEL:** Not Found

**UEL:** Not Found

**Extinguishing Methods:** Water in flooding quantities as fog, alcohol foam, dry chemical, or carbon dioxide (NIOSH/OSHA 1978, p. 84). Do not scatter the material (\*DOT 1984).

**Special Fire Fighting Procedures:** Use self-contained breathing apparatus with a full face piece operated on pressure-demand or other positive pressure mode. Prevent skin contact with protective clothing (\*NIOSH/OSHA 1978). Isolate area and deny entry. Fight fire from maximum distance. Dike fire control water for future disposal (\*DOT 1984).

**Unusual Fire and Explosion Hazards:** Highly toxic chloride fumes or phosgene may be released when this product burns. Firefighters should take precautions noted above (\*Sax 1979).

## DICHLORVOS

### SECTION IV -- REACTIVITY DATA

**Stability:** Unstable: Yes (\*Encyc Occupat Health and Safety 1971)  
Stable:

**Conditions to Avoid:** Hydrolyzes in water (\*Sunshine 1969).

**Incompatibility (Materials to Avoid):** Corrosive to iron and mild steel (\*Worthing 1979); acids or acid fumes (\*Sax 1979).

**Hazardous Decomposition or Byproducts:** Toxic chloride fumes and phosgene formed if heated to decomposition or on contact with acid or acid fumes (\*Sax 1979).

**Hazardous Polymerization:** May Occur: Not Found  
May Not Occur: Not Found

**Conditions to Avoid:** Not Found

### SECTION V -- HEALTH HAZARD DATA

**Routes of Entry:** Inhalation: Yes (\*DOT 1984)  
Skin: Yes (\*DOT 1984)  
Ingestion: Yes (\*DOT 1984)

**Health Hazards (Acute, Delayed, and Chronic):** Dichlorvos is a very toxic compound with a probable lethal oral dose in humans between 50 and 500 mg/kg, or between 1 teaspoonful and 1 oz. for a 70 kg (150 lb.) person. However, brief exposure (30-60 minutes) to vapor concentrations as high as 6.9 µg/liter did not result in clinical signs or depressed serum cholinesterase levels. Toxic changes are typical of organophosphate insecticide poisoning with progression to respiratory distress, respiratory paralysis, and death if there is no clinical intervention (Gosselin 1984, pp. II-291 and III-336, 337).

**Signs and Symptoms of Exposure:** Sweating, twitching, contracted pupils, respiratory distress (tightness in the chest and wheezing), salivation (drooling), lacrimation (tearing), nausea, vomiting, abdominal cramps, diarrhea, involuntary defecation and urination, slurred speech, coma, apnea (cessation of breathing), and death (Doull 1980, pp. 367-368).

**Medical Conditions Generally Aggravated by Exposure:** Not Found

**DICHLORVOS****SECTION V -- HEALTH HAZARD DATA (Continued)**

**Emergency and First Aid Procedures:** Call emergency medical care. If victim was exposed by inhalation, move to fresh air. If not breathing, give artificial respiration; if breathing is difficult, give oxygen. If exposure was by contact, flush skin or eyes with running water for at least 15 minutes; it is critical to remove the material from the skin as quickly as possible. Also remove contaminated clothing and shoes. Victim should be kept quiet, warm, and observed for delayed effects (\*DOT 1984).

**SECTION VI -- USE INFORMATION**

Agricultural insecticide for use on crops, stored products, animals, and premises; insecticide for slow release on pest-strips for pest control in homes and aircraft; anthelmintic for dogs, swine, and horses; boticide for horses; flea collars for dogs (\*Gosselin 1976; \*Rossoff 1974; \*Worthing 1979; \*SRI).

**SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE**

(Steps to be Taken in Case Material is Released or Spilled)

Prevent access to area from public by isolating area and denying entry. Ventilate closed spaces before entering them. Wear positive pressure breathing apparatus, goggles, and special protective clothing. Remove and isolate contaminated clothing at the site. Do not touch spilled material; stop leaks if you can do it without risk. Reduce vapors with water spray. Take up small spills with sand or other noncombustible absorbent material for later disposal in canisters. Dike large spills far ahead of spill for later disposal (\*DOT 1984).

EPA CHEMICAL PROFILE

INTERIM

Date: October 31, 1985

Revision: \_\_\_\_\_

CHEMICAL IDENTITY -- SODIUM FLUOROACETATE

CAS Registry Number: 62-74-8

**Synonyms:** Acetic Acid, Fluoro-, Sodium Salt; 1080; Compd 1080; Compound No. 1080; Fluoroacetic Acid, Sodium Salt; Fratol; Furatol; Ratbane 1080; SMFA; Sodium Fluoacetate; Sodium Fluoacetic Acid; Sodium Fluoracetate; Sodium Monofluoroacetate; Ten-Eighty; TL 869; Yasoknock

**Chemical Formula:**  $C_2H_2FO_2Na$

**Molecular Weight:** 100.02

SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

**OSHA PEL:** TWA 0.05 mg/m<sup>3</sup> (skin) (\*NIOSH/RTECS 1985)

**ACGIH TLV:** TWA 0.05 mg/m<sup>3</sup> (skin); STEL 0.15 mg/m<sup>3</sup> (skin) (\*ACGIH 1983)

**IDLH:** 5 mg/m<sup>3</sup> (NIOSH/OSHA 1978, p. 166)

**Other Limits Recommended:** Not Found

SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

**Boiling Point:** Not Found

**Specific Gravity (H<sub>2</sub>O=1):** Not Found

**Vapor Pressure (mmHg):** 0.0 at 20°C (\*ACGIH 1980)

**Melting Point:** 392°F, 200°C (\*Weast 1979); decomposes at 392°F, 200°C (\*Hawley 1981)

**Vapor Density (AIR=1):** Not Found

**Evaporation Rate (Butyl acetate=1):** Not Found

**Solubility in Water:** 1110 g/liter at 25°C (\*Weast 1979)

**SODIUM FLUOROACETATE**

**SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS (Continued)**

**Appearance and Odor:** White powder (\*Weast 1979); odorless (\*Hawley 1981). Usually marketed as water solution containing 0.5 percent Nigrosine as black warning color (\*Spencer 1982).

**SECTION III -- FIRE AND EXPLOSION HAZARD DATA**

**Flash Point (Method Used):** Not Found

**Flammable Limits:** Not combustible (NIOSH/OSHA 1978, p. 166)

**LEL:** Not Found

**UEL:** Not Found

**Extinguishing Methods:** Use dry chemical, carbon dioxide, water spray, or foam. For large fires, use water spray, fog, or foam (\*DOT 1984).

**Special Fire Fighting Procedures:** Stay upwind; keep out of low areas. Wear self-contained, positive pressure breathing apparatus and full protective clothing (\*DOT 1984).

**Unusual Fire and Explosion Hazards:** When heated to decomposition, it emits highly toxic fumes of sodium oxide and fluorides (\*Sax 1984).

**SECTION IV -- REACTIVITY DATA**

**Stability:** Unstable:

**Stable:** Yes (\*NIOSH/OSHA 1978)

**Conditions to Avoid:** Decomposing heat (\*Sax 1984)

**Incompatibility (Materials to Avoid):** None hazardous (NIOSH/OSHA 1978, p. 166)

**Hazardous Decomposition or Byproducts:** When heated to decomposition, it emits fumes of sodium oxide and fluorides (\*Sax 1984).

**Hazardous Polymerization:** May Occur: Not Found

**May Not Occur:** Not Found

**Conditions to Avoid:** Not Found

## SODIUM FLUOROACETATE

### SECTION V -- HEALTH HAZARD DATA

**Routes of Entry:** Inhalation: Yes (\*Rumack 1975 to Present)  
Skin: Yes (\*Rumack 1975 to Present)  
Ingestion: Yes (\*Gosselin 1976)

**Health Hazards** (Acute, Delayed, and Chronic): This material is super toxic. The probable oral lethal dose in humans is less than 5 mg/kg, or a taste (less than 7 drops) for a 150-lb. person (\*Gosselin 1976).

**Signs and Symptoms of Exposure:** Symptoms include nausea, vomiting, diarrhea, hyperactive behavior, convulsions, coma, and ventricular fibrillation. Symptoms are usually seen within one-half hour of exposure, but severe effects may be delayed as long as 20 hours (\*Rumack 1975 to Present).

**Medical Conditions Generally Aggravated by Exposure:** Not Found

**Emergency and First Aid Procedures:** There is no known specific treatment for fluoroacetate exposure, but generally symptomatic support should be provided (\*Rumack 1975 to Present). Move victim to fresh air. Call emergency medical care. Remove and isolate contaminated clothing and shoes at the site. In case of contact with material, immediately flush skin or eyes with running water for at least 15 minutes (\*DOT 1984).

### SECTION VI -- USE INFORMATION

This material is used for control of predatory animals, coyotes, and rodents (\*Farm Chemicals Handbook 1984).

### SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE (Steps to be Taken in Case Material is Released or Spilled)

Do not touch spilled material. Stay upwind; keep out of low areas. Wear self-contained, positive pressure breathing apparatus and full protective clothing (\*DOT 1984).



## EPA CHEMICAL PROFILE

### INTERIM

Date: October 31, 1985

Revision: \_\_\_\_\_

## CHEMICAL IDENTITY -- NITROSODIMETHYLAMINE

CAS Registry Number: 62-75-9

**Synonyms:** N-Nitrosodimethylamine; Dimethyl Nitrosamine; Dimethylamine, N-Nitroso-; Dimethylnitrosamine; Dimethylnitrosoamine; DMN; DMNA; Methanamine, N-Methyl-N-Nitroso-; N,N-Dimethylnitrosamine; N-Methyl-N-Nitrosomethanamine; N-Nitroso-N,N-Dimethylamine; NDMA

**Chemical Formula:**  $C_2H_6N_2O$

**Molecular Weight:** 74.08

## SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

**OSHA PEL:** Not Found

**ACGIH TLV:** TWA and STEL: Industrial substance suspected of carcinogenic potential in humans (\*ACGIH 1984)

**IDLH:** Not Found

**Other Limits Recommended:** Exposures should be avoided, in so far as possible or otherwise be kept to an absolute minimum; suspected of carcinogenic potential in humans (\*ACGIH 1984). Toxicity information: LC<sub>low</sub> inhalation (dog) 0.048 mg/liter/4 hours (\*NIOSH/RTECS 1985).

## SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

**Boiling Point:** 304-307°F, 151-153°C (\*Merck 1983)

**Specific Gravity (H<sub>2</sub>O=1):** 1.0048 at 20°C/4°C (\*Merck 1983)

**Vapor Pressure (mmHg):** Not Found

**Melting Point:** Not Found

**Vapor Density (AIR=1):** Not Found

**Evaporation Rate (Butyl acetate=1):** Not Found

NITROSODIMETHYLAMINE

SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS (Continued)

**Solubility in Water:** Very soluble (\*Merck 1983)

**Appearance and Odor:** Yellow oily liquid (\*IARC 1972-1985); faint characteristic odor (\*Clayton and Clayton 1982)

SECTION III -- FIRE AND EXPLOSION HAZARD DATA

**Flash Point (Method Used):** Not Found

**Flammable Limits:**

LEL: Not Found

UEL: Not Found

**Extinguishing Methods:** Not Found

**Special Fire Fighting Procedures:** Not Found

**Unusual Fire and Explosion Hazards:** Not Found

SECTION IV -- REACTIVITY DATA

**Stability: Unstable:**

**Stable:** Yes (Clayton and Clayton 1981, p. 3119)

**Conditions to Avoid:** Exposure to ultraviolet light (Clayton and Clayton 1981, p. 3119).

**Incompatibility (Materials to Avoid):** Not Found

**Hazardous Decomposition or Byproducts:** When heated to decomposition, it emits toxic fumes of nitrogen oxides (Sax 1984, pp. 1180-1181).

**Hazardous Polymerization: May Occur:** Not Found

**May Not Occur:** Not Found

**Conditions to Avoid:** Not Found

SECTION V -- HEALTH HAZARD DATA

**Routes of Entry: Inhalation:** Yes (\*Sunshine 1969)

**Skin:** Yes (\*Sunshine 1969)

**Ingestion:** Yes (\*Sunshine 1969)

## NITROSODIMETHYLAMINE

### SECTION V -- HEALTH HAZARD DATA (Continued)

**Health Hazards** (Acute, Delayed, and Chronic): Extremely high toxicity (\*Sunshine 1969). It is a suspected human carcinogen. The lowest lethal oral dose in humans has been reported at 10 mg/kg/80 week intermittent exposure (\*NIOSH/RTECS 1985).

**Signs and Symptoms of Exposure:** Symptoms include nausea, vomiting and malaise (\*Cooper 1980). Chronic exposure may cause liver disease with jaundice and swelling (\*Hamilton 1984) with low platelet count (\*Cooper 1980).

**Medical Conditions Generally Aggravated by Exposure:** Not Found

**Emergency and First Aid Procedures:** Establish respiration; prevent absorption; decontaminate with soap and water; for eye exposure, flush with water (\*Rumack 1975 to Present). (Poisonous Liquid or Gas, n.o.s.) Move victim to fresh air; call emergency medical care. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Remove and isolate contaminated clothing and shoes at the site. In case of contact with material, immediately flush skin or eyes with running water for at least 15 minutes. Keep victim quiet and maintain normal body temperature. Effects may be delayed; keep victim under observation (DOT 1984, Guide 15).

### SECTION VI -- USE INFORMATION

Dimethylnitrosamine was formerly used in the production of rocket fuels. Presently used as an antioxidant, as an additive for lubricants and as a softener of copolymers (Merck 1983, p. 952). It is an intermediate for 1,1-dimethylhydrazine (\*SRI).

### SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE

(Steps to be Taken in Case Material is Released or Spilled)

Avoid inhalation and skin contact (see Section V above). Spills can be absorbed by celite or commercial spill absorbent. After absorbent containing major share of nitrosamine has been picked-up (avoid dusts; do not sweep), surface should be thoroughly cleaned with strong detergent solution. If major spill occurs outside of ventilated area, room should be evacuated and cleanup operation should be carried out by persons equipped with self-contained breathing apparatus. Those involved should wear rubber gloves, lab coats and plastic aprons or equivalent protective apparel (\*NRC 1981).

## EPA CHEMICAL PROFILE

## INTERIM

Date: October 31, 1985

Revision: \_\_\_\_\_

## CHEMICAL IDENTITY -- PHENOL, 3-(1-METHYLETHYL)-, METHYLCARBAMATE

CAS Registry Number: 64-00-6

Synonyms (NIOSH/RTECS, 1983, Volume 1, p. 832): Carbamic Acid, Methyl-, m-Cumenyl Ester; Carbamic Acid, N-Methyl-, 3-Isopropylphenyl Ester; Compound 10854; m-Cumenol Methylcarbamate; m-Cumenyl Methylcarbamate; ENT 25,500; ENT 25,543; H 5727; H 8757; HER. 5727; Hercules 5727; Hercules AC 5727; HIP; m-Isopropylphenol N-Methylcarbamate; m-Isopropylphenyl Methylcarbamate; m-Isopropylphenyl N-Methylcarbamate; 3-Isopropylphenyl Methylcarbamate; N-Methyl m-Isopropylphenyl Carbamate; N-Methyl 3-Isopropylphenyl Carbamate; OMS 162; 1PC; Phenol, m-Isopropyl-, Methylcarbamate; UC 10854; Union Carbide 10854; Union Carbide UC-10,854

Chemical Formula:  $C_{11}H_{15}NO_2$ 

Molecular Weight: 193.27

## SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

OSHA PEL: Not Found

ACGIH TLV: Not Found

IDLH: Not Found

Other Limits Recommended: Toxicity information: LD<sub>50</sub> oral (guinea pig) 10 mg/kg (\*NIOSH/RTECS 1985)

## SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

Boiling Point: Not Found

Specific Gravity (H<sub>2</sub>O=1): Not Found

Vapor Pressure (mmHg): Not Found

Melting Point: 162-165°F, 72-74°C (Hayes 1982, p. 450)

Vapor Density (AIR=1): Not Found

Evaporation Rate (Butyl acetate=1): Not Found

**PHENOL, 3-(1-METHYLETHYL)-, METHYLCARBAMATE**

**SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS (Continued)**

**Solubility in Water:** 85 ppm at 30°C (Hayes 1982, p. 450)

**Appearance and Odor:** Pure white solid without appreciable odor (Hayes 1982, p. 450).

**SECTION III -- FIRE AND EXPLOSION HAZARD DATA**

**Flash Point (Method Used):** Not Found

**Flammable Limits:**

LEL: Not Found

UEL: Not Found

**Extinguishing Methods:** (Non-Specific -- Carbamate Pesticide, Solid, n.o.s.) Extinguish with dry chemical, carbon dioxide, water spray, fog, or foam (DOT 1984, Guide 55).

**Special Fire Fighting Procedures:** (Non-Specific -- Carbamate Pesticide, Solid, n.o.s.) Wear positive pressure breathing apparatus and special protective clothing. Move container from fire area if you can do it without risk. Dike fire control water for later disposal; do not scatter the material. Fight fire from maximum distance (DOT 1984, Guide 55).

**Unusual Fire and Explosion Hazards:** (Non-Specific -- Carbamate Pesticide, Solid, n.o.s.) Container may explode in heat of fire (DOT 1984, Guide 55).

**SECTION IV -- REACTIVITY DATA**

**Stability:** Unstable:

Stable: Yes (Hayes 1982, p. 450)

**Conditions to Avoid:** Decomposing heat (Sax 1984, p. 820)

**Incompatibility (Materials to Avoid):** Incompatible with alkalis (Hayes 1982, p. 450).

**Hazardous Decomposition or Byproducts:** When heated to decomposition, it emits toxic fumes of nitrogen oxides (Sax 1984, p. 820).

PHENOL, 3-(1-METHYLETHYL)-, METHYLCARBAMATE

SECTION IV -- REACTIVITY DATA (Continued)

Hazardous Polymerization: May Occur: Not Found  
May Not Occur: Not Found

Conditions to Avoid: Not Found

SECTION V -- HEALTH HAZARD DATA

Routes of Entry: Inhalation: Yes (Non-Specific -- Carbamate Pesticide,  
Solid, n.o.s.) (DOT 1984, Guide 55)  
Skin: Yes (Sax 1984, p. 820)  
Ingestion: Yes (Sax 1984, p. 820)

Health Hazards (Acute, Delayed, and Chronic): It is a cholinesterase inhibitor (Hayes 1982, p. 450).

Signs and Symptoms of Exposure: Exposure may result in weakness, dizziness, tightness in the chest, headache, pinpoint pupils, profuse sweating, blurred vision, stomach pain, vomiting, skin rashes, and giddiness (Hayes 1982, p. 451).

Medical Conditions Generally Aggravated by Exposure: Not Found

Emergency and First Aid Procedures: (Non-Specific -- Carbamate Pesticide, Solid, n.o.s.) Move victim to fresh air; call emergency medical care. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Remove and isolate contaminated clothing and shoes at the site. In case of contact with material, immediately flush skin or eyes with running water for at least 15 minutes. Keep victim quiet and maintain normal body temperature. Effects may be delayed; keep victim under observation (DOT 1984, Guide 55).

SECTION VI -- USE INFORMATION

It is used as an insecticide to protect cotton, fruit, vegetables and field crops (Farm Chemicals Handbook 1984, p. C-236). Not registered as a pesticide in the U.S. (USEPA/Pesticide Index 1985).

PHENOL, 3-(1-METHYLETHYL)-, METHYLCARBAMATE

SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE

(Steps to be Taken in Case Material is Released or Spilled)

(Non-Specific -- Carbamate Pesticide, Solid, n.o.s.) When handling, wear self-contained breathing apparatus and full protective clothing (i.e., boots, gloves, and goggles). Keep unnecessary people away and stay upwind. Do not touch the material or handle broken packages without protective clothing. Use water spray to reduce vapors. Take up spills with non-combustible absorbent material. For small dry spills, place material in a clean dry container with a clean shovel and cover; remove from site of spill. For large spills dike far ahead for later disposal (DOT 1984, Guide 55; Student 1981, p. 104).

COMMENTS:

Sources searched but no information found:

Weiss 1980  
Buchel 1983  
Gosselin 1984  
Merck 1983  
Weast 1979

EPA CHEMICAL PROFILE

INTERIM

Date: October 31, 1985

Revision: \_\_\_\_\_

CHEMICAL IDENTITY -- COLCHICINE

CAS Registry Number: 64-86-8

**Synonyms:** 7- $\alpha$ -H-Colchicine; Acetamide, N-(5,6,7,9-Tetrahydro-1,2,3,10-Tetramethoxy-9-oxobenzo[a]heptalen-7-yl); Benzo[a]heptalen-9(5H)-one, 7-acetamido-6,7-dihydro-1,2,3,10-tetramethoxy-; Colchicenos; Colchisol; Colcin; Colsaloid; Condylon; N-Acetyl Trimethylcolchicinic acid, Methyl Ether; NSC 757

**Chemical Formula:**  $C_{22}H_{25}NO_6$

**Molecular Weight:** 399.43

SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

OSHA PEL: Not Found

ACGIH TLV: Not Found

IDLH: Not Found

**Other Limits Recommended:** Toxicity information:  $LD_{low}$  oral (dog, cat) 0.125 mg/kg (\*NIOSH/RTECS 1985)

SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

**Boiling Point:** Not Found

**Specific Gravity** ( $H_2O=1$ ): Not Found

**Vapor Pressure** (mmHg): Not Found

**Melting Point:** 288-302°F, 142-150°C (\*Merck 1976)

**Vapor Density** (AIR=1): Not Found

**Evaporation Rate** (Butyl acetate=1): Not Found

**Solubility in Water:** 1 g dissolves in 22 ml (\*Merck 1976)



**COLCHICINE****SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS (Continued)**

**Appearance and Odor:** Odorless or nearly so (\*Hawley 1977); pale yellow needles or powder; darkens on exposure to light (\*Merck 1976).

**SECTION III -- FIRE AND EXPLOSION HAZARD DATA**

**Flash Point (Method Used):** Not Found

**Flammable Limits:**

LEL: Not Found

UEL: Not Found

**Extinguishing Methods:** Slight fire potential (\*Sax 1979). Material is a drug (\*SRI), with the following procedures for fires. Extinguish fire using agent suitable for type of surrounding fire. Use water in flooding quantities as fog. Use alcohol foam, carbon dioxide or dry chemical (Student 1981, p. 215).

**Special Fire Fighting Procedures:** For drugs, solid, n.o.s., avoid breathing dusts and fumes from burning material. Keep upwind. Wear boots, protective gloves, and goggles (Student 1981, p. 215).

**Unusual Fire and Explosion Hazards:** Not Found

**SECTION IV -- REACTIVITY DATA**

**Stability:** Unstable:

Stable: Yes (\*Clarke 1975)

**Conditions to Avoid:** Not Found

**Incompatibility (Materials to Avoid):** Not Found

**Hazardous Decomposition or Byproducts:** Not Found

**Hazardous Polymerization:** May Occur: Not Found

May Not Occur: Not Found

**Conditions to Avoid:** Not Found

**SECTION V -- HEALTH HAZARD DATA**

**Routes of Entry:** Inhalation: Not Found

Skin: Not Found

Ingestion: Yes (\*Gosselin 1976)

## COLCHICINE

### SECTION V -- HEALTH HAZARD DATA (Continued)

**Health Hazards** (Acute, Delayed, and Chronic): It is classified as super toxic. Probable oral lethal dose in humans is less than 5 mg/kg, i.e. less than 7 drops for a 70 kg (150 lb.) person (\*Gosselin 1976). Death results from respiratory arrest. The fatal dose varies considerably; as little as 7 mg of colchicine has proved fatal (\*Goodman 1975).

**Signs and Symptoms of Exposure:** Burning of throat and skin are prominent symptoms. Nausea, vomiting, diarrhea and abdominal pain may occur several hours after exposure. Shock occurs because of extensive vascular damage. Kidney damage resulting in bloody urine and diminished urine output may occur (\*Goodman 1975).

**Medical Conditions Generally Aggravated by Exposure:** Not Found

**Emergency and First Aid Procedures:** This material is an alkaloid (Merck 1983, p. 352); first aid for alkaloid exposure is as follows: move victim to fresh air; call emergency medical care. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In case of contact with material, immediately flush skin or eyes with running water for at least 15 minutes. Speed in removing material from skin is of extreme importance. Remove and isolate contaminated clothing and shoes at the site. Keep victim quiet and maintain normal body temperature. Effects may be delayed; keep victim under observation (DOT 1984, Guide 55).

### SECTION VI -- USE INFORMATION

Colchicine is a drug used to treat gouty arthritis, pseudogout, sarcoidal arthritis and calcific tendinitis (\*SRI).

### SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE

(Steps to be Taken in Case Material is Released or Spilled)

Precautions for drugs, solid, n.o.s., include the following. Avoid breathing dusts, and fumes from burning materials. Keep upwind. Wear self-contained breathing apparatus. Avoid bodily contact with the material. Wear full protective clothing. Wash away any material which may have contacted the body with copious amounts of water or soap and water (Student 1981, p. 215).

EPA CHEMICAL PROFILE

INTERIM

Date: October 31, 1985

Revision: \_\_\_\_\_

CHEMICAL IDENTITY -- NICOTINE SULFATE

CAS Registry Number: 65-30-5

**Synonyms:** (S)-3-(1-Methyl-2-Pyrrolidinyl)Pyridine Sulfate (2:1); L-1-Methyl-2-(3-Pyridyl)-Pyrrolidine Sulfate; L-3-(1-Methyl-2-Pyrrolidyl)Pyridine Sulfate; Black Leaf 40; Nicotine Sulfate, Solid; Nicotine, Sulfate (2:1); Pyridine, 3-(1-Methyl-2-Pyrrolidinyl)-, (S)-, Sulfate (2:1); Pyrrolidine, 1-Methyl-2-(3-Pyridyl)-, Sulfate

**Chemical Formula:**  $(C_{10}H_{14}N_2)_2 \cdot H_2SO_4$

**Molecular Weight:** 422.56

SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

**OSHA PEL:** Not Found

**ACGIH TLV:** TWA 0.5 mg (nicotine)/m<sup>3</sup>; STEL 1.5 mg (nicotine)/m<sup>3</sup> (skin) (\*ACGIH 1982)

**IDLH:** Not Found

**Other Limits Recommended:** TWA for nicotine: 0.5 mg/m<sup>3</sup> (skin) (OSHA 1984, p. 663). Toxicity information: LD<sub>50</sub> oral (mice) 8.55 mg/kg (\*NIOSH/RTECS 1985)

SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

**Boiling Point:** Not Found

**Specific Gravity (H<sub>2</sub>O=1):** 1.15 at 20°C (solid) (\*CHRIS 1978)

**Vapor Pressure (mmHg):** Not Found

**Melting Point:** Not Found

**Vapor Density (AIR=1):** Not Found

**Evaporation Rate (Butyl acetate=1):** Not Found

**Solubility in Water:** Soluble in water (\*Merck 1976)

## NICOTINE SULFATE

### SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS (Continued)

**Appearance and Odor:** A six-sided tablet (\*Merck 1976) or white crystals; (40% solution = Black Leaf Forty) (Hawley 1981, p. 727). No odor information.

### SECTION III -- FIRE AND EXPLOSION HAZARD DATA

**Flash Point (Method Used):** Not Found

**Flammable Limits:**

LEL: Not Found

UEL: Not Found

**Extinguishing Methods:** As for nicotine, extinguish with alcohol foam, dry chemical, or carbon dioxide (Sax 1984, p. 1997). Large fires can be extinguished with water spray, fog, or foam (\*DOT 1984).

**Special Fire Fighting Procedures:** Wear positive pressure breathing apparatus and special protective clothing. Dike fire control water; do not scatter the material (\*DOT 1984).

**Unusual Fire and Explosion Hazards:** As for nicotine, moderate explosion hazard when exposed to heat or flame (\*Sax 1975).

### SECTION IV -- REACTIVITY DATA

**Stability: Unstable:**

**Stable:** Yes (\*Menzie 1969)

**Conditions to Avoid:** Decomposing heat (Sax 1984, p. 1998)

**Incompatibility (Materials to Avoid):** (Non-Specific -- Nicotine)  
Avoid oxidizing materials (Sax 1984, p. 1997).

**Hazardous Decomposition or Byproducts:** When heated to decomposition, emits highly toxic fumes of sulfur oxides and organic fumes (Sax 1984, p. 1998).

**Hazardous Polymerization:** **May Occur:** Not Found  
**May Not Occur:** Not Found

**Conditions to Avoid:** Not Found

## NICOTINE SULFATE

### SECTION V -- HEALTH HAZARD DATA

**Routes of Entry:** Inhalation: Yes (\*Sax 1975)  
Skin: Yes (\*Sax 1975)  
Ingestion: Yes (\*Sax 1975)

**Health Hazards (Acute, Delayed, and Chronic):** It is classified as super toxic. Probable oral lethal dose in humans is less than 5 mg/kg (less than 7 drops) for a 70 kg (150 lb.) person (\*Gosselin 1976). Death is possible from respiratory failure caused by paralysis of the respiratory muscles (\*Goodman 1980).

**Signs and Symptoms of Exposure:** Onset of acute poisoning is rapid. Symptoms include nausea, salivation, abdominal pain, vomiting, diarrhea, cold sweat, headache, dizziness, disturbed hearing and vision, mental confusion, marked weakness, faintness and prostration, lowered blood pressure, difficult breathing, and weak, rapid and irregular pulse (\*Goodman 1980). Inhalation irritates nose and throat. The liquid form irritates the eyes and (on prolonged contact) skin (\*CHRIS 1978).

**Medical Conditions Generally Aggravated by Exposure:** Not Found

**Emergency and First Aid Procedures:** Move victim to fresh air; call emergency medical care. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In case of contact with material, immediately flush skin or eyes with running water for at least 15 minutes. Speed in removing material from skin is of extreme importance. Remove and isolate contaminated clothing and shoes at the site. Keep victim under observation (\*DOT 1984).

### SECTION VI -- USE INFORMATION

It is used as an insecticide (\*Merck 1976) and in veterinary medicine as an anthelmintic and external parasiticide (\*Garner 1967).

## NICOTINE SULFATE

### SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE

(Steps to be Taken in Case Material is Released or Spilled)

Full personal protective equipment should be worn (i.e., dust respirator and special protective clothing ) (\*CHRIS 1978). To clean up, do not touch spilled material; stop leak if possible. Use water spray to reduce vapors. Wear positive pressure breathing apparatus and special protective clothing. Small spills: take up with sand or other noncombustible absorbent material and place into containers for disposal. Small dry spill: with clean shovel place material into clean, dry container and cover; move containers from spill area. Large spills: dike far ahead of spill for later disposal (\*DOT 1984).

EPA CHEMICAL PROFILE

INTERIM

Date: October 31, 1985

Revision: \_\_\_\_\_

CHEMICAL IDENTITY -- OROTIC ACID

CAS Registry Number: 65-86-1

Synonyms: (NIOSH/RTECS 1983 Synonyms, Volume 2, p. 896)

6-Carboxyuracil; Animal Galactose Factor; Orodin; Orotonin; Orotoric; Orotyl;  
4-Pyrimidinecarboxylic Acid, 1,2,3,6-Tetrahydro-2,6-Dioxo-(9CI);  
6-Uracilcarboxylic Acid; Whey Factor

Chemical Formula:  $C_5H_4N_2O_4$

Molecular Weight: 156.11

SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

OSHA PEL: Not Found

ACGIH TLV: Not Found

IDLH: Not Found

Other Limits Recommended: Toxicity information: LD<sub>50</sub> oral (mouse) 2  
mg/kg (\*NIOSH/RTECS 1985) (SUSPECT)

SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

Boiling Point: Not Found

Specific Gravity (H<sub>2</sub>O=1): Not Found

Vapor Pressure (mmHg): Not Found

Melting Point: 653-655°F, 345-346°C (Hawley 1981, p. 763)

Vapor Density (AIR=1): Not Found

Evaporation Rate (Butyl acetate=1): Not Found

Solubility in Water: Slightly soluble (Weast 1980, p. C-536)

Appearance and Odor: Crystals (Hawley 1981, p. 763)

**OROTIC ACID**

**SECTION III -- FIRE AND EXPLOSION HAZARD DATA**

**Flash Point** (Method Used): Not Found

**Flammable Limits:**

LEL: Not Found

UEL: Not Found

**Extinguishing Methods:** Not Found

**Special Fire Fighting Procedures:** Not Found

**Unusual Fire and Explosion Hazards:** Not Found

**SECTION IV -- REACTIVITY DATA**

**Stability: Unstable:** Not Found

**Stable:** Not Found

**Conditions to Avoid:** Not Found

**Incompatibility** (Materials to Avoid): Not Found

**Hazardous Decomposition or Byproducts:** Not Found

**Hazardous Polymerization: May Occur:** Not Found

**May Not Occur:** Not Found

**Conditions to Avoid:** Not Found

**SECTION V -- HEALTH HAZARD DATA**

**Routes of Entry: Inhalation:** Not Found

**Skin:** Not Found

**Ingestion:** Not Found

**Health Hazards** (Acute, Delayed, and Chronic): Not Found

**Signs and Symptoms of Exposure:** Not Found

**Medical Conditions Generally Aggravated by Exposure:** Not Found

**Emergency and First Aid Procedures:** Not Found



## OROTIC ACID

### SECTION VI -- USE INFORMATION

Used in biochemical research, especially in the biosynthesis of nucleic acids (Hawley 1981, p. 763). Has been proposed as a feed supplement (Merck 1983, p. 986).

### SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE

(Steps to be Taken in Case Material is Released or Spilled)

Not Found

### COMMENTS

Sources checked but no information found:

- Sax 1984
- Student 1981
- NFPA 1984
- DOT 1984
- Weiss 1980
- Clayton and Clayton 1981-82
- Gosselin 1984
- Encyc Occupat Health and Safety 1983
- ACGIH 1983
- NIOSH/OSHA 1978

EPA CHEMICAL PROFILE

INTERIM

Date: October 31, 1985

Revision: \_\_\_\_\_

CHEMICAL IDENTITY -- CYCLOHEXIMIDE

CAS Registry Number: 66-81-9

**Synonyms:** Glutarimide, 3-(2-(3,5-Dimethyl-2-Oxocyclohexyl)-2-Hydroxyethyl)-; 2,6-Piperidinedione, 4-(2-(3,5-Dimethyl-2-Oxocyclohexyl)-2-Hydroxyethyl)- (1S-(1 alpha(S\*), 3 alpha, 5 beta))-; Acti-aid; Acti-Dione-PM (-RZ, -BR, & -S); Actidion; Actidione; Actidione PM; Actispray; beta-(2-(3,5-Dimethyl-2-Oxocyclohexyl)-2-Hydroxyethyl)Glutarimide; Hizarocin; Kaken; Naramycin; Naramycin A; Neocycloheximide; NSC-185; TZA; U 4527

**Chemical Formula:**  $C_{15}H_{23}NO_4$

**Molecular Weight:** 281.34

SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

OSHA PEL: Not Found

ACGIH TLV: Not Found

IDLH: Not Found

**Other Limits Recommended:** Toxicity information: LD<sub>50</sub> oral (rat)  
2 mg/kg (\*NIOSH/RTECS 1985)

SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

**Boiling Point:** Not Found

**Specific Gravity** (H<sub>2</sub>O=1): Not Found

**Vapor Pressure** (mmHg): Not Found

**Melting Point:** 247-250°F, 119.5-121°C (\*Merck 1976)

**Vapor Density** (AIR=1): Not Found

**Evaporation Rate** (Butyl acetate=1): Not Found

## CYCLOHEXIMIDE

### SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS (Continued)

**Solubility in Water:** Moderately soluble (Sax 1984, p. 833); 21 g/liter at 36°F, 2°C (\*Merck 1976)

**Appearance and Odor:** Colorless crystals (\*Spencer 1973). Odor not found.

### SECTION III -- FIRE AND EXPLOSION HAZARD DATA

**Flash Point (Method Used):** Not Found

**Flammable Limits:**

LEL: Not Found

UEL: Not Found

**Extinguishing Methods:** (Non-Specific -- Fungicides, Poison B Solid) Use agent suitable for surrounding fire. Use alcohol foam, carbon dioxide, or dry chemical. Use water in flooding quantities as fog (Student 1981, p. 259).

**Special Fire Fighting Procedures:** (Non-Specific -- Fungicides, Poison B Solid) Avoid breathing dusts and fumes from burning material. Keep upwind. Wear self-contained breathing apparatus. Avoid bodily contact with the material. Wear full protective clothing (Student 1981, p. 259).

**Unusual Fire and Explosion Hazards:** When exposed to heat, it emits toxic fumes, including nitrogen oxides (Sax 1984, p. 833).

### SECTION IV -- REACTIVITY DATA

**Stability: Unstable:**

Stable: Yes (\*Merck 1976)

**Conditions to Avoid:** Not Found

**Incompatibility (Materials to Avoid):** Not Found

**Hazardous Decomposition or Byproducts:** When exposed to heat, it emits toxic fumes, including nitrogen oxides (Sax 1984, p. 833).

**Hazardous Polymerization: May Occur:** Not Found

May Not Occur: Not Found

**Conditions to Avoid:** Not Found

## CYCLOHEXIMIDE

### SECTION V -- HEALTH HAZARD DATA

**Routes of Entry:** Inhalation: Not Found  
Skin: Yes (\*Rumack 1975 to Present)  
Ingestion: Yes (\*Gosselin 1976)

**Health Hazards** (Acute, Delayed, and Chronic): This material is extremely toxic; the probable oral lethal dose in humans is 5-50 mg/kg, or 7 drops to 1 teaspoonful for a 150-lb. person (\*Gosselin 1976).

**Signs and Symptoms of Exposure:** Symptoms include nausea, vomiting, and elevated blood urea nitrogen. Signs of skin irritation may appear as much as 6 to 24 hours after exposure (\*Rumack 1975 to Present)

**Medical Conditions Generally Aggravated by Exposure:** Not Found

**Emergency and First Aid Procedures:** In case of skin contact, wash with soap, followed by alcohol, followed by a second soap washing. In case of eye contact, rinse eyes with copious amounts of water for at least 15 minutes (\*Rumack 1975 to Present).

### SECTION VI -- USE INFORMATION

This material is used as a fungicide (\*Merck 1976), and as a medication in cancer therapy (\*Rumack 1975 to Present).

### SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE (Steps to be Taken in Case Material is Released or Spilled)

(Non-Specific -- Fungicides, Poison B Solid) Avoid breathing dusts. Keep upwind. Wear self-contained breathing apparatus. Avoid bodily contact with the material. Wear full protective clothing (Student 1981, p. 259). Material is rapidly inactivated at room temperature by dilute alkali (\*Merck 1976).

## EPA CHEMICAL PROFILE

### INTERIM

Date: October 31, 1985

Revision: \_\_\_\_\_

## CHEMICAL IDENTITY -- CHLOROFORM

CAS Registry Number: 67-66-3

**Synonyms:** Formyl Trichloride; Freon 20; Methane, Trichloro-; Methane Trichloride; Methenyl Chloride; Methenyl Trichloride; Methyl Trichloride; NCI-CO2686; R-20; R 20 (Refrigerant); TCM; Trichloroform; Trichloromethane

**Chemical Formula:**  $\text{CHCl}_3$

**Molecular Weight:** 119.39

## SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

**OSHA PEL:** Air: TWA 50 ppm (ceiling) (OSHA 1984, p. 661)

**ACGIH TLV:** TWA 10 ppm (50 mg/m<sup>3</sup>); STEL 50 ppm (225 mg/m<sup>3</sup>) (\*ACGIH 1985)

**IDLH:** 1,000 ppm (NIOSH/OSHA 1978, p. 68)

**Other Limits Recommended:** Industrial substance suspect of carcinogenic potential for humans (ACGIH 1985, p. 42).

## SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

**Boiling Point:** 143°F, 61.7°C (\*Weast 1979)

**Specific Gravity (H<sub>2</sub>O=1):** 1.4832 at 20°C/4°C (\*Weast 1979)

**Vapor Pressure (mmHg):** 100 at 10.4°C (\*Sax 1979)

**Melting Point:** -82.3°F, -63.5°C (\*Weast 1979)

**Vapor Density (AIR=1):** 4.12 (\*Sax 1979)

**Evaporation Rate (Butyl acetate=1):** (Carbon Tetrachloride = 1) 1.18 (\*General Electric Co. 1979, MSDS #315)

**Solubility in Water:** 1 mL/200 mL at 25°C (\*Merck 1976)

**Appearance and Odor:** A clear, colorless and mobile liquid with a characteristic odor (\*IARC 1972-1985).

## CHLOROFORM

### SECTION III -- FIRE AND EXPLOSION HAZARD DATA

**Flash Point (Method Used):** None (\*General Electric Co. 1979, MSDS #315)

**Flammable Limits:**

LEL: None (\*General Electric Co. 1979, MSDS #315)

UEL: None (\*General Electric Co. 1979, MSDS #315)

**Extinguishing Methods:** Extinguish with dry chemical, carbon dioxide, water spray, fog or foam (\*DOT 1984).

**Special Fire Fighting Procedures:** Wear self-contained breathing apparatus and special protective clothing. Move container from fire area. Fight fire from maximum distance. Dike fire control water for later disposal; do not scatter the material (\*DOT 1984).

**Unusual Fire and Explosion Hazards:** Container may explode in the heat of fire (\*DOT 1984). When heated it liberates phosgene (\*ITI 1982); hydrogen chloride, chlorine and toxic and corrosive oxides of carbon and chlorine (\*General Electric Co. 1979, MSDS #315).

### SECTION IV -- REACTIVITY DATA

**Stability: Unstable:**

**Stable:** Yes (\*CHRIS 1978)

**Conditions to Avoid:** It develops acidity from prolonged exposure to air and light (\*General Electric Co. 1979, MSDS #315).

**Incompatibility (Materials to Avoid):** Chloroform explodes when in contact with aluminum powder or magnesium powder or with alkali metals (e.g., lithium, sodium, and potassium) (\*NFPA 1978) and dinitrogen tetroxide. It reacts vigorously with acetone in the presence of potassium hydroxide or calcium hydroxide (\*Bretherick 1975). It is oxidized by strong oxidizers such as chromic acid forming phosgene and chlorine (\*IARC 1972-1985). It reacts vigorously with triisopropylphosphine (\*Bretherick 1975).

**Hazardous Decomposition or Byproducts:** When heated, it emits hydrogen chloride, chlorine, toxic and corrosive oxides of carbon and chlorine (\*General Electric Co. 1979, MSDS #315) and phosgene (\*ITI 1982).

**Hazardous Polymerization: May Occur:** Not Found

**May Not Occur:** Not Found

**Conditions to Avoid:** Not Found

## CHLOROFORM

## SECTION V -- HEALTH HAZARD DATA

**Routes of Entry:** Inhalation: Yes (\*NIOSH 1974)  
Skin: Yes (\*DOT 1984)  
Ingestion: Yes (\*ITI 1982)

**Health Hazards** (Acute, Delayed, and Chronic): It is classified as moderately toxic. Probable oral lethal dose for humans is 0.5 to 5 g/kg (between 1 ounce and 1 pint) for a 150 lb. person. The mean lethal dose is probably near 1 fluid ounce (44 g) (\*Gosselin 1976). It is a human suspected carcinogen (\*IARC 1972-1985). Also, it is a central nervous system depressant and a gastrointestinal irritant (\*Challen PS et al. 1958. Br J Ind Med 15:243). It has caused rapid death attributable to cardiac arrest and delayed death from liver and kidney damage (\*IARC 1972-1985).

**Signs and Symptoms of Exposure:** Symptoms of acute exposure include fainting sensation, vomiting, dizziness, salivation, nausea, fatigue, and headache (\*ACGIH 1971-1979). Other symptoms are respiratory depression, coma, kidney damage, and liver damage (\*IARC 1972-1985). Liquid in the eye causes tearing and conjunctivitis (\*Grant 1974). Symptoms of chronic exposure include loss of appetite, hallucinations, moodiness and physical and mental sluggishness (\*NIOSH 1974. Criteria for a recommended standard occupational exposure to chloroform. DHEW Pub NIOSH 75-114).

**Medical Conditions Generally Aggravated by Exposure:** Not Found

**Emergency and First Aid Procedures:** Move victim to fresh air; call emergency medical care. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In case of contact with material, immediately flush skin or eyes with running water for at least 15 minutes. Speed in removing material from skin is of extreme importance. Remove and isolate contaminated clothing and shoes at the site. Keep victim quiet and maintain normal body temperature. Effects may be delayed; keep victim under observation (\*DOT 1984).

## SECTION VI -- USE INFORMATION

It is used as a grain fumigant; solvent for pesticides, adhesives (\*IARC 1972-1985) fats, oils, rubbers, alkaloids, waxes (\*Merck 1976); chemical intermediate for dyes and pesticides; and a component of cough syrups, toothpastes, and linaments (\*SRI). Not registered as a pesticide in the U.S. (USEPA/Pesticide Index 1985).

## CHLOROFORM

### SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE

(Steps to be Taken in Case Material is Released or Spilled)

Keep unnecessary people away; isolate hazard area and deny entry. Stay upwind; keep out of low areas. Ventilate closed spaces before entering them. Wear positive pressure breathing apparatus and special protective clothing. Remove and isolate contaminated clothing at the site. Do not touch spilled material; stop leak if you can do it without risk. Use water spray to reduce vapors. Small spills: take up with sand or other non-combustible absorbent material and place into containers for later disposal. Large spills: dike far ahead of spill for later disposal (\*DOT 1984).



EPA CHEMICAL PROFILE

INTERIM

Date: October 31, 1985

Revision: \_\_\_\_\_

CHEMICAL IDENTITY -- DIGITOXIN

CAS Registry Number: 71-63-6

**Synonyms:** Acedoxin; Card-20(22)-Enolide, 3-((O-2,6-Dideoxy-beta-D-Ribo-Hexopyranosyl-(Hexopyranosyl-(1-4)-2,6-Dideoxy-beta-D-Ribo-Hexopyranosyl)oxy)-14-Hydroxy-, (3beta, 5beta)-; Cardigin; Carditoxin; Cristapurat; Crystalline Digitalin; Crystodigin; Digilong; Digimed; Digimerck; Digisidin; Digitalin; Digitaline Cristallisee; Digitaline Nativelle; Digitoksim; Digitophyllin; Digitoxigenin Tridigitoxoside; Ditaven; Glucodigin; Lanatoxin; Myodigin; Purodigin; Purpurid; Unidigin

**Chemical Formula:**  $C_{41}H_{64}O_{13}$

**Molecular Weight:** 764.92

SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

OSHA PEL: Not Found

ACGIH TLV: Not Found

IDLH: Not Found

**Other Limits Recommended:** Toxicity information: LD<sub>50</sub> oral (cat)  
0.18 mg/kg (\*NIOSH/RTECS 1985)

SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

**Boiling Point:** Not Found

**Specific Gravity** (H<sub>2</sub>O=1): Not Found

**Vapor Pressure** (mmHg): Not Found

**Melting Point:** 493-495°F, 256-257°C (when anhydrous) (\*Merck 1976)

**Vapor Density** (AIR=1): Not Found

**Evaporation Rate** (Butyl acetate=1): Not Found

**Solubility in Water:** 1 g in 100 liters at 20°C (\*Merck 1976)

## DIGITOXIN

### SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS (Continued)

**Appearance and Odor:** White or pale buff microcrystalline powder (\*Osol 1975); odorless (Merck 1983, p. 353)

### SECTION III -- FIRE AND EXPLOSION HAZARD DATA

**Flash Point** (Method Used): Not Found

**Flammable Limits:**

LEL: Not Found

UEL: Not Found

**Extinguishing Methods:** (Non-Specific -- Drugs or Medicines, Solid, n.o.s.) Extinguish fire using agent suitable for type of surrounding fire (material itself burns with difficulty.) Use water in flooding quantities as fog. Use alcohol foam, carbon dioxide or dry chemical. (Student 1981, p. 215)

**Special Fire Fighting Procedures:** (Non-Specific -- Drugs or Medicines, Solid, n.o.s.) Avoid breathing dusts and fumes from burning material. Keep unwind. Wear boots, protective gloves, and goggles (Student 1981, p. 216).

**Unusual Fire and Explosion Hazards:** When heated to decomposition, it emits acrid smoke and irritating fumes (Sax 1984, p. 1035).

### SECTION IV -- REACTIVITY DATA

**Stability:** Unstable: Not Found

Stable: Not Found

**Conditions to Avoid:** Not Found

**Incompatibility** (Materials to Avoid): Not Found

**Hazardous Decomposition or Byproducts:** Not Found

**Hazardous Polymerization:** May Occur: Not Found

May Not Occur: Not Found

**Conditions to Avoid:** Not Found

**DIGITOXIN****SECTION V -- HEALTH HAZARD DATA**

**Routes of Entry:** Inhalation: Not Found  
Skin: Not Found  
Ingestion: Yes (\*Gosselin 1976)

**Health Hazards** (Acute, Delayed, and Chronic): Material is bioactive and capable of causing cardiac arrhythmias and electrolyte imbalances that may be fatal. Death is due to ventricular fibrillation or cardiac standstill (\*Gosselin 1976). Material has a high toxicity hazard rating; it may cause death or permanent injury after a very short exposure (\*Sax 1979). It is classified as super toxic; an estimated single lethal dose is 3-10 mg (Gosselin 1984, p. II-252).

**Signs and Symptoms of Exposure:** Nausea and vomiting, headache, malaise, fatigue, weakness, drowsiness, abdominal discomfort are symptomatic of toxicity. Visual disturbances (reduction in visual acuity, illusions of flickering or shimmering lights, abnormal color vision) and emotional disorders (including confusion, disorientation, aphasia, delirium, hallucinations, and rarely convulsions) are also possible toxic effects (\*Gosselin 1976; \*Grant 1974) .

**Medical Conditions Generally Aggravated by Exposure:** Not Found

**Emergency and First Aid Procedures:** (Non-Specific -- Medicines, n.o.s.) Move victim to fresh air; call emergency medical care. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In case of contact with material, immediately flush skin or eyes with running water for at least 15 minutes. Remove and isolate contaminated clothing and shoes at the site. Keep victim quiet and maintain normal body temperature (DOT 1984, Guide 11).

**SECTION VI -- USE INFORMATION**

Material is a cardiotonic drug (\*Goodman 1975).

**SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE**

(Steps to be Taken in Case Material is Released or Spilled)

(Non-Specific -- Drugs or Medicines, Solids, n.o.s.) Keep upwind. Wear self-contained breathing apparatus. Avoid bodily contact with the material. Wear full protective clothing. Wash away any material which may have contacted the body with copious amounts of water or soap and water (Student 1981, p. 216).

EPA CHEMICAL PROFILE

INTERIM

Date: October 31, 1985

Revision: \_\_\_\_\_

CHEMICAL IDENTITY -- ENDRIN

CAS Registry Number: 72-20-8

**Synonyms:** 1,4:5,8-Dimethanonaphthalene, 1,2,3,4,10,10-Hexachloro-6,7-Epoxy-1,4,4a,5,6,7,8,8a-Octahydro-,endo,endo-; Compound 269; Endrex; Endricol; ENT 17,251; Experimental Insecticide 269; Hexachloroepoxyoctahydro-endo,endo-Dimethanonaphthalene; Hexadrin; Mendrin; NCI-C00157; SD 3419; Oktanex; EN 57; 2,7:3,6-Dimethanonaphth[2,3-b]Oxirene, 3,4,5,6,9,9-Hexachloro-1a,2,2a,3,6,6a,7,7a-Octahydro-, (1a.alpha., 2.beta., 2a.beta., 3.alpha., 6.alpha., 6a.beta., 7.beta., 7a.alpha.)-; Nendrin; 1,2,3,4,10,10-Hexachloro-6,7-epoxy-1,4,4a,5,6,7,8,8a-octahydro-endo,endo-1,4:5,8-dimethanonaphthalene; 1,2,3,4,10,10-Hexachloro-6,7-epoxy-1,4,4a,5,6,7,8,8a-octahydro-endo-1,4-endo-5,8-dimethanonaphthalene; 1,2,3,4,10,10-Hexachloro-6,7-epoxy-1,4,4a,5,6,7,8,8a-octahydro-1,4:5,8-endo,endo-dimethanonaphthalene; NCI 01565; C00157; Isodrin Epoxide; Endrical

**Chemical Formula:**  $C_{12}H_8Cl_6O$

**Molecular Weight:** 380.90

SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

**OSHA PEL:** TWA 0.1 mg/m<sup>3</sup> (skin) (\*NIOSH/RTECS 1985)

**ACGIH TLV:** TWA 0.1 mg/m<sup>3</sup>; STEL 0.3 mg/m<sup>3</sup> (skin) (\*ACGIH 1980)

**IDLH:** 200 mg/m<sup>3</sup> (\*NIH EPA, OHM/TADS 1984)

**Other Limits Recommended:** STEL 0.5 mg/m<sup>3</sup> for 30 minutes (Weiss 1980, p. 402)

SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

**Boiling Point:** Not Found

**Specific Gravity (H<sub>2</sub>O=1):** 1.7 at 68°F, 20°C (\*USEPA 1980)

**Vapor Pressure (mmHg):**  $2 \times 10^{-7}$  at 77°F, 25°C (\*Worthing 1979)

**Melting Point:** Decomposes at 473°F, 245°C (Merck 1983, p. 517)

## ENDRIN

## SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS (Continued)

**Vapor Density (AIR=1):** Not Found

**Evaporation Rate (Butyl acetate=1):** Not Found

**Solubility in Water:** Practically insoluble (\*IARC 1972-1985)

**Appearance and Odor:** White, crystalline solid; light tan color for technical grade (\*NFPA 1978). Odorless (\*CHRIS 1978) or mild chemical odor for technical grade (\*IARC 1972-1985).

## SECTION III -- FIRE AND EXPLOSION HAZARD DATA

**Flash Point (Method Used):** Commercial product may contain flammable liquid with flashpoint 80°F, 27°C (\*NIH EPA, OHM/TADS 1984)

**Flammable Limits:**

LEL: 1.1% (commercial product) (Weiss 1980, p. 402)

UEL: 7.0% (commercial product) (Weiss 1980, p. 402)

**Extinguishing Methods:** Use dry chemical, foam, carbon dioxide (\*CHRIS 1978), water spray for solution (\*NFPA 1978). Small fires: dry chemical, carbon dioxide, water spray, or foam. Large fires: water spray, fog, or foam (DOT 1984, Guide 55).

**Special Fire Fighting Procedures:** Use water to keep fire-exposed containers cool (\*NFPA 1978). Keep unnecessary people away; isolate hazard area and deny entry. Stay upwind; keep out of low areas. Ventilate closed spaces before entering them. Wear positive pressure breathing apparatus and special protective clothing. Remove and isolate contaminated clothing at the site. Move container from fire area if you can do it without risk. Fight fire from maximum distance. Dike fire control water for later disposal; do not scatter the material (DOT 1984, Guide 55).

**Unusual Fire and Explosion Hazards:** Toxic hydrogen chloride and phosgene may be generated when solution burns (\*CHRIS 1978).

## SECTION IV -- REACTIVITY DATA

**Stability:** Unstable:

Stable: Yes (\*USEPA 1980)

**Conditions to Avoid:** Not Found

**Incompatibility (Materials to Avoid):** Strong oxidizers, strong acids (\*NIH EPA, OHM/TADS 1984), and parathion (Sax 1984, p. 1279)

## ENDRIN

## SECTION IV -- REACTIVITY DATA (Continued)

**Hazardous Decomposition or Byproducts:** Toxic hydrogen chloride and phosgene may be generated when solutions burn (\*CHRIS 1978).

**Hazardous Polymerization:** May Occur: Not Found  
May Not Occur: Not Found

**Conditions to Avoid:** Not found

## SECTION V -- HEALTH HAZARD DATA

**Routes of Entry:** Inhalation: Yes (\*USEPA 1980)  
Skin: Yes (\*NFPA 1978)  
Ingestion: Yes (\*Gosselin 1976)

**Health Hazards** (Acute, Delayed, and Chronic): This material is extremely toxic (\*Gosselin 1976). It is rapidly absorbed through the skin (\*NFPA 1978). Symptoms appear between 20 minutes and 12 hours after exposure (\*Gosselin 1976). There is evidence that this material may cause chromosomal damage (\*USEPA 1980). Doses of 1 mg/kg can cause symptoms (Sax 1984, p. 1278). It is a suspected carcinogen (Hawley 1981, p. 410). Also, it is a central nervous system depressant and hepatotoxin (Farm Chemicals Handbook 1984, p. C-93).

**Signs and Symptoms of Exposure:** It can cause death by respiratory arrest. Symptoms include headache, nausea, vomiting, dizziness, tremors, convulsions, loss of consciousness, rise in blood pressure, fever, frothing of the mouth, deafness, coma, and death (\*Gosselin 1976, Gosselin 1984, pp. II-285, III-143).

**Medical Conditions Generally Aggravated by Exposure:** Pregnant women are considered to be at special risk (\*USEPA 1980).

**Emergency and First Aid Procedures:** Move victim to fresh air; call emergency medical care. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In case of contact with material, immediately flush skin or eyes with running water for at least 15 minutes. Speed in removing material from skin is of extreme importance. Remove and isolate contaminated clothing and shoes at the site. Keep victim quiet and maintain normal body temperature. Effects may be delayed; keep victim under observation (DOT 1984, Guide 55).

ENDRIN

**SECTION VI -- USE INFORMATION**

This material is used primarily as an insecticide for field crops (\*Worthing 1979). Only cotton and bird perch uses registered in the U.S. (USEPA/Pesticide Index 1985).

**SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE**

(Steps to be Taken in Case Material is Released or Spilled)

For leaks or spills, use water spray to disperse vapor and to flush spills (\*NFPA 1978). Liquid containing this material should be absorbed in vermiculite, dry sand, earth (\*NIOSH/OSHA 1981). Do not touch spilled material; stop leak if you can do it without risk. Small dry spills: with clean shovel place material into clean, dry container and cover; move containers from spill area. Large spills: dike far ahead of spill for later disposal. Keep unnecessary people away; isolate hazard area and deny entry. Ventilate closed spaces before entering them. Wear positive pressure breathing apparatus and special protective clothing. Remove and isolate contaminated clothing at the site (DOT 1984, Guide 55).

EPA CHEMICAL PROFILE

INTERIM

Date: October 31, 1985

Revision: \_\_\_\_\_

CHEMICAL IDENTITY -- METHYL BROMIDE

CAS Registry Number: 74-83-9

**Synonyms:** Brom-o-gas; Bromomethane; Curafume; Dowfume MC-2 Soil Fumigant; Dowfume MC-33; Edco; Embafume; Halon 1001; Haltox; Iscobrome; Kayafume; MB; MBX; MEBR; Metafume; Methane, Bromo-; Methogas; Monobromomethane; Pestmaster; Profume; R 40B1; Rotox; Terabol; Terr-o-gas 100; Zytex

**Chemical Formula:**  $\text{CH}_3\text{Br}$

**Molecular Weight:** 94.95

SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

**OSHA PEL:** Air: Ceiling Concentration 20 ppm (skin) (\*NIOSH/RTECS 1985)

**ACGIH TLV:** TWA 5 ppm (20 mg/m<sup>3</sup>); STEL 15 ppm (60 mg/m<sup>3</sup>) (skin) (\*ACGIH 1980)

**IDLH:** 2,000 ppm (NIOSH/OSHA 1978, p. 126)

**Other Limits Recommended:** Not Found

SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

**Boiling Point:** 38.4°F, 3.56°C (\*Weast 1979)

**Specific Gravity (H<sub>2</sub>O=1):** Liquid: 1.730 at 0°C/4°C (\*Merck 1976)

**Vapor Pressure (mmHg):** 1420 at 20°C (\*Merck 1976)

**Melting Point:** -136°F, -93.6°C (\*Merck 1976)

**Vapor Density (AIR=1):** 3.27 (\*NFPA 1978)

**Evaporation Rate (Butyl acetate=1):** Not Found

**Solubility in Water:** 1.34 g/100 g at 25°C (\*Worthing 1979)



METHYL BROMIDE

SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS (Continued)

**Appearance and Odor:** Colorless gas; usually odorless, but has a sweetish chloroform-like odor at high concentrations (\*Merck 1976).

SECTION III -- FIRE AND EXPLOSION HAZARD DATA

**Flash Point (Method Used):** None (\*Sax 1979)

**Flammable Limits:**

LEL: 10% (\*Sax 1979)

UEL: 16% (\*Sax 1979)

**Extinguishing Methods:** Non-flammable in air; burns in oxygen (\*Merck 1976). Use water spray, foam, carbon dioxide, or dry chemical (\*NFPA 1978).

**Special Fire Fighting Procedures:** Full protective clothing, including self-contained breathing apparatus, coat, pants, gloves, boots, and bands around legs, arms, and waist should be provided. No skin surface should be exposed (\*NFPA 1978). Move container from fire area if you can do it without risk. Fight fire from maximum distance. Dike fire control water for later disposal; do not scatter the material (DOT 1984, Guide 55).

**Unusual Fire and Explosion Hazards:** When heated to decomposition, it emits toxic fumes of bromides (\*Sax 1979).

SECTION IV -- REACTIVITY DATA

**Stability:** Unstable:

Stable: Yes (\*NFPA 1978)

**Conditions to Avoid:** Not Found

**Incompatibility (Materials to Avoid):** Not Found

**Hazardous Decomposition or Byproducts:** When heated to decomposition, it emits toxic fumes of bromides (\*Sax 1979).

**Hazardous Polymerization:** May Occur:

May Not Occur: Yes (Weiss 1980, p. 603)

**Conditions to Avoid:** Not Found

## METHYL BROMIDE

### SECTION V -- HEALTH HAZARD DATA

**Routes of Entry:** Inhalation: Yes (\*Gosselin 1976)  
Skin: Yes (\*Gosselin 1976)  
Ingestion: Not Found

**Health Hazards (Acute, Delayed, and Chronic):** Methyl bromide is a dangerous cumulative poison with delayed symptoms of central nervous system intoxication that may appear as long as several months after exposure (\*White-Stevens 1971). High concentrations can produce fatal pulmonary edema. Chronic exposure can cause central nervous system depression and kidney injury (\*Merck 1976). It may cause severe and permanent brain damage. Severe neurological signs may appear when there is a sudden exposure to high concentrations following continuous slight exposure (\*Encyc Occupat Health and Safety 1971). Methyl bromide has practically no odor or irritating effects and therefore no warning, even at hazardous concentrations (\*Clayton and Clayton 1981-82).

**Signs and Symptoms of Exposure:** Symptoms may appear 3-12 hours after inhalation, including dizziness, headache, anorexia, nausea, vomiting, abdominal pain, weakness, blurred vision, mental confusion, tremors, convulsions, rapid respiration, collapse, and coma. Later there may be bronchopneumonia, kidney failure, and severe weakness. Skin contact may cause blistering, if evaporation is delayed (\*Gosselin 1976).

**Medical Conditions Generally Aggravated by Exposure:** Not Found

**Emergency and First Aid Procedures:** Move victim to fresh air; call emergency medical care. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In case of contact with material, immediately flush skin or eyes with running water for at least 15 minutes. Speed in removing material from skin is of extreme importance. Remove and isolate contaminated clothing and shoes at the site. Keep victim quiet and maintain normal body temperature. Effects may be delayed; keep victim under observation (DOT 1984, Guide 55).

### SECTION VI -- USE INFORMATION

This material is used as an insecticide, rodenticide, fumigant, and nematocide; as a chemical intermediate (\*SRI); and as a fire extinguishing agent (\*Clayton and Clayton 1981-82).

METHYL BROMIDE

**SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE**

(Steps to be Taken in Case Material is Released or Spilled)

In case of a small spill or leak, isolate 50 feet in all directions. In case of a large spill, isolate 90 feet in all directions and evacuate an area 0.3 miles long and 0.2 miles wide in a downwind direction (DOT 1984, Table of Isolation and Evacuation Distances). Remove all ignition sources. Ventilate area of spill or leak, stop flow of gas or remove leaking cylinder to open air and repair leak or allow cylinder to empty. If material is in the liquid form, allow it to vaporize (\*NIOSH/OSHA 1981). Stay upwind, keep out of low areas. Wear positive pressure breathing apparatus and special protective clothing. Use water spray to reduce vapors (DOT 1984, Guide 55).

EPA CHEMICAL PROFILE

INTERIM

Date: October 31, 1985

Revision: \_\_\_\_\_

CHEMICAL IDENTITY -- HYDROCYANIC ACID

CAS Registry Number: 74-90-8

Synonyms: Hydrogen Cyanide; Prussic Acid; Aero Liquid HCN; Cyclon;  
Cyclone B; Evercyn; Formic Anammonide; Formonitrile; Zaclondiscoids

Chemical Formula: HCN

Molecular Weight: 27.03

SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

OSHA PEL: 10 ppm (skin) (\*NIOSH/RTECS 1985)

ACGIH TLV: Ceiling 10 ppm (\*ACGIH 1980)

IDLH: 50 ppm (NIOSH/OSHA 1978, p. 112)

Other Limits Recommended: NIOSH Occupational Exposure Recommended  
Standard -- 5 mg (cyanide)/m<sup>3</sup> for 10 minutes (\*NIOSH/RTECS 1985)

SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

Boiling Point: 78.1°F, 25.6°C (\*Merck 1976)

Specific Gravity (H<sub>2</sub>O=1): 0.699 (liquid) (\*Weast 1983)

Vapor Pressure (mmHg): 630 (\*White-Stevens 1971)

Melting Point: 7.9°F, -13.4°C (\*Merck 1983)

Vapor Density (AIR=1): 0.901 g/l (\*Weast 1983)

Evaporation Rate (Butyl acetate=1): Not Found

Solubility in Water: Miscible with water (\*Merck 1976)

Appearance and Odor: Colorless gas or liquid; bitter almond odor  
(\*Merck 1976; \*CHRIS 1978)

## HYDROCYANIC ACID

## SECTION III -- FIRE AND EXPLOSION HAZARD DATA

**Flash Point (Method Used):** 0°F, -18°C (CC) (\*NFPA 1978)

**Flammable Limits:**

LEL: 5.6% (\*NFPA 1978)

UEL: 40.0% (\*NFPA 1978)

**Extinguishing Methods:** Use dry chemicals, alcohol foam, or carbon dioxide (\*NFPA 1978). Small fires: let burn unless leak can be stopped immediately. Large fires: water spray, fog or foam. Move container from fire area if you can do it without risk. Stay away from ends of tanks. Withdraw immediately in case of rising sound from venting safety device or any discoloration of tank due to fire. Cool container with water using unmanned device until well after fire is out. Isolate area until gas has dispersed (\*DOT 1984).

**Special Fire Fighting Procedures:** Firefighting should be done from a safe distance. A few whiffs of gas, or liquid penetrating firefighter's protective clothing, could be fatal. Only special protective clothing should be worn. Water spray should be used to keep containers cool (\*NFPA 1978). Keep unnecessary people away; isolate hazard area and deny entry. Stay upwind; keep out of low areas. Ventilate closed spaces before entering them. Wear positive pressure breathing apparatus and special protective clothing. Evacuate area endangered by gas. Isolate for 1/2 mile in all directions if tank car or truck is involved in fire (\*DOT 1984).

**Unusual Fire and Explosion Hazards:** Unstabilized hydrocyanic acid may polymerize spontaneously with explosive violence (\*Hawley 1981). Flashback along vapor trail may occur (\*CHRIS 1978). The explosion hazard is severe when this material is exposed to heat, flame, or oxidizers (\*Sax 1975). It forms explosive mixtures with air, and will react with water, steam, acid, or acid fumes to produce highly toxic fumes of cyanides. It may decompose explosively upon contact with alkaline material (Sax 1984, p. 1548).

## SECTION IV -- REACTIVITY DATA

**Stability: Unstable:** Yes (\*Hawley 1981)

**Stable:**

**Conditions to Avoid:** Hydrocyanic acid solution is sensitive to light (\*Hawley 1977). It may become unstable and subject to explosion if stored for an extended time or exposed to high temperature and pressure (\*CHRIS 1978). Avoid heat, flame or oxidizers (Sax 1984, p. 1548).

## HYDROCYANIC ACID

## SECTION IV -- REACTIVITY DATA (Continued)

**Incompatibility** (Materials to Avoid): Acetylaldehyde, alkaline materials, oxidizers, water, steam, acid, and acid fumes (Sax 1984, p. 1548)

**Hazardous Decomposition or Byproducts:** Toxic cyanide fumes (Sax 1984, p. 1548)

**Hazardous Polymerization:** May Occur: Yes (\*Hawley 1981)  
May Not Occur:

**Conditions to Avoid:** Unstabilized hydrocyanic acid may polymerize spontaneously with explosive violence (\*Hawley 1981). Can polymerize at 50°-60°C or when catalyzed with traces of alkali (Sax 1984, p. 1548).

## SECTION V -- HEALTH HAZARD DATA

**Routes of Entry:** Inhalation: Yes (\*Goodman 1975)  
Skin: Yes (\*Encyc Occupat Health and Safety 1983)  
Ingestion: Yes (\*Gosselin 1976)

**Health Hazards** (Acute, Delayed, and Chronic): It is super toxic. Breathing in a small amount of the gas or swallowing a very small amount may be fatal (\*NFPA 1978; \*Gosselin 1976). Average fatal dose is 50-60 mg. A few minutes of exposure to 300 ppm may result in death. Exposure to 150 ppm for 1/2 to 1 hour may endanger life (Merck 1983, p. 696).

**Signs and Symptoms of Exposure:** Exposure to hydrocyanic acid can cause weakness; headache; confusion; nausea; vomiting; increased rate of respiration or slow, gasping respiration; and eye and skin irritation (NIOSH/OSHA 1978, p. 113). This is followed by collapse, coma, convulsions, and death (Weiss 1980, p. 514).

**Medical Conditions Generally Aggravated by Exposure:** Not Found

**Emergency and First Aid Procedures:** If hydrocyanic acid gets in the eyes, wash with water immediately. If it gets on the skin, flush with water immediately. If breathing has stopped, give artificial respiration (NIOSH/OSHA 1978, p. 113). Avoid mouth-to-mouth resuscitation (\*Rumack 1975 to Present). Use cyanide antidote kit (\*Peer Review Committee). Keep victim quiet and maintain normal body temperature. Effects may be delayed; keep victim under observation (DOT 1984, Guide 13).

## HYDROCYANIC ACID

### SECTION VI -- USE INFORMATION

Hydrogen cyanide is used as a rodent poison and as a fumigant (\*Rossoff 1974). It is a chemical intermediate in the manufacture of acrylates, methacrylates, hexamethylenediamine, nitriles, and other materials (\*Patty 1963). It is also used in metal polishes, electroplating solutions, and metallurgical and photographic processes (\*Gosselin 1976).

### SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE (Steps to be Taken in Case Material is Released or Spilled)

In case of a small spill or leak, isolate 90 feet in all directions. For a large spill, isolate 190 feet in all directions, then evacuate people who are downwind, an area of 0.5 miles wide and 0.7 miles long. Stay upwind; keep out of low areas. Ventilate closed spaces before entering. Wear positive pressure breathing apparatus and special protective clothing. Use water spray to reduce vapors. Do not touch spilled material; stop leak if you can do it without risk. Shut off ignition sources; no flares, smoking, or flames in hazard area. Isolate area until gas has dispersed (\*DOT 1984).

EPA CHEMICAL PROFILE

INTERIM

Date: October 31, 1985

Revision: \_\_\_\_\_

CHEMICAL IDENTITY -- METHYL MERCAPTAN

CAS Registry Number: 74-93-1

Synonyms: Mercaptomethane; Methanethiol; Methyl Sulfhydrate; Thiomethanol; Thiomethyl Alcohol

Chemical Formula:  $\text{CH}_4\text{S}$

Molecular Weight: 48.11

SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

OSHA PEL: Air: Ceiling 10 ppm/15 min., 20 mg/m<sup>3</sup> (NIOSH/OSHA 1978, p. 130)

ACGIH TLV: TWA 0.5 ppm, 1 mg/m<sup>3</sup> (\*ACGIH 1983)

IDLH: 400 ppm (\*Encyc Occupat Health and Safety 1983)

Other Limits Recommended: Not Found

SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

Boiling Point: 42.7°F, 5.95°C (\*Merck 1983)

Specific Gravity ( $\text{H}_2\text{O}=1$ ): 0.8665 at 20°C/4°C (\*Merck 1983)

Vapor Pressure (mmHg): 1 at -90.7°C; 10 at -67.5°C; 40 at -49.2°C; 100 at -34.8°C; 400 at -7.9°C; 760 at 6.8°C (\*Weast 1979)

Melting Point: -189.4°F, -123°C (\*Merck 1983)

Vapor Density (AIR=1): 1.66 (\*Sax 1984)

Evaporation Rate (Butyl acetate=1): Not Found



## METHYL MERCAPTAN

## SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS (Continued)

**Solubility in Water:** 23.30 g/liter (\*Merck 1983)

**Appearance and Odor:** Water-white liquid when below boiling point, or colorless gas (\*Hawley 1981); odor of rotten cabbage (\*Merck 1983)

## SECTION III -- FIRE AND EXPLOSION HAZARD DATA

**Flash Point (Method Used):** 0°F, -18°C (\*Sunshine 1969)

**Flammable Limits:**

LEL: 3.9% (Weiss 1980, p. 618)

UEL: 21.8% (Weiss 1980, p. 618)

**Extinguishing Methods:** Small fires: let burn unless leak can be stopped immediately. Large fires: water spray, fog, or foam. Move container from fire area if you can do so without risk. Stay away from ends of tanks. Withdraw immediately in case of rising sound from venting safety device or any discoloration of tank due to fire. Cool container with water using unmanned device until well after fire is out. Isolate area until gas has dispersed (DOT 1984, Guide 13). Preferably let fire burn, stop gas flow. Fires may be extinguished with dry chemical, foam, or carbon dioxide (Weiss 1980, p. 618).

**Special Fire Fighting Procedures:** Keep unnecessary people away; isolate hazard area and deny entry. Stay upwind; keep out of low areas. Ventilate closed spaces before entering them. Wear positive pressure breathing apparatus and special protective clothing. Evacuate area endangered by gas. Isolate for 1/2 mile in all directions if tank car or truck is involved in fire (DOT 1984, Guide 13).

**Unusual Fire and Explosion Hazards:** Combustion produces irritating sulfur dioxide. Flash back along vapor track may occur (\*CHRIS 1978). Very dangerous when exposed to heat, flame, or oxidizers. On decomposition it emits highly toxic fumes of sulfur oxides. It will react with water, steam or acids to produce toxic and flammable vapors; and can react vigorously with oxidizing materials (Sax 1984, p. 1764).

## SECTION IV -- REACTIVITY DATA

**Stability:** Unstable:

Stable: Yes (\*CHRIS 1978)

**Conditions to Avoid:** Direct sunlight, and areas of high fire hazards (\*Sax 1968)

## METHYL MERCAPTAN

### SECTION IV -- REACTIVITY DATA (Continued)

**Incompatibility (Materials to Avoid):** Incompatible with mercuric oxide and oxidizing materials (Sax 1984, p. 1764).

**Hazardous Decomposition or Byproducts:** Irritating sulfur dioxide is produced upon combustion (Weiss 1980, p. 618). When heated to decomposition, it emits highly toxic fumes and flammable vapors (Sax 1984, p. 1764).

**Hazardous Polymerization:** May Occur:  
May Not Occur: Yes (Weiss 1980, p. 618)

**Conditions to Avoid:** Not Found

### SECTION V -- HEALTH HAZARD DATA

**Routes of Entry:** Inhalation: Yes (Weiss 1980, p. 618)  
Skin: Yes (\*Rumack 1975 to Present)  
Ingestion: Not Found

**Health Hazards (Acute, Delayed, and Chronic):** Can cause death by respiratory paralysis (\*ACGIH 1980). It is an eye and respiratory tract irritant. Exposure results in pulmonary edema and hepatic and renal damage (Clayton and Clayton 1981-82, p. 2067).

**Signs and Symptoms of Exposure:** Can cause death by respiratory paralysis (\*ACGIH 1980). Low level eye and mucous membrane irritation, headache, dizziness, staggering stance, nausea and vomiting. Other symptoms include bronchopneumonia, rapid breathing, and dermatitis (Clayton and Clayton 1981-82, p. 2068).

**Medical Conditions Generally Aggravated by Exposure:** Not Found

**Emergency and First Aid Procedures:** Move victim to fresh air; call emergency medical care. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In case of contact with material, immediately flush skin or eyes with running water for at least 15 minutes. Keep victim quiet and maintain normal body temperature. Effects may be delayed; keep victim under observation (DOT 1984, Guide 13).

## METHYL MERCAPTAN

### SECTION VI -- USE INFORMATION

Manufacturing of pesticides (\*Merck 1983); chemical intermediate for pharmaceuticals; dimethyl sulfide; fungicides; methionine; in jet fuels; in preparation of plastics (\*SRI); and as a gas odorant to serve as a warning property for odorless but hazardous gases (\*Clayton and Clayton 1981-82).

### SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE

(Steps to be Taken in Case Material is Released or Spilled)

Initial isolation: isolate 370 feet in all directions for small spills or small leaks. If it is a large spill, first isolate 770 feet in all directions and evacuate an area 1.9 miles wide and 3.0 miles long in a downwind direction (DOT 1984, Table of Isolation and Evacuation Distances). Keep unnecessary people away; isolate hazard area and deny entry. Stay upwind; keep out of low areas. Ventilate closed spaces before entering them. Wear positive pressure breathing apparatus and special protective clothing. Do not touch spilled material; stop leak if you can do so without risk. Shut off ignition sources; no flares, smoking, or flames in hazard area. Use water spray to reduce vapors. Isolate area until gas has dispersed (DOT 1984, Guide 13). Avoid breathing vapors (see Section V above).

EPA CHEMICAL PROFILE

INTERIM

Date: October 31, 1985

Revision: \_\_\_\_\_

CHEMICAL IDENTITY -- CARBON DISULFIDE

CAS Registry Number: 75-15-0

**Synonyms:** Carbon Bisulfide; Carbon Bisulphide; Carbon Disulphide; Carbon Sulfide; Dithiocarbonic Anhydride; NCI-C04591; Sulphocarbonic Anhydride; Sulphuret of Carbon; Weeviltox

**Chemical Formula:** CS<sub>2</sub>

**Molecular Weight:** 76.13

SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

**OSHA PEL:** Air: TWA 20 ppm; Ceiling Concentration 30 ppm; Peak Concentration 100 ppm/30 minutes/8 hours (\*NIOSH 1985)

**ACGIH TLV:** 10 ppm (approximately 30 mg/m<sup>3</sup>) (skin) (\*ACGIH 1980)

**IDLH:** 500 ppm (NIOSH/OSHA 1978, p. 60)

**Other Limits Recommended:** Occupational Exposure to Carbon Disulfide Recommended Standard - Air: TWA 1 ppm; Ceiling Concentration 10 ppm/15 minutes (\*NIOSH 1985)

SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

**Boiling Point:** 116°F, 46.5°C (\*Merck 1983)

**Specific Gravity (H<sub>2</sub>O=1):** 1.2632 at 20°C/4°C (\*Merck 1983)

**Vapor Pressure (mmHg):** 360 at 25°C (\*Sunshine 1969)

**Melting Point:** -167°F, -110.8°C (\*Weast 1979)

**Vapor Density (AIR=1):** 2.67 (\*Merck 1983)

**Evaporation Rate (Butyl acetate=1):** Not Found

**Solubility in Water:** 0.294% at 20°C (\*Merck 1983)

**Appearance and Odor:** Mobile clear or faintly yellow liquid; reagent and commercial grades are foul smelling. Pure distillates have sweet, pleasing ethereal odor (\*Merck 1983)

## CARBON DISULFIDE

### SECTION III -- FIRE AND EXPLOSION HAZARD DATA

**Flash Point (Method Used):** -22°F, -30°C (CC) (Merck 1983, p. 251)

**Flammable Limits:**

LEL: 1.3% (\*Merck 1983); 1% (\*Sunshine 1969)

UEL: 50% (\*Merck 1983); 44% (\*Sunshine 1969)

**Extinguishing Methods:** Use dry chemical, carbon dioxide or other inert gas. Cooling and blanketing with water spray is effective in case of fires in metal containers or tanks to help prevent reignition by hot surfaces. Foam is ineffective (NFPA 1984, p. 49-27).

**Special Fire Fighting Procedures:** If the vapor concentration exceeds 2 percent by volume or is unknown, self-contained breathing mask with full face should be used by all persons entering contaminated area (\*CHRIS 1978). Wear special protective clothing. Isolate for 1/2 mile in all directions if tank car or truck is involved in fire (DOT 1984, Guide 28).

**Unusual Fire and Explosion Hazards:** Ignition temperature dangerously low: 212°F, 100°C (Merck 1983, p. 251). Vapors may be ignited by contact with ordinary light bulb (\*NPFA 1978); when heated to decomposition, it emits highly toxic fumes of oxides of sulfur (\*Sax 1979).

### SECTION IV -- REACTIVITY DATA

**Stability: Unstable:** Yes (Merck 1983, p. 251)

**Stable:**

**Conditions to Avoid:** Decomposes on standing for a long time (Merck 1983, p. 251)

**Incompatibility (Materials to Avoid):** Air, rust, halogens, metal azides, metals, oxidants; when exposed to heat or flame reacts violently with aluminum, chlorine, azides, hypochlorite, ethylamine diamine, ethylene imine, fluorine, metallic azides of lithium, potassium, cesium, rubidium and sodium, nitrogen oxides, potassium, zinc and (sulfuric acid plus permanganate) (Sax 1984, p. 641).

**Hazardous Decomposition or Byproducts:** When heated to decomposition, emits highly toxic fumes of sulfur oxides and can react vigorously with oxidizing materials (Sax 1984, p. 642).

## CARBON DISULFIDE

### SECTION IV -- REACTIVITY DATA (Continued)

Hazardous Polymerization: May Occur: Not Found  
May Not Occur: Not Found

Conditions to Avoid: Not Found

### SECTION V -- HEALTH HAZARD DATA

Routes of Entry: Inhalation: Yes (\*NIOSH/RTECS 1985)  
Skin: Yes (\*Gosselin 1976)  
Ingestion: Yes (\*NIOSH/RTECS 1985)

**Health Hazards** (Acute, Delayed, and Chronic): The material affects the central nervous system, cardiovascular system, eyes, kidneys, liver, and skin. It may be absorbed through the skin as a vapor or liquid, inhaled or ingested. The probable oral lethal dose for a human is between 0.5 and 5 g/kg or between 1 ounce and 1 pint (or 1 pound) for a 70 kg (150 lb.) person (\*Gosselin 1976). In chronic exposures, the central nervous system is damaged and results in the disturbance of vision and sensory changes at the most common early symptoms (Sax 1984, p. 641). Lowest lethal dose for humans has been reported at 14 mg/kg or 0.98 grams for a 70 kg person (\*NIOSH/RTECS 1985).

**Signs and Symptoms of Exposure:** In acute poisoning, early excitation of the central nervous system occurs, followed by depression with stupor, restlessness, and unconsciousness. If recovery occurs, the patient usually passes through the after-stage of narcosis, with nausea, vomiting, headache, etc. (Sax 1984 p. 642). Also possible are motor disturbances of the bowel, anemia, disturbances of cardiac rhythm, loss of weight, polyuria and menstrual disorders. Severe chronic poisoning may also result in liver degeneration and jaundice (\*Thienes 1972).

**Medical Conditions Generally Aggravated by Exposure:** Alcoholics and those suffering from neuropsychic trouble are at special risk (\*LeFaux 1968).

**Emergency and First Aid Procedures:** Call for emergency medical care. Remove victim from contaminated area and administer oxygen and artificial respiration, if needed. Wash affected areas with copious amounts of water. If this material is swallowed and victim is conscious, have victim drink water or milk and have victim induce vomiting; if victim is unconscious or having convulsions, keep victim warm and do not induce vomiting (Weiss 1980, p. 232).

## CARBON DISULFIDE

### SECTION VI -- USE INFORMATION

Carbon disulfide is used in the manufacture of soil disinfectants and vacuum tubes and is used as a solvent for cleaning and extractions, especially in metal treatment and plating. It is a fumigant for commodities, a corrosion inhibitor, and a polymerization inhibitor for vinyl chloride (\*SRI).

### SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE

(Steps to be Taken in Case Material is Released or Spilled)

In case of a spill: (1) remove all ignition sources, (2) ventilate area of spill or leak, and (3) for small quantities, absorb on paper towels. Evaporate the spills in a safe place, such as a fume hood. Large quantities can be reclaimed or collected and atomized in a suitable combustion chamber equipped with an appropriate effluent gas-cleaning device (\*NIOSH/OSHA 1981). If carbon disulfide is spilled in water, neutralize with agricultural lime, crushed limestone, or sodium bicarbonate. If dissolved, apply activated carbon at ten times the spilled amount. Use mechanical dredges or lifts to remove immobilized masses of pollutants and precipitates (Student 1981, p. 106). In case of a spill or leak from a drum or smaller container or a small leak from a tank, isolate 50 feet in all directions. In case of a large spill, first isolate 100 feet in all directions, then evacuate in a downwind direction an area 0.2 miles wide and 0.3 miles long (DOT 1984, Table of Isolation and Evacuation Distances). Do not touch spilled material; stop leak if you can do it without risk. Use water spray to reduce vapors. Wear positive pressure breathing apparatus and special protective clothing (DOT 1984, Guide 28).

EPA CHEMICAL PROFILE

INTERIM

Date: October 31, 1985

Revision: \_\_\_\_\_

CHEMICAL IDENTITY -- DIMETHYL SULFIDE

CAS Registry Number: 75-18-3

**Synonyms:** 2-Thiapropene; 2-Thiopropene; Dimethyl Monosulfide; Dimethyl Sulphide; Dimethyl Thioether; DMS, Exact-S; Methane, Thiobis-; Methanethiomethane; Methyl Monosulfide; Methyl Sulphide; Methylthiomethane; Thiobismethane

**Chemical Formula:**  $C_2H_6S$

**Molecular Weight:** 62.13

SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

OSHA PEL: Not Found

ACGIH TLV: Not Found

IDLH: Not Found

**Other Limits Recommended:** Toxicity information:  $IC_{50}$  inhalation (mouse) 0.031 mg/liter (\*NIOSH/RTECS 1985) (SUSPECT)

SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

**Boiling Point:** 99.7°F, 37.3°C (\*Weast 1979)

**Specific Gravity** ( $H_2O=1$ ): 0.8483 at 20°C/4°C (\*Weast 1979)

**Vapor Pressure** (mmHg): 15 (\*Clayton and Clayton 1981-82) (SUSPECT)

**Melting Point:** -144.9°F, -98.27°C (\*Weast 1979)

**Vapor Density** (AIR=1): 2.14 (\*Sax 1979)

**Evaporation Rate** (Butyl acetate=1): Not Found

**Solubility in Water:** Insoluble (\*Weast 1979)

**Appearance and Odor:** Colorless liquid with an unpleasant, wild radish, cabbage-like odor (\*Fenaroli 1975).



## DIMETHYL SULFIDE

## SECTION III -- FIRE AND EXPLOSION HAZARD DATA

**Flash Point** (Method Used): -55°F (\*Clayton and Clayton 1981-82)

**Flammable Limits:**

LEL: 2.2% (\*Sax 1979)

UEL: 19.7% (\*Sax 1979)

**Extinguishing Methods:** Extinguish with dry chemical, carbon dioxide, water spray, fog or foam (\*DOT 1984).

**Special Fire Fighting Procedures:** Wear self-contained breathing apparatus and full protective clothing. Move container from fire area. Cool containers that are exposed to flames with water from the side until well after the fire is out. For massive fire in cargo area, used unmanned hose holder or monitor nozzles; if this is impossible withdraw from area and let fire burn. Withdraw immediately in case of rising sound from venting safety device or any discoloration of tank due to fire. Isolate for 1/2 mile in all directions if tank car or truck is involved in fire (\*DOT 1984).

**Unusual Fire and Explosion Hazards:** Flammable/combustible material, may be ignited by heat, sparks or flames. Vapors may travel to a source of ignition and flash back. Container may explode in heat of fire. Vapor explosion hazard indoors, outdoors or in sewers (\*DOT 1984).

## SECTION IV -- REACTIVITY DATA

**Stability:** Unstable: Not Found

Stable: Not Found

**Conditions to Avoid:** Not Found

**Incompatibility** (Materials to Avoid): Reacts vigorously with oxidizing materials (\*Sax 1979). Incompatible with dibenzoyl peroxide (Sax 1984, p. 1201).

**Hazardous Decomposition or Byproducts:** Combustion products include toxic and irritating fumes of sulfur dioxide (Weiss 1980, p. 367).

**Hazardous Polymerization:** May Occur:

May Not Occur: Yes (Weiss 1980, p. 367)

**Conditions to Avoid:** Not Found

## DIMETHYL SULFIDE

### SECTION V -- HEALTH HAZARD DATA

**Routes of Entry:** Inhalation: Yes (\*Clayton and Clayton 1981-82)  
Skin: Yes (\*Clayton and Clayton 1981-82)  
Ingestion: Yes (\*Sax 1975)

**Health Hazards** (Acute, Delayed, and Chronic): Dimethyl sulfide causes softening and irritation of the skin. Orally it is an irritant (\*Sax 1975). It is a moderate eye irritant (\*Clayton and Clayton 1981-82). It is an eye, nose, throat and skin irritant (\*CHRIS 1978).

**Signs and Symptoms of Exposure:** Not Found

**Medical Conditions Generally Aggravated by Exposure:** Not Found

**Emergency and First Aid Procedures:** Move victim to fresh air; call emergency medical care. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In case of contact with material, immediately flush eyes with running water for at least 15 minutes. Wash skin with soap and water. Remove and isolate contaminated clothing and shoes at the site (\*DOT 1984).

### SECTION VI -- USE INFORMATION

It is a gas odorant, catalyst impregnator, solvent for anhydrous mineral salts, flavoring ingredient in foods and beverages, chemical intermediate for solvents and dimethyl sulfoxide (\*SRI).

### SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE

(Steps to be Taken in Case Material is Released or Spilled)

Keep unnecessary people away; isolate hazard area and deny entry. Stay upwind. Wear self-contained breathing apparatus and full protective clothing. Shut off ignition sources; no flares, smoking or flames in hazard area. Stop leak. Use water spray to reduce vapors. Take up spills with noncombustible absorbent material (\*DOT 1984).

## EPA CHEMICAL PROFILE

### INTERIM

Date: October 31, 1985

Revision: \_\_\_\_\_

### CHEMICAL IDENTITY -- ETHYLENE OXIDE

CAS Registry Number: 75-21-8

**Synonyms:** alpha, beta-Oxidoethane; Anprolene; Dihydrooxirene; Dimethylene Oxide; E O; ETO; NCI-C50088; Oxacyclopropane; Oxane; Oxidoethane; 1,2-Epoxyethane; Oxiran; Oxirane; Oxirene, Dihydro-; Oxyfume; Oxyfume 12; T-Gas

**Chemical Formula:**  $C_2H_4O$

**Molecular Weight:** 44.06

### SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

**OSHA PEL:** Air: TWA 50 ppm (\*48 FR 17284, 1983)

**ACGIH TLV:** 1 ppm (2 mg/m<sup>3</sup>) (\*ACGIH 1984)

**IDLH:** 800 ppm (\*NIOSH/OSHA 1981)

**Other Limits Recommended:** Ceiling concentration of 75 ppm (135 mg/m<sup>3</sup>) determined during a 15 minute period (\*NIOSH 1981). Industrial substance suspect of carcinogenic potential for humans -- recommended TLV 1 ppm (ACGIH 1984, p. 42).

### SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

**Boiling Point:** 51.3°F, 10.7°C (\*Sunshine 1969)

**Specific Gravity (H<sub>2</sub>O=1):** 0.8222 at 10°C/10°C (\*Sunshine 1969)

**Vapor Pressure (mmHg):** 1095 at 20°C (NIOSH/OSHA 1978, p. 100)

**Melting Point:** -170.5°F, -112.5°C (\*Sunshine 1969)

**Vapor Density (AIR=1):** 1.49 (\*Environment Canada 1982)

**Evaporation Rate (Butyl acetate=1):** Not Found

**Solubility in Water:** Soluble (\*Merck 1976)

**Appearance and Odor:** Colorless gas at room temperature but a mobile liquid below 12°C (54°F) and has a sweet odor (\*Merck 1976; \*CHRIS 1978)

## ETHYLENE OXIDE

## SECTION III -- FIRE AND EXPLOSION HAZARD DATA

**Flash Point** (Method Used): Greater than -18°C (\*Sunshine 1969); but less than 0°F (OC) (\*CHRIS 1978)

**Flammable Limits:**

LEL: 3.0% (\*Sax 1975)

UEL: 100% (\*Sax 1975)

**Extinguishing Methods:** Extinguish with alcohol foam, carbon dioxide, dry chemical or water spray, fog, or foam. Let burn unless leak can be stopped immediately (\*DOT 1984).

**Special Fire Fighting Procedures:** Move container from fire area if you can do so without risk. Stay away from ends of tanks. Fight fire from maximum distance. For massive fire in cargo area, use unmanned hose holder or monitor nozzles; if this is impossible, withdraw from area and let fire burn. Withdraw immediately in case of rising sound from venting safety device or any discoloration of tank due to fire. Isolate for 1 mile in all directions if tank car or truck is involved in fire. Keep unnecessary people away; isolate hazard area and deny entry. Stay upwind; keep out of low areas. Wear positive pressure breathing apparatus and full protective clothing. Evacuate area endangered by gas (\*DOT 1984).

**Unusual Fire and Explosion Hazards:** Severe explosion hazard when exposed to heat or flame (Sax 1984, p. 1348). Irritating vapors are generated when heated. Vapor is heavier than air and may travel considerable distance to a source of ignition and flash back (\*CHRIS 1978). Vapor forms explosive mixtures with air over a wide range (\*NFPA 1978). Liquid is not detonable but the vapor may be readily initiated into explosive decomposition (\*Bretherick 1979).

## SECTION IV -- REACTIVITY DATA

**Stability:** Unstable: Yes (\*NFPA 1978)

Stable:

**Conditions to Avoid:** Air, heat, acids and bases (Sax 1984, p. 1348); metal or metal chloride catalysts (\*NFPA 1978)

**Incompatibility** (Materials to Avoid): Metal fittings containing copper, silver, mercury or magnesium; ammonia (\*Bretherick 1979); pharmaceutical substances; vitamins; amino acids; food constituents (\*Osol 1975); oxidizing agents; acids, organic bases; amines; certain salts; alcohols; mercaptans (\*General Electric Co. 1980, MSDS #433); ferric chloride; magnesium perchlorate; m-nitroaniline; trimethylamine (\*ITI 1982); potassium, tin chlorides; contaminants; alkanethiols; bromoethane; aluminum chloride; aluminum oxide; iron chlorides; and iron oxides (Sax 1984, p. 1348).

## ETHYLENE OXIDE

### SECTION IV -- REACTIVITY DATA (Continued)

**Hazardous Decomposition or Byproducts:** Decomposition products are explosive (\*ITI 1982).

**Hazardous Polymerization:** May Occur: Yes (\*Sax 1975)  
May Not Occur:

**Conditions to Avoid:** Acids; covalent halides such as chlorides of aluminum, iron (III), tin (IV); basic materials like alkali hydrides, ammonia, amines, and potassium; catalytically active solids such as aluminum or iron oxides or rust (\*Bretherick 1975); chlorides of boron, aluminum, tin, and iron; some carbonates; and metals such as copper and copper alloys (\*Patty 1963)

### SECTION V -- HEALTH HAZARD DATA

**Routes of Entry:** Inhalation: Yes (\*Gilman 1980)  
Skin: Yes (Sax 1984, p. 1348)  
Ingestion: Yes (Sax 1984, p. 1348)

**Health Hazards (Acute, Delayed, and Chronic):** It can cause death. Low toxic concentration when inhaled is 12500 ppm/10 seconds (\*NIOSH/RTECS 1985). It is a strong skin irritant (\*CHRIS 1978). Neurological disorders and even death have been reported (\*Gilman 1980).

**Signs and Symptoms of Exposure:** Low vapor concentration often results in delayed nausea and vomiting. Higher concentration produces irritation of eyes, nose and throat (\*CHRIS 1978).

**Medical Conditions Generally Aggravated by Exposure:** Not Found

**Emergency and First Aid Procedures:** Move victim to fresh air; call emergency medical care. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In case of contact with material, immediately flush skin or eyes with running water for at least 15 minutes. Remove and isolate contaminated clothing and shoes at the site. Keep victim quiet and maintain normal body temperature. Effects may be delayed; keep victim under observation (\*DOT 1984).

## ETHYLENE OXIDE

### SECTION VI -- USE INFORMATION

Ethylene oxide is a chemical intermediate for ethylene glycol, nonionic surfactants, glycol ethers, ethanolamines, triethylene glycol, and polyethylene glycol (\*SRI). Used as a fumigant for foodstuffs and textiles, for sterilizing surgical instruments, and as an agricultural fungicide (Merck 1983, p. 550). Registered as a pesticide in the U.S. (USEPA/Active Ingredients 1985).

### SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE

(Steps to be Taken in Case Material is Released or Spilled)

Avoid inhalation and skin contact. Wear proper eye and respiratory protection and protective clothing (see Section V above). Shut off ignition sources; do not allow flares, smoking or flames in the hazard area. Stop leak if you can do so without risk. Use water spray to reduce vapors; do not get water inside container. For small spills flush area with flooding amounts of water. For large spills dike spill for later disposal. If there is a spill or leak from a drum or smaller container or a small leak from a tank, then isolate 80 feet in all directions. If there is a large spill from a tank or from many containers or drums, etc., first isolate 160 feet in all directions. Then evacuate in a downwind direction, an area 0.4 miles wide and 0.5 miles long (\*DOT 1984).

EPA CHEMICAL PROFILE

INTERIM

Date: October 31, 1985

Revision: \_\_\_\_\_

**CHEMICAL IDENTITY -- PHOSGENE**

**CAS Registry Number:** 75-44-5

**Synonyms:** Carbon Oxychloride; Carbonyl Chloride; CG; Chloroformyl Chloride; NCI-C60219; Carbon Dichloride Oxide; Carbonic Acid Dichloride; Carbonic Dichloride; Carbonyl Dichloride; Phosgen

**Chemical Formula:**  $\text{CCl}_2\text{O}$

**Molecular Weight:** 98.92

**SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION**

**OSHA PEL:** Air: TWA 0.1 ppm (\*NIOSH 1977)

**ACGIH TLV:** 0.1 ppm (\*ACGIH 1979)

**IDLH:** 2 ppm (NIOSH/OSHA 1978, p. 154)

**Other Limits Recommended:** Recommended standard: Air: TWA 0.1 ppm; Ceiling 0.2 ppm for 15 minutes (\*NIOSH 1977)

**SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS**

**Boiling Point:** 47°F, 8.2°C (\*Merck 1976)

**Specific Gravity ( $\text{H}_2\text{O}=1$ ):** 1.432 at 0°C/4°C (\*Merck 1976)

**Vapor Pressure (mmHg):** 1215 at 20°C (\*Merck 1976)

**Melting Point:** -180°F, -118°C (\*Merck 1976)

**Vapor Density (AIR=1):** 3.4 (\*NFPA 1975)

**Evaporation Rate (Butyl acetate=1):** Not Found

**Solubility in Water:** Slightly soluble (\*Merck 1976)

## PHOSGENE

## SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS (Continued)

**Appearance and Odor:** Colorless gas; colorless, fuming liquid; suffocating odor reminiscent of moldy hay (\*Merck 1976). In dilute concentration has odor of green corn (\*Arena 1974); odor similar to decaying fruit at room temperature (\*Encyc Occupat Health and Safety 1971).

## SECTION III -- FIRE AND EXPLOSION HAZARD DATA

**Flash Point (Method Used):** Not Found

**Flammable Limits:**

LEL: Not Found

UEL: Not Found

**Extinguishing Methods:** Nonflammable (NFPA 1984, p. 49-73). For small fires, use dry chemical or carbon dioxide. Use water spray, fog, or foam for larger fires. Do not get water inside containers. Move container from fire area if you can do so without risk. Stay away from the ends of tanks, and cool exposed containers with water until well after the fire is out. Isolate the area until gas has dispersed (\*DOT 1984).

**Special Fire Fighting Procedures:** If necessary to stop flow of gas, use water spray to protect the personnel effecting shutoff. Sodium hydroxide or anhydrous ammonia have been used to neutralize phosgene (\*NFPA 1975).

**Unusual Fire and Explosion Hazards:** When heated to decomposition or on contact with water or steam, it will react to produce toxic and corrosive fumes (\*Sax 1975).

## SECTION IV -- REACTIVITY DATA

**Stability:** Unstable:

**Stable:** Yes, in steel containers if dry (U.S. Army 1975, p. 3-1)

**Conditions to Avoid:** Moisture (\*Sax 1975)

**Incompatibility (Materials to Avoid):** Reacts violently with aluminum; tert-butyl azido formate; 2,4-hexadiyn-1,6-diol; isopropyl alcohol; potassium; sodium; hexafluoro isopropylidene; amino lithium; lithium (Sax 1984, p. 2211).

**Hazardous Decomposition or Byproducts:** When heated to decomposition or on contact with water or steam, it will react to produce toxic and corrosive fumes (\*Sax 1975).



## PHOSGENE

### SECTION IV -- REACTIVITY DATA (Continued)

Hazardous Polymerization: May Occur: Not Found  
May Not Occur: Not Found

Conditions to Avoid: Not Found

### SECTION V -- HEALTH HAZARD DATA

Routes of Entry: Inhalation: Yes (\*Sax 1975)  
Skin: Yes (\*DOT 1984)  
Ingestion: Not Found

**Health Hazards** (Acute, Delayed, and Chronic): Phosgene is a lung toxicant that causes damage to the capillaries, bronchioles and alveoli of the lungs (U.S. Army 1975, p. 3-1) by decomposition to hydrochloric acid. There is little immediate irritant effect upon the respiratory tract, and the warning properties of the gas are therefore very slight. Pulmonary edema, bronchopneumonia and occasionally lung abscesses develop. Degenerative changes in the nerves have been reported as later developments. A concentration of 25 ppm is dangerous for exposures lasting 30-60 minutes and 50 ppm is rapidly fatal after even short exposure (Sax 1984, p. 2210).

**Signs and Symptoms of Exposure:** The severity of poisoning cannot be estimated from the immediate symptoms, since the full effect is not usually apparent until 3 or 4 hours after exposure (U.S. Army 1975, p. 3-1). After the latent period, burning in the throat and chest, shortness of breath and labored breathing are common symptoms. There may be moist rales in the chest. If the exposure is severe, the development of pulmonary edema may be so rapid that the patient dies within 36 hours after exposure. In less severe exposures, pneumonia may develop several days after the accident (Sax 1984, p. 2210). Contact may cause burns to the skin and eyes (\*DOT 1984).

**Medical Conditions Generally Aggravated by Exposure:** Not Found

**Emergency and First Aid Procedures:** Move victim to fresh air and call emergency medical care. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Remove and isolate contaminated clothing and shoes at the site. In case of contact with material, immediately flush skin or eyes with running water. Keep victim quiet. Effects may be delayed, keep victim under observation (\*DOT 1984).

## PHOSGENE

### SECTION VI -- USE INFORMATION

Delayed-action military chemical agent (U.S. Army 1975, p. 3-1). Chemical intermediate for toluene diisocyanate, methyl isocyanate, acyl chlorides, diphenylmethane-4,4'-diisocyanate, chloroformate esters, diethyl carbonate, dimethyl carbamoyl chloride, polymethylene polyphenylisocyanate, polycarbonate resins (\*SRI); aniline dyes (\*Hamilton 1974); pesticides, herbicides, dyes (Hawley 1981, p. 807).

### SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE (Steps to be Taken in Case Material is Released or Spilled)

Respiratory protective equipment must be available. Suitable emergency masks are those with acid gas canisters. For extended use, supplied-air respirators or self-contained breathing equipment are necessary (\*Encyc Occupat Health and Safety 1971). Keep unnecessary people away; isolate hazard area and deny entry. Stay upwind and keep out of low areas. Ventilate closed spaces before entering. Isolate 600 feet in all directions for a small spill. For a large spill, first isolate 1,250 feet in all directions, and then evacuate in a downwind direction an area 3.3 miles wide and 5.2 miles long (\*DOT 1984).

EPA CHEMICAL PROFILE

INTERIM

Date: October 31, 1985

Revision: \_\_\_\_\_

CHEMICAL IDENTITY -- PROPYLENEIMINE

CAS Registry Number: 75-55-8

Synonyms: Aziridine, 2-Methyl-; 2-Methylazacyclopropane; 2-Methylaziridine; 2-Methylethylenimine; Methylethylenimine; Propylenimine; Propylene Imine

Chemical Formula:  $C_3H_7N$

Molecular Weight: 57.11

SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

OSHA PEL: 2 ppm (5 mg/m<sup>3</sup>) (NIOSH/OSHA 1978, p. 160)

ACGIH TLV: TWA 2 ppm (5 mg/m<sup>3</sup>) (skin) (ACGIH 1985, p. 28)

IDLH: 500 ppm (NIOSH/OSHA 1978, p. 160)

Other Limits Recommended: Industrial substances suspect of carcinogenic potential to man (\*ACGIH 1983)

SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

Boiling Point: 151-153°F, 66-67°C (\*Encyc Occupat Health and Safety 1983)

Specific Gravity (H<sub>2</sub>O=1): 0.8039-0.8070 at 25°C/25°C (Hawley 1981, p. 865)

Vapor Pressure (mmHg): 112 at 20°C (\*IARC 1972-1985)

Melting Point: -85°F, -65°C (\*IARC 1972-1985)

Vapor Density (AIR=1): 2.0 (\*Encyc Occupat Health and Safety 1983)

Evaporation Rate (Butyl acetate=1): Not Found

Solubility in Water: Miscible (\*IARC 1972-1985)

Appearance and Odor: Colorless, oily liquid with an odor similar to aliphatic amines (i.e., fishy) (\*IARC 1972-1985)

## PROPYLENEIMINE

## SECTION III -- FIRE AND EXPLOSION HAZARD DATA

**Flash Point** (Method Used): 25°F (CC) (\*ACGIH 1980)

**Flammable Limits:**

LEL: Not Found

UEL: Not Found

**Extinguishing Methods:** If material is on fire, use foam, carbon dioxide, or dry chemical (Student 1981, p. 433).

**Special Fire Fighting Procedures:** If material is on fire, do not extinguish fire unless flow can be stopped. Use water in flooding quantities as a "fog" and use to cool all affected containers. Keep material out of water sources and sewers. Build dikes to contain flow as necessary (Student 1981, p. 433).

**Unusual Fire and Explosion Hazards:** Chemical is extremely flammable; vapors are heavier than air (Student 1981, pp. 433).

## SECTION IV -- REACTIVITY DATA

**Stability:** **Unstable:** Thermally unstable (Student 1981, p. 433)

**Stable:**

**Conditions to Avoid:** Not Found

**Incompatibility** (Materials to Avoid): Acids, strong oxidizers (NIOSH/OSHA 1978, p. 160)

**Hazardous Decomposition or Byproducts:** Toxic oxides of nitrogen are produced during combustion (Student 1981, p. 433).

**Hazardous Polymerization:** **May Occur:** Yes (Student 1981, p. 433)

**May Not Occur:**

**Conditions to Avoid:** Contact with acid promotes violent polymerization (Student 1981, p. 433)

## SECTION V -- HEALTH HAZARD DATA

**Routes of Entry:** **Inhalation:** Yes (Hawley 1981, p. 865)

**Skin:** Yes (Hawley 1981, p. 865)

**Ingestion:** Yes (Hawley 1981, p. 865)

## PROPYLENEIMINE

### SECTION V -- HEALTH HAZARD DATA (Continued)

**Health Hazards** (Acute, Delayed, and Chronic): Toxic after acute exposure. Can severely irritate eyes, skin, and lungs (\*Encyc Occupat Health and Safety 1983).

**Signs and Symptoms of Exposure:** Inflammation and blistering of the skin, eye and upper respiratory tract; irritation, nausea, itching, and periodic vomiting. Headache, dizziness, and pain in the temple. Shortness of breath, and increased nasal and laryngeal secretion are seen (\*Encyc Occupat Health and Safety 1983).

**Medical Conditions Generally Aggravated by Exposure:** Not Found

**Emergency and First Aid Procedures:** Move victim to fresh air; call emergency medical care. If victim is not breathing, give artificial respiration; if breathing is labored, give oxygen. In case of eye/skin contact, immediately flush with water for at least 15 minutes (DOT 1984, Guide 30). Neutralization with acids (e.g., vinegar, fruit juices) is contraindicated. Avoid vomiting (\*Rumack 1975 to Present).

### SECTION VI -- USE INFORMATION

Propyleneimine is used as a chemical intermediate in the modification of latex surface coating resins, polymers in textile and paper industries, dyes, photography, gelatins, oil additives and organic synthesis. It is a comonomer for polymers with methacrylic acid and esters (\*SRI).

### SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE

(Steps to be Taken in Case Material is Released or Spilled)

Avoid breathing vapors; wear self-contained breathing apparatus. Avoid bodily contact with the material; wear full protective clothing. Do not handle broken packages without protective equipment. Wash away any material which may have contacted the body with copious amounts of water or soap with water. Use water spray to disperse vapors and dilute standing pools of liquid. Keep sparks and flames away. Attempt to stop leak if it can be done without hazard. (Student 1981, p. 433).

EPA CHEMICAL PROFILE

INTERIM

Date: October 31, 1985

Revision: \_\_\_\_\_

CHEMICAL IDENTITY -- PROPYLENE OXIDE

CAS Registry Number: 75-56-9

**Synonyms:** 1,2-Epoxypropane; Epoxypropane; Ethylene oxide, Methyl-; Methyl Ethylene Oxide; Methyl Oxirane; Methyloxirane; NCI-C50099; Oxirane, Methyl-; Propane, 1,2-Epoxy-; Propane, Epoxy-; Propene Oxide; Propylene Epoxide; Propylene Oxide; Propyleneoxide; 1,2-Propylene Oxide

**Chemical Formula:**  $C_3H_6O$

**Molecular Weight:** 58.08

SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

**OSHA PEL:** Air: TWA 100 ppm (\*NIOSH/RTECS 1985)

**ACGIH TLV:** TWA 20 ppm (50 mg/m<sup>3</sup>) (\*ACGIH 1983)

**IDLH:** 2000 ppm (NIOSH/OSHA 1978, p. 160)

**Other Limits Recommended:** Not Found

SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

**Boiling Point:** 93.61°F, 34.23°C (\*Merck 1976)

**Specific Gravity (H<sub>2</sub>O=1):** 0.859 at 0°C/4°C (\*Merck 1976)

**Vapor Pressure (mmHg):** 445 at 20°C (\*Sunshine 1969)

**Melting Point:** -169.83°F, -112.13°C (\*Merck 1976)

**Vapor Density (AIR=1):** 2.0 (\*Clayton and Clayton 1981-82)

**Evaporation Rate (Butyl acetate=1):** Not Found

**Solubility in Water:** 40.5% by weight at 20°C (\*Merck 1976)

## PROPYLENE OXIDE

## SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS (Continued)

**Appearance and Odor:** Colorless liquid (\*Merck 1976) with sweet, alcoholic odor like natural gas, ether, or benzene (\*Clayton and Clayton 1981-82)

## SECTION III -- FIRE AND EXPLOSION HAZARD DATA

**Flash-Point** (Method Used): -35°F, -37°C (CC) (\*Sunshine 1969)

**Flammable Limits:**

LEL: 2.8% (\*Sax 1979)

UEL: 37% (\*Sax 1979)

**Extinguishing Methods:** Extinguish with dry chemical, carbon dioxide, water spray, fog or foam (DOT 1984, Guide 26).

**Special Fire Fighting Procedures:** Firefighting should be done from a safe distance or from a protected location (\*NFPA 1978). Wear self-contained (positive pressure if available) breathing apparatus and full protective clothing. Isolate for 1/2 mile in all directions if tank car or truck is involved in fire. Move container from area if you can do so without risk. Spray cooling water on containers that are exposed to flames until well after fire is out. For massive fire in cargo area, use unmanned hose holder or monitor nozzles; if this is impossible, withdraw from area and let fire burn. Withdraw immediately in case of rising sound from venting safety device or any discoloration of tank due to fire (DOT 1984, Guide 26).

**Unusual Fire and Explosion Hazards:** Vapor is heavier than air and may travel considerable distance to source of ignition and flash back. Vapors form explosive mixture with air. If polymerization takes place in container, there may be a violent rupture of container (\*NFPA 1978). Explosion hazard is severe when exposed to flame (\*Sax 1979).

## SECTION IV -- REACTIVITY DATA

**Stability:** Unstable:

Stable: Yes (Weiss 1980, p. 787)

**Conditions to Avoid:** Not Found

**Incompatibility** (Materials to Avoid): Violently reacts with acetylide-forming metals such as copper or copper alloys (\*Clayton and Clayton 1981-82); ammonium hydroxide; chlorosulfonic acid; hydrochloric acid; hydrofluoric acid; nitric acid; oleum and sulfuric acid (Sax 1984, p. 1289).

## PROPYLENE OXIDE

### SECTION IV -- REACTIVITY DATA (Continued)

**Hazardous Decomposition or Byproducts:** Not Found

**Hazardous Polymerization:** May Occur: Yes (\*Clayton and Clayton  
1981-82)

May Not Occur:

**Conditions to Avoid:** Active catalytic surfaces such as anhydrous chlorides of iron, tin, and aluminum; peroxides of iron and aluminum; and alkali metal hydroxides (\*NFPA 1978); high temperatures; alkalies; aqueous acids; amines and acidic alcohols (Weiss 1980, p. 787).

### SECTION V -- HEALTH HAZARD DATA

**Routes of Entry:** Inhalation: Yes (\*Sax 1975)  
Skin: Yes (\*Clayton and Clayton 1981-82)  
Ingestion: Yes (\*Sax 1975)

**Health Hazards** (Acute, Delayed, and Chronic): This material is moderately toxic by inhalation and ingestion. It may cause irreversible and reversible changes (\*Sax 1975). Skin contact with the material or solutions of the material cause irritation; diluted solutions are more irritating than undiluted materials (\*Encyc Occupat Health and Safety 1971). Exposure may cause mild depression of the central nervous system and eye, nasal and lung irritation (\*Rumack 1975 to Present). Contact with the liquid can cause blindness and death. Pulmonary edema may recur up to 2 weeks after exposure (\*Morgan 1982).

**Signs and Symptoms of Exposure:** Exposure may cause headache, nausea, vomiting, and drunkenness (\*Rumack 1975 to Present). Eye contact may cause burns (\*Encyc Occupat Health and Safety 1971).

**Medical Conditions Generally Aggravated by Exposure:** Not Found

**Emergency and First Aid Procedures:** In case of inhalation, move victim to fresh air immediately. Keep quiet and warm. If breathing stops, give artificial respiration. In case of skin or eye contact, immediately flush with plenty of water for at least 15 minutes. Immediately remove contaminated clothing, watch bands, rings, etc. If material is swallowed, have victim drink water or milk (Weiss 1980, p. 787).



## PROPYLENE OXIDE

### SECTION VI -- USE INFORMATION

This material is used primarily as a chemical intermediate for polyurethane polyols, propylene glycol, and dipropylene glycol (\*SRI). It is also used for sterilization of packaged foods (\*Farm Chemicals Handbook 1983), as a herbicide (\*Clayton and Clayton 1981-82), in the preparation of lubricants, surfactants, and oil demulsifiers, and as a fumigant, and soil sterilant (\*Merck 1976).

### SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE

(Steps to be Taken in Case Material is Released or Spilled)

Ventilate area of spill or leak. Do not allow the material to enter confined space, such as a sewer, because of the possibility of an explosion (\*NIOSH/OSHA 1981). Stop discharge if possible. Stay upwind and use water spray to knock down vapor. Avoid contact with liquid and vapor. Wear goggles, self-contained breathing apparatus, and rubber overclothing (Weiss 1980, p. 787). Water spray may be used to flush spills away from exposure and to dilute spills to nonflammable mixture (\*NFPA 1978). Shut off ignition sources; no flares, smoking or flames in hazard area. Stop leak if you can do so without risk. Use water spray to reduce vapors. Small spills: absorb with sand or other noncombustible absorbent material and place into containers for later disposal. Large spills: dike far ahead of spill for later disposal (DOT 1984, Guide 26).

EPA CHEMICAL PROFILE

INTERIM

Date: October 31, 1985

Revision: \_\_\_\_\_

CHEMICAL IDENTITY -- TETRAMETHYL LEAD

CAS Registry Number: 75-74-1

Synonyms: Lead Tetramethyl; Methylplumbane; TML

Chemical Formula:  $C_4H_{12}Pb$

Molecular Weight: 267.33

SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

OSHA PEL: Air: TWA 0.075 mg (Lead)/m<sup>3</sup> (skin) (OSHA 1984, p. 663)

ACGIH TLV: TWA 0.15 mg (Lead)/m<sup>3</sup> (skin), STEL 0.5 mg (Lead)/m<sup>3</sup> (skin) (ACGIH 1985, p. 30).

IDLH: 40 mg/m<sup>3</sup> (NIOSH/OSHA 1978, p. 176)

Other Limits Recommended: Maximum air concentration: 0.15 mg/m<sup>3</sup> (skin) (\*Casarett 1975)

SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

Boiling Point: 230°F, 110°C at 10 mmHg (\*IARC 1972-1985); decomposes above 212°F, 100°C (\*NFPA 1975)

Specific Gravity (H<sub>2</sub>O=1): 1.995 (\*Weast 1976)

Vapor Pressure (mmHg): 22 at 20°C (NIOSH/OSHA 1978, p. 176)

Melting Point: -17.5°F, -27.5°C (\*Weast 1976)

Vapor Density (AIR=1): 6.5 (NFPA 1984, p. 325M-87) (SUSPECT)

Evaporation Rate (Butyl acetate=1): Not Found

Solubility in Water: Insoluble (\*IARC 1972-1985)

Appearance and Odor: Colorless liquid (\*Encyc Occupat Health and Safety 1971); dyed red, orange or blue with a slight musty odor (NIOSH/OSHA 1978, p. 176).

## TETRAMETHYL LEAD

### SECTION III -- FIRE AND EXPLOSION HAZARD DATA

**Flash Point (Method Used):** 38°C (\*IARC 1972-1985)

**Flammable Limits:**

LEL: Not Found

UEL: Not Found

**Extinguishing Methods:** On fires in which containers are not exposed, use water spray, dry chemical, foam or carbon dioxide (\*NFPA 1975).

**Special Fire Fighting Procedures:** Use water to keep fire exposed containers cool. If leak or spill has not ignited, use water spray to disperse vapors or flush spill (\*NFPA 1975). For massive fire in cargo area, use unmanned hose holder or monitor nozzle; if this is impossible withdraw from area and let fire burn (\*DOT 1984).

**Unusual Fire and Explosion Hazards:** Thermal decomposition is likely to take the form of vapors at the surface. Rapid decomposition will cause container to explode (\*NFPA 1975). Dangerous fire hazard when exposed to heat, flame, or oxidizers (Sax 1984, p. 2546).

### SECTION IV -- REACTIVITY DATA

**Stability:** Unstable:

Stable: Yes (Weiss 1980, p. 865)

**Conditions to Avoid:** Fire, heat, physical damage, and strong oxidizers (\*NFPA 1975). Starts to decompose at about 212°F (100°C). If confined, may explode or detonate at high temperatures (Weiss 1980, p. 865).

**Incompatibility (Materials to Avoid):** Strong oxidizers such as sulfuryl chloride or potassium permanganate (NIOSH/OSHA 1978, p. 176).

**Hazardous Decomposition or Byproducts:** Toxic gases are generated in fire (Weiss 1980, p. 865).

**Hazardous Polymerization:** May Occur:

May Not Occur: Yes (Weiss 1980, p. 865)

**Conditions to Avoid:** Not Found

### SECTION V -- HEALTH HAZARD DATA

**Routes of Entry:** Inhalation: Yes (\*NFPA 1975)

Skin: Yes (\*NFPA 1975)

Ingestion: Yes (\*NFPA 1975)

**TETRAMETHYL LEAD****SECTION V -- HEALTH HAZARD DATA (Continued)**

**Health Hazards (Acute, Delayed, and Chronic):** Vapors are very toxic. Fatal lead poisoning may occur by ingestion, vapor inhalation or skin absorption (\*NFPA 1975). Several cases of acute toxicity, usually in the form of degenerative brain disease, have been described following occupational exposure (\*IARC 1972-1985).

**Signs and Symptoms of Exposure:** If inhaled or absorbed by skin, may cause insomnia, excitability, delirium, coma and death. Vapors cause a slight irritation of the eyes or respiratory system if present in high concentrations. Causes irritation of the skin and first degree burns on short exposure; may cause secondary burns on long exposure (Weiss 1980, p. 865). Other symptoms include bad dreams, anxiety, low blood pressure, nausea, mania, and convulsions (NIOSH/OSHA 1978, p. 176).

**Medical Conditions Generally Aggravated by Exposure:** Not Found

**Emergency and First Aid Procedures:** Move victim to fresh air; call emergency medical care. If not breathing give artificial respiration. If breathing is difficult, give oxygen. In case of contact with material, immediately flush skin or eyes with running water for at least 15 minutes. Speed in removing material from skin is of extreme importance. Remove and isolate contaminated clothing and shoes at the site. Keep victim quiet and maintain normal temperature. Effects may be delayed; keep victim under observation (\*DOT 1984).

**SECTION VI -- USE INFORMATION**

Antiknock additive for gasolines; component of mixed alkyl leads for gasoline additives (\*SRI).

**SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE**

(Steps to be Taken in Case Material is Released or Spilled)

Wear positive pressure breathing apparatus and special protective clothing. Do not touch spilled material; stop leak if you can do it without risk. Use water spray to reduce vapors. Small spills: take up with sand or other non-combustible absorbent material and place into containers for later disposal. Large spills: dike far ahead of spill for later disposal (\*DOT 1984).

EPA CHEMICAL PROFILE

INTERIM

Date: October 31, 1985

Revision: \_\_\_\_\_

CHEMICAL IDENTITY -- TRIMETHYLCHLOROSILANE

CAS Registry Number: 75-77-4

**Synonyms:** Chlorotrimethylsilane; Monochlorotrimethylsilicon; Silane, Chlorotrimethyl-; Silane, Trimethylchloro-; Silicane, Chlorotrimethyl; Silylium, Trimethyl-, Chloride; Trimethyl Chlorosilane; Trimethylsilyl Chloride

**Chemical Formula:**  $C_3H_9ClSi$

**Molecular Weight:** 108.66

SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

OSHA PEL: Not Found

ACGIH TLV: Not Found

IDLH: Not Found

**Other Limits Recommended:** Toxicity information:  $LC_{low}$  inhalation (mouse) 0.5 mg/liter/10 minutes (\*NIOSH/RTECS 1985)

SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

**Boiling Point:** 135°F, 57°C (\*Hawley 1977)

**Specific Gravity** ( $H_2O=1$ ): 0.854 at 25°C (\*Hawley 1977)

**Vapor Pressure** (mmHg): Not Found

**Melting Point:** -72°F, -57.7°C (\*Weast 1984)

**Vapor Density** (AIR=1): 3.7 (\*CHRIS 1978)

**Evaporation Rate** (Butyl acetate=1): Not Found

**Solubility in Water:** Decomposes in water (\*Hawley 1977)

**Appearance and Odor:** Colorless liquid (\*Hawley 1977), with a sharp hydrochloric acid-like odor (\*CHRIS 1978).

## TRIMETHYLCHLOROSILANE

### SECTION III -- FIRE AND EXPLOSION HAZARD DATA

**Flash Point** (Method Used): -18°F (\*Hawley 1977); 0°F (OC) (\*CHRIS 1978)

**Flammable Limits:**

LEL: 1.8% (\*CHRIS 1978)

UEL: Not Found

**Extinguishing Methods:** Extinguish with dry chemicals or carbon dioxide. Do not use water or foam. Cool exposed containers with water (\*CHRIS 1978). Water spray, fog, or foam may be required to fight large fires. However, trimethylchlorosilane may react violently with water. Do not get water inside containers (\*DOT 1984).

**Special Fire Fighting Procedures:** Use acid-vapor-type respirator, rubber gloves, chemical worker's goggles, and other protective equipment as necessary to protect skin and eyes (\*CHRIS 1978).

**Unusual Fire and Explosion Hazards:** Violent reaction with water (Sax 1984, p. 2665). Toxic and irritating hydrogen chloride and phosgene may be formed in fires. Difficult to extinguish, re-ignition may occur. Flashback along vapor trail may occur. Containers may explode in fire. Vapor may explode if ignited in enclosed area (\*CHRIS 1978).

### SECTION IV -- REACTIVITY DATA

**Stability:** Unstable:

Stable: Yes (Weiss 1980, p. 895, \*CHRIS 1978)

**Conditions to Avoid:** Avoid contact with water; it readily hydrolyzes, liberating hydrochloric acid (\*Hawley 1977).

**Incompatibility** (Materials to Avoid): Reacts with surface moisture, releasing hydrogen chloride, which will corrode common metals and form flammable hydrogen gas (\*CHRIS 1978).

**Hazardous Decomposition or Byproducts:** When heated to decomposition or on contact with acids or acid fumes, chloride fumes are emitted (\*Sax 1979).

**Hazardous Polymerization:** May Occur:

May Not Occur: Yes (Weiss 1980, p. 895)

**Conditions to Avoid:** Not Found

## TRIMETHYLCHLOROSILANE

### SECTION V -- HEALTH HAZARD DATA

**Routes of Entry:** **Inhalation:** Yes (\*Rumack 1975 to Present)  
**Skin:** Yes (\*Hawley 1977; \*Rumack 1975 to Present)  
**Ingestion:** Yes (\*Sax 1975)

**Health Hazards** (Acute, Delayed, and Chronic): Similar to other silanes. Toxicity is rated high for inhalation, ingestion and local irritation. May cause death or permanent injury after a very short exposure to small quantities (\*Sax 1975).

**Signs and Symptoms of Exposure:** Inhalation of vapor irritates mucous membranes. Contact with skin or eye causes severe burns. Ingestion causes severe burns of mouth and stomach (\*CHRIS 1978).

**Medical Conditions Generally Aggravated by Exposure:** Not Found

**Emergency and First Aid Procedures:** Move victim to fresh air. If not breathing give artificial respiration. If breathing is difficult, give oxygen. Remove and isolate contaminated clothing and shoes. In case of contact with material, immediately flush skin or eyes with running water for at least 15 minutes. Keep victim quiet and maintain normal body temperature (\*DOT 1984).

### SECTION VI -- USE INFORMATION

Chemical intermediate for silicone fluids silylating agent, and a component of a catalyst for propylene oxide (\*SRI).

### SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE (Steps to be Taken in Case Material is Released or Spilled)

Avoid breathing vapors (see Section V above). In case of spill or leak, shut off ignition sources; no flares, smoking or flames in hazard area. Do not touch spilled material. Stop leak if you can do it without risk. Do not get water inside container. For small spills, take up with sand or other non-combustible absorbent material and place into container for later disposal. For large spills, dike far ahead of spill for later disposal (\*DOT 1984).

EPA CHEMICAL PROFILE

INTERIM

Date: October 31, 1985

Revision: \_\_\_\_\_

CHEMICAL IDENTITY -- DIMETHYLDICHLOROSILANE

CAS Registry Number: 75-78-5

Synonyms: Dichlorodimethylsilane; Dichlorodimethylsilicon; Inerton  
AW-DMCS; Silane, Dichlorodimethyl-

Chemical Formula:  $C_2H_6Cl_2Si$

Molecular Weight: 129.07

SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

OSHA PEL: Not Found

ACGIH TLV: Not Found

IDLH: Not Found

Other Limits Recommended: Toxicity information:  $LC_{10\%}$  inhalation  
(rat) 4.9 mg/liter/4 hours (\*NIOSH/RTECS 1985)

SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

Boiling Point: 158°F, 70°C (NFPA 1984, p. 325M-42)

Specific Gravity ( $H_2O=1$ ): 1.1 (NFPA 1984, p. 325M-42)

Vapor Pressure (mmHg): 100 at 17.5°C (Weast 1984, p. D-200)

Melting Point: -123°F, -86°C (\*CHRIS 1978)

Vapor Density (AIR=1): 4.45 (NFPA 1984, p. 352M-42)

Evaporation Rate (Butyl acetate=1): Not Found

Solubility in Water: Decomposes (NFPA 1984, p. 325M-42)

Appearance and Odor: Colorless liquid with sharp irritating odor  
(\*CHRIS 1978).



**DIMETHYLDICHLOROSILANE**

**SECTION III -- FIRE AND EXPLOSION HAZARD DATA**

**Flash Point** (Method Used): 16°F (OC) (\*Hawley 1977)

**Flammable Limits:**

LEL: 3.4% (\*Sax 1975)

UEL: 9.5% (\*Sax 1975)

**Extinguishing Methods:** Extinguish with dry chemical, carbon dioxide, water spray, fog, or foam. Move container from fire area if it can be done without risk. Do not get water inside container. Cool containers that are exposed to fire from outside until well after fire is out. Withdraw immediately in case of rising sound from venting safety device or discoloration of tank due to fire (DOT 1984, Guide 29).

**Special Fire Fighting Procedures:** Avoid contact with skin, eyes, or clothing. Wear acid-vapor respirator, rubber gloves, chemical worker's goggles, other protective and corrosive-resistant equipment as needed (\*CHRIS 1978; \*Encyc Occupat Health and Safety 1971). Runoff from fire control or dilution water may cause pollution. Isolate for one-half mile in all directions if tank car or truck involved in fire (DOT 1984, Guide 29).

**Unusual Fire and Explosion Hazards:** Vapor may explode if ignited in an enclosed area; reacts with water to produce irritating and toxic gases (\*CHRIS 1978). Runoff to sewer may create fire or explosion hazard (DOT 1984, Guide 29).

**SECTION IV -- REACTIVITY DATA**

**Stability:** Unstable:

Stable: Yes (Weiss 1980)

**Conditions to Avoid:** Not Found

**Incompatibility** (Materials to Avoid): Reacts vigorously with water to generate hydrogen chloride (\*CHRIS 1978).

**Hazardous Decomposition or Byproducts:** Reacts with water; irritating gas is produced. Hydrogen chloride and phosgene gases may be formed upon heating (\*CHRIS 1978).

**Hazardous Polymerization:** May Occur: Not Found

May Not Occur: Not Found

**Conditions to Avoid:** Not Found

## DIMETHYLDICHLOROSILANE

### SECTION V -- HEALTH HAZARD DATA

**Routes of Entry:** Inhalation: Yes (\*CHRIS 1978)  
Skin: Yes (\*CHRIS 1978)  
Ingestion: Yes (\*Rumack 1975 to Present)

**Health Hazards** (Acute, Delayed, and Chronic): Inhalation irritates mucous membranes. Severe gastrointestinal damage may occur. Vapors cause severe eye and lung injury. Upon short contact, second and third degree burns may occur (\*CHRIS 1978).

**Signs and Symptoms of Exposure:** Inhalation may produce labored breathing, shortness of breath, chest pain, and pulmonary edema. Severe irritation results in low blood oxygen. Onset of symptoms following inhalation of vapors may be delayed for several hours. Contact with liquid causes severe burns on the skin. Ingestion causes severe burns of mouth and stomach. Contact with the eye produces severe pain, swelling, corneal erosions and possible blindness (\*Rumack 1975 to Present).

**Medical Conditions Generally Aggravated by Exposure:** Not Found

**Emergency and First Aid Procedures:** Move victim to fresh air; call emergency medical care. If breathing is difficult, administer oxygen. Remove and isolate contaminated clothing and shoes at site. In case of contact with material, immediately flush skin or eyes with running water for at least 15 minutes. Keep victim quiet and maintain normal body temperature (DOT 1984, Guide 29).

### SECTION VI -- USE INFORMATION

Chemical introduction for silicone fluids and in ethchlorvynol assays (\*SRI; \*AOAC 1965).

### SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE (Steps to be Taken in Case Material is Released or Spilled)

Avoid inhalation and skin contact; wear proper respiratory protection, eye protection and protective clothing (see Section V above). Shut off ignition sources; no flares, smoking or flames in hazard area. Do not touch spilled materials; stop leak if you can do so without risk. Use water spray to reduce vapors; however do not get water inside containers. Small spills: absorb with sand or other non-combustible absorbent material and place into containers for later disposal. Large spills: dike far ahead of spill for later disposal (DOT 1984, Guide 29). Use effective fume removal device (\*AOAC 1965).

EPA CHEMICAL PROFILE

INTERIM

Date: October 31, 1985

Revision: \_\_\_\_\_

CHEMICAL IDENTITY -- METHYLTRICHLOROSILANE

CAS Registry Number: 75-79-6

Synonyms: Methylsilyl Trichloride; Silane, Methyltrichloro-; Silane, Trichloromethyl-; Trichloromethylsilane; Trichloromethylsilicon

Chemical Formula:  $\text{CH}_3\text{Cl}_3\text{Si}$

Molecular Weight: 149.48

SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

OSHA PEL: Not Found

ACGIH TLV: Not Found

IDLH: Not Found

Other Limits Recommended: Toxicity information:  $\text{LC}_{\text{low}}$  inhalation (rat) 2.75 mg/liter/4 hours (\*NIOSH/RTECS 1985)

SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

Boiling Point: 152°F, 66.5°C (\*Clayton and Clayton 1981-82)

Specific Gravity ( $\text{H}_2\text{O}=1$ ): 1.27 at 25°C (\*CHRIS 1978)

Vapor Pressure (mmHg): Not Found

Melting Point: -108°F, -77.8°C (Weast 1983, p. C-515)

Vapor Density (AIR=1): 5.17 (\*Clayton and Clayton 1981-82)

Evaporation Rate (Butyl acetate=1): Not Found

Solubility in Water: Not Found

Appearance and Odor: Acrid odor, sharp like hydrochloric acid, colorless liquid (\*CHRIS 1978).

## METHYLTRICHLOROSILANE

## SECTION III -- FIRE AND EXPLOSION HAZARD DATA

**Flash Point** (Method Used): 45°F (OC); 15°F (CC) (\*CHRIS 1978)

**Flammable Limits:**

LEL: 7.6% (\*NFPA 1978)

UEL: 20% (\*NFPA 1978)

**Extinguishing Methods:** Dry chemical or carbon dioxide may be used for small fires. Water may be used for large fires if firefighters are protected from violent reaction of methyltrichlorosilane with water. Water may be used to keep containers cool (\*NFPA 1978).

**Special Fire Fighting Procedures:** Self-contained breathing apparatus is required as combustion/decomposition yields acid gases/pulmonary irritants. Corrosion-resistant protective clothing, as well as appropriate foot, hand, arm, head, eye, and face protection are required where contact is possible (\*Encyc Occupat Health and Safety 1971).

**Unusual Fire and Explosion Hazards:** Upon thermal decomposition, hydrogen chloride and phosgene are formed. Reacts with water to form hydrochloric acid (\*CHRIS 1978). Vapor forms flammable mixture with air (\*NFPA 1978). May form explosive mixture in air (\*Hawley 1977).

## SECTION IV -- REACTIVITY DATA

**Stability:** Unstable: Yes (\*Hawley 1977; \*CHRIS 1978)

Stable:

**Conditions to Avoid:** Contact with water or moist air (\*NFPA 1978, \*Sax 1979).

**Incompatibility** (Materials to Avoid): Reacts with water or steam to form hydrochloric acid (\*CHRIS 1978).

**Hazardous Decomposition or Byproducts:** Hydrogen chloride and phosgene formed in fires (\*CHRIS 1978).

**Hazardous Polymerization:** May Occur: Not Found  
May Not Occur: Not Found

**Conditions to Avoid:** Not Found

## SECTION V -- HEALTH HAZARD DATA

**Routes of Entry:** Inhalation: Yes (\*Sax 1975)  
Skin: Yes (\*Sax 1975)  
Ingestion: Yes (\*Rumack 1975 to Present)

## METHYLTRICHLOROSILANE

### SECTION V -- HEALTH HAZARD DATA (Continued)

**Health Hazards** (Acute, Delayed, and Chronic): As with other chlorosilanes, acute exposures may be highly toxic and may cause death or permanent injury after very short exposures to small quantities. Chronic exposures may be moderately toxic and involve irreversible and reversible changes (\*Sax 1975). Skin contact may produce severe burns with pain and risk of secondary infections. Ingestion may produce oral, esophageal, and stomach burns, intensity will vary from mild to very severe, gastrointestinal damage is rare but may occur (\*Rumack 1975 to Present).

**Signs and Symptoms of Exposure:** The vapor is irritating to nose and throat and if inhaled will cause difficult breathing. Contact with the liquid causes severe burns of eyes and skin. Ingestion causes severe burns of mouth and stomach (\*CHRIS 1978). Vomiting may occur. Inhalation exposures may produce labored breathing, shortness of breath, and pulmonary edema. Symptoms may be delayed for several hours (\*Rumack 1975 to Present).

**Medical Conditions Generally Aggravated by Exposure:** Not Found

**Emergency and First Aid Procedures:** Remove from exposure, establish and maintain respiration, irrigate exposed surfaces with copious amounts of water for at least 15 minutes. Obtain medical attention at once following exposure to this compound (\*Rumack 1975 to Present).

### SECTION VI -- USE INFORMATION

Monomer for silicone resins (\*SRI).

### SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE (Steps to be Taken in Case Material is Released or Spilled)

Spills can be neutralized by flushing with large quantities of water followed by treatment with sodium bicarbonate. Provide adequate protection against generated hydrogen chloride. Do not allow water to get into container since resulting pressure could cause container to rupture (\*NFPA 1978). Protect against potentially violent reaction with water (see Section III above). Avoid breathing vapors and contact with skin; wear proper respiratory protection and protective clothing (see Section V above).

EPA CHEMICAL PROFILE

INTERIM

Date: October 31, 1985

Revision: \_\_\_\_\_

CHEMICAL IDENTITY -- ACETONE CYANOHYDRIN

CAS Registry Number: 75-86-5

Synonyms: 2-Cyano-2-Propanol; 2-Hydroxy-2-Methylpropionitrile;  
2-Hydroxyisobutyronitrile; 2-Methylactonitrile; 2-Propanone, Cyanohydrin;  
alpha-Hydroxyisobutyronitrile; Lactonitrile, 2-Methyl-; Propanenitrile,  
2-Hydroxy-2-Methyl-; USAF RH-8

Chemical Formula:  $C_4H_7NO$

Molecular Weight: 85.10

SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

OSHA PEL: Not Found

ACGIH TLV: Not Found

IDLH: Not Found

Other Limits Recommended: Toxicity information:  $LC_{10}$  inhalation  
(rat) 0.116 mg/liter/4 hours (\*NIOSH/RTECS 1985)

SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

Boiling Point: 180°F, 82°C at 23 mmHg (Weast 1983, p. C-209)

Specific Gravity ( $H_2O=1$ ): 0.9267 at 25°C/4°C (\*Merck 1976)

Vapor Pressure (mmHg): 0.8 at 20°C (\*Clayton and Clayton 1981-82)

Melting Point: -2.2°F, -19°C (\*Merck 1976)

Vapor Density (AIR=1): 2.93 (\*Clayton and Clayton 1981-82)

Evaporation Rate (Butyl acetate=1): Not Found

Solubility in Water: Freely soluble in water (\*Merck 1976)

Appearance and Odor: Colorless liquid (\*Hawley 1977); distinct strong  
cyanide odor (\*Lefaux 1968)

## ACETONE CYANOHYDRIN

### SECTION III -- FIRE AND EXPLOSION HAZARD DATA

**Flash Point** (Method Used): 165°F, 74°C (CC) (\*NFPA 1978)

**Flammable Limits:**

LEL: 2.2% (\*NFPA 1978)

UEL: 12% (\*NFPA 1978)

**Extinguishing Methods:** Water may cause frothing if it gets below surface of liquid and turns to steam. Water fog gently applied to surface will cause frothing which will extinguish fire. Use water spray, dry chemical, alcohol foam, or carbon dioxide. Use water to keep fire-exposed containers cool, from a safe distance (\*NFPA 1978).

**Special Fire Fighting Procedures:** Wear air-supplied mask with canister approved for use with acrylonitrile in less than 2 percent concentration, rubber or plastic gloves, cover goggles or face mask, rubber boots, slicker suit, safety helmet (\*CHRIS 1978).

**Unusual Fire and Explosion Hazards:** Too dangerous to health to expose fire fighters; a few whiffs of vapor could cause death; vapor or liquid could be fatal on penetrating normal protective clothing. Vapor forms explosive mixture with air (\*NFPA 1978). On contact with sulfuric acid, it may explode (\*Sax 1979).

### SECTION IV -- REACTIVITY DATA

**Stability:** Unstable: Yes (\*NFPA 1978)

Stable:

**Conditions to Avoid:** Vapor forms explosive mixtures with air (\*NFPA 1978).

**Incompatibility** (Materials to Avoid): May react violently with water (\*NFPA 1978). Contact with sulfuric acid may cause it to explode (\*Sax 1979).

**Hazardous Decomposition or Byproducts:** Decomposes when heated to 248°F or at lower temperature under alkaline conditions, emitting highly toxic hydrogen cyanide (\*NFPA 1978).

**Hazardous Polymerization:** May Occur: Not Found  
May Not Occur: Not Found

**Conditions to Avoid:** Not Found

## ACETONE CYANOHYDRIN

### SECTION V -- HEALTH HAZARD DATA

**Routes of Entry:** Inhalation: Yes (\*Patty 1963)  
Skin: Yes (\*Patty 1963)  
Ingestion: Yes (\*Rumack 1975 to Present)

**Health Hazards** (Acute, Delayed, and Chronic): This material is considered very hazardous and should only be handled under conditions that prevent any inhalation of vapor or skin contact (\*Patty 1963). May be slightly irritating to skin and mucous membranes (\*Merck 1976).

**Signs and Symptoms of Exposure:** Nausea, loss of consciousness, convulsions (\*Clayton and Clayton 1982); irregular heart beat, headache, vomiting (\*Patty 1963). Slightly irritating to the skin (\*Merck 1976).

**Medical Conditions Generally Aggravated by Exposure:** Not Found

**Emergency and First Aid Procedures:** Move victim to fresh air; call emergency medical care. If not breathing, give artificial respiration (avoid mouth to mouth resuscitation). If breathing is difficult, give oxygen. In case of contact with material, immediately flush skin or eyes with running water for at least 15 minutes. Speed in removing material from skin is of extreme importance. Remove and isolate contaminated clothing and shoes at the site. Keep victim quiet and maintain normal body temperature. Effects may be delayed; keep victim under observation. Avoid contact with contaminated skin (DOT 1984, Guide 55; \*Rumack 1975 to Present).

### SECTION VI -- USE INFORMATION

Used in the manufacture of insecticides (\*Hawley 1977) and as a chemical intermediate (\*SRI).

### SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE

(Steps to be Taken in Case Material is Released or Spilled)

Do not touch spilled material. Use water spray to reduce vapors. Small spills: take up with sand or other noncombustible absorbent material and place into containers for later disposal. Large spills: dike far ahead of spill for later disposal (DOT 1984, Guide 55). Wear air supplied mask with canister approved for acrylonitrile and full protective clothing (\*CHRIS 1978). Prevent any inhalation of vapor or skin contact (\*Patty 1963).



EPA CHEMICAL PROFILE

INTERIM

Date: October 31, 1985

Revision: \_\_\_\_\_

CHEMICAL IDENTITY -- PENTACHLOROETHANE

CAS Registry Number: 76-01-7

Synonyms: Ethane Pentachloride; Ethane, Pentachloro-; NCI-C53859; Pentalin

Chemical Formula:  $C_2HCl_5$

Molecular Weight: 202.31

SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

OSHA PEL: Not Found

ACGIH TLV: Not Found

IDLH: Not Found

Other Limits Recommended: Toxicity information:  $LC_{low}$  inhalation  
(mouse) 0.035 mg/liter/2 hours (\*NIOSH/RTECS 1985)

SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

Boiling Point: 322°F, 161°C (\*Merck 1976)

Specific Gravity ( $H_2O=1$ ): 1.6712 at 25°C/4°C (\*Merck 1976)

Vapor Pressure (mmHg): 3.4 at 25°C (\*Clayton and Clayton 1981-82)

Melting Point: -20°F, -29°C (\*Weast 1979)

Vapor Density (AIR=1): 7.0 (\*Browning 1965)

Evaporation Rate (Butyl acetate=1): 0.03 (ether = 1) (\*Browning 1965)

Solubility in Water: 0.05 g/100 ml at 20°C, 68°F (\*Clayton and Clayton 1981-82)

Appearance and Odor: Colorless liquid (\*Browning 1965); chloroform-like odor (\*Merck 1976); camphor-like odor (\*Browning 1965)

PENTACHLOROETHANE

SECTION III -- FIRE AND EXPLOSION HAZARD DATA

**Flash Point** (Method Used): Not Found

**Flammable Limits:**

LEL: Not Found

UEL: Not Found

**Extinguishing Methods:** Fires should be extinguished using water, carbon dioxide, or dry chemical (\*Sax 1979). Move container from fire area if you can do so without risk. Fight fire from maximum distance. Dike fire control water for later disposal; do not scatter the material (DOT 1984, Guide 55).

**Special Fire Fighting Procedures:** Keep unnecessary people away; isolate hazard area and deny entry. Stay upwind; keep out of low areas. Ventilate closed spaces before entering them. Wear positive pressure breathing apparatus and special protective clothing. Remove and isolate contaminated clothing at the site (DOT 1984, Guide 55).

**Unusual Fire and Explosion Hazards:** The material is a moderate fire hazard when exposed to heat or flame and is a moderate explosive hazard by spontaneous chemical reaction. Dehalogenation by reaction with alkalis, metals, etc., will produce spontaneous explosive chloroacetylenes. Violent reactions with (sodium potassium alloy + bromoform) and potassium occur (Sax 1984, p. 2126).

SECTION IV -- REACTIVITY DATA

**Stability:** Unstable: Not Found

Stable: Not Found

**Conditions to Avoid:** Not Found

**Incompatibility** (Materials to Avoid): Pentachloroethane undergoes a violent reaction with sodium potassium alloy plus bromoform. Dehalogenation reactions with alkalis and metals will produce spontaneous explosive chloroacetylenes (\*Sax 1979).

**Hazardous Decomposition or Byproducts:** When heated to decomposition, the compound emits highly toxic fumes of chlorine containing compounds (\*Sax 1979).

**Hazardous Polymerization:** May Occur: Not Found

May Not Occur: Not Found

**Conditions to Avoid:** Not Found

PENTACHLOROETHANE

SECTION V -- HEALTH HAZARD DATA

**Routes of Entry:** Inhalation: Yes (\*Gosselin 1976)  
Skin: Not Found  
Ingestion: Yes (\*Gosselin 1976)

**Health Hazards** (Acute, Delayed, and Chronic): Pentachloroethane is an irritant and a central nervous system depressant (\*Merck 1976). The chemical is very toxic with a probable oral lethal dose of 50-500 mg/kg or between 1 teaspoon and 1 ounce for a 150 lb. person (\*Gosselin 1976). It acts as a strong central nervous system depressant (Encyc Occupat Health and Safety 1983, p. 1078). Death may occur by respiratory arrest or circulatory collapse (\*Gosselin 1976). Pentachloroethane has a strong narcotic effect. Exposure to this material may also result in injury to the liver, lungs and kidneys (Clayton and Clayton 1981-82, p. 3520).

**Signs and Symptoms of Exposure:** Symptoms include prompt nausea, vomiting, abdominal pain with diarrhea, headaches, dizziness, confusion, drowsiness, and occasionally convulsions. Visual disturbances may arise followed by coma and possibly death from respiratory arrest or circulatory collapse. Occasionally sudden death may occur due to ventricular fibrillation. Other effects may include weight gain, edema, loss of appetite, jaundice, and pain (due to enlarged liver) (\*Gosselin 1976).

**Medical Conditions Generally Aggravated by Exposure:** Not Found

**Emergency and First Aid Procedures:** Move victim to fresh air; call emergency medical care. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In case of contact with material, immediately flush skin or eyes with running water for at least 15 minutes. Speed in removing material from skin is of extreme importance. Remove and isolate contaminated clothing and shoes at the site. Keep victim quiet and maintain normal body temperature. Effects may be delayed; keep victim under observation (DOT 1984, Guide 55).

SECTION VI -- USE INFORMATION

It is used as a solvent for oil and grease in metal cleaning and separation of coal from impurities (\*Hawley 1977). The compound is used to a small extent in dry cleaning and in soil sterilization (\*Browning 1965).

## PENTACHLOROETHANE

### SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE (Steps to be Taken in Case Material is Released or Spilled)

Do not breathe vapors. Wear proper respiratory protection (see Section V above). Do not touch spilled material; stop leak if you can do so without risk. Use water spray to reduce vapors. Small spills: absorb with sand or other noncombustible absorbent material and place into containers for later disposal. Small dry spills: with clean shovel place material into clear, dry container and cover; move containers from spill area. Large spills: dike far ahead of spill for later disposal (DOT 1984, Guide 55).

EPA CHEMICAL PROFILE

INTERIM

Date: October 31, 1985

Revision: \_\_\_\_\_

CHEMICAL IDENTITY -- TRICHLOROACETYL CHLORIDE

CAS Registry Number: 76-02-8

Synonyms: (NIOSH/RTECS 1985 Synonyms On-Line File) Acetyl Chloride, Trichloro-; Trichloroacetic Acid Chloride; Trichloroacetochloride

Chemical Formula:  $\text{CCl}_3\text{COCl}$

Molecular Weight: 181.83

SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

OSHA PEL: Not Found

ACGIH TLV: Not Found

IDLH: Not Found

Other Limits Recommended: Toxicity information:  $\text{LC}_{50}$  inhalation (mouse) 0.445 mg/liter (\*NIOSH/RTECS 1985)

SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

Boiling Point: 244°F, 118°C (Hawley 1981, p. 1040)

Specific Gravity ( $\text{H}_2\text{O}=1$ ): 1.654 at 0°C/4°C (Hawley 1981, p. 1040)

Vapor Pressure (mmHg): Not Found

Melting Point: Not Found

Vapor Density (AIR=1): Not Found

Evaporation Rate (Butyl acetate=1): Not Found

Solubility in Water: Decomposes (Weast 1979, p. C-98)

Appearance and Odor: Liquid (Hawley 1981, p. 1040)

TRICHLOROACETYL CHLORIDE

SECTION III -- FIRE AND EXPLOSION HAZARD DATA

**Flash Point** (Method Used): Not Found

**Flammable Limits:**

LEL: Not Found

UEL: Not Found

**Extinguishing Methods:** Material may react violently with water. Extinguish with dry chemical, carbon dioxide, water spray, fog, or foam (DOT 1984, Guide 59).

**Special Fire Fighting Procedures:** Move container from fire area if you can do so without risk. Spray cooling water on containers that are exposed to flames until well after fire is out. Keep unnecessary people away; isolate hazard area and deny entry. Stay upwind; keep out of low areas. Wear positive pressure breathing apparatus and special protective clothing (DOT 1984, Guide 59).

**Unusual Fire and Explosion Hazards:** Material may burn but does not ignite readily. Poisonous if inhaled or swallowed; skin contact poisonous. Contact may cause burns to skin and eyes (DOT 1984, Guide 59).

SECTION IV -- REACTIVITY DATA

**Stability:** Unstable: Not Found

Stable: Not Found

**Conditions to Avoid:** Not Found

**Incompatibility** (Materials to Avoid): Not Found

**Hazardous Decomposition or Byproducts:** Not Found

**Hazardous Polymerization:** May Occur: Not Found

May Not Occur: Not Found

**Conditions to Avoid:** Not Found

SECTION V -- HEALTH HAZARD DATA

**Routes of Entry:** Inhalation: Yes (Hawley 1981, p. 1040)

Skin: Yes (Hawley 1981, p. 1040)

Ingestion: Yes (Hawley 1981, p. 1040)

**Health Hazards** (Acute, Delayed, and Chronic): Highly toxic by ingestion and inhalation; strong irritant to skin and tissues (Hawley 1981, p. 1040).

## TRICHLOROACETYL CHLORIDE

### SECTION V -- HEALTH HAZARD DATA (Continued)

**Signs and Symptoms of Exposure:** Contact may cause burns to skin and eyes (DOT 1984, Guide 59).

**Medical Conditions Generally Aggravated by Exposure:** Not Found

**Emergency and First Aid Procedures:** Move victim to fresh air; call emergency medical care. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In case of contact with material, immediately flush skin or eyes with running water for at least 15 minutes. Remove and isolate contaminated clothing and shoes at the site. Keep victim quiet and maintain normal body temperature. Effects may be delayed; keep victim under observation (DOT 1984, Guide 59).

### SECTION VI -- USE INFORMATION

Not Found

### SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE (Steps to be Taken in Case Material is Released or Spilled)

Avoid breathing vapors (see Section V above). Do not touch spilled material; stop leak if you can do so without risk. Use water spray to reduce vapors. Small spills: absorb with sand or other noncombustible absorbent material and place into containers for later disposal. Large spills: dike far ahead of spill for later disposal. Keep unnecessary people away; isolate hazard area and deny entry. Stay upwind; keep out of low areas. Wear positive pressure breathing apparatus and special protective clothing (DOT 1984, Guide 59).

TRICHLOROACETYL CHLORIDE

COMMENTS

Sources searched but no information found:

NIOSH/RTECS 1983

ACGIH 1983

NIOSH/OSHA 1978

Merck 1983

Sax 1984

NFPA 1984

Student 1981

Weiss 1980

CHRIS 1978

Doull 1980

Clayton and Clayton 1981-82

Arena 1979

Gosselin 1984

Encyc Occupat Health and Safety 1983

Buchel 1983

Farm Chemicals Handbook 1984

Hayes 1982

Gilman 1985



EPA CHEMICAL PROFILE

INTERIM

Date: October 31, 1985

Revision: \_\_\_\_\_

CHEMICAL IDENTITY -- HEXACHLOROCYCLOPENTADIENE

CAS Registry Number: 77-47-4

Synonyms: 1,3-Cyclopentadiene, 1,2,3,4,5,5-Hexachloro-; C 56; Graphlox;  
HCCPD; Hexachlorocyclopentadien; Hexachloropentadiene; HRS 1655; NCI-C55607;  
PCL; Perchlorocyclopentadiene

Chemical Formula:  $C_5Cl_6$

Molecular Weight: 272.77

SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

OSHA PEL: Not Found

ACGIH TLV: TWA 0.01 ppm (0.1 mg/m<sup>3</sup>); STEL 0.03 ppm (0.3 mg/m<sup>3</sup>)  
(\*ACGIH 1984)

IDLH: Not Found

Other Limits Recommended: Toxicity information: LC<sub>low</sub> inhalation  
(mouse, rat) 0.017 mg/liter/7 hours (\*NIOSH/RTECS 1985)

SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

Boiling Point: 462°F, 239°C at 753 mmHg (\*Weast 1984)

Specific Gravity (H<sub>2</sub>O=1): 1.7019 at 25/4°C (\*Weast 1984)

Vapor Pressure (mmHg): 0.080 at 25°C (\*Clayton and Clayton 1981-82)

Melting Point: 16°F, -9°C (\*Weast 1984)

Vapor Density (AIR=1): 9.4 (\*Clayton and Clayton 1981-82)

Evaporation Rate (Butyl acetate=1): Not Found

Solubility in Water: 800 ppb (\*Clayton and Clayton 1981-82)

Appearance and Odor: Yellow-green liquid (\*Weast 1984) with a pungent  
odor (\*Hawley 1981)

## HEXACHLOROCYCLOPENTADIENE

### SECTION III -- FIRE AND EXPLOSION HAZARD DATA

**Flash Point** (Method Used): Non-flammable (\*Hawley 1981)

**Flammable Limits:**

LEL: Not Found

UEL: Not Found

**Extinguishing Methods:** Use dry chemical, carbon dioxide, water spray or foam for small fires. For large fires, use water spray, fog, or foam. Move hexachlorocyclopentadiene from fire area if this can be done without risk (\*DOT 1984).

**Special Fire Fighting Procedures:** Isolate hazard area and deny entry. Wear positive pressure breathing apparatus and special protective clothing. Fight fire from maximum distance. Dike fire control water for later disposal (\*DOT 1984).

**Unusual Fire and Explosion Hazards:** Toxic hydrogen chloride, chlorine, and phosgene gases may form in fires. In presence of moisture, will corrode iron and other materials; flammable and explosive hydrogen gas may collect in enclosed space (Weiss 1980, p. 498).

### SECTION IV -- REACTIVITY DATA

**Stability:** Unstable: Not Found

Stable: Not Found

**Conditions to Avoid:** Reacts slowly with water to form hydrochloric acid; however, the reaction is not hazardous (Weiss 1980, p. 498).

**Incompatibility** (Materials to Avoid): Will corrode iron and other metals in the presence of moisture (Weiss 1980, p. 498).

**Hazardous Decomposition or Byproducts:** Not Found

**Hazardous Polymerization:** May Occur:

May Not Occur: Yes (Weiss 1980, p. 498)

**Conditions to Avoid:** Not Found

### SECTION V -- HEALTH HAZARD DATA

**Routes of Entry:** Inhalation: Yes (\*Hawley 1981)

Skin: Yes (\*Hawley 1981)

Ingestion: Yes (\*Hawley 1981)

## HEXACHLOROCYCLOPENTADIENE

### SECTION V -- HEALTH HAZARD DATA (Continued)

**Health Hazards** (Acute, Delayed, and Chronic): This compound is very toxic and may be fatal if inhaled, swallowed, or absorbed through the skin. The probable human lethal dose is 50-500 mg/kg, or between 1 teaspoon and 1 ounce for a 150 lb. (70 kg) person. Severe exposure induces pulmonary hyperemia and edema, degenerative and necrotic changes in brain, heart and adrenal glands and necrosis of liver and kidney tubules (\*DOT 1984; Gosselin 1984, p. II-169).

**Signs and Symptoms of Exposure:** Inhalation of mist is highly irritating to mucous membranes, causing tearing, sneezing, and salivation. Eye contact may result in severe irritation. Contact of liquid with the skin may cause blistering and burning (\*CHRIS 1978). Headaches and throat irritation have also been reported as a result of exposure to this compound (Clayton and Clayton 1981, p. 3751).

**Medical Conditions Generally Aggravated by Exposure:** Not Found

**Emergency and First Aid Procedures:** Move victim to fresh air and call emergency medical care. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Remove and isolate contaminated clothing and shoes at the site. In case of contact with the material, immediately flush skin or eyes with running water for at least 15 minutes. Speed in removing material from the skin is of extreme importance. Keep victim quiet and maintain normal body temperature. Since effects may be delayed, keep victim under observation (\*DOT 1984).

### SECTION VI -- USE INFORMATION

Major uses of hexachlorocyclopentadiene include applications as a chemical intermediate for insecticides and flame retardants (\*SRI).

### SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE (Steps to be Taken in Case Material is Released or Spilled)

Keep unnecessary people away; isolate hazard and deny entry. Stay upwind and keep out of low areas. Ventilate closed spaces before entering. Wear positive pressure breathing apparatus and special protective clothing. Do not touch spilled material; stop leak if this can be done without risk. Use water spray to reduce vapors. Absorb small spills with sand or other noncombustible absorbent material and place into containers for later disposal. Dike far ahead of large spills for later disposal (\*DOT 1984).

EPA CHEMICAL PROFILE

INTERIM

Date: October 31, 1985

Revision: \_\_\_\_\_

CHEMICAL IDENTITY -- DIMETHYL SULFATE

CAS Registry Number: 77-78-1

**Synonyms:** Dimethyl Monosulfate; Dimethyl Sulphate; DMS; DMS (Methyl Sulfate); Methyl Sulfate; Sulfuric Acid, Dimethyl Ester; Dimethylsulfate

**Chemical Formula:**  $C_2H_6O_4S$

**Molecular Weight:** 126.14

SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

**OSHA PEL:** Air: TWA 1 ppm (skin) (\*NIOSH/RTECS 1985)

**ACGIH TLV:** TWA 0.1 ppm (0.5 mg/m<sup>3</sup>) (skin) (ACGIH 1985, p. 17)

**IDLH:** 10 ppm (NIOSH/OSHA 1978, p. 90)

**Other Limits Recommended:** Industrial substance suspect of carcinogenic potential for man (ACGIH 1985, p. 42). Toxicity information: LC<sub>low</sub> inhalation (mouse) 0.39 mg/liter (\*NIOSH/RTECS 1985)

SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

**Boiling Point:** About 370°F, 188°C (with decomposition) (\*Merck 1983)

**Specific Gravity** (H<sub>2</sub>O=1): 1.3283 at 20°C (\*Weast 1979)

**Vapor Pressure** (mmHg): 0.1 at room temperature (\*IARC 1972-1985); 0.5 at 20°C (NIOSH/OSHA 1978, p. 90)

**Melting Point:** -25.15°F, -31.75°C (\*Weast 1979)

**Vapor Density** (AIR=1): 4.35 (\*Clayton and Clayton 1981-82)

**Evaporation Rate** (Butyl acetate=1): Not Found

**Solubility in Water:** 2.8 g/100 mL at 18°C (\*Merck 1983)

**Appearance and Odor:** It is a colorless oily liquid (\*Merck 1983) with a faint, onion-like odor (\*NFPA 1978)

## DIMETHYL SULFATE

### SECTION III -- FIRE AND EXPLOSION HAZARD DATA

**Flash Point (Method Used):** 182°F (CC) (\*Hawley 1977)

**Flammable Limits:** Moderate fire potential when exposed to heat or flame (\*Sax 1975)

**LEL:** Not Found

**UEL:** Not Found

**Extinguishing Methods:** To extinguish small fires use water, foam, carbon dioxide, and dry chemicals (\*Sax 1975). For large fires use water spray, fog, or foam. Move container from fire area if you can do it without risk. Cool containers exposed to flames with water. Fight fire from a maximum distance (DOT 1984, Guide 57).

**Special Fire Fighting Procedures:** Wear positive pressure breathing apparatus and special protective clothing. Dike fire control water for later disposal. Do not scatter material (DOT 1984, Guide 57).

**Unusual Fire and Explosion Hazards:** Not Found

### SECTION IV -- REACTIVITY DATA

**Stability:** Unstable:

**Stable:** Yes (\*IARC 1972-1985)

**Conditions to Avoid:** Not Found

**Incompatibility (Materials to Avoid):** Material is normally stable even under fire exposure conditions and is not hazardously reactive with water (\*NFPA 1978). It is incompatible with strong oxidizers and strong ammonia solutions (NIOSH/OSHA 1978, p. 90).

**Hazardous Decomposition or Byproducts:** Not Found

**Hazardous Polymerization:** May Occur: Not Found

**May Not Occur:** Not Found

**Conditions to Avoid:** Not Found

### SECTION V -- HEALTH HAZARD DATA

**Routes of Entry:** Inhalation: Yes (\*Sax 1975)

Skin: Yes (\*Sax 1975)

Ingestion: Yes (\*Sax 1975)

## DIMETHYL SULFATE

### SECTION V -- HEALTH HAZARD DATA (Continued)

**Health Hazards** (Acute, Delayed, and Chronic): Acute: extremely toxic vapors and liquid -- a few whiffs or contact on skin could be fatal (\*NFPA 1978). Also acutely toxic if ingested. Delayed effects which are ultimately fatal may also occur (\*Merck 1983). Lethal concentrations as low as 97 ppm/10 min have been reported in humans. DNA inhibition and damage to human somatic cells, and sister chromatid exchange in human fibroblast cells were observed (\*NIOSH/RTECS 1985). Delayed appearance of symptoms may permit unnoticed exposure to lethal quantities (Merck 1983, p. 475).

**Signs and Symptoms of Exposure:** Immediate effects of vapor exposure are eye irritation, cough, swelling of tongue, lips, and larynx, and lungs (later). Ingestion or direct contact with mucous membranes causes corrosion. Once absorbed, lung damage and liver and kidney injury will occur (\*Dreisbach 1977). Liquid dermal exposure causes blistering, followed by convulsions, delirium, coma, and death in severe cases (\*Merck 1983).

**Medical Conditions Generally Aggravated by Exposure:** Not Found

**Emergency and First Aid Procedures:** Move victim to fresh air and call emergency medical care. If not breathing, start artificial respiration; if breathing is difficult, give oxygen. If dermal contact occurs, immediately flush with water for 15 minutes. It is very important to quickly remove material from skin. Remove and isolate contaminated clothing and shoes at the site. Keep victim quiet and maintain normal body temperature. Since effects may be delayed, keep a close watch on the victim (DOT 1984, Guide 57).

### SECTION VI -- USE INFORMATION

Used as a chemical intermediate for quaternary ammonium salts and for alkylation of phenols and thiols (\*SRI), and as a methylating agent in the manufacture of many organic chemicals (\*Merck 1983). Formerly, dimethyl sulfate was used as a war gas. It is also used in the manufacture of dyes, perfumes, for the separation of mineral oils, and for the analysis of auto fluids (\*Browning 1965).

## DIMETHYL SULFATE

### SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE

(Steps to be Taken in Case Material is Released or Spilled)

If spilled in a building, the building must be evacuated and the agent decomposed by hosing with water or spraying with 5 percent sodium hydroxide (caustic soda). Workers who enter contaminated area should wear positive pressure airline hose masks or self-contained breathing apparatus. Canister-type gas masks are not safe (\*Dreisbach 1977). Wear special protective clothing (DOT 1984, Guide 57). For large spills, evaporating vapors can be collected in a chamber with a gas cleaning device (\*NIOSH/OSHA 1981). In case of a small spill or leak (i.e., from a drum or smaller container or a small leak from a tank), isolate 80 feet in all directions. In case of a large spill, first isolate 170 feet in all directions, then evacuate an area 1.4 miles wide and 2.2 miles long in a downwind direction (DOT 1984, Table of Isolation and Evacuation Distances).

EPA CHEMICAL PROFILE

INTERIM

Date: October 31, 1985

Revision: \_\_\_\_\_

CHEMICAL IDENTITY -- TABUN

CAS Registry Number: 77-81-6

Synonyms: (NIOSH/RTECS 1983 Synonyms, Volume 3, p. 127) Phosphoramido-cyanidic Acid, Dimethyl-, Ethyl Ester; Dimethylamidoethoxyphosphoryl Cyanide; Dimethylphosphoramidocyanidic Acid, Ethyl Ester; Ethyl Dimethylamidocyano-phosphate; Ethyl N,N-Dimethylphosphoramidocyanidate; Ethyl N,N-Dimethylamino Cyanophosphate; GA; LE-100; MCE; T-2104; TL 1578

Chemical Formula:  $C_5H_{11}N_2O_2P$

Molecular Weight: 162.15

SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

OSHA PEL: Not Found

ACGIH TLV: Not Found

IDLH: Not Found

Other Limits Recommended: Toxicity information:  $LC_{low}$  inhalation (human) 0.15 mg/liter (\*NIOSH/RTECS 1985)

SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

Boiling Point: 464°F, 240°C (Merck 1983, p. 1297)

Specific Gravity ( $H_2O=1$ ): 1.073 (U.S. Army 1975, p. 3-2)

Vapor Pressure (mmHg): 0.07 at 25°C (U.S. Army 1975, p. 3-2)

Melting Point: -58°F, -50°C (Merck 1983, p. 1297)

Vapor Density (AIR=1): 5.63 (U.S. Army 1975, p. 3-2)

Evaporation Rate (Butyl acetate=1): Not Found

Solubility in Water: Miscible (Merck 1976, p. 1297).

Appearance and Odor: Colorless to brown liquid; faint fruity odor (U.S. Army 1975, p. 3-2)



## TABUN

## SECTION III -- FIRE AND EXPLOSION HAZARD DATA

**Flash Point** (Method Used): 172°F (Sax 1984, p. 1335)

**Flammable Limits:**

LEL: Not Found

UEL: Not Found

**Extinguishing Methods:** (Non-Specific -- Poison A, Liquid) Extinguish with alcohol foam, carbon dioxide, or dry chemical (Student 1981, p. 56)

**Special Fire Fighting Procedures:** Complete protection required; have available decontaminants (bleach, alkali) and atropine (U.S. Army 1975, p. 3-2). Bleaching powder (chlorinated lime) destroys Tabun but gives rise to cyanogen chloride (Merck 1983, p. 1297).

**Unusual Fire and Explosion Hazards:** Extremely poisonous (Merck 1983, p. 1297). (Non-Specific -- Poison A, Liquid) Keep away from sparks, flames, and sources of ignition. Keep out of water sources and sewers (Student 1981, p. 56).

## SECTION IV -- REACTIVITY DATA

**Stability:** Unstable:

Stable: Yes (U.S. Army 1975, p. 3-3)

**Conditions to Avoid:** Not Found

**Incompatibility** (Materials to Avoid): Avoid water and acids (U.S. Army 1975, p. 3-2). Can react with oxidizing materials (Sax 1984, p. 1335).

**Hazardous Decomposition or Byproducts:** Hydrolysis forms hydrogen cyanide (U.S. Army 1975, p. 3-2). When heated to decomposition, it emits very toxic fumes of oxides of phosphorus and nitrogen (Sax 1984, p. 1335).

**Hazardous Polymerization:** May Occur: Not Found

May Not Occur: Not Found

**Conditions to Avoid:** Not Found

## SECTION V -- HEALTH HAZARD DATA

**Routes of Entry:** Inhalation: Yes (U.S. Army 1975, p. 3-2)

Skin: Yes (U.S. Army 1975, p. 3-2)

Ingestion: Yes (U.S. Army 1975, p. 3-2)

## TABUN

### SECTION V -- HEALTH HAZARD DATA (Continued)

**Health Hazards** (Acute, Delayed, and Chronic): This material is toxic by inhalation and by absorption through skin and eyes. The lethal dose for humans may be as low as 0.01 mg/kg (Merck 1983, p. 1297). Tabun is a nerve agent; it acts as a cholinesterase inhibitor. The median lethal dosage (respiratory) is 400 mg-minute/m<sup>3</sup> for humans; the median incapacitating dosage is 300 mg-minute/m<sup>3</sup>. Respiratory lethal dosages kill in 1 to 10 minutes; liquid in the eye kills nearly as rapidly. Skin absorption great enough to cause death may occur in 1 to 2 minutes, but may be delayed for 1 to 2 hours (U.S. Army 1975, p. 3-3).

**Signs and Symptoms of Exposure:** Nerve agent symptoms include difficulty in breathing, drooling, nausea, vomiting, cramps, involuntary defecation and urination, twitching, jerking, staggering, headache, confusion, drowsiness, coma, and convulsion. Inhalation causes dimness of vision and pinpointing of the pupils (U.S. Army 1975, p. 3-2).

**Medical Conditions Generally Aggravated by Exposure:** Not Found

**Emergency and First Aid Procedures:** The toxic effects of tabun are similar to parathion (Sax 1984, p. 1335). First aid for parathion is as follows: move victim to fresh air; call emergency medical care. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In case of contact with material, immediately flush skin or eyes with running water for at least 15 minutes. Speed in removing material from skin is of extreme importance. Remove and isolate contaminated clothing and shoes at the site. Keep victim quiet and maintain normal body temperature. Effects may be delayed; keep victim under observation (DOT 1984, Guide 55).

### SECTION VI -- USE INFORMATION

This material is a chemical warfare agent (Merck 1983, p. 1297).

### SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE

(Steps to be Taken in Case Material is Released or Spilled)

(Non-Specific -- Poison A, Liquid) When handling, avoid breathing vapors, keep upwind, wear self-contained breathing apparatus, avoid bodily contact with the material, wear full protective clothing, and upon skin contact wash with soap and water (Student 1981, p. 56). Speed in removing material from skin is of extreme importance. Remove and isolate contaminated clothing and shoes (see Section V above).

EPA CHEMICAL PROFILE

INTERIM

Date: October 31, 1985

Revision: \_\_\_\_\_

CHEMICAL IDENTITY -- TETRAETHYLLEAD

CAS Registry Number: 78-00-2

Synonyms: Lead, Tetraethyl-; NCI-C54988; Plumbane, Tetraethyl-; TEL; Tetraethyl Lead, Liquid; Tetraethyl Lead; Tetraethylplumbane

Chemical Formula:  $C_8H_{20}Pb$

Molecular Weight: 323.45

SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

OSHA PEL: 0.075 mg/m<sup>3</sup> (\*NIOSH/RTECS 1985)

ACGIH TLV: 0.100 mg (lead)/m<sup>3</sup>; STEL 0.3 mg (lead)/m<sup>3</sup> (\*ACGIH 1983)

IDLH: 40 mg/m<sup>3</sup> (NIOSH/OSHA 1978, p. 176)

Other Limits Recommended: Not Found

SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

Boiling Point: About 392°F, 200°C (\*Merck 1983); decomposes between 110 and 200°C (Verschuere 1983, p. 1085)

Specific Gravity (H<sub>2</sub>O=1): 1.653 at 20°C (\*Merck 1983)

Vapor Pressure (mmHg): 0.2 at 20°C (\*IARC 1972-1985)

Melting Point: -202°F, -130°C (\*IARC 1972-1985)

Vapor Density (AIR=1): 8.6 (NFPA 1984, p. 325M-86) (SUSPECT)

Evaporation Rate (Butyl acetate=1): Not Found

Solubility in Water: Insoluble (\*IARC 1972-1985)

Appearance and Odor: Colorless liquid with a pleasant odor (Hawley 1981, p. 1006)

**TETRAETHYLLEAD**

**SECTION III -- FIRE AND EXPLOSION HAZARD DATA**

**Flash Point** (Method Used): 200°F (no method given) (NFPA 1984, p. 325M-86)

**Flammable Limits:**

LEL: 1.8 percent by volume (NFPA 1984, p. 325M-86)

UEL: Not Found

**Extinguishing Methods:** Water spray may be used because the material can be cooled below its flash point (\*NFPA 1978).

**Special Fire Fighting Procedures:** Fire fighting should be done from an explosive-resistant location. Use water from unmanned monitors and hose-holders to keep fire-exposed containers cool. When stopping leak, use water spray to protect firefighters (\*NFPA 1978). Runoff from fire control or dilution water may cause pollution (\*DOT 1984).

**Unusual Fire and Explosion Hazards:** May explode in fires (\*CHRIS 1978).

**SECTION IV -- REACTIVITY DATA**

**Stability:** Unstable: Yes (\*IARC 1972-1985)

Stable:

**Conditions to Avoid:** Decomposes slowly at room temperature and more rapidly at elevated temperatures (\*IARC 1972-1985).

**Incompatibility** (Materials to Avoid): Not Found

**Hazardous Decomposition or Byproducts:** Not Found

**Hazardous Polymerization:** May Occur: Not Found

May Not Occur: Not Found

**Conditions to Avoid:** Not Found

**SECTION V -- HEALTH HAZARD DATA**

**Routes of Entry:** Inhalation: Yes (\*Venugopal 1978)

Skin: Yes (\*Venugopal 1978)

Ingestion: Yes (\*Venugopal 1978)

## TETRAETHYLLEAD

### SECTION V -- HEALTH HAZARD DATA (Continued)

**Health Hazards** (Acute, Delayed, and Chronic): Extremely poisonous; may be fatal if inhaled, swallowed, or absorbed from the skin. Contact may cause burns to skin and eyes (\*DOT 1984). Most symptoms of poisoning are due to the effects of tetraethyllead on the nervous system (\*Gilman 1980).

**Signs and Symptoms of Exposure:** Major symptoms of exposure to tetraethyllead are due to interaction with the central nervous system. The victim suffers from insomnia, nightmares, anorexia, nausea, vomiting, headache, weakness, and emotional instability. Subjective central nervous system symptoms such as irritability, restlessness, and anxiety are next evident. In the case of intense acute exposure, central nervous system symptoms progress to delusions, uncoordinated and exaggerated muscle movements, and finally a maniacal state (\*Gilman 1980).

**Medical Conditions Generally Aggravated by Exposure:** Not Found

**Emergency and First Aid Procedures:** Move victim to fresh air; call emergency medical care. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. If contaminated, flush skin with water. Speed in removing material is of utmost importance. Remove contaminated clothing. Keep victim quiet and maintain normal body temperature. Effects may be delayed; keep victim under observation (\*DOT 1984).

### SECTION VI -- USE INFORMATION

Virtually all of the tetraethyllead produced in the USA is used as an antiknock additive for gasolines (\*IARC 1972-1985).

### SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE (Steps to be Taken in Case Material is Released or Spilled)

Tetraethyllead is hazardous, but areas may be entered with extreme care. Full protective clothing, including self-contained breathing apparatus, coats, pants, gloves, boots, and bands around legs, arms, and waist should be provided. No skin surface should be exposed. Use water spray to disperse vapors (\*NFPA 1978). Outdoors, stay upwind and keep out of low areas. Isolate hazard area (\*DOT 1984).

EPA CHEMICAL PROFILE

INTERIM

Date: October 31, 1985

Revision: \_\_\_\_\_

CHEMICAL IDENTITY -- DIOXATHION

CAS Registry Number: 78-34-2

**Synonyms:** 1,4-Dioxan-2,3-diyl Bis(0,0-Diethyl Phosphorothiolothionate); 1,4-Dioxan-2,3-Diyl 0,0,0',0'-Tetraethyl Di(Phosphorodithioate); 1,4-Dioxane-2,3-S,S'-Bis(0,0-Diethyl Dithiophosphate); 2,3-Bis(Diethoxyphosphinothioylthio)-1,4-Dioxane; 2,3-Dioxane S,S-Bis(0,0-Diethylphosphorodithioate); 2,3-Dioxanedithiol S,S-Bis(0,0-Diethyl Phosphorodithioate); AC 528; Bercotox; Delnatex; Delnav; Dioxation; Dioxothion; ENT 22,897; Hercules 528; Hercules AC528; Kavadel; Navadel; NCI-C00395; p-Dioxane-2,3-Dithiol, S,S-Diester with 0,0-Diethyl Phosphorodithioate; p-Dioxane-2,3-diyl Ethyl Phosphorodithioate; Phosphorodithioic Acid, S,S'-1,4-Dioxane-2,3-diyl 0,0,0',0'-Tetraethyl Ester; Phosphorodithioic Acid, S,S'-p-Dioxane-2,3-diyl 0,0,0',0'-Tetraethyl Ester; Ruphos

**Chemical Formula:**  $C_{12}H_{26}O_6P_2S_4$

**Molecular Weight:** 456.54

SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

OSHA PEL: Not Found

ACGIH TLV: 0.2 mg/m<sup>3</sup> (skin) (ACGIH 1985, p. 17)

IDLH: Not Found

**Other Limits Recommended:** ADI 0.0015 mg/kg (\*Hayes 1975). Toxicity information: LC<sub>50</sub> inhalation (mouse) 0.34 mg/liter/1 hour (\*NIOSH/RTECS 1985).

SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

Boiling Point: Not Found

Specific Gravity (H<sub>2</sub>O=1): 1.257 at 26°C/4°C (\*Merck 1976)

Vapor Pressure (mmHg): Not Found

Melting Point: -4°F, -20°C (\*Merck 1983)

## DIOXATHION

### SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS (Continued)

**Vapor Density (AIR=1):** Not Found

**Evaporation Rate (Butyl acetate=1):** Not Found

**Solubility in Water:** Practically insoluble (\*Merck 1983)

**Appearance and Odor:** Tan liquid (\*Merck 1983). (Technical) Brown liquid (\*Martin 1974).

### SECTION III -- FIRE AND EXPLOSION HAZARD DATA

**Flash Point (Method Used):** Not Found

**Flammable Limits:**

LEL: Not Found

UEL: Not Found

**Extinguishing Methods:** (Non-Specific -- Organophosphorus Pesticide, Liquid, n.o.s.) Small fires: dry chemical, carbon dioxide, water spray, or foam. Large fires: water spray, fog or foam (DOT 1984, Guide 55).

**Special Fire Fighting Procedures:** (Non-Specific -- Organophosphorus Pesticide, Liquid, n.o.s.) Stay upwind; keep out of low areas. Ventilate closed spaces before entering them. Wear positive pressure breathing apparatus and special protective clothing. Remove and isolate contaminated clothing at the site. Move container from fire area if you can do so without risk. Fight fire from maximum distance. Dike fire control water for later disposal; do not scatter the material (DOT 1984, Guide 55).

**Unusual Fire and Explosion Hazards:** Shock can shatter container, releasing contents (\*Sax 1975). (Non-Specific -- Organophosphorus Pesticide, Liquid, n.o.s.) Container may explode in heat of fire. Fire may produce irritating or poisonous gases. Runoff from fire control water may give off poisonous gases. Runoff from fire control or dilution water may cause pollution (DOT 1984, Guide 55).

### SECTION IV -- REACTIVITY DATA

**Stability:** Unstable:

Stable: Yes (\*ACGIH 1979)

**Conditions to Avoid:** Avoid alkali materials and heat. It is unstable to iron or tin surfaces and when mixed with certain carriers (\*Martin 1974).

## DIOXATHION

### SECTION IV -- REACTIVITY DATA (Continued)

**Incompatibility (Materials to Avoid):** Avoid alkali materials (\*Martin 1974)

**Hazardous Decomposition or Byproducts:** When heated to decomposition, it emits highly toxic fumes of oxides of nitrogen, phosphorus, and sulfur (\*Sax 1975).

**Hazardous Polymerization:** May Occur: Not Found  
May Not Occur: Not Found

**Conditions to Avoid:** Not Found

### SECTION V -- HEALTH HAZARD DATA

**Routes of Entry:** Inhalation: Yes (\*Hawley 1977)  
Skin: Yes (Farm Chemicals Handbook 1984, p. C-82)  
Ingestion: Yes (\*Hawley 1977)

**Health Hazards (Acute, Delayed, and Chronic):** Very toxic. Probable oral lethal dose for humans is 50-500 mg/kg or between 1 teaspoonful and 1 oz. for a 70 kg (150 lb.) person (\*Gosselin 1976). It is a cholinesterase inhibitor (\*Hawley 1977). Death is primarily due to respiratory arrest arising from failure of the respiratory center, paralysis of respiratory muscles, intense bronchoconstriction, or all three (\*Gosselin 1976).

**Signs and Symptoms of Exposure:** Symptoms are similar to those of parathion. Nausea is often the first symptom, followed by vomiting, abdominal cramps, diarrhea, and excessive salivation. Headache, giddiness, vertigo, and weakness are also common symptoms. Rhinorrhea and a sensation of tightness in the chest are common in inhalation exposure. Blurring or dimness of vision, pinpoint pupils, tearing, ciliary muscle spasm, loss of accommodation, and ocular pain. Also, mental confusion, disorientation, and drowsiness are experienced (\*Gosselin 1976).

**Medical Conditions Generally Aggravated by Exposure:** Not Found

**Emergency and First Aid Procedures:** (Non-Specific -- Organophosphorus Pesticide, Liquid, n.o.s.) Move victim to fresh air; call emergency medical care. If not breathing, perform artificial respiration. If breathing is difficult, give oxygen. In case of contact with material, immediately flush skin or eyes with running water for at least 15 minutes. Speed in removing material from skin is of extreme importance. Remove and isolate contaminated clothing and shoes at the site. Keep victim quiet and maintain normal body temperature. Effects may be delayed; keep victim under observation (DOT 1984, Guide 55).



## DIOXATHION

### SECTION VI -- USE INFORMATION

Dioxathion is used for control of insects and mites on grapes, citrus, walnuts, ornamentals, apples, pears, and quince. Also used as a spray or dip for the control of ticks, lice, hornfly, and sheep ked on cattle, goats, sheep, and hogs (Farm Chemicals Handbook 1984, p. C-82).

### SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE

(Steps to be Taken in Case Material is Released or Spilled)

(Non-Specific -- Organophosphorus Pesticide, Liquid, n.o.s.) Keep unnecessary people away; isolate hazard area and deny entry. Stay upwind; keep out of low areas. Ventilate closed spaces before entering them. Wear positive pressure breathing apparatus and special protective clothing. Remove and isolate contaminated clothing at the site. Do not touch spilled material; stop leak if you can do so without risk. Use water spray to reduce vapors. Small spills: absorb with sand or other noncombustible absorbent material and place into containers for later disposal. Large spills: dike far ahead of spill for later disposal (DOT 1984, Guide 55).

## EPA CHEMICAL PROFILE

### INTERIM

Date: October 31, 1985

Revision: \_\_\_\_\_

### CHEMICAL IDENTITY -- AMITON

CAS Registry Number: 78-53-5

Synonyms: (NIOSH/RTECS SYNONYMS 1983, Volume 3, p. 150)

Phosphorothioic Acid, S-(2-(Diethylamino)Ethyl) O,O-Diethyl Ester; Chipman 6200; Citram; S-(Diethylaminoethyl) O,O-Diethyl Phosphorothioate; Diethyl S-2-Diethylaminoethyl Phosphorothioate; (2-Diethylamino)Ethylphosphorothioic Acid O,O-Diethyl Ester; O,O-Diethyl S-2-Diethylaminoethyl Phosphorothioate; O,O-Diethyl S-Diethylaminoethyl Phosphorothiolate; O,O-Diethyl S-2-Diethylaminoethyl Phosphorothiolate; O,O-Diethyl S-(beta-Diethylamino)Ethyl Phosphorothiolate; O,O-Diethyl S-(2-Diethylaminoethyl) Thiophosphate; DSDP; ENT 24,980-X; Inferno; Metramac; Metramak; R-5,158; Rhodia-6200; Tetram

Chemical Formula:  $C_{10}H_{24}NO_3PS$

Molecular Weight: 269.38

### SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

OSHA PEL: Not Found

ACGIH TLV: Not Found

IDLH: Not Found

Other Limits Recommended: Toxicity information: LD<sub>50</sub> oral (rat) 3.3 mg/kg (\*NIOSH/RTECS 1985)

### SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

Boiling Point: 230°F, 110°C at 0.2 mm (Sax 1984, p. 1008)

Specific Gravity (H<sub>2</sub>O=1): Not Found

Vapor Pressure (mmHg): Not Found

Melting Point: Not Found

Vapor Density (AIR=1): Not Found

Evaporation Rate (Butyl acetate=1): Not Found

AMITON

SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS (Continued)

Solubility in Water: Not Found

Appearance and Odor: Liquid (Merck 1983, p. 73)

SECTION III -- FIRE AND EXPLOSION HAZARD DATA

Flash Point (Method Used): Not Found

Flammable Limits:

LEL: Not Found

UEL: Not Found

Extinguishing Methods: (Non-Specific -- Organophosphorus Pesticide, Liquid, n.o.s.) Small fires: dry chemical, carbon dioxide, water spray, or foam. Large fires: water spray, fog, or foam (DOT 1984, Guide 55).

Special Fire Fighting Procedures: (Non-Specific -- Organophosphorus Pesticide, Liquid, n.o.s.) Stay upwind; keep out of low areas. Ventilate closed spaces before entering them. Wear positive pressure breathing apparatus and special protective clothing. Remove and isolate contaminated clothing at the site. Move container from fire area if you can do so without risk. Fight fire from maximum distance. Dike fire control water for later disposal; do not scatter the material (DOT 1984, Guide 55).

Unusual Fire and Explosion Hazards: When heated to decomposition, can emit toxic fumes of oxides of nitrogen, phosphorus, and sulfur (Sax 1984, p. 1009). (Non-Specific -- Organophosphorus Pesticide, Liquid, n.o.s.) Container may explode in heat of fire. Fire may produce irritating or poisonous gases. Runoff from fire control water may give off poisonous gases. Runoff from fire control or dilution water may cause pollution (DOT 1984, Guide 55).

SECTION IV -- REACTIVITY DATA

Stability: Unstable: Not Found

Stable: Not Found

Conditions to Avoid: Extreme heat (Sax 1984, p. 1009)

Incompatibility (Materials to Avoid): Not Found

Hazardous Decomposition or Byproducts: Very toxic nitrogen oxides, phosphorus oxides, and sulfur oxides when heated to decomposition (Sax 1984, p. 1009).

AMITON

SECTION IV -- REACTIVITY DATA (Continued)

Hazardous Polymerization: May Occur: Not Found  
May Not Occur: Not Found

Conditions to Avoid: Not Found

SECTION V -- HEALTH HAZARD DATA

Routes of Entry: Inhalation: Yes (Hawley 1981, p. 1009)  
Skin: Not Found  
Ingestion: Yes (Sax 1984, p. 1009)

Health Hazards (Acute, Delayed, and Chronic): This material is highly toxic orally. It is a cholinesterase inhibitor (Sax 1984, p. 1009).

Signs and Symptoms of Exposure: The toxic effects are similar to parathion (Sax 1984, p. 1009). Symptoms of parathion poisoning include anorexia, nausea, vomiting, diarrhea, excessive salivation, pupillary constriction, bronchoconstriction, muscle twitching, convulsions, coma, respiratory failure. Effects are cumulative (Sax 1984, p. 2119).

Medical Conditions Generally Aggravated by Exposure: Not Found

Emergency and First Aid Procedures: Effects are similar to those of parathion (Sax 1984, p. 1009). First aid procedures for parathion are as follows: move victim to fresh air; call emergency medical care. If not breathing, perform artificial respiration. If breathing is difficult, give oxygen. In case of contact with material, immediately flush skin or eyes with running water for at least 15 minutes. Speed in removing material from skin is of extreme importance. Remove and isolate contaminated clothing and shoes at the site. Keep victim quiet and maintain normal body temperature. Effects may be delayed; keep victim under observation (DOT 1984, Guide 55).

SECTION VI -- USE INFORMATION

This material is used as an acaricide and insecticide (Farm Chemicals Handbook 1984, p. C222).

AMITON

**SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE**

(Steps to be Taken in Case Material is Released or Spilled)

(Non-Specific -- Organophosphorus Pesticide, Liquid, n.o.s.) Keep unnecessary people away; isolate hazard area and deny entry. Stay upwind; keep out of low areas. Ventilate closed spaces before entering them. Wear positive pressure breathing apparatus and special protective clothing. Remove and isolate contaminated clothing at the site. Do not touch spilled material; stop leak if you can do so without risk. Use water spray to reduce vapors. Small spills: absorb with sand or other noncombustible absorbent material and place into containers for later disposal. Large spills: dike far ahead of spill for later disposal (DOT 1984, Guide 55).

EPA CHEMICAL PROFILE

INTERIM

Date: October 31, 1985

Revision: \_\_\_\_\_

CHEMICAL IDENTITY -- OXETANE, 3,3-BIS(CHLOROMETHYL)-

CAS Registry Number: 78-71-7

Synonyms: (NIOSH/RTECS 1985 Synonyms On-Line File) 3,3-Bis  
(Chloromethyl)Oxetane; Penton; 3,3-bis(Chloromethyl)-1-Oxacyclobutane

Chemical Formula:  $C_5H_8Cl_2O$

Molecular Weight: 155

SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

OSHA PEL: Not Found

ACGIH TLV: Not Found

IDLH: Not Found

Other Limits Recommended: Toxicity information:  $LC_{50}$  inhalation  
(mouse) 0.2 mg/liter/2 hours (\*NIOSH/RTECS 1985)

SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

Boiling Point: 217°F, 103°C at 30 mmHg (Beilstein 1974, Volume 17/1,  
p. 68)

Specific Gravity ( $H_2O=1$ ): Not Found

Vapor Pressure (mmHg): Not Found

Melting Point: 66°F, 19°C (Beilstein 1974, Volume 17/1, p. 68)

Vapor Density (AIR=1): Not Found

Evaporation Rate (Butyl acetate=1): Not Found

Solubility in Water: Not Found

Appearance and Odor: Not Found

**OXETANE, 3,3-BIS(CHLOROMETHYL)-**

**SECTION III -- FIRE AND EXPLOSION HAZARD DATA**

**Flash Point** (Method Used): Not Found

**Flammable Limits:**

LEL: Not Found

UEL: Not Found

**Extinguishing Methods:** Not Found

**Special Fire Fighting Procedures:** Not Found

**Unusual Fire and Explosion Hazards:** Not Found

**SECTION IV -- REACTIVITY DATA**

**Stability:** Unstable: Not Found

Stable: Not Found

**Conditions to Avoid:** Not Found

**Incompatibility** (Materials to Avoid): Not Found

**Hazardous Decomposition or Byproducts:** Not Found

**Hazardous Polymerization:** May Occur: Not Found

May Not Occur: Not Found

**Conditions to Avoid:** Not Found

**SECTION V -- HEALTH HAZARD DATA**

**Routes of Entry:** Inhalation: Not Found

Skin: Not Found

Ingestion: Not Found

**Health Hazards** (Acute, Delayed, and Chronic): Not Found

**Signs and Symptoms of Exposure:** Not Found

**Medical Conditions Generally Aggravated by Exposure:** Not Found

**Emergency and First Aid Procedures:** Not Found

**OXETANE, 3,3-BIS(CHLOROMETHYL)-**

**SECTION VI -- USE INFORMATION**

Penton is the trademark for a thermoplastic resin derived from 3,3-bis(chloromethyl)oxetane. Penton is a liner polymer used for solid and lined valves, pumps, pipe and fittings, and a monofilament for filter supports and column packing (Hawley 1981, p. 785).

**SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE**  
(Steps to be Taken in Case Material is Released or Spilled)

Not Found

**COMMENTS:**

Sources searched but no information found:

Weast 1979  
Merck 1983  
Sax 1984  
DOT 1984  
NFPA 1984  
Student 1981  
Weiss 1980  
Doull 1980  
Clayton and Clayton 1981-82  
Encyc Occupat Health and Safety 1983  
CHRIS 1978  
Hayes 1982



EPA CHEMICAL PROFILE

INTERIM

Date: October 31, 1985

Revision: \_\_\_\_\_

CHEMICAL IDENTITY -- ISOBUTYRONITRILE

CAS Registry Number: 78-82-0

**Synonyms:** 2-Methylpropanenitrile; 1-Cyano-1-Methylethane; 2-Cyanopropane; 2-Methylpropane Nitrile; 2-Methylpropionitrile; Dimethylacetoneitrile; Isopropyl Cyanide; Isopropyl Nitrile; Isopropylcyanide; Propanenitrile, 2-Methyl-; Propanoic Acid, 2-Methyl-, Nitrile

**Chemical Formula:**  $C_4H_7N$

**Molecular Weight:** 69.1

SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

OSHA PEL: Not Found

ACGIH TLV: Not Found

IDLH: Not Found

**Other Limits Recommended:** Occupational exposure to nitriles -- recommended standard in air: TWA 22 mg/m<sup>3</sup> (\*NIOSH/RTECS 1985).  
**Toxicity information:** LC<sub>low</sub> inhalation (rat) 2.82 mg/liter/2 hours (\*NIOSH/RTECS 1985).

SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

**Boiling Point:** 219°F, 103.8°C (\*Weast 1979)

**Specific Gravity** (H<sub>2</sub>O=1): 0.7608 at 30°C/4°C (\*Weast 1979); 0.733 at 20°C (\*Hawley 1977)

**Vapor Pressure** (mmHg): Not Found

**Melting Point:** -96.7°F, -71.5°C (\*Weast 1979)

**Vapor Density** (AIR=1): 2.38 (\*NFPA 1978)

**Evaporation Rate** (Butyl acetate=1): Not Found

**Solubility in Water:** Slightly (\*Weast 1979)

## ISOBUTYRONITRILE

### SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS (Continued)

**Appearance and Odor:** Colorless liquid (\*Hawley 1977)

### SECTION III -- FIRE AND EXPLOSION HAZARD DATA

**Flash Point (Method Used):** 47°F, 8°C (\*NFPA 1978)

**Flammable Limits:**

LEL: Not Found

UEL: Not Found

**Extinguishing Methods:** Extinguish with dry chemical, carbon dioxide, water spray, foam, or fog (DOT 1984, Guide 28).

**Special Fire Fighting Procedures:** Keep unnecessary people away; isolate hazard area and deny entry. Stay upwind; keep out of low areas. Wear positive pressure breathing apparatus and special protective clothing. Isolate for 1/2 mile in all directions if tank car or truck is involved in fire. Move container from fire area if you can do so without risk. Dike fire control water for later disposal; do not scatter the material. Spray cooling water on containers that are exposed to flames until well after fire is out. Withdraw immediately in case of rising sound from venting safety device or any discoloration of tank due to fire (DOT 1984, Guide 28).

**Unusual Fire and Explosion Hazards:** Vapor may explode if ignited in an enclosed area (Weiss 1980, p. 531). Toxic oxides of nitrogen are produced during combustion (Student 1981, p. 297). It is a flammable/combustible material and may be ignited by heat, sparks, or flames. Vapors may travel to a source of ignition and flash back. Container may explode in heat of fire. Vapor explosion and poison hazard indoors, outdoors or in sewers. Runoff to sewer may create fire or explosion hazard (DOT 1984, Guide 28).

### SECTION IV -- REACTIVITY DATA

**Stability:** Unstable:

Stable: Yes (Weiss 1980, p. 531)

**Conditions to Avoid:** Not Found

**Incompatibility (Materials to Avoid):** Not Found

**Hazardous Decomposition or Byproducts:** When heated to decomposition, it emits toxic fumes of oxides of nitrogen (Sax 1984, p. 1639).

## ISOBUTYRONITRILE

### SECTION IV -- REACTIVITY DATA (Continued)

Hazardous Polymerization: May Occur:  
May Not Occur: Yes (Weiss 1980, p. 531)

Conditions to Avoid: Not Found

### SECTION V -- HEALTH HAZARD DATA

Routes of Entry: Inhalation: Yes (Hawley 1981, p. 577)  
Skin: Yes (Hawley 1981, p. 577)  
Ingestion: Yes (Hawley 1981, p. 577)

**Health Hazards** (Acute, Delayed, and Chronic): Poisonous; may be fatal if inhaled, swallowed, or absorbed through skin. Contact may cause burns to skin and eyes (DOT 1984, Guide 28). (Non-Specific -- Nitriles) Primarily, they are skin and eye irritants. Large doses cause collapse and stop breathing (Clayton and Clayton 1981-82, p. 4846).

**Signs and Symptoms of Exposure:** (Non-Specific -- Nitriles) Exposure may cause weakness, headache, confusion, nausea, vomiting (Clayton and Clayton 1981-82, p. 4846), convulsion, dilated pupils, weak pulse, shallow and gasping breathing and cyanosis (Clayton and Clayton 1981-82, p. 4874).

**Medical Conditions Generally Aggravated by Exposure:** Not Found

**Emergency and First Aid Procedures:** Move victim to fresh air; call emergency medical care. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Remove and isolate contaminated clothing and shoes at the site. In case of contact with material, immediately flush skin or eyes with running water for at least 15 minutes. Keep victim quiet and maintain normal body temperature. Effects may be delayed; keep victim under observation (DOT 1984, Guide 28).

### SECTION VI -- USE INFORMATION

It is used in organic synthesis (\*Patty 1963); as an intermediate for insecticides (Hawley 1981, p. 577); and as a gasoline additive (Clayton and Clayton 1981-82, p. 4873).

## ISOBUTYRONITRILE

### SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE

(Steps to be Taken in Case Material is Released or Spilled)

Keep sparks, flames, and other sources of ignition away. Keep material out of water sources and sewers. Build dikes to control flow as necessary. Attempt to stop leak if this can be done without hazard. Use water spray to disperse vapors and dilute standing pools of liquid. Avoid breathing vapors. Keep upwind. Avoid bodily contact with the material. Wear boots, protective gloves, and goggles. Do not handle broken packages without protective equipment. Wash away any material which may have contacted the body with copious amounts of water or soap and water. If contact with this material is anticipated, wear full protective clothing (Student, 1981, p. 297). Wear positive pressure breathing apparatus and special protective clothing. Shut off ignition sources; no flares, smoking, or flames in hazard area. Do not touch spilled material. Use water spray to reduce vapors. Small spills: absorb with sand or other noncombustible absorbent material and place into containers for later disposal. Large spills: dike far ahead of spill for later disposal (DOT 1984, Guide 28).

EPA CHEMICAL PROFILE

INTERIM

Date: October 31, 1985

Revision: \_\_\_\_\_

CHEMICAL IDENTITY -- METHYL VINYL KETONE

CAS Registry Number: 78-94-4

Synonyms: 1-Buten-3-one; 2-Butenone; 3-Buten-2-one; 3-Butene-2-one; Acetone, Methylene-; Acetyl Ethylene; Butenone; Delta(3)-2-Butenone; Gamma-Oxo-Alpha-Butylene; Ketone, Methyl Vinyl; Methylene Acetone; Methylvinyl Ketone; Vinyl Methyl Ketone

Chemical Formula:  $C_4H_6O$

Molecular Weight: 70.09

SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

OSHA PEL: Not Found

ACGIH TLV: Not Found

IDLH: Not Found

Other Limits Recommended: Toxicity information:  $LC_{50}$  inhalation (rat) 0.007 mg/liter/4 hours (\*NIOSH/RTECS 1985)

SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

Boiling Point: 179°F, 81.4°C (\*Merck 1983)

Specific Gravity ( $H_2O=1$ ): 0.8636 at 20/4°C; 0.8407 at 25/4°C (\*Merck 1983)

Vapor Pressure (mmHg): Not Found

Melting Point: 20°F, -7°C (\*CHRIS 1978)

Vapor Density (AIR=1): 2.41 (\*Sax 1979)

Evaporation Rate (Butyl acetate=1): Not Found

## METHYL VINYL KETONE

### SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS (Continued)

**Solubility in Water:** Soluble (\*Merck 1983)

**Appearance and Odor:** Colorless liquid (\*Hawley 1981) with pungent odor (\*Merck 1983)

### SECTION III -- FIRE AND EXPLOSION HAZARD DATA

**Flash Point (Method Used):** 20°F, -6.6°C (CC) (\*Hawley 1981);  
30°F, -1.1°C (OC) (\*CHRIS 1978)

**Flammable Limits:**

LEL: 2.1% (\*NFPA 1978)  
UEL: 15.6% (\*NFPA 1978)

**Extinguishing Methods:** Use dry chemical, alcohol foam, or carbon dioxide. Water spray may be ineffective as an extinguishing agent (\*NFPA 1978). Small fires: dry chemical, carbon dioxide, and foam. Large fires: fog or foam. Move container from fire area if you can do so without risk. Dike fire control water for later disposal; do not scatter the material. Spray cooling water on containers that are exposed to flames until well after fire is out. Withdraw immediately in case of rising sound from venting safety device or any discoloration of tank due to fire (DOT 1984, Guide 28).

**Special Fire Fighting Procedures:** Use water to keep fire-exposed containers cool (\*NFPA 1978). Keep unnecessary people away; isolate hazard area and deny entry. Stay upwind; keep out of low areas. Wear positive pressure breathing apparatus and special protective clothing. Isolate for 1/2 mile in all directions if tank car or truck is involved in fire (DOT 1984, Guide 28).

**Unusual Fire and Explosion Hazards:** Vapors form flammable mixtures with air, and may travel a considerable distance to a source of ignition and flash back. Polymerization may take place in containers, possibly with violent rupture of containers (\*NFPA 1978). Upon exposure to heat or flame, it emits toxic and irritating fumes (\*Sax 1979). Container may explode in heat of fire. Vapor explosion and poison hazard indoors, outdoors, or in sewers (DOT 1984, Guide 28).

### SECTION IV -- REACTIVITY DATA

**Stability:** Unstable: Yes (\*NFPA 1978)  
Stable:

**Conditions to Avoid:** Polymerizes on standing (\*Merck 1983)

## METHYL VINYL KETONE

### SECTION IV -- REACTIVITY DATA (Continued)

**Incompatibility (Materials to Avoid):** Not Found

**Hazardous Decomposition or Byproducts:** Not Found

**Hazardous Polymerization:** May Occur: Yes (\*NFPA 1978)  
May Not Occur:

**Conditions to Avoid:** Heat or sunlight (\*NFPA 1978)

### SECTION V -- HEALTH HAZARD DATA

**Routes of Entry:** Inhalation: Yes (Similar to other ketones) (\*Rumack 1975 to Present)  
Skin: Yes (\*Merck 1983)  
Ingestion: Yes (\*DOT 1984)

**Health Hazards (Acute, Delayed, and Chronic):** This material is readily absorbed through the skin, causing general poisoning (\*Merck 1983) similar to other ketones; inhalation has central nervous system depressant effects (\*Rumack 1975 to Present). It is irritating to mucous membranes and respiratory tract (\*Merck 1983) and to the skin; it is a lachrymator and can cause eye injury (\*Grant 1974).

**Signs and Symptoms of Exposure:** Liquid or high concentration of vapors causes blistering of the skin (\*NFPA 1978). Similar to other ketones; can cause sore throat, sneezing, coughing, and salivation. Inhalation may cause nausea and vomiting; inhalation of high concentrations can cause headache, dizziness, fainting, tremor, uncoordination, lowered body temperature, depressed respiratory and heart rate, gasping, coma, and death. Direct aspiration of liquid into lungs can cause chemical pneumonia. (\*Rumack 1975 to Present)

**Medical Conditions Generally Aggravated by Exposure:** Not Found

**Emergency and First Aid Procedures:** Move victim to fresh air; call emergency medical care. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Remove and isolate contaminated clothing and shoes at site. In case of contact with material, immediately flush skin or eyes with running water for at least 15 minutes. Keep victim quiet and maintain normal body temperature. Effects may be delayed; keep victim under observation (\*DOT 1984).

## METHYL VINYL KETONE

### SECTION VI -- USE INFORMATION

This material is used as an alkylating agent, a starting material for plastics, and an intermediate in the synthesis of steroids and Vitamin A (\*Merck 1983).

### SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE

(Steps to be Taken in Case Material is Released or Spilled)

Avoid breathing vapors (see Section V above). Isolate area. Stay upwind; keep out of low areas. Wear positive pressure breathing apparatus and special protective clothing. Shut off ignition sources; no flares, smoking, or flames in hazard area. Do not touch spilled material; stop leak if you can do so without risk. Use water spray to reduce vapors. Absorb small spills with sand or other noncombustible absorbent material and place into containers for later disposal. For large spills, dike far ahead for later disposal (\*DOT 1984).



EPA CHEMICAL PROFILE

INTERIM

Date: October 31, 1985

Revision: \_\_\_\_\_

CHEMICAL IDENTITY -- LACTONITRILE

CAS Registry Number: 78-97-7

**Synonyms:** 2-Hydroxypropanenitrile; 2-Hydroxypropionitrile; Acetaldehyde Cyanohydrin; Acetocyanohydrin; alpha-Hydroxypropionitrile; Ethylidene Cyanohydrin; Propanenitrile, 2-Hydroxy-; Propanoic Acid, 2-Hydroxy-, Nitrile

**Chemical Formula:**  $C_3H_5NO$

**Molecular Weight:** 71

SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

OSHA PEL: Not Found

ACGIH TLV: Not Found

IDLH: Not Found

**Other Limits Recommended:** Toxicity information:  $LC_{10\%}$  inhalation (rat) 0.36 mg/liter/4 hours (\*NIOSH/RTECS 1985)

SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

**Boiling Point:** 360-363°F, 182-184°C; slight decomposition (Weast 1979, p. C-456)

**Specific Gravity ( $H_2O=1$ ):** 0.9877 at 20°C/4°C (\*Weast 1979)

**Vapor Pressure (mmHg):** 10 at 74°C (\*Patty 1963)

**Melting Point:** -40°F, -40°C (\*Weast 1979)

**Vapor Density (AIR=1):** 2.45 (\*NFPA 1978)

**Evaporation Rate (Butyl acetate=1):** Not Found

**Solubility in Water:** Soluble in all proportions (\*Weast 1979)

**Appearance and Odor:** Straw colored liquid (\*Patty 1963)

## LACTONITRILE

### SECTION III -- FIRE AND EXPLOSION HAZARD DATA

**Flash Point** (Method Used): 170°F (TCC) (Sax 1984, p. 1683)

**Flammable Limits:** Moderate when exposed to heat or flame (\*Encyc Occupat Health and Safety 1971)

LEL: Not Found

UEL: Not Found

**Extinguishing Methods:** Foam, carbon dioxide, dry chemical (Sax 1984, p. 1683).

**Special Fire Fighting Procedures:** Not Found

**Unusual Fire and Explosion Hazards:** Cyanide fumes released when heated to decomposition (\*Encyc Occupat Health and Safety 1971).

### SECTION IV -- REACTIVITY DATA

**Stability:** Unstable: Not Found

Stable: Not Found

**Conditions to Avoid:** Not Found

**Incompatibility** (Materials to Avoid): Alkali (\*Hawley 1977); oxidizing material (Sax 1984, p. 1683).

**Hazardous Decomposition or Byproducts:** Cyanide fumes when heated to decomposition (\*Encyc Occupat Health and Safety 1971); hydrocyanic acid in presence of alkali (\*Hawley 1977).

**Hazardous Polymerization:** May Occur: Not Found

May Not Occur: Not Found

**Conditions to Avoid:** Not Found

### SECTION V -- HEALTH HAZARD DATA

**Routes of Entry:** Inhalation: Yes (\*Encyc Occupat Health and Safety 1971)

Skin: Yes (\*Encyc Occupat Health and Safety 1971)

Ingestion: Yes (\*Encyc Occupat Health and Safety 1971)

## LACTONITRILE

### SECTION V -- HEALTH HAZARD DATA (Continued)

**Health Hazards** (Acute, Delayed, and Chronic): Extremely toxic by oral, skin, or eye contact (\*Patty 1963)

**Signs and Symptoms of Exposure:** Not Found

**Medical Conditions Generally Aggravated by Exposure:** Not Found

**Emergency and First Aid Procedures:** Treat as cyanide poisoning. Get emergency medical treatment immediately. If there is exposure through skin contact, wash with soap and water. Exposed eyes should be flushed copiously with water for at least 15 minutes. If the victim stops breathing before emergency medical treatment is available, give artificial respiration or oxygen, but avoid mouth to mouth respiration; also avoid contact with contaminated skin (\*Rumack 1975 to Present).

### SECTION VI -- USE INFORMATION

Solvent -- intermediate in production of ethyl lactate and lactic acid (\*Hawley 1977).

### SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE

(Steps to be Taken in Case Material is Released or Spilled)

Do not breathe vapors or touch spilled material. Wear proper respiratory protection, eye protection and full protective clothing (see Section V above).

EPA CHEMICAL PROFILE

INTERIM

Date: October 31, 1985

Revision: \_\_\_\_\_

CHEMICAL IDENTITY -- ACRYLAMIDE

CAS Registry Number: 79-06-1

Synonyms: 2-Propenamide; Acrylic Amide; Ethylene Carboxamide; Propenamide; Propenoic Acid, Amide

Chemical Formula:  $C_3H_5NO$

Molecular Weight: 71.08

SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

OSHA PEL: Air: TWA 0.3 mg/m<sup>3</sup> (skin) (OSHA 1984, p. 660)

ACGIH TLV: TWA 0.3 mg/m<sup>3</sup>; STEL 0.6 mg/m<sup>3</sup> (skin) (\*ACGIH 1981)

IDLH: Not Found

**Other Limits Recommended:** It is recommended that no more than 0.05 mg/kg/day be absorbed by workers (\*ACGIH 1980). Suspected of carcinogenic potential in humans; notice of intent to change to 0.03 mg/m<sup>3</sup> for 1985-86 (ACGIH 1985, p. 42).

SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

Boiling Point: 189°F, 87°C at 2 mmHg (\*Merck 1976)

Specific Gravity (H<sub>2</sub>O=1): 1.122 at 30°C/4°C (\*Merck 1976)

Vapor Pressure (mmHg): 0.007 at 20°C (\*ACGIH 1980)

Melting Point: 184°F, 84.5°C (\*Merck 1976)

Vapor Density (AIR=1): 2.45 (\*Sax 1975)

Evaporation Rate (Butyl acetate=1): Not Found

Solubility in Water: 215.5 g/100 mL water at 30°C (\*Merck 1976)

Appearance and Odor: Odorless (\*Grant 1974) white, crystalline solid (\*Sax 1975).

ACRYLAMIDE

SECTION III -- FIRE AND EXPLOSION HAZARD DATA

**Flash Point** (Method Used): 138°C (CC) (\*Sunshine 1969)

**Flammable Limits:**

LEL: Not Found

UEL: Not Found

**Extinguishing Methods:** For small fires, use dry chemical, carbon dioxide, water spray or foam. For large fires use water spray, fog or foam. Move container from fire area if you can do so without risk (\*DOT 1984).

**Special Fire Fighting Procedures:** Fight fire from maximum distance. Dike fire control water for later disposal; do not scatter the material (\*DOT 1984).

**Unusual Fire and Explosion Hazards:** Heating to decomposition evolves ammonia, hydrogen and carbon monoxide (\*Rumack 1975 to Present).

SECTION IV -- REACTIVITY DATA

**Stability:** Unstable:

Stable: Yes (\*Hawley 1977)

**Conditions to Avoid:** Heat (\*ACGIH 1980); ultraviolet light (\*Merck 1976).

**Incompatibility** (Materials to Avoid): Strong oxidizers (NIOSH/OSHA 1978, p. 42).

**Hazardous Decomposition or Byproducts:** Pure acrylamide will decompose at 175-300°C giving ammonia, hydrogen and carbon monoxide (\*Rumack 1975 to Present).

**Hazardous Polymerization:** May Occur: Yes (\*ACGIH 1980)  
May Not Occur:

**Conditions to Avoid:** It readily polymerizes when heated to the melting point or when exposed to ultraviolet light (\*Merck 1976). It is known to polymerize with violence when heated (\*ACGIH 1980).

SECTION V -- HEALTH HAZARD DATA

**Routes of Entry:** Inhalation: Yes (NIOSH/OSHA 1978, p. 43)  
Skin: Yes (\*Hamilton 1974)  
Ingestion: Yes (NIOSH/OSHA 1978, p. 43)

## ACRYLAMIDE

### SECTION V -- HEALTH HAZARD DATA (Continued)

**Health Hazards** (Acute, Delayed, and Chronic): Classified as very toxic; probable oral lethal human dose is between 50 and 500 mg/kg or between 1 teaspoon and 1 ounce for a 150 lb. person (Gosselin 1984, p. II-409). Polymerized acrylamide is not toxic, but the monomer can cause peripheral nerve damage (\*Doull 1980). It is a cumulative neurotoxin and repeated exposure to small amounts may cause serious injury to the nervous system (\*Rumack 1975 to Present). The neurological effects may be delayed. Polymer inhibitors or stabilizers added to the monomer may also produce toxicity (\*Peer Review Committee). The symptoms of acrylamide toxicity are consistent with mid-brain lesions (\*Hamilton 1974) and blocked transport along both motor and sensory axons (\*Doull 1980).

**Signs and Symptoms of Exposure:** Complaints of drowsiness, fatigue, tingling of fingers, and a stumbling, propulsive type of walking with sense of unsteadiness have been reported (\*Patty 1963). Motor and sensory impairment, numbness, tremor, abnormal feelings in the lower limbs accompanied by weakness, and speech disturbances were also reported (\*Hamilton 1974).

**Medical Conditions Generally Aggravated by Exposure:** Individuals with nervous system diseases should not be exposed to acrylamide (\*Plunkett 1976).

**Emergency and First Aid Procedures:** Move victim to fresh air. If not breathing give artificial respiration. If breathing is difficult, give oxygen. In case of contact with material, wash skin or eyes with running water. Speed in removing material from the skin is of extreme importance. Remove contaminated clothing, keep victim quiet and maintain normal body temperature. Effects may be delayed, keep victim under observation (\*DOT 1984).

### SECTION VI -- USE INFORMATION

Reactive monomer and intermediate in production of organic chemicals, polymers or copolymers (\*ACGIH 1980); the latter are used as or in flocculants for sewage and waste treatment; soil conditioning agents; ore processing; adhesives; paper and textile industries; permanent press fabrics (\*Hawley 1977).

## ACRYLAMIDE

### SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE

(Steps to be Taken in Case Material is Released or Spilled)

Keep unnecessary people away; isolate hazard area and deny entry. Stay upwind; keep out of low areas. Ventilate closed spaces before entering them. Wear positive pressure breathing apparatus and special protective clothing. Remove and isolate contaminated clothing at the site. Do not touch spilled material; stop leak if you can do so without risk. Use water spray to reduce vapors. Small spills: absorb with sand or other non-combustible absorbent material and place into containers for later disposal. Small dry spills: with clean shovel place material into clean, dry container and cover; move containers from spill area. Large spills: dike far ahead of spill for later disposal (\*DOT 1984).

## EPA CHEMICAL PROFILE

### INTERIM

Date: October 31, 1985

Revision: \_\_\_\_\_

## CHEMICAL IDENTITY -- CHLOROACETIC ACID

CAS Registry Number: 79-11-8

**Synonyms:** Acetic Acid, Chloro-; alpha-Chloroacetic Acid; Chloracetic Acid; Chloroethanoic Acid; MCA; MKHUK; Monochloroacetic Acid; Monochloroacetic Acid; Monochloroacetic Acid Solution; Monochloroethanoic Acid; NCI-C60231

**Chemical Formula:**  $C_2H_3ClO_2$

**Molecular Weight:** 94.50

## SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

**OSHA PEL:** Not Found

**ACGIH TLV:** Not Found

**IDLH:** Not Found

**Other Limits Recommended:** Toxicity information:  $LC_{50}$  inhalation (rat) 0.160 mg/liter (\*NIOSH/RTECS 1985)

## SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

**Boiling Point:** 372°F, 189°C (\*Merck 1976)

**Specific Gravity ( $H_2O=1$ ):** 1.4043 at 40°C (\*Weast 1979)

**Vapor Pressure (mmHg):** 1 at 43°C (\*Patty 1963)

**Melting Point:** 145°F, 63°C (\*Weast 1979)

**Vapor Density (AIR=1):** 3.26 (\*Sax 1975)

**Evaporation Rate (Butyl acetate=1):** Not Found

**Solubility in Water:** Very soluble in water (\*Weast 1979)

**Appearance and Odor:** Colorless or white crystals (\*Merck 1976).  
Colorless to light brown crystals (\*Hawley 1977).



## CHLOROACETIC ACID

### SECTION III -- FIRE AND EXPLOSION HAZARD DATA

**Flash Point** (Method Used): 302°F, 150°C (\*NFPA 1978)

**Flammable Limits:**

LEL: Not Found

UEL: Not Found

**Extinguishing Methods:** Water fog applied gently to surface will cause frothing which will extinguish fire. Normal fire fighting procedures may be used (\*NFPA 1978). Extinguish fire using agent suitable for surroundings. Material itself does not burn or burns with difficulty. (\*Student 1981) For small fires use dry chemical, carbon dioxide, water spray or foam. For large fires use water spray, fog, or foam (\*DOT 1984).

**Special Fire Fighting Procedures:** This material is extremely hazardous to health, but fire fighters may enter areas with extreme care. Full protective clothing including a self-contained breathing apparatus, coat, pants, gloves, boots and bands around legs, arms and waist should be provided. No skin surface should be exposed (\*NFPA 1978). Cool fire-exposed containers with water (\*Student 1981). Move container from fire area if you can do so without risk. Spray cooling water on containers that are exposed to flames until well after fire is out (\*DOT 1984).

**Unusual Fire and Explosion Hazards:** When heated to decomposition, it emits highly toxic fumes of phosgene and chlorides (\*Sax 1975). Water may cause frothing if it gets below surface of the liquid and turns to steam (\*NFPA 1978). Flammable/poisonous gases may accumulate in tanks and hopper cars. Some of these materials may ignite combustibles, e.g., wood, paper, oil (\*DOT 1984).

### SECTION IV -- REACTIVITY DATA

**Stability:** Unstable:

Stable: Yes (\*NFPA 1978)

**Conditions to Avoid:** Heating (\*Sax 1975)

**Incompatibility** (Materials to Avoid): It is corrosive to metals (\*Student 1981).

**Hazardous Decomposition or Byproducts:** When heated to decomposition, it emits highly toxic fumes of phosgene and chlorides (\*Sax 1975).

## CHLOROACETIC ACID

### SECTION IV -- REACTIVITY DATA (Continued)

Hazardous Polymerization: May Occur: Not Found  
May Not Occur: Not Found

Conditions to Avoid: Not Found

### SECTION V -- HEALTH HAZARD DATA

Routes of Entry: Inhalation: Yes (\*Rumack 1975 to Present)  
Skin: Yes (\*Encyc Occupat Health and Safety 1971)  
Ingestion: Yes (\*Encyc Occupat Health and Safety 1971)

**Health Hazards** (Acute, Delayed, and Chronic): This material is very toxic. The probable lethal oral dose is 50-500 mg/kg of body weight, between one teaspoon and one ounce, for a 150 lb. person. Chloroacetic acid is irritating to the skin, cornea, and respiratory tract and causes burns. It may severely damage skin and mucous membranes. Ingestion may interfere with essential enzyme systems and cause perforation and peritonitis. Burns to skin result in marked fluid and electrolyte loss. Death may follow if more than 3% of the skin is exposed to this material. Other health hazards include central nervous system depression, and respiratory system depression (\*Rumack 1975 to Present).

**Signs and Symptoms of Exposure:** Irritation and pain in skin. If chloroacetic acid is inhaled the patient may exhibit difficulty in breathing. Vomiting may occur if the material is ingested. It can burn the skin, cornea and respiratory tract (\*Rumack 1975 to Present).

**Medical Conditions Generally Aggravated by Exposure:** Persons with lung diseases are at greater risk (\*ITI 1982).

**Emergency and First Aid Procedures:** Move victim to fresh air; call emergency care. Remove and isolate contaminated clothing and shoes at site. If contact occurs with the material, flush skin or eyes with running water for at least 15 minutes. Keep victim quiet and maintain normal body temperature (\*DOT 1984)

## CHLOROACETIC ACID

### SECTION VI -- USE INFORMATION

Chloroacetic acid is used as a pre-emergence herbicide. It is also used as a defoliant (\*Martin and Worthing 1974). It is an intermediate for synthetic caffeine (\*NIOSH 1984) as well as sarcosine, EDTA, and ethylchloroacetate (\*ITI 1982) and sodium carboxymethylcellulose, glycine, thioglycolic acid, pharmaceuticals like Vitamin A and indigoid dyes (\*SRI). Additional uses include disinfectant and as a drying agent for curing hay (USEPA/Pesticide Index 1985).

### SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE

(Steps to be Taken in Case Material is Released or Spilled)

Neutralize spilled materials with crushed limestone, soda ash, or lime (\*Student 1981). Waste water containing chloroacetic acid can be treated with ammonia, ammonium salts, or amines followed by separation of suspended solids (\*Opavsky 1976). Keep unnecessary people away; isolate hazard and deny entry. Stay upwind; keep out of low areas. Wear self-contained breathing apparatus and full protective clothing. Notify authorities if water pollution occurs. Do not touch spilled material. Stop leak if you can without risk. Take up small spills with an absorbent, non-combustible material and place into clean, dry containers for later disposal. Dike large spills far ahead of spill for later disposal (\*DOT 1984).

EPA CHEMICAL PROFILE

INTERIM

Date: October 31, 1985

Revision: \_\_\_\_\_

CHEMICAL IDENTITY -- THIOSEMICARBAZIDE

CAS Registry Number: 79-19-6

Synonyms: 1-Amino-2-Thiourea; 1-Aminothiourea; 2-Thiosemicarbazide; Aminothiourea; Hydrazinecarbothioamide; Isothiosemicarbazide; N-Aminothiourea; Thiocarbamoylhydrazine

Chemical Formula:  $\text{CH}_5\text{N}_3\text{S}$

Molecular Weight: 91.15

SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

OSHA PEL: Not Found

ACGIH TLV: Not Found

IDLH: Not Found

Other Limits Recommended: Toxicity information:  $\text{LD}_{50}$  oral (rat)  
9.16 mg/kg (\*NIOSH/RTECS 1985)

SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

Boiling Point: Not Found

Specific Gravity ( $\text{H}_2\text{O}=1$ ): Not Found

Vapor Pressure (mmHg): Not Found

Melting Point: 356-363°F, 180-184°C (\*Hawley 1977)

Vapor Density (AIR=1): Not Found

Evaporation Rate (Butyl acetate=1): Not Found

Solubility in Water: Soluble (\*Hawley 1977)

Appearance and Odor: This compound is a white crystalline powder and is odorless. (\*Hawley 1977)

THIOSEMICARBAZIDE

SECTION III -- FIRE AND EXPLOSION HAZARD DATA

**Flash Point** (Method Used): Not Found

**Flammable Limits:**

LEL: Not Found

UEL: Not Found

**Extinguishing Methods:** (Non-Specific -- Poisonous, Solid, n.o.s)  
Extinguish with any chemical, carbon dioxide, water spray, fog, or foam  
(DOT 1984, Guide 53).

**Special Fire Fighting Procedures:** (Non-Specific -- Poisonous, Solid, n.o.s.) Stay upwind; keep out of low areas. Wear self-contained (positive pressure if available) breathing apparatus and full protective clothing. Move container from fire area if you can do so without risk (DOT 1984, Guide 53).

**Unusual Fire and Explosion Hazards:** When heated to decomposition, very toxic fumes of sulfur oxides and nitrogen oxides are emitted (Sax 1984, p. 2575).

SECTION IV -- REACTIVITY DATA

**Stability:** Unstable: Not Found

Stable: Not Found

**Conditions to Avoid:** Not Found

**Incompatibility** (Materials to Avoid): Not Found

**Hazardous Decomposition or Byproducts:** When heated to decomposition, thiosemicarbazide emits very toxic fumes of oxides of sulfur and nitrogen (Sax 1984, p. 2575).

**Hazardous Polymerization:** May Occur: Not Found

May Not Occur: Not Found

**Conditions to Avoid:** Not Found

SECTION V -- HEALTH HAZARD DATA

**Routes of Entry:** Inhalation: Not Found

Skin: Not Found

Ingestion: Yes (Sax 1984, p. 2575)

## THIOSEMICARBAZIDE

### SECTION V -- HEALTH HAZARD DATA (Continued)

**Health Hazards** (Acute, Delayed, and Chronic): This material is highly toxic by ingestion (Sax 1984, p. 2575). May induce goiter and cause delayed toxic effects in blood and skin (\*Rumack 1975 to Present). May be mutagenic in human cells (\*NIOSH/RTECS 1985).

**Signs and Symptoms of Exposure:** Thiosemicarbazide may induce goiter and has also been reported to cause bone marrow depression with accompanying decreases in white blood cells and platelets. It may also cause skin irritation (\*Rumack 1975 to Present).

**Medical Conditions Generally Aggravated by Exposure:** Not Found

**Emergency and First Aid Procedures:** For inhalation, remove victim to fresh air and monitor for breathing difficulty. For eye exposure, irrigate copiously with water for 15 minutes and follow with eye exam if pain persists. For dermal exposure, wash skin twice with water and soap, followed by exam if pain persists (\*Rumack 1975 to Present). (Non-Specific -- Poisonous, Solid, n.o.s.) Call emergency medical care. Remove and isolate contaminated clothing and shoes at the site (DOT 1984, Guide 53).

### SECTION VI -- USE INFORMATION

This compound is used as a reagent for ketones and certain metals, for photography and as a rodenticide (\*Hawley 1977). It is also effective for control of bacterial leaf blight of rice (\*Nippon Noyaku Gakkaishi 1976, 1(2)95). Not a registered pesticide in the U.S. (USEPA/Active Ingredients, 1985). It is a chemical intermediate for herbicides and a reagent for detection of metals (\*SRI).

### SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE

(Steps to be Taken in Case Material is Released or Spilled)

Avoid skin contact, ingestion or inhalation (see Section V above). (Non-Specific -- Poisonous, Solid, n.o.s.) Do not touch spilled material; stop leak if you can do it without risk. Small spills: take up with sand or other noncombustible absorbent material and place into containers for later disposal. Small dry spills: with clean shovel place material into clean, dry container and cover; move containers from spill area. Large spills: dike far ahead of spill for later disposal (DOT 1984, Guide 53).

EPA CHEMICAL PROFILE

INTERIM

Date: October 31, 1985

Revision: \_\_\_\_\_

CHEMICAL IDENTITY -- PERACETIC ACID

CAS Registry Number: 79-21-0

**Synonyms:** Peroxyacetic Acid; Acetyl Hydroperoxide; Hydroperoxide, Acetyl; Peracetic Acid Solution (Sax 1984, p. 2148); Ethaneperoxoic Acid (Merck 1983, p. 1028)

**Chemical Formula:**  $C_2H_4O_3$

**Molecular Weight:** 76.05

SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

OSHA PEL: Not Found

ACGIH TLV: Not Found

IDLH: Not Found

**Other Limits Recommended:** Toxicity information:  $LC_{50}$  inhalation (rat) 0.45 mg/liter (\*NIOSH/RTECS 1985)

SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

**Boiling Point:** 221°F, 105°C (\*Weast 1979)

**Specific Gravity** ( $H_2O=1$ ): 1.226 at 15°C (\*Weast 1979)

**Vapor Pressure** (mmHg): Not Found

**Melting Point:** 32°F, 0.1°C (\*Weast 1979); approximately -22°F, -30°C (Hawley 1981, p. 786)

**Vapor Density** (AIR=1): Not Found

**Evaporation Rate** (Butyl acetate=1): Not Found

**Solubility in Water:** Very soluble (\*Weast 1979)

**Appearance and Odor:** Colorless liquid (\*NFPA 1978). Strong, pungent acrid odor (\*CHRIS 1978, \*Merck 1983).

## PERACETIC ACID

### SECTION III -- FIRE AND EXPLOSION HAZARD DATA

**Flash Point** (Method Used): (Peracetic Acid, 60% Acetic Acid Solution)  
105°F, 41°C (no method given) (NFPA 1984, p. 49-72)

**Flammable Limits:**

LEL: Not Found

UEL: Not Found

**Extinguishing Methods:** Fight fires from an explosion-resistant location. In advanced or massive fires, area should be evacuated (NFPA 1984, p. 49-72). For small fires: use dry chemical, carbon dioxide, water spray, or foam. For large fires: flood area with water (DOT 1984, Guide 51).

**Special Fire Fighting Procedures:** If fire occurs in the vicinity of this compound, water should be used to keep containers cool. Cleanup and salvage operations should not be attempted until all of the peroxyacetic acid solution has cooled completely (NFPA 1984, p. 49-72). Keep unnecessary people away; wear self-contained breathing apparatus and full protective clothing (DOT 1984, Guide 51).

**Unusual Fire and Explosion Hazards:** Decomposes violently at 230°F, 110°C (NFPA 1984, p. 325M-78). When heated to decomposition, this compound emits acrid smoke and fumes (Sax 1984, p. 2148). Runoff to sewer may create a fire or explosion hazard (DOT 1984, Guide 51).

### SECTION IV -- REACTIVITY DATA

**Stability:** Unstable: Yes (NFPA 1984, p. 49-72)  
Stable:

**Conditions to Avoid:** Shock and heat (NFPA 1984, p. 49-72).

**Incompatibility** (Materials to Avoid): Powerful oxidizer. Isolate from other stored material, particularly accelerators, oxidizers, and organic or flammable materials (NFPA 1984, p. 49-72).

**Hazardous Decomposition or Byproducts:** Emits acrid smoke and fumes when heated to decomposition (Sax 1984, p. 2148).

**Hazardous Polymerization:** May Occur:  
May Not Occur: Yes (NFPA 1984, p. 49-72)

**Conditions to Avoid:** Not Found



## PERACETIC ACID

### SECTION V -- HEALTH HAZARD DATA

**Routes of Entry:** Inhalation: Yes (\*NFPA 1978)  
Skin: Yes (Sax 1984, p. 2148)  
Ingestion: Yes (\*Gosselin 1984)

**Health Hazards** (Acute, Delayed, and Chronic): This is a very toxic compound. The probable human oral lethal dose is 50-500 mg/kg, or between 1 teaspoon and 1 ounce for a 150 pound person (\*Gosselin 1984).

**Signs and Symptoms of Exposure:** Inhalation causes severe irritation of mucous membranes. Contact with liquid causes severe irritation of eyes and skin. Ingestion causes severe distress, including burns of the mouth and stomach (Weiss 1982, p. 737).

**Medical Conditions Generally Aggravated by Exposure:** Not Found

**Emergency and First Aid Procedures:** Move victim to fresh air and call emergency medical care. If victim is not breathing apply artificial respiration and give oxygen. Remove and isolate contaminated clothing. In case of contact with material, immediately flush eyes with running water for at least 15 minutes; wash skin with soap and water. Keep victim quiet and maintain normal body temperature. If material is ingested, give plenty of warm water (DOT 1984, Guide 51; Weiss 1982, p. 730).

### SECTION VI -- USE INFORMATION

This compound is used as a bactericide and fungicide, especially in food processing; a reagent in making caprolactam and glycerol; an oxidant for preparing epoxy compounds; a bleaching agent; a sterilizing agent; and a polymerization catalyst for polyester resins (\*Hawley 1981; \*SRI).

### SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE

(Steps to be Taken in Case Material is Released or Spilled)

Avoid breathing vapors. Wear proper respiratory protection, eye protection, and full protective clothing (see Section V above). Do not touch the spilled material; shut off all ignition sources and stop the leak if this can be done without risk (DOT 1984, Guide 51). The spilled material should be absorbed with a noncombustible absorbent such as vermiculite. Sweep up and place in a metal container for immediate disposal. Do not use spark-generating metals or organic materials for sweeping up or handling spilled material. Dispose of the absorbed peroxyacetic acid solution, in small quantities at a time, by placing it on the ground in a remote outdoor area and igniting with a long torch. Empty containers should be washed with a 10% sodium hydroxide solution (NFPA 1984, p. 49-72).

EPA CHEMICAL PROFILE

INTERIM

Date: October 31, 1985  
Revision: \_\_\_\_\_

CHEMICAL IDENTITY -- METHYL CHLOROFORMATE

CAS Registry Number: 79-22-1

**Synonyms:** Carbonochloridic Acid, Methyl Ester; Chlorocarbonic Acid, Methyl Ester; Chloroformic Acid Methyl Ester; Formic Acid, Chloro-, Methyl Ester; K-Stoff; Methoxycarbonyl Chloride; Methyl Chlorocarbonate; TL 438

**Chemical Formula:**  $C_2H_3ClO_2$

**Molecular Weight:** 94.50

SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

OSHA PEL: Not Found

ACGIH TLV: Not Found

IDLH: Not Found

**Other Limits Recommended:** Toxicity information:  $LC_{low}$  inhalation  
(cat) 1.5 mg/liter/30 minutes (\*NIOSH/RTECS 1985)

SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

**Boiling Point:** 160°F, 71.0°C (\*Merck 1976)

**Specific Gravity** ( $H_2O=1$ ): 1.223 at 20°C/4°C (\*Merck 1976)

**Vapor Pressure** (mmHg): Not Found

**Melting Point:** Not Found

**Vapor Density** (AIR=1): 3.26 (\*Sax 1979)

**Evaporation Rate** (Butyl acetate=1): Not Found

**Solubility in Water:** Slightly soluble (Sax 1984, p. 1826)

**Appearance and Odor:** Clear liquid (\*Merck 1976)

METHYL CHLOROFORMATE

SECTION III -- FIRE AND EXPLOSION HAZARD DATA

**Flash Point (Method Used):** 54°F (no method given) (\*Sax 1979)

**Flammable Limits:**

LEL: Not Found

UEL: Not Found

**Extinguishing Methods:** For small fires, use dry chemical, carbon dioxide, water spray, and foam. For large fires, use water spray, fog, or foam. Move container from fire area if it can be done without risk. Cool containers exposed to flames with water (DOT 1984, Guide 28).

**Special Fire Fighting Procedures:** Isolate for 1/2 mile in all directions if tank car or truck is involved in fire. Wear positive pressure breathing apparatus and special protective clothing (DOT 1984, Guide 28).

**Unusual Fire and Explosion Hazards:** This chemical is very dangerous when exposed to heat sources, sparks, flame, or oxidizers. It will react with water or steam to produce toxic and corrosive fumes (\*Sax 1979). Vapors may travel to a source of ignition and flash back. Withdraw immediately in case of rising sound from venting safety device or any discoloration of tank due to fire (DOT 1984, Guide 28).

SECTION IV -- REACTIVITY DATA

**Stability:** Unstable: Not Found

Stable: Not Found

**Conditions to Avoid:** Heat or steam should be avoided (\*Sax 1979).

**Incompatibility (Materials to Avoid):** Not Found

**Hazardous Decomposition or Byproducts:** Toxic fumes of phosgene are produced when the material is heated to decomposition. Will react with water or steam to produce toxic and corrosive fumes (\*Sax 1979).

**Hazardous Polymerization:** May Occur: Not Found

May Not Occur: Not Found

**Conditions to Avoid:** Not Found

SECTION V -- HEALTH HAZARD DATA

**Routes of Entry:** Inhalation: Yes (Sax 1984, p. 1826)

Skin: Yes (Sax 1984, p.1826)

Ingestion: Yes (Sax 1984, p. 1826)

## METHYL CHLOROFORMATE

### SECTION V -- HEALTH HAZARD DATA (Continued)

**Health Hazards** (Acute, Delayed, and Chronic): Methyl chloroformate is highly toxic upon inhalation and upon ingestion (\*Merck 1976; Sax 1984, p. 1826). A concentration of 1 mg/liter (190 ppm) has been lethal in 10 minutes (\*Clayton and Clayton 1981-82). It is corrosive and irritating to skin (\*Hawley 1977).

**Signs and Symptoms of Exposure:** It is an irritant to the skin and is corrosive by ingestion or inhalation. Concentrations of 10 ppm have caused lachrymation and a concentration of 190 ppm for 10 minutes has been lethal to humans. Irritation of the lung and eyes may persist after cessation of exposure. Skin allergies may also occur (\*Clayton and Clayton 1981-82). After 2-3 inhalations, brief initial irritation may occur followed by massive symptoms (heavy cough) after 36 hours. Relapses may occur in following days with eventual full recovery (\*Schuckmann 1972).

**Medical Conditions Generally Aggravated by Exposure:** Not Found

**Emergency and First Aid Procedures:** Move victim to fresh air and call emergency medical care. If not breathing, give artificial respiration; if breathing is difficult, provide oxygen. Remove and isolate contaminated clothing and shoes at the site. In case of contact, immediately flush skin or eyes with water for at least 15 minutes. Keep victim quiet and maintain normal body temperature. Since effects may be delayed, keep careful watch on the victim (DOT 1984, Guide 28).

### SECTION VI -- USE INFORMATION

Methyl chloroformate is used in organic synthesis and in manufacturing of insecticides (\*Hawley 1977). It was used as a warfare agent during World War I (\*Clayton and Clayton 1981-82).

### SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE (Steps to be Taken in Case Material is Released or Spilled)

Avoid breathing vapors and contact with skin. Wear proper respiratory protection, goggles and protective clothing. In case of contact, immediately flush skin or eyes with water. Remove and isolate contaminated clothing (see Section V above). Runoff from fire control or dilution water should be contained for later disposal. In case of a small spill, take up with sand or other noncombustible absorbent material and place in containers for later disposal. In case of a large spill, dike far ahead of the spill for later disposal. In case of spills or leaks, shut off ignition sources, and have no flares, smoking, or flames in hazard area. Do not touch spilled material and use water spray to reduce vapors (DOT 1984, Guide 28).

EPA CHEMICAL PROFILE

INTERIM

Date: October 31, 1985

Revision: \_\_\_\_\_

CHEMICAL IDENTITY -- METHYL 2-CHLOROACRYLATE

CAS Registry Number: 80-63-7

**Synonyms:** 2-Chloroacrylic Acid, Methyl Ester; 2-Propenoic Acid, 2-Chloro-, Methyl Ester; Acrylic Acid, 2-Chloro-, Methyl Ester; Methyl Alpha-Chloroacrylate; Propenoic Acid, 2-Chloro-, Methyl Ester

**Chemical Formula:**  $C_4H_5ClO_2$

**Molecular Weight:** 120.54

SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

**OSHA PEL:** Not Found

**ACGIH TLV:** Not Found

**IDLH:** Not Found

**Other Limits Recommended:** Toxicity information:  $LC_{50}$  inhalation (rat) 0.5 mg/liter/2 hours (\*NIOSH/RTECS 1985)

SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

**Boiling Point:** 126°F, 52°C at 51 mmHg (\*Weast 1979)

**Specific Gravity ( $H_2O=1$ ):** 1.189 at 20°C/4°C (\*Weast 1979)

**Vapor Pressure (mmHg):** Not Found

**Melting Point:** Not Found

**Vapor Density (AIR=1):** Not Found

**Evaporation Rate (Butyl acetate=1):** Not Found

**Solubility in Water:** Not Found

**Appearance and Odor:** Colorless liquid (\*Lefaux 1968)

**METHYL 2-CHLOROACRYLATE**

**SECTION III -- FIRE AND EXPLOSION HAZARD DATA**

**Flash Point** (Method Used): Not Found

**Flammable Limits:**

LEL: Not Found

UEL: Not Found

**Extinguishing Methods:** (Non-Specific -- Poisonous Liquid, n.o.s.)

Small fires: dry chemical, carbon dioxide, water spray, or foam. Large fires: water spray, fog, or foam. Move container from fire area if you can do so without risk (DOT 1984, Guide 55).

**Special Fire Fighting Procedures:** Fight fire from maximum distance.

Keep unnecessary people away; isolate hazard area and deny entry. Stay upwind; keep out of low areas. Ventilate closed spaces before entering them. Wear positive pressure breathing apparatus and special protective clothing (DOT 1984, Guide 55).

**Unusual Fire and Explosion Hazards:** Not Found

**SECTION IV -- REACTIVITY DATA**

**Stability:** Unstable: Not Found

Stable: Not Found

**Conditions to Avoid:** Not Found

**Incompatibility** (Materials to Avoid): Not Found

**Hazardous Decomposition or Byproducts:** Not Found

**Hazardous Polymerization:** May Occur: Not Found

May Not Occur: Not Found

**Conditions to Avoid:** Not Found

**SECTION V -- HEALTH HAZARD DATA**

**Routes of Entry:** Inhalation: Yes (\*Lefaux 1968)

Skin: Yes (\*Lefaux 1968)

Ingestion: Not Found

## METHYL 2-CHLOROACRYLATE

**Health Hazards** (Acute, Delayed, and Chronic): It is a skin, eye, and lung irritant. The least trace on skin raises large blisters. It is also a respiratory poison; breathing the vapors can cause pulmonary edema (\*Lefaux 1968).

**Signs and Symptoms of Exposure:** A trace on skin causes large blisters. Inhalation of high concentrations may cause rapid breathing, headache, nausea, lethargy, pulmonary edema, convulsions, and death (Gosselin 1984, p. II-409).

**Medical Conditions Generally Aggravated by Exposure:** Not Found

**Emergency and First Aid Procedures:** (Non-Specific -- Poisonous Liquid, n.o.s.) Move victim to fresh air; call emergency medical care. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Remove and isolate contaminated clothing and shoes at the site. In case of contact with material, immediately flush skin or eyes with running water for at least 15 minutes. Speed in removing material from skin is of extreme importance. Keep victim quiet and maintain normal body temperature. Effects may be delayed; keep victim under observation (DOT 1984, Guide 55).

## SECTION VI -- USE INFORMATION

Used to make acrylic high polymer with properties closely resembling those of polymethylmethacrylate (\*Lefaux 1968). Monomer for specialty polymers (e.g., aircraft glazing) (\*SRI).

## SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE (Steps to be Taken in Case Material is Released or Spilled)

(Non-Specific -- Poisonous Liquid, n.o.s.) Keep unnecessary people away; isolate hazard area and deny entry. Stay upwind; keep out of low areas. Ventilate closed spaces before entering them. Wear positive pressure breathing apparatus and special protective clothing. Remove and isolate contaminated clothing at the site. Stop leak if you can do so without risk. Use water spray to reduce vapors. Small spills: take up with sand or other noncombustible absorbent material and place into containers for later disposal. Large spills: dike far ahead of spill for later disposal (DOT 1984, Guide 55).

EPA CHEMICAL PROFILE

INTERIM

Date: October 31, 1985

Revision: \_\_\_\_\_

CHEMICAL IDENTITY -- WARFARIN

CAS Registry Number: 81-81-2

**Synonyms:** Coumarin,3-(alpha-Acetylbenzyl)-4-Hydroxy-; 1-(4'-hydroxy-3'-coumarinyl)-1-phenyl-3-butanone; 2H-1-benzopyran-2-one, 4-hydroxy-3-(3-oxo-1-phenylbutyl); 3-(1'-phenyl-2'-acetylethyl)-4-hydroxycoumarin; 3-(alpha-acetylbenzyl)-4-hydroxycoumarin; 200 Coumarin; Athrombine-K; Brumolin; Compound 42; Coumadin; Coumafen; Coumafene; Coumarin, 3-(alpha-acetylbenzyl)-4-hydroxy; Coumarin, 4-hydroxy-3(1-phenyl-3-oxo-butyl)-; Coumefene; D-Con; Dethmor; Dethnel; Eastern States Duocide; Fasco Fascrat Powder; Frass-Ratron; Kumader; Kumadu; Kypfarin; Maag Rattentod Cum; Mar-Frin; Maveran; Prothromadin; Rat-a-way; Rat-b-gon; Rat-Gard; Rat-Kill; Rat-Mix; Rat-ola; Ratron; Rats-No-More; Rodafarin; Temus W; Warf 42; Warf Compound 42; Warf-12; Warfarat; Warficide; Zoocoumarin; Co-Rax; Cov-R-Tox; Liqua-Tox; Martin's Mar-Frin; Mouse-Pak; Rat and Mice Bait; Rat-o-cide #2; Rat-trol; Ratorex; Ratox; Ratoxin; Ratron G; Rax; Ro-deth; Rodex, Rodex Blox; Rosex; Rough and Ready Mouse Mix; Solfarin; Spray-trol Brand Roden-trol; Tox-Hid; Twin light rat away; Vampirinip II & III; Waran; Warfarin plus; Warfarin Q; 3-(alpha-Phenyl-beta-Acetylethyl)-4-Hydroxycoumarin; 3-(Acetylbenzyl)-4-Hydroxycoumarin; 4-Hydroxy-3(3-oxo-1-Phenylbutyl)-2H-1-Benzopyran-2-one

**Chemical Formula:**  $C_{19}H_{16}O_4$

**Molecular Weight:** 308.32

SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

OSHA PEL: TWA 0.1 mg/m<sup>3</sup> (\*NIOSH/RTECS 1985)

ACGIH TLV: TWA 0.1 mg/m<sup>3</sup>; STEL 0.3 mg/m<sup>3</sup> (\*ACGIH 1980)

IDLH: 200 mg/m<sup>3</sup> (\*NIOSH/OSHA 1981)

Other Limits Recommended: Not Found

SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

Boiling Point: Not Found

Specific Gravity (H<sub>2</sub>O=1): Not Found



WARFARIN

SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS (Continued)

Vapor Pressure (mmHg): Not Found

Melting Point: 322°F, 161°C (\*Merck 1976)

Vapor Density (AIR=1): Not Found

Evaporation Rate (Butyl acetate=1): Not Found

Solubility in Water: Insoluble (\*Weast 1979)

Appearance and Odor: Odorless and colorless solid (\*Sax 1984).

SECTION III -- FIRE AND EXPLOSION HAZARD DATA

Flash Point (Method Used): Not Found

Flammable Limits:

LEL: Not Found

UEL: Not Found

Extinguishing Methods: (Non-Specific -- Poison B Solid) Extinguish fire using agent suitable for type of surrounding fire. Use alcohol foam, carbon dioxide, or dry chemical (Student 1981, p. 416).

Special Fire Fighting Procedures: (Non-Specific -- Poison B Solid) Wear full protective clothing and self-contained breathing apparatus (Student 1981, p. 416).

Unusual Fire and Explosion Hazards: Contact with strong oxidizers may cause fires and explosions (\*NIOSH/OSHA 1981).

SECTION IV -- REACTIVITY DATA

Stability: Unstable: Not Found

Stable: Not Found

Conditions to Avoid: Not Found

Incompatibility (Materials to Avoid): Strong oxidizers (\*NIOSH/OSHA 1981)

## WARFARIN

### SECTION IV -- REACTIVITY DATA (Continued)

**Hazardous Decomposition or Byproducts:** Toxic gases and vapors (e.g., carbon monoxide) may be released in heating to decomposition (\*NIOSH/OSHA 1981).

**Hazardous Polymerization:** May Occur: Not Found  
May Not Occur: Not Found

**Conditions to Avoid:** Not Found

### SECTION V -- HEALTH HAZARD DATA

**Routes of Entry:** Inhalation: Not Found  
Skin: Yes (\*Arena 1974)  
Ingestion: Yes (\*Morgan 1982)

**Health Hazards (Acute, Delayed, and Chronic):** It is classified as very toxic. Probable oral lethal dose in humans is 50-500 mg/kg, between 1 teaspoon and 1 ounce for a 150 lb. person (\*Gosselin 1976). Material is an anticoagulant. Toxic effects other than hemorrhage are rarely seen in humans (\*Goodman 1975). Material is believed to be teratogenic in humans (\*Hayes 1982).

**Signs and Symptoms of Exposure:** Symptoms begin a few days or weeks after ingestion. They include nose bleed, bleeding gums, pallor, and sometimes hematomas around joints and on buttocks, blood in urine and feces. Later, paralysis due to cerebral hemorrhage, and finally hemorrhagic shock and death may occur (\*Doull 1980).

**Medical Conditions Generally Aggravated by Exposure:** Persons with a history of blood disorders with bleeding tendencies would be expected to be at increased risk from exposure (\*NIOSH/OSHA 1981).

**Emergency and First Aid Procedures:** (Non-Specific -- Coumarin Derivative Pesticide, Solid, n.o.s.) Move victim to fresh air; call emergency medical care. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In case of contact with material, immediately flush skin or eyes with running water for at least 15 minutes. Speed in removing material from skin is of extreme importance. Remove and isolate contaminated clothing and shoes at the site. Keep victim quiet and maintain normal body temperature. Effects may be delayed; keep victim under observation (DOT 1984, Guide 55).

## WARFARIN

### SECTION VI -- USE INFORMATION

Material is used as a rodenticide for Norway rats and for house mice (\*SRI).

### SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE

(Steps to be Taken in Case Material is Released or Spilled)

Do not touch spilled material (see Section V above). Protective clothing and self-contained breathing apparatus is to be worn in the event of a spill (\*Sittig 1981). Eating and smoking should not be permitted in areas where it is handled, processed or stored. For small spills: sweep onto paper or other suitable material. Place in an appropriate container and burn in a safe place. Large quantities may be destroyed by dissolving in a flammable solvent (e.g., alcohol) and atomizing in a combustion chamber (\*NIOSH/OSHA 1981).

EPA CHEMICAL PROFILE

INTERIM

Date: October 31, 1985

Revision: \_\_\_\_\_

CHEMICAL IDENTITY -- DIPHACINONE

CAS Registry Number: 82-66-6

**Synonyms:** 1,3-Indandione, 2-Diphenylacetyl-; 2-(Diphenylacetyl)-1H-Indene-1,3(2H)-Dione; 2-(Diphenylacetyl)Indan-1,3-Dione; 2-Diphenylacetyl-1,3-Diketohydrindene; 2-Diphenylacetyl-1,3-Indanedione; Diandin; Didandin; Didion; Difacione; Dipaxin; Diphacin; Diphenacin; Diphenandione; Oragulant; PID; Promar; Ramik; Ratindan 1; Solvan; U1363; 1H-Indene-1,3(2H)-Dione, 2-(Diphenylacetyl)-

**Chemical Formula:**  $C_{23}H_{16}O_3$

**Molecular Weight:** 340.38

SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

OSHA PEL: Not Found

ACGIH TLV: Not Found

IDLH: Not Found

**Other Limits Recommended:** Toxicity information: LD<sub>50</sub> oral (mammal)  
0.91 mg/kg (\*NIOSH/RTECS 1985)

SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

Boiling Point: Not Found

Specific Gravity (H<sub>2</sub>O=1): Not Found

Vapor Pressure (mmHg): Not Found

Melting Point: 295-297°F, 146-147°C (\*Merck 1976)

Vapor Density (AIR=1): Not Found

Evaporation Rate (Butyl acetate=1): Not Found

**Solubility in Water:** Practically insoluble (\*Merck 1976); 17 mg/liter  
(Farm Chemicals Handbook 1984, p. C-82)

## DIPHACINONE

### SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS (Continued)

**Appearance and Odor:** Pale yellow crystals (\*Merck 1976); odorless (\*Osol 1975)

### SECTION III -- FIRE AND EXPLOSION HAZARD DATA

**Flash Point (Method Used):** Not Found

**Flammable Limits:**

LEL: Not Found

UEL: Not Found

**Extinguishing Methods:** The material is similar to coumarin and indandione (\*Morgan 1982). (Non-Specific -- Coumarin Derivative Pesticide, Solid, n.o.s.) Small fires: dry chemical, carbon dioxide, water spray, or foam. Large fires: water spray, fog, or foam. Move container from fire area if you can do it without risk. Fight fire from maximum distance. Dike fire control water for later disposal; do not scatter the material (DOT 1984, Guide 55).

**Special Fire Fighting Procedures:** (Non-Specific -- Coumarin Derivative Pesticide, Solid, n.o.s.) Keep unnecessary people away; isolate hazard area and deny entry. Stay upwind; keep out of low areas. Ventilate closed spaces before entering them. Wear positive pressure breathing apparatus and special protective clothing. Remove and isolate contaminated clothing at the site (DOT 1984, Guide 55).

**Unusual Fire and Explosion Hazards:** When heated to decomposition it emits acrid smoke and fumes (Sax 1984, p. 1231).

### SECTION IV -- REACTIVITY DATA

**Stability: Unstable:**

**Stable:** Yes (\*Worthing 1979)

**Conditions to Avoid:** Sensitive to light (\*Worthing 1979)

**Incompatibility (Materials to Avoid):** Not Found

**Hazardous Decomposition or Byproducts:** When heated to decomposition, it emits acrid smoke and fumes (Sax 1984, p. 1231).

**Hazardous Polymerization: May Occur:** Not Found

**May Not Occur:** Not Found

**Conditions to Avoid:** Not Found

## DIPHACINONE

### SECTION V -- HEALTH HAZARD DATA

**Routes of Entry:** Inhalation: Not Found  
Skin: Not Found  
Ingestion: Yes (Sax 1984, p. 1231)

**Health Hazards** (Acute, Delayed, and Chronic): This material is extremely toxic; probable oral lethal dose in humans is 5-50 mg/kg, or between 7 drops and 1 teaspoonful for a 150-lb. person (\*Gosselin 1976).

**Signs and Symptoms of Exposure:** Can cause death due to inhibiting blood clotting. Symptoms seen after a few days or a few weeks of repeated ingestion. Symptoms include nose bleeds, gum bleeding, small measles-like rash, large bruises especially of the elbows, knees, and buttocks, blood in urine, blood in stools, shock, and death (Gosselin 1984, p. III-396).

**Medical Conditions Generally Aggravated by Exposure:** Many medical conditions will be aggravated by this material (\*Goodman 1980).

**Emergency and First Aid Procedures:** (Non-Specific -- Coumarin Derivative Pesticide, Solid, n.o.s.) Move victim to fresh air; call emergency medical care. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In case of contact with material, immediately flush skin or eyes with running water for at least 15 minutes. Speed in removing material from skin is of extreme importance. Remove and isolate contaminated clothing and shoes at the site. Keep victim quiet and maintain normal body temperature. Effects may be delayed; keep victim under observation (DOT 1984, Guide 55).

### SECTION VI -- USE INFORMATION

Rodenticide (\*Worthing 1979); and anticoagulant medication (\*Merck 1976).

### SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE

(Steps to be Taken in Case Material is Released or Spilled)

(Non-Specific -- Coumarin Derivative Pesticide, Solid, n.o.s.) Do not touch spilled material; stop leak if you can do it without risk. Use water spray to reduce vapors. Wear positive pressure breathing apparatus and special protective clothing. Small spills: take up with sand or other noncombustible absorbent material and place into containers for later disposal. Small dry spills: with clean shovel place material into clean, dry container and cover; move containers from spill area. Large spills: dike far ahead of spill for later disposal (DOT 1984, Guide 55).

EPA CHEMICAL PROFILE

INTERIM

Date: October 31, 1985

Revision: \_\_\_\_\_

CHEMICAL IDENTITY -- DIBUTYL PHTHALATE

CAS Registry Number 84-74-2

**Synonyms:** 1,2-Benzenedicarboxylic Acid Dibutyl Ester; 1,2-Benzenedicarboxylic Acid, Dibutyl Ester; Benzene-o-Dicarboxylic Acid Di-n-Butyl Ester; Butylphthalate; Celluflex DPB; DPB; Di-n-Butylphthalate; Dibutyl 1,2-Benzene dicarboxylate; Dibutyl-o-Phthalate; Elaol; Ergoplast FDB; Genoplast B; Hexaplast M/B; N-Butylphthalate; o-Benzenedicarboxylic Acid, Dibutyl Ester; Palatinol C; Phthalic Acid Dibutyl Ester; Phthalic Acid, Dibutyl Ester; Polycizer DBP; PX 104; RC Plasticizer DBP

**Chemical Formula:**  $C_{16}H_{22}O_4$

**Molecular Weight:** 278.34

SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

OSHA PEL: 5 mg/m<sup>3</sup> (NIOSH/OSHA 1978, p. 80)

ACGIH TLV: TWA 5 mg/m<sup>3</sup>; STEL 10 mg/m<sup>3</sup> (ACGIH 1983, p. 17)

IDLH: 9300 mg/m<sup>3</sup> (NIOSH/OSHA 1978, p. 80)

Other Limits Recommended: Not Found

SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

**Boiling Point:** 644°F, 340°C (\*Kirk-Othmer 1978)

**Specific Gravity** (H<sub>2</sub>O=1): 1.0484 at 20°C/20°C (Hawley 1981, p. 330)

**Vapor Pressure** (mmHg): 1.1 at 150°C (Hawley 1981, p. 330)

**Melting Point:** -31°F, -35°C (Sax 1984, p. 926)

**Vapor Density** (AIR=1): 9.58 (\*Clayton and Clayton 1981-82)

**Evaporation Rate** (Butyl acetate=1): Not Found

## DIBUTYL PHTHALATE

### SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS (Continued)

**Solubility in Water:** 13 mg/liter at 25°C (\*USEPA/ECAO, 1980)

**Appearance and Odor:** Colorless, oily liquid with a weak aromatic odor (NIOSH/OSHA 1978, p. 80)

### SECTION III -- FIRE AND EXPLOSION HAZARD DATA

**Flash Point (Method Used):** 315°F, 157°C (CC) (NFPA 1984, p. 33); 339.8°F, 171.1°C (OC) (\*ITI 1982)

**Flammable Limits:**

LEL: 0.5% at 456°F (235°C) (NFPA 1984, p. 33)

UEL: Not Found

**Extinguishing Methods:** Extinguish with dry chemicals or carbon dioxide (\*CHRIS 1978).

**Special Fire Fighting Procedures:** Firefighters should wear self-contained breathing apparatus (\*NFPA 1978).

**Unusual Fire and Explosion Hazards:** Reacts explosively with chlorine (\*NFPA 1978).

### SECTION IV -- REACTIVITY DATA

**Stability:** Unstable:

Stable: Yes (\*NFPA 1978)

**Conditions to Avoid:** Liquid chlorine reacts explosively with dibutyl phthalate (\*NFPA 1978).

**Incompatibility (Materials to Avoid):** Nitrates, strong oxidizers, strong alkalies, strong acids (NIOSH/OSHA 1978, p. 80); chlorine (Sax 1984, p. 926)

**Hazardous Decomposition or Byproducts:** None (\*NFPA 1978)

**Hazardous Polymerization:** May Occur:

May Not Occur: Yes (\*General Electric Co. 1980, MSDS #429)

**Conditions to Avoid:** Not Found



## DIBUTYL PHTHALATE

### SECTION V -- HEALTH HAZARD DATA

**Routes of Entry:** Inhalation: Yes (\*ACGIH 1980)  
Skin: Yes (\*Grant 1974)  
Ingestion: Yes (\*ACGIH 1980)

**Health Hazards** (Acute, Delayed, and Chronic): Generally non-irritating to humans (\*Martin 1974).

**Signs and Symptoms of Exposure:** Eye irritation with profuse tearing. Contact with surface of eye has caused severe stinging pain with profuse tearing (\*Grant 1974). Mild throat irritation has been observed (\*Lefaux 1968). Ingestion has caused nausea, dizziness, photophobia, lachrymation, and conjunctivitis (\*ACGIH 1980).

**Medical Conditions Generally Aggravated by Exposure:** Not Found

**Emergency and First Aid Procedures:** If ingested, induce vomiting with administration of syrup of ipecac (if victim is conscious). If unconscious, administer artificial respiration. Wash skin with soap and water. Irrigate eyes with plain tap water. Seek immediate medical attention (\*Rumack 1975 to Present).

### SECTION VI -- USE INFORMATION

Plasticizer in nitrocellulose lacquers, elastomers, explosives, nail polish, and solid rocket propellants; solvent for perfume oils; perfume fixative; textile lubricating agent; safety glass; insecticides; printing inks; resin solvent; paper coatings; adhesives; insect repellants for textiles (Hawley 1981, p. 330). Not registered as a pesticide in the U.S. (USEPA/Pesticide Index 1985).

### SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE

(Steps to be Taken in Case Material is Released or Spilled)

Workers should wear rubber or neoprene gloves. In addition, an apron and face shield should be worn to prevent exposure to eyes. Respiratory equipment should be worn if vapors are present. Contact lenses should not be worn (\*General Electric Co. 1980, MSDS #429).

EPA CHEMICAL PROFILE

INTERIM

Date: October 31, 1985

Revision: \_\_\_\_\_

CHEMICAL IDENTITY -- PHYLLOQUINONE

CAS Registry Number: 84-80-0

**Synonyms:** Vitamin K1; 1,4-Naphthalenedione, 2-Methyl-3-(3,7,11,15-Tetramethyl-2-Hexadecenyl)-, (R-(R\*,R\*-(E))) -; 2',3'-Trans-Vitamin K1; 2-Methyl-3-(3,7,11,15-Tetramethyl-2-Hexadecenyl)-1,4-Naphthalenedione; 2-Methyl-3-Phytyl-1,4-Naphthoquinone; 3-Phytylmenadione; Alpha-Phylloquinone; Antihemorrhagic Vitamin; Aquamephyton; Phytomenadione; Phytonadione; Phytylmenadione; Synthex P; Trans-Phylloquinone; Vitamin K1 (20); Combinal K1; K-Ject; Kativ N; Kephton; Kinadion; Konakion; Mephyton; Mono-Kay; Monodion

**Chemical Formula:**  $C_{31}H_{46}O_2$

**Molecular Weight:** 450.68

SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

OSHA PEL: Not Found

ACGIH TLV: Not Found

IDLH: Not Found

**Other Limits Recommended:** Toxicity information: LD<sub>50</sub> oral (mouse)  
25 mg/kg (\*NIOSH/RTECS 1985)

SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

**Boiling Point:** 284-293°F, 140-145°C at 0.001 mmHg (\*Weast 1979)

**Specific Gravity** (H<sub>2</sub>O=1): 0.967 at 25°C/25°C (\*Weast 1979)

**Vapor Pressure** (mmHg): Not Found

**Melting Point:** -4°F, -20°C (\*Weast 1979)

**Vapor Density** (AIR=1): Not Found

**Evaporation Rate** (Butyl acetate=1): Not Found

**Solubility in Water:** Insoluble (\*Merck 1976)

## PHYLLOQUINONE

## SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS (Continued)

**Appearance and Odor:** Phylloquinone is a yellow viscous oil (\*Merck 1976) or solid (\*Osol 1975). It is odorless (\*Hawley 1977).

## SECTION III -- FIRE AND EXPLOSION HAZARD DATA

**Flash Point (Method Used):** Not Found

**Flammable Limits:**

LEL: Not Found

UEL: Not Found

**Extinguishing Methods:** (Non-Specific -- Medicines, n.o.s.) Extinguish with dry chemical, carbon dioxide, water spray, fog, or foam (DOT 1984, Guide 11).

**Special Fire Fighting Procedures:** (Non-Specific -- Medicines, n.o.s.) Move container from fire area if you can do so without risk. Spray cooling water on containers that are exposed to flames until well after fire is out (DOT 1984, Guide 11).

**Unusual Fire and Explosion Hazards:** Not Found

## SECTION IV -- REACTIVITY DATA

**Stability:** Unstable:

Stable: Yes (\*Merck 1976)

**Conditions to Avoid:** Sunlight (\*Merck 1976)

**Incompatibility (Materials to Avoid):** Phylloquinone decomposes in sunlight and is destroyed by alkali hydroxides and reducing agents (\*Merck 1976).

**Hazardous Decomposition or Byproducts:** When heated to decomposition, it emits acrid smoke and fumes (Sax 1985, p. 1933).

**Hazardous Polymerization:** May Occur: Not Found  
May Not Occur: Not Found

**Conditions to Avoid:** Not Found

## PHYLLOQUINONE

### SECTION V -- HEALTH HAZARD DATA

**Routes of Entry:** Inhalation: Not Found  
Skin: Not Found  
Ingestion: Yes (Sax 1985, p. 1933)

**Health Hazards** (Acute, Delayed, and Chronic): High oral toxicity (Sax 1985, p. 1933). Intravenous injection can cause toxic responses and occasionally death (\*AMA 1977).

**Signs and Symptoms of Exposure:** Rapid intravenous administration of phylloquinone has produced flushing, irregular breathing, and chest pains (\*Goodman 1975). In newborns, can cause hemolytic anemia and hemoglobinuria (\*AMA 1977).

**Medical Conditions Generally Aggravated by Exposure:** In patients who have severe liver disease, administration of large doses of menadione or phylloquinone may further depress function of liver (\*Goodman 1975). Individuals resistant to coumarin may have unusual sensitivity to the antidotal effects of Vitamin K (\*Ladu 1971).

**Emergency and First Aid Procedures:** (Non-Specific -- Medicines, n.o.s.) Move victim to fresh air; call emergency medical care. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In case of contact with material, immediately flush skin or eyes with running water for at least 15 minutes. Remove and isolate contaminated clothing and shoes at the site. Keep victim quiet and maintain normal body temperature (DOT 1984, Guide 11).

### SECTION VI -- USE INFORMATION

Phylloquinone is a dietary principle essential for normal biosynthesis of several factors required for clotting of blood and as a therapeutic drug to correct bleeding tendency (\*Goodman 1975). It is also used as a food supplement (\*Hawley 1977).

### SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE

(Steps to be Taken in Case Material is Released or Spilled)

(Non-Specific -- Medicines, n.o.s.) Keep unnecessary people away; isolate hazard area and deny entry. Stay upwind; keep out of low areas. Wear self-contained (positive pressure if available) breathing apparatus and full protective clothing. Shut off ignition sources; no flares, smoking or flames in hazard area. Keep combustibles (wood, paper, oil, etc.) away from spilled material. Do not touch spilled material. Small spills: absorb with sand or other noncombustible absorbent material and place into containers for later disposal. Large spills: dike far ahead of spill for later disposal (DOT 1984, Guide 11).

EPA CHEMICAL PROFILE

INTERIM

Date: October 31, 1985

Revision: \_\_\_\_\_

CHEMICAL IDENTITY -- AZINOPHOS-METHYL

CAS Registry Number: 86-50-0

**Synonyms:** Methyl Guthion; 1,2,3-Benzotriazin-4(3H)-one, 3-(Mercapto-methyl)-, 0,0-Dimethyl Phosphorodithioate; 3-(Mercaptomethyl)-1,2,3-Benzotriazin-4(3H)-one 0,0- Dimethyl Phosphorodithioate S-Ester; Bay 17147; Bay 9027; Bayer 17147; Bayer 9027; Benzotriazine Derivative of a Methyl Dithiophosphate; Benzotriazinedithiophosphoric Acid Dimethoxy Ester; Carfene; Cotneon; Cotnion; Cotnion Methyl; Crysthion 2L; Crysthyon; DBD; Dimethyldithiophosphoric Acid N-Methylbenzazimide Ester; ENT 23,233; Gothnion; Gusathion; Gusathion 25; Gusathion K; Gusathion M; Gusathion Methyl; Gusathion-20; Guthion; Methyl Azinphos; Methyl Gusathion; Metiltriazonion; N-Methylbenzazimide, Dimethyldithiophosphoric Acid Ester; NCI-C00066; 0,0-Dimethyl S-(3,4-Dihydro-4-Keto-1,2,3-Benzotriazinyl-3-Methyl) Dithiophosphate; 0,0-Dimethyl S-(4-Oxo-1,2,3-Benzotriazino(3)-Methyl) Thiothionophosphate; 0,0-Dimethyl S-(4-Oxo-3H-1,2,3-Benzotriazine-3-Methyl) Phosphorodithioate; 0,0-Dimethyl S-(4-Oxobenzotriazino-3-Methyl) Phosphorodithioate; 0,0-Dimethyl S-4-Oxo-1,2,3-Benzotriazin-3(4H)-ylmethyl Phosphorodithioate; 0,0-Dimethyl-S-(1,2,3-Benzotriazinyl-4-Keto)Methyl Phosphorodithioate; 0,0-Dimethyl-S-(Benzaziminomethyl) Dithiophosphate; Phosphorodithioic Acid, 0,0-Dimethyl Ester, S-Ester With 3-(Mercaptomethyl)-1,2,3-Benzotriazin-4(3H)-one; Phosphorodithioic Acid, 0,0-Dimethyl S-((4-Oxo-1,2,3-Benzotriazin-3(4H)-yl)Methyl) Ester; Phosphorodithioic Acid, 0,0-Dimethyl S-(4-Oxo-1,2,3-Benzotriazin-3(4H)-ylmethyl)Ester; R 1582; S-(3,4-Dihydro-4-Oxo-1,2,3-Benzotriazin-3-ylmethyl) 0,0-Dimethyl Phosphorodithioate; S-(3,4-Dihydro-4-Oxo-Benzo(alpha)-(1,2,3-Triazin-3-yl Methyl) 0,0-Dimethyl Phosphorodithioate

**Chemical Formula:**  $C_{10}H_{12}N_3O_3PS_2$

**Molecular Weight:** 317.34

SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

**OSHA PEL:** TWA 200  $\mu\text{g}/\text{m}^3$  (skin) (\*NIOSH/RTECS 1985)

**ACGIH TLV:** TWA 0.2  $\text{mg}/\text{m}^3$ ; STEL 0.6  $\text{mg}/\text{m}^3$  (\*ACGIH 1980a)

**IDLH:** Not Found

**Other Limits Recommended:** ADI 0.0025  $\text{mg}/\text{kg}$  (\*NRC 1977). Toxicity information:  $\text{LC}_{50}$  inhalation (rat) 0.069  $\text{mg}/\text{liter}/1$  hour (\*NIOSH/RTECS 1985).

**AZINOPHOS-METHYL**

**SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS**

**Boiling Point:** Not Found

**Specific Gravity** ( $H_2O=1$ ): 1.44 at 20°C/4°C (\*Merck 1983)

**Vapor Pressure** (mmHg): Negligible at 20°C (\*Worthing 1979)

**Melting Point:** 163-165°F; 73-74°C (\*Merck 1983)

**Vapor Density** (AIR=1): Not Found

**Evaporation Rate** (Butyl acetate=1): Not Found

**Solubility in Water:** 33 ppm at room temperature (\*Worthing 1979)

**Appearance and Odor:** White crystals (\*Worthing 1979) or brown waxy solid (\*Hawley 1981)

**SECTION III -- FIRE AND EXPLOSION HAZARD DATA**

**Flash Point** (Method Used): Not Found

**Flammable Limits:**

LEL: Not Found

UEL: Not Found

**Extinguishing Methods:** Small fires: dry chemical, carbon dioxide, water spray, or foam. Large fires: water spray, fog, or foam (\*DOT 1984).

**Special Fire Fighting Procedures:** Move containers from fire area if you can do it without risk. Fight fire from maximum distance. Dike fire control water for later disposal; do not scatter the material (\*DOT 1984).

**Unusual Fire and Explosion Hazards:** Some of the formulations may burn, but none of them ignite easily. Container may explode in the heat of the fire (\*DOT 1984).

**SECTION IV -- REACTIVITY DATA**

**Stability:** **Unstable:** Unstable at temperatures above 390°F (200°C) (\*Worthing 1979)

**Stable:**

**Conditions to Avoid:** Not Found

**Incompatibility** (Materials to Avoid): Rapidly hydrolyzed by cold alkali or cold acid (\*Worthing 1979)

**AZINOPHOS-METHYL**

**SECTION IV -- REACTIVITY DATA (Continued)**

**Hazardous Decomposition or Byproducts:** Not Found

**Hazardous Polymerization:** May Occur: Not Found  
May Not Occur: Not Found

**Conditions to Avoid:** Not Found

**SECTION V -- HEALTH HAZARD DATA**

**Routes of Entry:** Inhalation: Yes (Hayes 1982, p. 358)  
Skin: Yes (Hayes 1982, p. 358)  
Ingestion: Yes (Hayes 1982, p. 358)

**Health Hazards** (Acute, Delayed, and Chronic): Acute: extremely toxic. Probable oral lethal dose in humans is 5-50 mg/kg, or between 7 drops and 1 teaspoon for a 70 kg (150 lb.) person. A potent cholinesterase inhibitor which can cause death (\*Gosselin 1976).

**Signs and Symptoms of Exposure:** Symptoms of nausea, vomiting, diarrhea, excessive salivation, blurring of vision and other signs of cholinesterase inhibition, loss of muscle coordination, twitching of muscles, confusion, difficulty breathing, convulsions, and death are observed with this organophosphate poison (\*Gosselin 1976).

**Medical Conditions Generally Aggravated by Exposure:** Not Found

**Emergency and First Aid Procedures:** Move victim to fresh air; call emergency medical care. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In case of contact with material, immediately flush skin or eyes with running water for at least 15 minutes. Speed in removing material from skin is of extreme importance. Remove and isolate contaminated clothing and shoes at the site. Keep victim quiet and maintain normal body temperature. Effects may be delayed; keep victim under observation (\*DOT 1984).

**SECTION VI -- USE INFORMATION**

Insecticide for control of pests on a wide range of crops. Used to control boll weevil on cotton, and for control of insects on deciduous fruits, nuts, vegetables, field crops, citrus, and for non-agricultural use (\*SRI).

**AZINOPHOS-METHYL****SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE**

(Steps to be Taken in Case Material is Released or Spilled)

Keep unnecessary people away; isolate hazard area and deny entry. Stay upwind; keep out of low areas. Ventilate closed spaces before entering them. Wear positive pressure breathing apparatus and special protective clothing. Remove and isolate contaminated clothing at the site (\*DOT 1984). Do not touch spilled material. Stop leak if you can do so without risk. Use water spray to reduce vapors. Small spills: absorb with sand or other noncombustible absorbent material and place into containers for later disposal. Small dry spills: with clean shovel place material into clean, dry container and cover; move containers from spill area. Large spills: dike far ahead of spill for later disposal (\*DOT 1984).



## EPA CHEMICAL PROFILE

## INTERIM

Date: October 31, 1985

Revision: \_\_\_\_\_

## CHEMICAL IDENTITY -- ANTU

CAS Registry Number: 86-88-4

**Synonyms:** Urea, 1-(1-Naphthyl)-2-Thio-; alpha-Naphthylthiourea; 1-(1-Naphthyl)-2-Thiourea; 1-(1-Naphthyl)Thiourea; 1-Naphthyl Thiourea; 1-Naphthylthiourea; alpha-Naphthothiourea; alpha-Naphthylthiocarbamide; alphanaphthyl Thiourea; Alrato; Anturat; Bantu; Chemical 109; Dirax; Kill Kantz; Kripid; Krysid; Krysid PI; N-(1-Naphthyl)-2-Thiourea; N-1-Naphthylthiourea; Naphtox; Rat-Tu; Rattrack; Smeesana; Thiourea, 1-Naphthalenyl-; U-5227; USAF EK-P-5976

Chemical Formula:  $C_{11}H_{10}N_2S$ 

Molecular Weight: 202.23

## SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

OSHA PEL: TWA 0.3 mg/m<sup>3</sup> (\*NIOSH/RTECS 1985)ACGIH TLV: TWA 0.3 mg/m<sup>3</sup>; STEL 0.9 mg/m<sup>3</sup> (skin) (\*ACGIH 1980)IDLH: 100 mg/m<sup>3</sup> (\*NIH EPA, OHM/TADS 1984)

Other Limits Recommended: Not Found

## SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

Boiling Point: Not Found

Specific Gravity (H<sub>2</sub>O=1): Not Found

Vapor Pressure (mmHg): 0 at 25°C (\*Sax 1975)

Melting Point: 388°F, 198°C (\*Merck 1976)

Vapor Density (AIR=1): 6.99 (\*NIH EPA, OHM/TADS 1984)

Evaporation Rate (Butyl acetate=1): Not Found

Solubility in Water: 0.6 g/L water at 25°C (\*Merck 1976)

ANTU

SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS (Continued)

**Appearance and Odor:** White crystal or powder; technical product is gray powder (\*Clarke 1981). No odor (\*ACGIH 1980); bitter taste (\*Merck 1976).

SECTION III -- FIRE AND EXPLOSION HAZARD DATA

**Flash Point (Method Used):** May burn but will not ignite readily (\*DOT 1984)

**Flammable Limits:**

LEL: Not Found

UEL: Not Found

**Extinguishing Methods:** Extinguish with dry chemical, carbon dioxide, water spray, fog, or foam (\*DOT 1984).

**Special Fire Fighting Procedures:** Stay upwind, and out of low areas. Wear self-contained breathing apparatus and full protective clothing (\*DOT 1984).

**Unusual Fire and Explosion Hazards:** Emits toxic fumes upon decomposition (\*Sax 1975).

SECTION IV -- REACTIVITY DATA

**Stability:** Unstable:

Stable: Yes (\*Worthing 1979)

**Conditions to Avoid:** Decomposing heat (\*Sax 1975)

**Incompatibility (Materials to Avoid):** It reacts with silver nitrate and strong oxidizers (\*Sax 1975)

**Hazardous Decomposition or Byproducts:** When heated it emits sulfur dioxide, oxides of nitrogen, and carbon monoxide (\*NIOSH/OSHA 1981).

**Hazardous Polymerization:** May Occur: Not Found  
May Not Occur: Not Found

**Conditions to Avoid:** Not Found

ANTU

SECTION V -- HEALTH HAZARD DATA

**Routes of Entry:** Inhalation: Yes (\*Rumack 1975 to Present)  
Skin: Yes (\*Rumack 1975 to Present)  
Ingestion: Yes (\*Rumack 1975 to Present)

**Health Hazards** (Acute, Delayed, and Chronic): Moderately toxic: probable oral lethal dose (human) 0.5-5 gm/kg, or between 1 ounce and 1 pint (or 1 lb.) for 150 lb. person (\*Gosselin 1976). Chronic sublethal exposure may cause antithyroid activity. Can produce hyperglycemia of three times normal in three hours (\*Rumack 1975 to Present).

**Signs and Symptoms of Exposure:** Symptoms include seizures, pulmonary edema and dermal irritation (\*Rumack 1975 to Present). Ingestion may cause vomiting, shortness of breath, and bluish discoloration of the skin (\*NIOSH/OSHA 1981).

**Medical Conditions Generally Aggravated by Exposure:** People with chronic respiratory disease or liver disease may be especially at risk (\*NIOSH/OSHA 1981).

**Emergency and First Aid Procedures:** Move victim to fresh air. Treat pulmonary edema with positive pressure oxygen (\*Rumack 1975 to Present). Immediately flush with fresh water for at least 15 minutes in case of skin or eye contact (\*Gosselin 1976).

SECTION VI -- USE INFORMATION

This material was used primarily as a rodenticide for control of adult Norway rats. It is not produced commercially in the U.S. (\*SRI).

SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE  
(Steps to be Taken in Case Material is Released or Spilled)

Avoid inhalation and skin contact; wear proper respiratory protection and protective clothing (see Section V above). Do not touch spilled material, stay upwind, keep out of low areas, deny entry, wear protective clothing (\*DOT 1984).

EPA CHEMICAL PROFILE

INTERIM

Date: October 31, 1985

Revision: \_\_\_\_\_

CHEMICAL IDENTITY -- PENTACHLOROPHENOL

CAS Registry Number: 87-86-5

**Synonyms:** 2,3,4,5,6-Pentachlorophenol; Chem-Tol; Chlorophen; Dowicide 7; Durotox; EP 30; Fungifen; Grundier Arbezol; Lauxtol; Lauxtol A; Liroprem; NCI-C54933; PCP; Penchlorol; Penta; Penta-Kil; Pentachlorophenate; Pentacon; Pentasol; Penwar; Peratox; Permicide; Permagard; Permasan; Permatox DP-2; Permitte; Santophen; Santophen 20; Sinituho; Term-I-Trol; Thompson's Wood Fix; Weedone; Phenol, Pentachloro-

**Chemical Formula:**  $C_6HCl_5O$

**Molecular Weight:** 266.35

SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

**OSHA PEL:** TWA 500  $\mu\text{g}/\text{m}^3$  (NIOSH/OSHA 1978, p. 148)

**ACGIH TLV:** TWA 0.5  $\text{mg}/\text{m}^3$ ; STEL 1.5  $\text{mg}/\text{m}^3$  (skin) (\*ACGIH 1982)

**IDLH:** 150  $\text{mg}/\text{m}^3$  (NIOSH/OSHA 1978, p. 148)

**Other Limits Recommended:** Not Found

SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

**Boiling Point:** 588°F, 309°C (\*Merck 1976)

**Specific Gravity ( $H_2O=1$ ):** 1.978 at 22°C/4°C (\*Merck 1976)

**Vapor Pressure (mmHg):** 0.0002 at 20°C (NIOSH/OSHA 1978, p. 148)

**Melting Point:** 374°F, 190°C (\*Merck 1976)

**Vapor Density (AIR=1):** 9.20 (\*Verschuereen 1983)

**Evaporation Rate (Butyl acetate=1):** Not Found

**Solubility in Water:** 0.002 g/100 ml at 30°C (\*Spencer 1982)

## PENTACHLOROPHENOL

### SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS (Continued)

**Appearance and Odor:** Needle-like crystals (\*Merck 1983). Colorless crystals (pure); dark greyish powder or flakes (crude product) (\*Spencer 1982). Phenolic odor (\*Spencer 1982) and also a very pungent odor when hot (\*Merck 1976).

### SECTION III -- FIRE AND EXPLOSION HAZARD DATA

**Flash Point (Method Used):** Not Found

**Flammable Limits:** This material may burn but may not ignite readily (\*DOT 1984). Under normal conditions it is not flammable (\*CHRIS 1978).

LEL: Not Found

UEL: Not Found

**Extinguishing Methods:** Water spray may be used to extinguish fire. Dry chemicals, foam, or carbon dioxide can also be used. Use water to keep fire-exposed containers cool (\*NFPA 1978).

**Special Fire Fighting Procedures:** Full protective clothing: self-contained breathing apparatus, rubber gloves, boots, and bands around legs, arms, and waist. No skin surface should be exposed (\*NFPA 1978). If protective clothing becomes soaked it must be replaced immediately (\*Clayton and Clayton 1982).

**Unusual Fire and Explosion Hazards:** Liquid must be moderately heated before ignition will occur (\*NFPA 1978).

### SECTION IV -- REACTIVITY DATA

**Stability:** Unstable:

Stable: Yes (\*NFPA 1978)

**Conditions to Avoid:** Prolonged heating above 200°C produces trace amounts of octachlorodibenzo-para-dioxin (\*IARC 1972-1985).

**Incompatibility (Materials to Avoid):** Contact with strong oxidizers may cause fires or explosions (\*NIOSH/OSHA 1981).

**Hazardous Decomposition or Byproducts:** When heated to decomposition, it emits highly toxic fumes of chlorides (\*Sax 1975). Hydrogen chloride, chlorinated phenols, and carbon monoxide may be released upon decomposition (\*NIOSH/OSHA 1981).

## PENTACHLOROPHENOL

### SECTION IV -- REACTIVITY DATA (Continued)

Hazardous Polymerization: May Occur: Not Found  
May Not Occur: Not Found

Conditions to Avoid: Not Found

### SECTION V -- HEALTH HAZARD DATA

Routes of Entry: Inhalation: Yes (\*Clayton and Clayton 1982)  
Skin: Yes (\*Clayton and Clayton 1982)  
Ingestion: Yes (\*Clayton and Clayton 1982)

**Health Hazards** (Acute, Delayed, and Chronic): Poisonous if swallowed or inhaled (\*DOT 1984). Very toxic: probable oral lethal dose (human) 50-500 mg/kg (1 teaspoon to 1 ounce) for 70 kg person (150 lbs.) (\*Gosselin 1976). Lethal oral doses in humans have been reported at 29 mg/kg (\*NIOSH 1985). Causes lung, liver, and kidney damage, and contact dermatitis (\*Merck 1976). Inhalation results in acute poisoning centering in circulatory system with accompanying heart failure. Also, visual damage, scotoma, inflammation of conjunctiva, cornea opacity, cornea numbness and slight pupil dilation are experienced (\*ACGIH 1980). Repeated exposure to commercial material preceded aplastic anemia, pure red cell aplasia, Hodgkins disease and acute leukemia (\*Roberts 1983).

**Signs and Symptoms of Exposure:** Ingestion causes increased then decreased respiration, blood pressure, and urinary output; fever; increased bowel action; motor weakness; collapse with convulsions; and death (\*Merck 1976). Inhalation of dust and mist cause violent sneezing and coughing (\*USEPA, AWQC 1980). Liquid or solid dermal contact causes smarting of skin and first-degree burns on short exposure; may cause secondary burns on long exposure (\*CHRIS 1978).

**Medical Conditions Generally Aggravated by Exposure:** Kidney and liver diseases (\*Clayton and Clayton 1982).

**Emergency and First Aid Procedures:** Move victim to fresh air. Remove and isolate contaminated clothing and shoes at the site. In case of contact with material, immediately flush skin or eyes with running water for at least 15 minutes (\*DOT 1984). Bathe and shampoo contaminated skin and hair promptly with soap and water. Flush eyes with copious amount of clean water. Systemic poisoning: reduce elevated body temperature by physical means. (Do not administer aspirin.) Administer sponge baths and cover with low-temperature blankets (\*Morgan 1982).

## PENTACHLOROPHENOL

### SECTION VI -- USE INFORMATION

Wood preservative; soil fumigant for termites, herbicide, fungicide, slimicide, algicide, antibacterial agent in disinfectants and cleaners (\*SRI).

### SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE

(Steps to be Taken in Case Material is Released or Spilled)

Avoid inhalation. Wear proper respiratory protection and protective clothing (see Section V above). Avoid contact with solid and dust. Keep unnecessary people away (\*CHRIS 1978). Ventilate area of spill. Collect spilled material in most convenient and safe manner and deposit in sealed containers for reclamation or disposal in secure sanitary landfill. Liquid should be absorbed in vermiculite, dry sand, earth, or similar material (\*NIOSH/OSHA 1981).

EPA CHEMICAL PROFILE

INTERIM

Date: October 31, 1985

Revision: \_\_\_\_\_

CHEMICAL IDENTITY -- ANILINE, 2,4,6-TRIMETHYL-

CAS Registry Number: 88-05-1

**Synonyms:** 2,4,6-Trimethylaniline; 2-Aminomesitylene; Aminomesitylene; Benzenamine, 2,4,6-Trimethyl-; Mesidin; Mesidine; Mesitylamine; Mesitylene, 2-Amino-

**Chemical Formula:**  $C_9H_{13}N$

**Molecular Weight:** 135.2

SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

OSHA PEL: Not Found

ACGIH TLV: Not Found

IDLH: Not Found

**Other Limits Recommended:** Toxicity information:  $LC_{50}$  inhalation (mouse) 0.29 mg/liter/2 hours (\*NIOSH/RTECS 1985)

SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

**Boiling Point:** 450-451°F, 232-233°C (Weast 1980, p. C-148)

**Specific Gravity** ( $H_2O=1$ ): 0.9633 (Weast 1980, p. C-148)

**Vapor Pressure** (mmHg): Not Found

**Melting Point:** 23°F, -5°C (Weast 1980, p. C-148)

**Vapor Density** (AIR=1): Not Found

**Evaporation Rate** (Butyl acetate=1): Not Found

**Solubility in Water:** Not Found

**Appearance and Odor:** Not Found



ANILINE, 2,4,6-TRIMETHYL-

SECTION III -- FIRE AND EXPLOSION HAZARD DATA

**Flash Point** (Method Used): Not Found

**Flammable Limits:**

LEL: Not Found

UEL: Not Found

**Extinguishing Methods:** (Non-Specific -- Poisonous Liquid, n.o.s.)

Small fires: dry chemical, carbon dioxide, water spray or foam. Large fires: water spray, fog or foam. Move container from fire area if you can do so without risk. Fight fire from maximum distance. Dike fire control water for later disposal; do not scatter the material (DOT 1984, Guide 55).

**Special Fire Fighting Procedures:** (Non-Specific -- Poisonous Liquid, n.o.s.) Keep unnecessary people away; isolate hazard area and deny entry. Stay upwind; keep out of low areas. Ventilate closed spaces before entering them. Wear positive pressure breathing apparatus and special protective clothing. If water pollution occurs, notify appropriate authorities (DOT 1984, Guide 55).

**Unusual Fire and Explosion Hazards:** When heated to decomposition, it emits toxic fumes of nitrogen oxides (Sax 1984, p. 2661).

SECTION IV -- REACTIVITY DATA

**Stability:** Unstable: Not Found

Stable: Not Found

**Conditions to Avoid:** Decomposing heat (Sax 1984, p. 2661)

**Incompatibility** (Materials to Avoid): Not Found

**Hazardous Decomposition or Byproducts:** When heated to decomposition, it emits toxic fumes of nitrogen oxides (Sax 1984, p. 2661).

**Hazardous Polymerization:** May Occur: Not Found

May Not Occur: Not Found

**Conditions to Avoid:** Not Found

SECTION V -- HEALTH HAZARD DATA

**Routes of Entry:** Inhalation: Not Found

Skin: Not Found

Ingestion: Yes (Sax 1984, p. 2661)

**ANILINE, 2,4,6-TRIMETHYL-**

**SECTION V -- HEALTH HAZARD DATA (Continued)**

**Health Hazards** (Acute, Delayed, and Chronic): This material is moderately toxic orally. It is also considered highly toxic by unspecified routes. It is a skin and eye irritant (Sax 1984, p. 2661). Suspect occupational carcinogen (Clayton and Clayton 1981-82, p. 2892). (Non-Specific -- Aromatic Amines) The danger of acute poisoning is represented by methemoglobinemia leading to adverse effects on the red cells. A number of the amines may act as skin sensitizers (Encyc Occupat Health and Safety 1983, p. 142).

**Signs and Symptoms of Exposure:** Repeated exposure results in narrowing of peripheral vision, increase in size of blind spot and decrease in photosensitivity (\*Grant 1974).

**Medical Conditions Generally Aggravated by Exposure:** Not Found

**Emergency and First Aid Procedures:** (Non-Specific -- Poisonous Liquid, n.o.s.) Move victim to fresh air; call emergency medical care. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In case of contact with material, immediately flush skin or eyes with running water for at least 15 minutes. Speed in removing material from skin is of extreme importance. Remove and isolate contaminated clothing and shoes at the site. Keep victim quiet and maintain normal body temperature. Effects may be delayed, keep victim under observation (DOT 1984, Guide 55).

**SECTION VI -- USE INFORMATION**

Not Found

**SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE**  
(Steps to be Taken in Case Material is Released or Spilled)

(Non-Specific -- Poisonous Liquid, n.o.s.) Do not touch spilled material; stop leak if you can do so without risk. Use water spray to reduce vapors. Small spills: absorb with sand or other noncombustible absorbent material and place into containers for later disposal. Large spills: dike far ahead of spill for later disposal. Wear positive pressure breathing apparatus and special protective clothing (DOT 1984, Guide 55).

## EPA CHEMICAL PROFILE

## INTERIM

Date: October 31, 1985

Revision: \_\_\_\_\_

## CHEMICAL IDENTITY -- DINOSEB

CAS Registry Number: 88-85-7

**Synonyms:** 2,4-Dinitro-6-(1-Methylpropyl)Phenol; 2,4-Dinitro-6-sec-Butylphenol; 2-(1-Methylpropyl)-4,6-Dinitrophenol; Phenol, 2-sec-Butyl-4,6-Dinitro-; 4,6-Dinitro-2-(1-Methyl-n-Propyl)Phenol; 4,6-Dinitro-2-sec-Butylphenol; 4,6-Dinitro-o-sec-Butylphenol; AATOX; Aretit; Basanite; BNP 20; BNP 30; Butaphene; Caldon; Chemox General; Chemox PE; DBNF; Dibutox; Dinitrall; Dinitro Weed Killer; Dinitro-Ortho-Sec-Butyl Phenol; Dinitrobutylphenol; Phenol, 2-(1-Methylpropyl)-4,6-Dinitro-; DN 289; DNBP; DNOSBP; DNSBP; Dow General; Dow General Weed Killer; Dow Selective Weed Killer; Dytol; Elgetol; Elgetol 318; ENT 1,122; Gebutox; Hivertox; Kiloseb; Knoxweed; Ladob; Laseb; Nitropone; Phenol, 2-(1-Methylpropyl)-4,6-Dinitro-; Phenol, 2-sec-Butyl-4,6-Dinitro-; Premerg; Sinox General; Subitex

Chemical Formula:  $C_{10}H_{12}N_2O_5$ 

Molecular Weight: 240.2

## SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

OSHA PEL: Not Found

ACGIH TLV: Not Found

IDLH: Not Found

**Other Limits Recommended:** Toxicity information:  $LC_{low}$  inhalation (rat) 0.045 mg/liter/3 hours (\*NIOSH/RTECS 1985)

## SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

Boiling Point: Not Found

**Specific Gravity** ( $H_2O=1$ ): 1.2647 at 45°C (\*Weed Science Society of America 1979)

**Vapor Pressure** (mmHg): 1 at 151.1°C (\*Weed Science Society of America 1979)

**Melting Point:** 100-108°F, 38-42°C (Merck 1983, p. 479)

DINOSEB

SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS (Continued)

**Vapor Density (AIR=1):** 7.73 (Sax 1984, p. 582)

**Evaporation Rate (Butyl acetate=1):** Not Found

**Solubility in Water:** 0.0052 g/100 ml (\*Weed Science Society of America 1979)

**Appearance and Odor:** Orange-brown viscous liquid (Merck 1983, p. 479); pungent odor (\*Weed Science Society of America 1979) or crystals (\*Sax 1979); orange solid when pure; technical grade is orange-brown solid (Worthing 1983)

SECTION III -- FIRE AND EXPLOSION HAZARD DATA

**Flash Point (Method Used):** 60.1°F to 84.9°F, 15.6°C to 29.4°C for 3 commercial products (\*Weed Science Society of America 1979)

**Flammable Limits:**

LEL: Not Found

UEL: Not Found

**Extinguishing Methods:** This material is a dinitrophenol herbicide (Buchel 1983, p. 304). (Non-Specific -- Dinitrophenol, Flammable Solid) Extinguish by flooding with water. Cool all affected containers with flooding quantities of water. Apply water from as far a distance as possible (Student 1981, p. 205).

**Special Fire Fighting Procedures:** This is a dinitrophenol herbicide (Buchel 1983, p. 304). (Non-Specific -- Dinitrophenol, Flammable Solid) Wear self-contained breathing apparatus and full protective clothing. If fire becomes uncontrollable, evacuate for a radius of 5000 feet (Student 1981, p. 206).

**Unusual Fire and Explosion Hazards:** This is a dinitrophenol herbicide (Buchel 1983, p. 304). (Non-Specific -- Dinitrophenol, Flammable Solid). It is dangerously explosive. When not water wet it is a high explosive. Dry, the material is easily ignited and it will burn very rigorously (Student 1981, p. 205).

DINOSEB

SECTION IV -- REACTIVITY DATA

**Stability:** Unstable:

Stable: Yes (\*Kearney 1975)

**Conditions to Avoid:** Appear to be stable in acid solution, but are susceptible to decomposition by ultraviolet radiation in alkaline solution (\*Kearney 1975).

**Incompatibility (Materials to Avoid):** Not Found

**Hazardous Decomposition or Byproducts:** On decomposition, nitro compounds such as this emit toxic fumes (\*Sax 1979).

**Hazardous Polymerization:** May Occur: Not Found

May Not Occur: Not Found

**Conditions to Avoid:** Not Found

SECTION V -- HEALTH HAZARD DATA

**Routes of Entry:** Inhalation: Yes (\*Weed Science Society of America 1979)

Skin: Yes (Hawley 1981, p. 374)

Ingestion: Yes (\*Gosselin 1976)

**Health Hazards (Acute, Delayed, and Chronic):** Extremely toxic: Probable oral lethal dose is 5-50 mg/kg; between 7 drops and 1 teaspoonful for 70 kg person (150 lb.) (Gosselin 1976, p. II-197).

**Signs and Symptoms of Exposure:** Marked fatigue, tremendous thirst, profuse sweating, flushing of face. Nausea, vomiting, abdominal pain, occasional diarrhea. Restlessness, anxiety, excitement, occasionally leading to convulsions. Rise in body temperature, rapid heart beat, difficulty breathing, bluish skin and sometimes muscle cramps. Loss of consciousness, cessation of breathing and death (\*Gosselin 1976). Skin: staining of skin and minor irritation by very small amount. Eyes: mild to moderate irritation expected. Inhalation: dusts may be irritating and may cause serious illness (\*Weed Science Society of America 1979).

**Medical Conditions Generally Aggravated by Exposure:** Not Found

**Emergency and First Aid Procedures:** Wash contaminated skin and hair promptly with soap and water, or with water alone. Flush chemical from eyes with copious amount of water. In systemic poisoning: reduce elevated body temperature by physical means. Administer sponge baths and cover victim with low-temperature blankets (\*Morgan 1982)

DINOSEB

SECTION VI -- USE INFORMATION

Plant growth regulator; insecticide and herbicide (Hawley 1981, p. 374).

SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE

(Steps to be Taken in Case Material is Released or Spilled)

This is a dinitrophenol herbicide (Buchel 1983, p. 340). (Non-Specific -- Dinitrophenol, Flammable Solid) Wear boots, protective gloves and goggles. Do not handle broken packages without protective equipment. Wash away any material which may have contacted the body with copious amounts of water. Keep sparks, flames, and other sources of ignition away. Keep material out of water sources and sewers. Keep spilled material wet. Do not attempt to sweep up dry material (Student 1981, p. 206).

EPA CHEMICAL PROFILE

INTERIM

Date: October 31, 1985

Revision: \_\_\_\_\_

CHEMICAL IDENTITY -- TOLUENE 2,6-DIISOCYANATE

CAS Registry Number: 91-08-7

**Synonyms:** 2,6-Toluene Diisocyanate; 1,3-Diisocyanato-2-Methylbenzene; 2,6-Diisocyanato-1-Methylbenzene; 2,6-Diisocyanatotoluene; 2,6-TDI; 2-Methyl-m-Phenylene Isocyanate; 2-Methyl-meta-Phenylene Isocyanate; Benzene, 2,6-Diisocyanato-1-Methyl-; Hylene TCPA; Hylene TIC; Hylene TM; Hylene TM-65; Hylene TRF; Isocyanic Acid, 2-Methyl-m-Phenylene Ester; Isocyanic Acid, 2-Methyl-meta-Phenylene Ester; m-Tolylene Diisocyanate; meta-Tolylene Diisocyanate; NIAx TDI; NIAx TDI-P; Toluene 2,6-Diisocyanate

**Chemical Formula:**  $C_9H_6N_2O_2$

**Molecular Weight:** 174.2

SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

OSHA PEL: Not Found

ACGIH TLV: Not Found

IDLH: Not Found

**Other Limits Recommended:** Toxicity information:  $LC_{50}$  inhalation (mouse) 0.091 mg/liter 4 hours (\*NIOSH/RTECS 1985)

SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

**Boiling Point:** 264-271°F, 129-133°C at 18 mmHg (\*IARC 1972-1985)

**Specific Gravity ( $H_2O=1$ ):** 1.22 at 25°C for a 80% 2,4:20% 2,6 TDI mixture (\*ACGIH 1980)

**Vapor Pressure (mmHg):** 0.5 at 25°C for a 80% 2,4:20% 2,6 TDI mixture (\*ACGIH 1980)

**Melting Point:** 68-72°F, 20-22°C for a 80% 2,4:20% 2,6 TDI mixture (\*ACGIH 1980)

**Vapor Density (AIR=1):** Not Found

**TOLUENE 2,6-DIISOCYANATE**

**SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS (Continued)**

**Evaporation Rate** (Butyl acetate=1): Not Found

**Solubility in Water:** Not Found

**Appearance and Odor:** Not Found

**SECTION III -- FIRE AND EXPLOSION HAZARD DATA**

**Flash Point** (Method Used): 270°F, 132°C for a 80% 2,4:20% 2,6 TDI mixture (\*ACGIH 1980)

**Flammable Limits:**

LEL: Not Found

UEL: Not Found

**Extinguishing Methods:** Should be extinguished with carbon dioxide, dry chemical or inert gas. For large fires fight with water in the form of spray (\*Encyc Occupat Health and Safety 1981).

**Special Fire Fighting Procedures:** Should wear a self-contained breathing apparatus (\*Encyc Occupat Health and Safety 1971). Move container from fire area if you can do so without risk. Spray cooling water on containers that are exposed to flames until well after fire is out. Fight fire from maximum distance. Dike fire control water for later disposal; do not scatter the material (DOT 1984, Guide 57).

**Unusual Fire and Explosion Hazards:** When heated to decomposition, it emits toxic fumes of nitrogen oxides (Sax 1984, p. 1084). Ventilation should be adequate. If polyurethane products are heated, protection against isocyanate release is necessary (\*Encyc Occupat Health and Safety 1971).

**SECTION IV -- REACTIVITY DATA**

**Stability:** Unstable: Not Found  
Stable: Not Found

**Conditions to Avoid:** Decomposing heat (Sax 1984, p. 1084)

**Incompatibility** (Materials to Avoid): Not Found

**Hazardous Decomposition or Byproducts:** When heated to decomposition, it emits toxic fumes of nitrogen oxides (Sax 1984, p. 1084).



## TOLUENE 2,6-DIISOCYANATE

### SECTION IV -- REACTIVITY DATA (Continued)

Hazardous Polymerization: May Occur: Not Found  
May Not Occur: Not Found

Conditions to Avoid: Not Found

### SECTION V -- HEALTH HAZARD DATA

Routes of Entry: Inhalation: Yes (Hawley 1981, p. 1030)  
Skin: Yes (Hawley 1981, p. 1030)  
Ingestion: Yes (Hawley 1981, p. 1030)

**Health Hazards** (Acute, Delayed, and Chronic): Classified as slightly toxic orally. Probable oral lethal dose in humans is 5 to 15 g/kg or between 1 pint and 1 quart for a 70 (150 lb.) person (\*Gosselin 1976). Particularly poisonous when breathed. This is among the most poisonous of isocyanates (\*Lefaux 1968). Acute and chronic exposures to low concentrations may produce asthmatic attacks (Doull 1980, p. 533).

**Signs and Symptoms of Exposure:** It is a powerful irritant of the eyes, skin and respiratory tract. Tightness in the chest, coughing, shortness of breath and labored breathing have been reported upon inhalation of low concentrations (Gosselin 1984, p. II-414).

**Medical Conditions Generally Aggravated by Exposure:** Not Found

**Emergency and First Aid Procedures:** Rescuers must wear self-contained breathing apparatus. Remove patient rapidly from the contaminated environment (\*Rumack 1975 to Present). Move victim to fresh air; call emergency medical care. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In case of contact with material, immediately flush skin or eyes with running water for at least 15 minutes. Speed in removing material from skin is of extreme importance. Remove and isolate contaminated clothing and shoes at the site. Keep victim quiet and maintain normal body temperature. Effects may be delayed, keep victim under observation (DOT 1984, Guide 57).

### SECTION VI -- USE INFORMATION

Manufacturing of polyurethane foams, elastomers, and coatings; crosslinking agent for nylon 6 (\*Hawley 1977).

## TOLUENE 2,6-DIISOCYANATE

### SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE

(Steps to be Taken in Case Material is Released or Spilled)

Decontaminate with a suitable solution such as 10 percent ammonia with alcohol (\*Encyc Occupat Health and Safety 1971). Keep unnecessary people away, isolate hazard area and deny entry. Stay upwind and keep out of low areas. Ventilate closed spaces before entering them. Wear positive pressure breathing apparatus and special protective clothing. Shut off ignition sources; no flares, smoking or flames in hazard area. Do not touch spilled material, stop leak if you can do so without risk. Use water spray to reduce vapors. Small spills: absorb with sand or other noncombustible material and place into containers for later disposal. Small dry spills: with clean shovel place material into clean dry container and cover; move containers from spill area. Large spills: dike far ahead of spill for later disposal (DOT 1984, Guide 57).

EPA CHEMICAL PROFILE

INTERIM

Date: October 31, 1985

Revision: \_\_\_\_\_

CHEMICAL IDENTITY -- DIETHYL-p-PHENYLENEDIAMINE

CAS Registry Number: 93-05-0

**Synonyms:** N,N-Diethyl-p-Phenylenediamine; 1,4-Benzenediamine, N,N-diethyl-; 4-(diethylamino)aniline; 4-Amino-N,N-diethylaniline; Diethyl-para-phenylenediamine; Diethylaminoaniline; N,N-Diethyl-4-aminoaniline; N,N-Diethyl-para-phenylenediamine; p-(Diethylamino)aniline; p-Amino-N,N-diethylaniline; p-Aminodiethylaniline; p-Phenylenediamine, N,N-diethyl-

**Chemical Formula:**  $C_{10}H_{16}N_2$

**Molecular Weight:** 164.28

SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

OSHA PEL: Not Found

ACGIH TLV: Not Found

IDLH: Not Found

**Other Limits Recommended:** Toxicity information: LD<sub>low</sub> oral (cat) 300 mg/kg; LD<sub>low</sub> dermal (rabbit) 5 mg/kg (\*NIOSH/RTECS 1985)

SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

**Boiling Point:** 500-504°F, 260-262°C (\*Hawley 1977)

**Specific Gravity** (H<sub>2</sub>O=1): Not Found

**Vapor Pressure** (mmHg): Not Found

**Melting Point:** Not Found

**Vapor Density** (AIR=1): Not Found

**Evaporation Rate** (Butyl acetate=1): Not Found

**Solubility in Water:** Insoluble (\*Hawley 1977)

**Appearance and Odor:** Material is a liquid (\*Hawley 1977); odor not found.

**DIETHYL-p-PHENYLENEDIAMINE**

**SECTION III -- FIRE AND EXPLOSION HAZARD DATA**

**Flash Point** (Method Used): Not Found

**Flammable Limits:**

LEL: Not Found

UEL: Not Found

**Extinguishing Methods:** (Non-Specific -- Phenylenediamine) Extinguish with dry chemical, carbon dioxide, water spray, fog, or foam (DOT 1984, Guide 53).

**Special Fire Fighting Procedures:** (Non-Specific -- Phenylenediamine) Stay upwind; keep out of low areas. Wear self-contained (positive pressure if available) breathing apparatus and full protective clothing. Move container from fire area if you can do it without risk (DOT 1984, Guide 53).

**Unusual Fire and Explosion Hazards:** Emits toxic nitrogen oxide fumes when heated to decomposition (Sax 1984, p. 1024).

**SECTION IV -- REACTIVITY DATA**

**Stability:** Unstable: Not Found

Stable: Not Found

**Conditions to Avoid:** Not Found

**Incompatibility** (Materials to Avoid): Not Found

**Hazardous Decomposition or Byproducts:** Material emits toxic nitrogen oxides fumes when heated to decomposition. (Sax 1984, p. 1024).

**Hazardous Polymerization:** May Occur: Not Found

May Not Occur: Not Found

**Conditions to Avoid:** Not Found

**SECTION V -- HEALTH HAZARD DATA**

**Routes of Entry:** Inhalation: Not Found

Skin: Yes (Sax 1984, p. 1024)

Ingestion: Yes (Sax 1984, p. 1024)

**Health Hazards** (Acute, Delayed, and Chronic): The lowest toxic dermal dose reported in humans is 73 µg/kg (\*NIOSH/RTECS 1985).

## DIETHYL-p-PHENYLENEDIAMINE

### SECTION V -- HEALTH HAZARD DATA (Continued)

Signs and Symptoms of Exposure: Not Found

Medical Conditions Generally Aggravated by Exposure: Not Found

Emergency and First Aid Procedures: (Non-Specific -- Phenylenediamine) Move victim to fresh air; call emergency medical care. Remove and isolate contaminated clothing and shoes at the site. In case of contact with material, immediately flush skin or eyes with running water for at least 15 minutes (DOT 1984, Guide 53).

### SECTION VI -- USE INFORMATION

Material is used as a dye intermediate and in color photography (\*Hawley 1977).

### SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE

(Steps to be Taken in Case Material is Released or Spilled)

(Non-Specific -- Phenylenediamine) Do not touch spilled material; stop leak if you can do it without risk. Small spills: take up with sand or other noncombustible absorbent material and place into containers for later disposal. Large spills: dike far ahead of spill for later disposal (DOT 1984, Guide 53).

EPA CHEMICAL PROFILE

INTERIM

Date: October 31, 1985

Revision: \_\_\_\_\_

CHEMICAL IDENTITY -- CRESYLIC ACID

CAS Registry Number: 95-48-7

Synonyms: o-Cresol; 1-Hydroxy-2-Methylbenzene; 2-Cresol; 2-Hydroxytoluene; 2-Methylphenol; o-Cresylic Acid; o-Hydroxytoluene; o-Methylphenol; o-Methylphenylol; o-Oxytoluene; o-Toluol; Orthocresol; Phenol, 2-Methyl-

Chemical Formula:  $C_7H_8O$

Molecular Weight: 108.15

SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

OSHA PEL: TWA 5 ppm (22 mg/m<sup>3</sup>) (skin) (\*NIOSH/RTECS 1985)

ACGIH TLV: Air: TWA 5 ppm (22 mg/m<sup>3</sup>) (skin) (\*ACGIH 1983)

IDLH: 250 ppm (NIOSH/OSHA 1978, p. 72)

Other Limits Recommended: Not Found

SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

Boiling Point: 376°F, 191°C (\*Weast 1979)

Specific Gravity (H<sub>2</sub>O=1): 1.047 at 20°C/4°C (\*Merck 1983)

Vapor Pressure (mmHg): 1 at 38.2°C (\*Sax 1979)

Melting Point: 88°F, 31°C (\*Weast 1979)

Vapor Density (AIR=1): 3.72 (\*Sax 1979)

Evaporation Rate (Butyl acetate=1): Not Found

Solubility in Water: Soluble in 40 parts water (\*Merck 1983)

Appearance and Odor: Colorless liquid (NFPA 1978, p. 49-32), colorless crystalline compound (\*Clayton and Clayton 1981-82) or white crystals (\*Hawley 1981) with phenolic odor (\*Merck 1983)

## CRESYLIC ACID

## SECTION III -- FIRE AND EXPLOSION HAZARD DATA

**Flash Point** (Method Used): 81-83°C (\*Merck 1983)

**Flammable Limits:**

LEL: 1.4% at 300°F (\*Sax 1979)

UEL: Not Found

**Extinguishing Methods:** Water to blanket the fire and dry chemical, foam, or carbon dioxide to extinguish the flames (\*NFPA 1978). Extinguish small fires with dry chemical, carbon dioxide, water spray, or foam. For large fires use water spray, fog, or foam. Move container from fire area if you can do so without risk (\*DOT 1984).

**Special Fire Fighting Procedures:** Use water to keep fire-exposed containers cool (\*NFPA 1978). Fight fire from a maximum distance. Dike fire control water for later disposal; don't scatter the material. Wear positive pressure breathing apparatus and full protective clothing. Keep unnecessary people away; isolate hazard area and deny entry. Stay upwind; keep out of low areas. Ventilate closed spaces before entering them. Remove and isolate contaminated clothing at the site (\*DOT 1984).

**Unusual Fire and Explosion Hazards:** Fire may produce irritating or poisonous gases. Runoff from fire control water may give off poisonous gases. This material may burn but does not ignite readily. Container may explode in heat of fire (\*DOT 1984). Slight explosion and fire hazard in the form of vapor when exposed to heat or flame (Sax 1984, p. 814).

## SECTION IV -- REACTIVITY DATA

**Stability:** Unstable:

Stable: Yes (\*NFPA 1978)

**Conditions to Avoid:** Not Found

**Incompatibility** (Materials to Avoid): Reacts violently with nitric acid, oleum, and chlorosulfonic acid (Sax 1984, p. 814).

**Hazardous Decomposition or Byproducts:** When heated to decomposition, it emits highly toxic fumes (\*Sax 1979).

**Hazardous Polymerization:** May Occur:

May Not Occur: Yes (Weiss 1980, p. 279)

**Conditions to Avoid:** Not Found

## CRESYLIC ACID

### SECTION V -- HEALTH HAZARD DATA

**Routes of Entry:** **Inhalation:** Yes (\*Rumack 1975 to Present)  
**Skin:** Yes (\*Gosselin 1976)  
**Ingestion:** Yes (\*Merck 1983)

**Health Hazards** (Acute, Delayed, and Chronic): The chemical is rated as a very toxic compound with a probable oral lethal dose in humans of 50-500 mg/kg, or between 1 teaspoon and 1 ounce for a 70 kg (150 lb.) person (\*Gosselin 1976). It is a strong dermal irritant and frequently causes dermatitis. Serious or fatal poisoning may result if large areas of skin are wet with cresylic acid and the substance is not removed immediately (\*ACGIH 1980). Ingestion of even a small amount may cause paralysis and coma (\*Merck 1983). It is corrosive to body tissues (NFPA 1978, 49-32) with toxicity similar to phenol (Encyc Occupat Health and Safety 1983, p. 569).

**Signs and Symptoms of Exposure:** Exposure may result in a burning pain in the mouth and throat; white necrotic lesions in the mouth, esophagus and stomach; abdominal pain, vomiting, diarrhea, paleness; sweating; weakness; headache; dizziness; ringing in ears; shallow respiration with "phenol" odor on the breath; scanty, dark-colored or "smoky" urine; and possibly delirium followed by unconsciousness. Convulsions are rarely seen, except in children (\*Gosselin 1976). Hypersensitivity develops in certain individuals (Clayton and Clayton 1981-82, p. 2600).

**Medical Conditions Generally Aggravated by Exposure:** Not Found

**Emergency and First Aid Procedures:** Move victim to fresh air; call emergency medical care. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In case of contact with material, immediately flush eyes with running water for at least 15 minutes (\*DOT 1984) and wash the skin twice with soap and water (\*Rumack 1975 to Present). Speed in removing material from skin is of extreme importance. Remove and isolate contaminated clothing and shoes at the site. Keep victim quiet and maintain normal body temperature. Effects may be delayed; keep victim under observation (\*DOT 1984).

### SECTION VI -- USE INFORMATION

Chemical intermediate for phenolic and epoxy resins, sulfur chromium dyes, herbicides, magnet wire coatings, and pharmaceuticals; disinfectant; solvent; fiber treatment agent; tanning agent; and metal degreasing agent (\*SRI).



## CRESYLIC ACID

### SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE (Steps to be Taken in Case Material is Released or Spilled)

Avoid inhalation. Wear proper respiratory protection and eye protection (see Section V above). Keep unnecessary people away; isolate the hazard area and deny entry. Wear protective clothing. Do not touch spilled material. Stop leak if you can do so without risk. Use water spray to reduce vapors. For small spills, absorb the material with sand or other noncombustible absorbent material and place into containers for later disposal. For small dry spills, shovel up and place into clean, dry containers and cover. For large spills, dike far ahead of spill for later disposal. If clothing becomes contaminated remove immediately and isolate at the site (\*DOT 1984). If a leak or spill has not ignited, use water spray to disperse the vapors and to provide protection for personnel attempting to stop a leak. Water spray may be used to flush spills away from exposures (NFPA 1978, p. 49-32).

EPA CHEMICAL PROFILE

INTERIM

Date: October 31, 1985

Revision: \_\_\_\_\_

CHEMICAL IDENTITY -- PSEUDOCUMENE

CAS Registry Number: 95-63-6

**Synonyms:** 1,2,4-Trimethylbenzene; 1,2,5-Trimethylbenzene;  
1,3,4-Trimethylbenzene; as-Trimethylbenzene; Asymmetrical Trimethylbenzene;  
Benzene, 1,2,4-Trimethyl-; Benzene, 1,2,5-Trimethyl-; Pseudocumol; psi-Cumene;  
uns-Trimethylbenzene

**Chemical Formula:**  $C_9H_{12}$

**Molecular Weight:** 120.2

SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

OSHA PEL: Not Found

ACGIH TLV: TWA 25 ppm, ca. 125 mg/m<sup>3</sup>; STEL 35 ppm, ca. 170 mg/m<sup>3</sup>  
for individual isomers or mixtures (\*ACGIH 1980b)

IDLH: Not Found

**Other Limits Recommended:** Toxicity information: LD<sub>low</sub> oral (rat)  
5000 mg/kg; LC<sub>50</sub> inhalation (rat) 0.018 mg/liter/4 hours (\*NIOSH/RTECS  
1985)

SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

**Boiling Point:** 336-340°F, 169-171°C (\*Merck 1976)

**Specific Gravity** (H<sub>2</sub>O=1): 0.876 at 20°C/4°C (\*Merck 1976)

**Vapor Pressure** (mmHg): Not Found

**Melting Point:** -47°F, -43.8°C (\*Weast 1979)

**Vapor Density** (AIR=1): 4.15 (\*NFPA 1978)

**Evaporation Rate** (Butyl acetate=1): Not Found

**Solubility in Water:** Practically insoluble (\*Merck 1976)

**Appearance and Odor:** Liquid (\*Merck 1976)

**PSEUDOCUMENE**

**SECTION III -- FIRE AND EXPLOSION HAZARD DATA**

**Flash Point** (Method Used): 130°F (\*Hawley 1977)

**Flammable Limits:**

LEL: 0.9% by volume (\*NFPA 1978)

UEL: 6.4% by volume (\*NFPA 1978)

**Extinguishing Methods:** Small fires: dry chemical, carbon dioxide, water spray, or alcohol foam. Large fires: water spray, fog, or alcohol foam (DOT 1984, Guide 26).

**Special Fire Fighting Procedures:** Moderate fire risk (\*Hawley 1977). Isolate area from public and deny entry. Wear self-contained breathing apparatus and full protective clothing. Isolate for 1/2 mile in all directions if tank car or truck is involved in fire. For massive fire in cargo area, use unmanned hose holder or monitor nozzles; if this is impossible, withdraw from area and let fire burn. Withdraw immediately in case of rising sound from venting safety device or any discoloration of tank due to fire (DOT 1984, Guide 26).

**Unusual Fire and Explosion Hazards:** Autoignition at 932°F (500°C) (\*NFPA 1978). In the absence of precautions, flammable concentrations of vapor may be present where liquid is used for solvent and thinner operations (\*Encyc Occupat Health and Safety 1971). Runoff to sewers may create fire or explosion hazard (DOT 1984, Guide 26).

**SECTION IV -- REACTIVITY DATA**

**Stability:** Unstable: Not Found  
Stable: Not Found

**Conditions to Avoid:** Flammable concentrations of vapors may be present when liquids are used for solvent and thinners (\*Encyc Occupat Health and Safety 1971).

**Incompatibility** (Materials to Avoid): Not Found

**Hazardous Decomposition or Byproducts:** Not Found

**Hazardous Polymerization:** May Occur: Not Found  
May Not Occur: Not Found

**Conditions to Avoid:** Not Found

## PSEUDOCUMENE

### SECTION V -- HEALTH HAZARD DATA

**Routes of Entry:** **Inhalation:** Yes (\*NIOSH/RTECS 1985)  
**Skin:** Systemic intoxication is not probable  
(\*ACGIH 1980) but liquid is a primary skin  
irritant (\*Rumack 1975 to Present)  
**Ingestion:** Yes (\*Rumack 1975 to Present)

**Health Hazards** (Acute, Delayed, and Chronic): Central nervous system depressant; can cause chemical pneumonia. Delayed effects (especially in exposed workers) -- anemia, disturbances of blood clotting (failure to clot) (\*ACGIH 1980a).

**Signs and Symptoms of Exposure:** Vomiting (oral exposure), depression, convulsions, anxiety, difficulty in breathing if pneumonia and lung edema occur (\*Rumack 1975 to Present).

**Medical Conditions Generally Aggravated by Exposure:** Not Found

**Emergency and First Aid Procedures:** Remove victim from source of liquid or vapors. In case of contact with material, wash skin twice with soap and water, flush eyes with running water for 15 minutes. If patient is not breathing, give artificial respiration. If difficulty in breathing, give oxygen (DOT 1984, Guide 26). If patient is conscious and has taken substance orally, give syrup of ipecac. Remove contaminated clothing (\*Rumack 1975 to Present).

### SECTION VI -- USE INFORMATION

Chief use is as solvent and paint thinner (\*Encyc Occupat Health and Safety 1971). Manufacture of trimellitic anhydride, pharmaceuticals and pseudocumidine (\*Hawley 1977). Also used to sterilize catgut and in the manufacture of dyes, perfumes, and resins (\*Merck 1976). Not a registered pesticide in the U.S. (USEPA/Active Ingredients 1985).

### SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE

(Steps to be Taken in Case Material is Released or Spilled)

Avoid inhalation and skin contact; wear proper respiratory protection (see Section V above). Shut off ignition sources and forbid smoking, flares, or flames in hazard area. Stop leak if you can do so without risk. Use water spray to reduce vapors. Small spills: take up with sand or other noncombustible absorbent material and place into containers for future disposal. Large spills: dike ahead of spill for later disposal (DOT 1984, Guide 26).

EPA CHEMICAL PROFILE

INTERIM

Date: October 31, 1985

Revision: \_\_\_\_\_

CHEMICAL IDENTITY -- PHENOL, 2,2'-THIOBIS(4,6-DICHLORO-

CAS Registry Number: 97-18-7

**Synonyms (NIOSH/RTECS 1983 Synonyms, Volume 3, p. 77):** Actamer; Bidiphen; bis(2-Hydroxy-3,5-Dichlorophenyl) Sulfide; Bithionol; Bithionol Sulfide; Bitin; CP 3438; 2,2'-Dihydroxy-3,3',5,5'-Tetrachlorodiphenylsulfide; 2-Hydroxy-3,5-Dichlorophenyl Sulphide; Lorotheidol; Lorotheidol; NCI-C60628; Neopellis; TBP; USAF B-22; XL 7; 2,2'-Thiobis(4,6-Dichlorophenol); Vancide BL

**Chemical Formula:**  $C_{12}H_6Cl_4O_2S$

**Molecular Weight:** 356.04

SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

OSHA PEL: Not Found

ACGIH TLV: Not Found

IDLH: Not Found

**Other Limits Recommended:** Toxicity information:  $LD_{50}$  oral (rat) 7 mg/kg (\*NIOSH/RTECS 1985) (SUSPECT)

SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

**Boiling Point:** Not Found

**Specific Gravity ( $H_2O=1$ ):** 1.73 at 25°C/4°C (Merck 1983, p. 182)

**Vapor Pressure (mmHg):**  $1.1 \times 10^{-9}$  at 37°C (Merck 1983, p. 182)

**Melting Point:** 370°F, 188°C (Merck 1983, p. 182)

**Vapor Density (AIR=1):** Not Found

**Evaporation Rate (Butyl acetate=1):** Not Found

**Solubility in Water:** Practically insoluble (Merck 1983, p. 182)

**Appearance and Odor:** White or grayish-white powder with an odorless to phenolic odor (Hawley 1981, p. 137).

**PHENOL, 2,2'-THIOBIS(4,6-DICHLORO-**

**SECTION III -- FIRE AND EXPLOSION HAZARD DATA**

**Flash Point (Method Used):** Not Found

**Flammable Limits:**

LEL: Not Found

UEL: Not Found

**Extinguishing Methods:** Not Found

**Special Fire Fighting Procedures:** Not Found

**Unusual Fire and Explosion Hazards:** Not Found

**SECTION IV -- REACTIVITY DATA**

**Stability: Unstable:** Not Found

**Stable:** Not Found

**Conditions to Avoid:** Decomposing heat (Sax 1984, p. 2567)

**Incompatibility (Materials to Avoid):** Not Found

**Hazardous Decomposition or Byproducts:** Emits very toxic fumes of chlorine-containing compounds and sulfur oxides when heated to decomposition (Sax 1984, p. 2567).

**Hazardous Polymerization: May Occur:** Not Found

**May Not Occur:** Not Found

**Conditions to Avoid:** Not Found

**SECTION V -- HEALTH HAZARD DATA**

**Routes of Entry: Inhalation:** Not Found

**Skin:** Yes (Non-Specific -- Phenol) (Gosselin 1976, p. III-272)

**Ingestion:** Yes (Sax 1984, p. 2567)

**Health Hazards (Acute, Delayed, and Chronic):** It is classified as slightly toxic. Probable oral lethal dose for humans is 5-15 g/kg for a 70 kg (150 lb) person. The toxicity of this compound is similar to that of phenol (Gosselin 1984, p. II-193). Major hazard of phenol poisoning stems from its systemic effects which include central nervous system depression with coma, hypothermia, loss of vasoconstrictor tone, cardiac depression and respiratory arrest (Gosselin 1984, p. III-345).

**PHENOL, 2,2'-THIOBIS(4,6-DICHLORO-**

**SECTION V -- HEALTH HAZARD DATA (Continued)**

**Signs and Symptoms of Exposure:** (Non-Specific -- Phenol) Symptoms include burning pain in mouth and throat; white necrotic lesions in mouth, esophagus and stomach; abdominal pain; vomiting; bloody diarrhea; paleness; sweating; weakness; headache; dizziness; tinnitus; scanty, dark-colored urine; weak irregular pulse and shallow respiration (Gosselin 1984, p. III-346).

**Medical Conditions Generally Aggravated by Exposure:** Not Found

**Emergency and First Aid Procedures:** (Non-Specific -- Phenol, Solid) Move victim to fresh air; call emergency medical care. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In case of contact with material, immediately flush skin or eyes with running water for at least 15 minutes. Speed in removing material from skin is of extreme importance. Remove and isolate contaminated clothing and shoes at the site (DOT 1984, Guide 55).

**SECTION VI -- USE INFORMATION**

It is used as a surfactant-formulated antimicrobial against bacteria, molds and yeast. It is proposed as an agricultural fungicide (Merck 1983, p. 182). Other uses include deodorant, germicide, fungistat and in the manufacture of pharmaceuticals (Hawley 1981, p. 137). It is no longer allowed to be used in cosmetics (Merck 1983, p. 182). A food additive in feed and drinking water of animals. Also a food additive permitted in food for human consumption (Sax 1984, p. 2567).

**SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE**  
(Steps to be Taken in Case Material is Released or Spilled)

(Non-Specific -- Phenol, Solid) When handling wear positive pressure breathing apparatus and special protective clothing. Keep unnecessary people away and stay upwind. Do not touch spilled material. Use water spray to reduce vapors. Absorb spills with non-combustible absorbent material. For large spills dike far ahead for later disposal (DOT 1984, Guide 55).

PHENOL, 2,2'-THIOBIS(4,6-DICHLORO-

**COMMENTS:**

Sources searched but no information found:

Hayes 1982

Farm Chemicals Handbook 1984

NFPA 1984

CHRIS 1978

Weiss 1980

Encyc of Occupat Health and Safety 1983

Student 1981



EPA CHEMICAL PROFILE

INTERIM

Date: October 31, 1985  
Revision: \_\_\_\_\_

CHEMICAL IDENTITY -- BENZENEARSONIC ACID

CAS Registry Number: 98-05-5

Synonyms: (NIOSH/RTECS 1983 Synonyms, Volume 1, p. 542) Phenyl arsenic acid; Phenylarsonic acid

Chemical Formula:  $C_6H_7AsO_3$

Molecular Weight: 202.05

SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

OSHA PEL: Air: TWA 500  $\mu g$  (arsenic)/ $m^3$  (NIOSH/RTECS 1983, Volume 1, p. 542)

ACGIH TLV: 0.2  $mg/m^3$ , as Arsenic (Soluble Arsenic Compounds) (ACGIH 1984, p. 10)

IDLH: Not Found

Other Limits Recommended: Toxicity information:  $LD_{low}$  oral (rat) 50  $mg/kg$ ;  $LD_{50}$  oral (mouse) 0.27  $mg/kg$  (\*NIOSH/RTECS 1985)

SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

Boiling Point: Not Found

Specific Gravity ( $H_2O=1$ ): 1.760 (Sax 1984, p. 362)

Vapor Pressure (mmHg): Not Found

Melting Point: 320°F, 160°C, decomposes (Sax 1984, p. 362)

Vapor Density (AIR=1): Not Found

Evaporation Rate (Butyl acetate=1): Not Found

Solubility in Water: Soluble in 40 parts water (Merck 1983, p. 151) (Sax 1984, p. 362)

Appearance and Odor: Colorless solid (Sax 1984, p. 362).

**BENZENEARSONIC ACID****SECTION III -- FIRE AND EXPLOSION HAZARD DATA**

**Flash Point** (Method Used): Not Found

**Flammable Limits:**

LEL: Not Found

UEL: Not Found

**Extinguishing Methods:** (Non-Specific -- Arsenical Compound, Solid, n.o.s.) This material does not burn or burns with difficulty. Extinguish fire using agent suitable for surrounding fire (Student 1981, p. 51).

**Special Fire Fighting Procedures:** (Non-Specific -- Arsenical Compound, Solid, n.o.s.) Use water in flooding quantities as fog. Avoid breathing dusts and fumes; keep upwind; wear self-contained breathing apparatus (Student 1981, p. 51).

**Unusual Fire and Explosion Hazards:** Benzenearsonic acid emits poisonous fumes of arsenic when heated to decomposition (Sax 1984, p. 362).

**SECTION IV -- REACTIVITY DATA**

**Stability:** Unstable: Not Found

Stable: Not Found

**Conditions to Avoid:** Not Found

**Incompatibility** (Materials to Avoid): Not Found

**Hazardous Decomposition or Byproducts:** When heated to decomposition (320°F), it emits toxic arsenic fumes (Sax 1984, p. 362).

**Hazardous Polymerization:** May Occur: Not Found

May Not Occur: Not Found

**Conditions to Avoid:** Not Found

**SECTION V -- HEALTH HAZARD DATA**

**Routes of Entry:** Inhalation: Not Found

Skin: Not Found

Ingestion: Yes (Hawley 1981, p. 799)

## BENZENEARSONIC ACID

### SECTION V -- HEALTH HAZARD DATA (Continued)

**Health Hazards** (Acute, Delayed, and Chronic): Benzenearsonic acid is a deadly poison (Sax 1984, p. 342). (Non-Specific -- Arsenic Compounds) Chronic exposure to arsenic compounds can cause dermatitis and digestive disorders (Clayton and Clayton 1981-82, p. 1522). Renal damage may develop (Gosselin 1981, p. III-43).

**Signs and Symptoms of Exposure:** (Non-Specific -- Arsenic) Symptoms of arsenic poisoning usually appear one-half to one hour after ingestion, but may be delayed many hours. Symptoms include a sweetish metallic taste and garlicky odor; difficulty in swallowing; abdominal pain; vomiting and painful diarrhea; dehydration, thirst, and cramps; dizziness, stupor, and delirium, rapid heart beat, headache, skin disorders, and coma (Gosselin 1981, p. III-45).

**Medical Conditions Generally Aggravated by Exposure:**

**Emergency and First Aid Procedures:** (Non-Specific -- Arsenic Compound, Solid, n.o.s.) Move victim to fresh air; call emergency medical care. Remove and isolate contaminated clothing and shoes at the site. In case of contact with material, immediately flush skin or eyes with running water for at least 15 minutes (DOT 1984, Guide 53).

### SECTION VI -- USE INFORMATION

It is used as an analytical reagent for tin (Merck 1983, p. 151).

### SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE (Steps to be Taken in Case Material is Released or Spilled)

(Non-Specific -- Arsenic Compound, Solid, n.o.s.) Keep unnecessary people away; isolate hazard area and deny entry. Stay upwind; keep out of low areas. Wear self-contained (positive pressure if available) breathing apparatus and full protective clothing. Do not touch spilled material; stop leak if you can do it without risk. Small spills: take up with sand or other noncombustible absorbent material and place into containers for later disposal. Small dry spills: with clean shovel place material into clean, dry container and cover; move containers from spill area. Large spills: dike far ahead of spill for later disposal (DOT 1984, Guide 53).

BENZENEARSONIC ACID

COMMENTS

Sources searched but no information found:

ACGIH 1983  
NIOSH/OSHA 1978  
Weast 1979  
NFPA 1984  
Student 1981  
Weiss 1980  
CHRIS 1978  
Arena 1979

EPA CHEMICAL PROFILE

INTERIM

Date: October 31, 1985

Revision: \_\_\_\_\_

CHEMICAL IDENTITY -- BENZOTRICHLORIDE

CAS Registry Number: 98-07-7

**Synonyms:** Toluene, alpha,alpha,alpha-Trichloro-; (Trichloromethyl)Benzene; 1-(Trichloromethyl) Benzene; alpha,alpha,alpha-Trichlorotoluene; Benzene, (Trichloromethyl)-; Benzenyl Chloride; Benzenyl Trichloride; Benzoic Trichloride; Benzyl Trichloride; Benzylidene Chloride; omega,omega,omega-Trichlorotoluene; Phenylchloroform; Phenyltrichloromethane; Toluene Trichloride; Trichloromethylbenzene; Trichlorophenylmethane

**Chemical Formula:**  $C_7H_5Cl_3$

**Molecular Weight:** 195.48

SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

OSHA PEL: Not Found

ACGIH TLV: Not Found

IDLH: Not Found

**Other Limits Recommended:** Toxicity information:  $LC_{50}$  inhalation (mouse) 0.064 mg/liter/2 hours (\*NIOSH/RTECS 1985)

SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

**Boiling Point:** 429.4°F, 220.8°C (\*Merck 1983)

**Specific Gravity ( $H_2O=1$ ):** 1.3756 at 20°C/4°C (\*Merck 1983)

**Vapor Pressure (mmHg):** 1 at 45.8°C; 10 at 87.6°C (\*Weast 1979)

**Melting Point:** 23°F, -5.0°C (\*Merck 1983)

**Vapor Density (AIR=1):** 6.77 (\*Sax 1979)

**Evaporation Rate (Butyl acetate=1):** Not Found

**Solubility in Water:** Insoluble (\*Merck 1983)

**BENZOTRICHLORIDE**

**SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS (Continued)**

**Appearance and Odor:** Material is a clear, colorless to yellowish, oily liquid with a penetrating odor (\*IARC 1972-1985; \*Sax 1979; \*Hawley 1981)

**SECTION III -- FIRE AND EXPLOSION HAZARD DATA**

**Flash Point (Method Used):** 260°F, 127°C (CC) (\*NFPA 1978)

**Flammable Limits:**

LEL: Not Found

UEL: Not Found

**Extinguishing Methods:** Small fires: dry chemical, carbon dioxide, water spray, or foam. Large fires: water spray, fog, or foam. Cool containers that are exposed to flames with water from the side until well after the fire is out (DOT 1984, Guide 60).

**Special Fire Fighting Procedures:** Wear self-contained breathing apparatus and full protective clothing (DOT 1984, Guide 60). Normal fire fighting procedures may be used (\*NFPA 1978).

**Unusual Fire and Explosion Hazards:** This material may react violently with water. Fire may produce irritating or poisonous gases. Flammable/poisonous gases may accumulate in tanks and hopper cars. Materials may ignite combustibles (wood, paper, oil, etc.) (\*DOT 1984).

**SECTION IV -- REACTIVITY DATA**

**Stability:** Unstable: Yes (\*Merck 1983)

Stable:

**Conditions to Avoid:** Not Found

**Incompatibility (Materials to Avoid):** Similar to hydrochloric acid; material will react with water or steam to produce toxic and corrosive fumes (\*Sax 1979). Hydrolyzes in presence of water forming benzoic and hydrochloric acids (Hawley 1981, p. 119; \*Merck 1983).

**Hazardous Decomposition or Byproducts:** Produces toxic and corrosive fumes when it reacts with water or steam (\*Sax 1979).

**Hazardous Polymerization:** May Occur: Not Found  
May Not Occur: Not Found

**Conditions to Avoid:** Not Found

## BENZOTRICHLORIDE

### SECTION V -- HEALTH HAZARD DATA

Routes of Entry: Inhalation: Yes (\*Sax 1975)  
Skin: Not Found  
Ingestion: Yes (\*Sax 1975)

**Health Hazards** (Acute, Delayed, and Chronic): Toxic by inhalation; fumes are highly irritating to skin and mucous membranes (\*Merck 1983, Hawley 1981, p. 119). May cause death or permanent injury after very short exposure to small quantities (\*Sax 1975). A suspected carcinogen (\*Sorahan 1983).

**Signs and Symptoms of Exposure:** Highly irritating to skin and mucous membranes (\*Merck 1983).

**Medical Conditions Generally Aggravated by Exposure:** Not Found

**Emergency and First Aid Procedures:** Move victim to fresh air; call emergency medical care. In case of contact with material, immediately flush skin or eyes with copious amounts of running water for at least 15 minutes. Remove and isolate contaminated clothing and shoes at the site. Keep victim quiet and maintain normal body temperature (DOT 1984, Guide 60).

### SECTION VI -- USE INFORMATION

Synthetic dyes; organic synthesis (Hawley 1981, p. 119).

### SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE (Steps to be Taken in Case Material is Released or Spilled)

Material is extremely hazardous to health but areas may be entered with extreme care. Full protective clothing including self-contained breathing apparatus should be provided. No skin surface should be exposed (\*NFPA 1978). Spilled material should not be touched. Take up spills with noncombustible absorbent material. For large spills dike far ahead of spill for later disposal (DOT 1984, Guide 60). Water should be used in copious amounts because of reaction with water and formation of toxic by-products (see Section IV above).

EPA CHEMICAL PROFILE

INTERIM

Date: October 31, 1985

Revision: \_\_\_\_\_

CHEMICAL IDENTITY -- BENZENESULFONYL CHLORIDE

CAS Registry Number: 98-09-9

**Synonyms:** Benzene sulfochloride; Benzene Sulfonechloride; Benzenesulfonic (acid) chloride; Benzenesulfonic chloride; Benzenesulphonyl chloride; Benzenosulphochloride; Phenylsulfonyl chloride

**Chemical Formula:**  $C_6H_5ClO_2S$

**Molecular Weight:** 176.62

SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

OSHA PEL: Not Found

ACGIH TLV: Not Found

IDLH: Not Found

**Other Limits Recommended:** Toxicity information:  $LC_{50}$  inhalation (rat) 0.23 mg/liter/1 hour (\*NIOSH/RTECS 1985)

SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

**Boiling Point:** 483-486°F, 251-252°C at 760 mmHg (decomposes) (Merck 1983, p. 152)

**Specific Gravity** ( $H_2O=1$ ): 1.3842 at 15°C/15°C (\*Merck 1976)

**Vapor Pressure** (mmHg): Not Found

**Melting Point:** 58°F, 14.5°C (\*Merck 1976)

**Vapor Density** (AIR=1): Not Found

**Evaporation Rate** (Butyl acetate=1): Not Found

**Solubility in Water:** Insoluble in water (\*Merck 1976)

**Appearance and Odor:** Colorless, oily liquid (Merck 1983, p. 152)



**BENZENESULFONYL CHLORIDE**

**SECTION III -- FIRE AND EXPLOSION HAZARD DATA**

**Flash Point** (Method Used): Not Found

**Flammable Limits:**

LEL: Not Found

UEL: Not Found

**Extinguishing Methods:** Extinguish with dry chemicals, carbon dioxide and water spray, fog, or foam (DOT 1984, Guide 55).

**Special Fire Fighting Procedures:** Wear positive pressure breathing apparatus and special protective clothing. Fight fire from maximum distance. Dike fire control water for later disposal; do not scatter the material (DOT 1984, Guide 55).

**Unusual Fire and Explosion Hazards:** May burn but will not ignite readily. Cylinder may explode in heat of fire (DOT 1984, Guide 55).

**SECTION IV -- REACTIVITY DATA**

**Stability:** Unstable: Not Found

Stable: Not Found

**Conditions to Avoid:** Not Found

**Incompatibility** (Materials to Avoid): Reacts vigorously with dimethyl sulfoxide and methyl formamide (Sax 1984, p. 367).

**Hazardous Decomposition or Byproducts:** When heated to decomposition, it emits toxic fumes of chlorides and sulfur oxides (Sax 1984, p. 367).

**Hazardous Polymerization:** May Occur: Not Found  
May Not Occur: Not Found

**Conditions to Avoid:** Not Found

**SECTION V -- HEALTH HAZARD DATA**

**Routes of Entry:** Inhalation: Yes (Sax 1984, p. 367)  
Skin: Yes (DOT 1984, Guide 55)  
Ingestion: Yes (DOT 1984, Guide 55)

**Health Hazards** (Acute, Delayed, and Chronic): It is poisonous; may be fatal if inhaled, swallowed or absorbed through the skin; contact may cause burns to skin and eyes (DOT 1984, Guide 55). Reversible toxic damage to the liver is possible after dermal exposure (\*Stasik 1975).

## BENZENESULFONYL CHLORIDE

### SECTION V -- HEALTH HAZARD DATA (Continued)

**Signs and Symptoms of Exposure:** Symptoms may include allergic reactions, and severe shock (\*Stasik 1975). Contact may cause burns to skin and eyes (DOT 1984, Guide 55).

**Medical Conditions Generally Aggravated by Exposure:** Not Found

**Emergency and First Aid Procedures:** Move victim to fresh air; call emergency medical care. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In case of contact with material, immediately flush skin or eyes with running water for at least 15 minutes. Speed in removing material from skin is of extreme importance. Remove and isolate contaminated clothing and shoes at the site (DOT 1984, Guide 55).

### SECTION VI -- USE INFORMATION

It is used as a chemical intermediate for benzenesulfonamides, thiophenol, glybuzole (hypoglycemic agent), N-2-chloroethylamides, benzonitrile; for its esters -- useful as insecticides, and miticides (\*SRI).

### SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE

(Steps to be Taken in Case Material is Released or Spilled)

Do not breathe vapors. Wear proper respiratory protection, eye protection and full protective clothing (see Section V above). Do not touch spilled material; stop leak; use water spray to reduce vapors. Small spills: take up with sand or other noncombustible absorbent material and place into containers for later disposal. Small dry spills: with clean shovel place material into clean, dry container and cover; move containers from spill area. Large spills: dike far ahead of spill for later disposal (DOT 1984, Guide 55).

### COMMENTS

Sources searched but no information found:

Gilman 1985  
Student 1981  
Hayes 1982  
Hawley 1981  
Doull 1980  
Farm Chemicals Handbook 1984

EPA CHEMICAL PROFILE

INTERIM

Date: October 31, 1985

Revision: \_\_\_\_\_

CHEMICAL IDENTITY -- TRICHLOROPHENYLSILANE

CAS Registry Number: 98-13-5

Synonyms: Silane, Trichlorophenyl-; Phenyltrichlorosilane; Phenyl Trichlorosilane; Phenylsilicon Trichloride; Phenyltrichlorosilicane; Silane, Phenyltrichloro-; Silicon Phenyl Trichloride

Chemical Formula:  $C_6H_5Cl_3Si$

Molecular Weight: 211.55

SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

OSHA PEL: Not Found

ACGIH TLV: Not Found

IDLH: Not Found

Other Limits Recommended: Toxicity information:  $LC_{50}$  inhalation (mouse) 0.0003 mg/liter/2 hours (\*NIOSH/RTECS 1985)

SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

Boiling Point: 395°F, 201.5°C (\*Weast 1979)

Specific Gravity ( $H_2O=1$ ): 1.326 at 18°C (\*Weast 1979)

Vapor Pressure (mmHg): Not Found

Melting Point: Not Found

Vapor Density (AIR=1): 7.36 (\*NFPA 1978)

Evaporation Rate (Butyl acetate=1): Not Found

Solubility in Water: Decomposes in water (\*Weast 1979)

Appearance and Odor: Colorless liquid (\*Weast 1979)

TRICHLOROPHENYLSILANE

SECTION III -- FIRE AND EXPLOSION HAZARD DATA

**Flash Point** (Method Used): 196°F (OC) (\*Sax 1979)

**Flammable Limits:**

LEL: Not Found

UEL: Not Found

**Extinguishing Methods:** Dry chemical, carbon dioxide, fog, or foam.

May react violently with water (DOT 1984, Guide 29).

**Special Fire Fighting Procedures:** Full protective clothing, including self-contained breathing apparatus, coat, pants, gloves, boots, and bands around legs, arms, and waist should be provided. No skin surface should be exposed (\*NFPA 1978). Move container from fire area if you can do so without risk. Cool containers that are exposed to flames with water from the side until well after fire is out. Withdraw immediately in case of rising sound from venting safety device or any discoloration of tank due to fire (DOT 1984, Guide 29).

**Unusual Fire and Explosion Hazards:** Do not get water inside containers. Vapors may travel to ignition source and flash back. Runoff to sewer may create fire or explosion hazard. Flammable/combustible material; may be ignited by heat, sparks or flames. Container may explode in heat of fire. Vapor explosion hazard indoors, outdoors or in sewers. Runoff to sewer may create fire or explosion hazard (DOT 1984, Guide 29).

SECTION IV -- REACTIVITY DATA

**Stability:** Unstable: Yes (\*Hawley 1977)

Stable:

**Conditions to Avoid:** Readily hydrolyzed in water/moisture, producing hydrochloric acid (\*Hawley 1977). Avoid mixing with water or exposing to moisture (\*Sax 1979).

**Incompatibility** (Materials to Avoid): Do not mix with halogenated compounds, because a trace quantity of free halogen may cause violent explosion (\*Bretherick 1979). May react violently with water (DOT 1984, Guide 29).

**Hazardous Decomposition or Byproducts:** Emits toxic chloride fumes when heated to decomposition (Sax 1984, p. 2631).

**Hazardous Polymerization:** May Occur: Not Found

May Not Occur: Not Found

**Conditions to Avoid:** Not Found

## TRICHLOROPHENYLSILANE

### SECTION V -- HEALTH HAZARD DATA

**Routes of Entry:** Inhalation: Yes (Sax 1984, p. 2631)  
Skin: Yes (Sax 1984, p. 2631)  
Ingestion: Yes (Sax 1984, p. 2631)

**Health Hazards** (Acute, Delayed, and Chronic): Highly toxic; may cause death or permanent injury after short inhalation exposure to small quantity (\*Sax 1975). Chemical burns to all exposed membranes and tissues with severe tissue destruction. Inhalation -- lungs may fill up with fluid or throat may swell causing suffocation. Eyes -- damage to corneas may cause blindness. Delayed: after oral exposure stomach and intestines may perforate or be obstructed by scar tissue (\*Rumack 1975 to Present, Gosselin 1984, pp. III-10-11).

**Signs and Symptoms of Exposure:** Inhalation -- severe difficulty in breathing, chest pains. Eye contact -- severe pain, swelling, cornea damage. Skin contact severe burns and pain. Ingestion -- mild to moderately severe oral and esophageal burns, with severe burns occurring in stomach. Perforations and peritonitis may occur. Severe irritation may produce spontaneous vomiting. Viscid white or blood-stained foamy mucus and threads of tissue may appear in mouth (\*Rumack 1975 to Present).

**Medical Conditions Generally Aggravated by Exposure:** Not Found

**Emergency and First Aid Procedures:** Move victim to fresh air. If not breathing, perform artificial respiration. If breathing is difficult, give oxygen. In case of contact with material, immediately flush skin or eyes with running water for at least 15 minutes. Keep victim quiet and maintain normal body temperature (DOT 1984, Guide 29). In case of oral exposure, do not induce vomiting. Have patient drink 1-2 large glasses of water or milk to dilute stomach contents, then give demulcents such as milk, cornstarch, and water (\*Rumack 1975 to Present).

### SECTION VI -- USE INFORMATION

Monomer for copolymers in water repellants, in electrical insulating resins, in high temperature resins for paints (\*SRI). Intermediate for silicones (\*Hawley 1977).

## TRICHLOROPHENYLSILANE

### SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE

(Steps to be Taken in Case Material is Released or Spilled)

Wear suitable eye protection. No skin surface should be exposed (see Section V above). Isolate hazard area. Stay upwind; keep out of low areas. Wear self-contained (positive pressure if available) breathing apparatus and full protective clothing. Shut off ignition sources; no flares, smoking, or flames in hazard area. Do not touch spilled material; stop leak if you can do it without risk. Do not get water inside container. Take up small spills with sand or other noncombustible absorbent material and place into containers for later disposal. Dike far ahead of large spills for later disposal (DOT 1984, Guide 29).

EPA CHEMICAL PROFILE

INTERIM

Date: October 31, 1985

Revision: \_\_\_\_\_

CHEMICAL IDENTITY -- BENZENAMINE, 3-(TRIFLUOROMETHYL)-

CAS Registry Number: 98-16-8

**Synonyms:** m-(Trifluoromethyl)aniline; 1-Amino-3-(Trifluoromethyl)Benzene; 3-(Trifluoromethyl)Aniline; 3-(Trifluoromethyl)Benzenamine; 3-Aminobenzo-trifluoride; alpha,alpha,alpha-Trifluoro-m-Toluidine; m-Amino-alpha,alpha,alpha-Trifluorotoluene; m-Aminobenzotrifluoride; m-Toluidine, alpha,alpha,alpha-Trifluoro-; Toluene, 3-Amino-alpha,alpha,alpha-Trifluoro-

**Chemical Formula:**  $C_7H_6F_3N$

**Molecular Weight:** 161.13

SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

OSHA PEL: Not Found

ACGIH TLV: Not Found

IDLH: Not Found

**Other Limits Recommended:** Toxicity information:  $LC_{50}$  inhalation (rat) 0.44 mg/liter/4 hours (\*NIOSH/RTECS 1985)

SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

**Boiling Point:** 369.5°F, 187.5°C at 764 mmHg (\*Weast 1979)

**Specific Gravity ( $H_2O=1$ ):** 1.303 at 15.5°C (Sax 1984, p. 192)

**Vapor Pressure (mmHg):** Not Found

**Melting Point:** 37°F, 3°C (Sax 1984, p. 192)

**Vapor Density (AIR=1):** 5.56 (Sax 1984, p. 192)

**Evaporation Rate (Butyl acetate=1):** Not Found

**Solubility in Water:** Slightly soluble (\*Weast 1979)

**BENZENAMINE, 3-(TRIFLUOROMETHYL)-**

**SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS (Continued)**

**Appearance and Odor:** Colorless to yellow oily liquid (\*Hawley 1977) with aniline-like odor (Sax 1984, p. 192).

**SECTION III -- FIRE AND EXPLOSION HAZARD DATA**

**Flash Point (Method Used):** Not Found

**Flammable Limits:**

LEL: Not Found

UEL: Not Found

**Extinguishing Methods:** Extinguish with dry chemical, carbon dioxide, water spray, fog, or foam (DOT 1984, Guide 55).

**Special Fire Fighting Procedures:** Wear positive pressure breathing apparatus and special protective clothing. Move container from fire area if you can do so without risk. Fight fire from maximum distance. Dike fire control water for later disposal; do not scatter the material (DOT 1984, Guide 55).

**Unusual Fire and Explosion Hazards:** This material may burn but does not ignite readily. Cylinder may explode in heat of fire (DOT 1984, Guide 55).

**SECTION IV -- REACTIVITY DATA**

**Stability: Unstable:** Not Found

**Stable:** Not Found

**Conditions to Avoid:** Not Found

**Incompatibility (Materials to Avoid):** Not Found

**Hazardous Decomposition or Byproducts:** When heated to decomposition, it emits very toxic fumes of fluorides and nitrogen oxides (Sax 1984, p. 192).

**Hazardous Polymerization:** **May Occur:** Not Found  
**May Not Occur:** Not Found

**Conditions to Avoid:** Not Found



**BENZENAMINE, 3-(TRIFLUOROMETHYL)-**

**SECTION V -- HEALTH HAZARD DATA**

**Routes of Entry:** Inhalation: Yes (Sax 1984, p. 192)  
Skin: Yes (DOT 1984, Guide 55)  
Ingestion: Yes (Sax 1984, p. 192)

**Health Hazards** (Acute, Delayed, and Chronic): Contact may cause burns to skin and eyes. May be poisonous if inhaled, swallowed or absorbed through the skin (DOT 1984, Guide 55).

**Signs and Symptoms of Exposure:** Not Found

**Medical Conditions Generally Aggravated by Exposure:** Not Found

**Emergency and First Aid Procedures:** Move victim to fresh air; call emergency medical care. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In case of contact with material, immediately flush skin or eyes with running water for at least 15 minutes. Speed in removing material from skin is of extreme importance. Remove and isolate contaminated clothing and shoes at the site. Keep victim quiet and maintain normal body temperature. Effects may be delayed; keep victim under observation (DOT 1984, Guide 55).

**SECTION VI -- USE INFORMATION**

This material is used as a chemical intermediate for herbicides, antihypertensives, and diuretics (\*SRI).

**SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE**  
(Steps to be Taken in Case Material is Released or Spilled)

Keep unnecessary people away; isolate hazard area and deny entry. Stay upwind; keep out of low areas. Ventilate closed spaces before entering them. Wear positive pressure breathing apparatus and special protective clothing. Remove and isolate contaminated clothing at the site. If water pollution occurs, notify appropriate authorities. Do not touch spilled material; stop leak if you can do so without risk. Use water spray to reduce vapors. Small spills: absorb with sand or other non-combustible absorbent material and place into containers for later disposal. Large spills: dike far ahead of spill for later disposal (DOT 1984, Guide 55).

BENZENAMINE, 3-(TRIFLUOROMETHYL)-

COMMENTS:

Sources searched but no information found:

ACGIH 1984  
NIOSH/OSHA 1978  
Hawley 1981  
Merck 1983  
NFPA 1984  
Student 1981  
Weiss 1980  
CHRIS 1978  
Doull 1980  
Clayton and Clayton 1981-82  
Arena 1979  
Gosselin 1984  
Encyc Occupat Health & Safety 1983  
Buchel 1983  
Farm Chemicals Handbook 1984  
Hayes 1982  
Physicians' Desk Reference 1985  
Gilman 1985

EPA CHEMICAL PROFILE

INTERIM

Date: October 31, 1985

Revision: \_\_\_\_\_

CHEMICAL IDENTITY -- BENZAL CHLORIDE

CAS Registry Number: 98-87-3

**Synonyms:** (Dichloromethyl)Benzene; alpha,alpha-Dichlorotoluene; Benzene, (Dichloromethyl)-; Benzyl Dichloride; Benzylene Chloride; Benzylidene Chloride; Chlorobenzal; Dichlorophenylmethane; Toluene, alpha,alpha-Dichloro-

**Chemical Formula:**  $C_7H_6Cl_2$

**Molecular Weight:** 161.03

SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

OSHA PEL: Not Found

ACGIH TLV: Not Found

IDLH: Not Found

**Other Limits Recommended:** Toxicity information:  $LC_{50}$  inhalation (mouse) 0.21 mg/liter/2 hours (\*NIOSH/RTECS 1985)

SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

**Boiling Point:** 401°F, 205°C (\*Merck 1983)

**Specific Gravity ( $H_2O=1$ ):** 1.26 (\*Merck 1983)

**Vapor Pressure (mmHg):** 1 at 35.4°C (Weast 1979, p. D-209)

**Melting Point:** 2.48°F, -16.4°C (Weast 1979, p. C-523)

**Vapor Density (AIR=1):** Not Found

**Evaporation Rate (Butyl acetate=1):** Not Found

**Solubility in Water:** Insoluble in water (\*Merck 1983)

**Appearance and Odor:** Colorless oily liquid with a faint aromatic odor (\*Hawley 1981) or pungent odor (\*Merck 1983)

## BENZAL CHLORIDE

### SECTION III -- FIRE AND EXPLOSION HAZARD DATA

**Flash Point** (Method Used): Not Found

**Flammable Limits:** This material may burn but will not ignite easily (\*DOT 1984).

**LEL:** Not Found

**UEL:** Not Found

**Extinguishing Methods:** For small fires: dry chemical, carbon dioxide, water spray, or foam. For large fires: water spray, fog, or foam. Move container from fire area if possible. Fight fire from maximum distance. Dike fire control water for later disposal; do not scatter the material (\*DOT 1984).

**Special Fire Fighting Procedures:** Keep unnecessary people away and isolate hazard area. Stay upwind and keep out of low areas. Wear positive pressure breathing apparatus and special protective clothing (\*DOT 1984).

**Unusual Fire and Explosion Hazards:** Fire may produce irritating or poisonous gases. Runoff from fire control water may give off poisonous gases and may cause pollution. Cylinder may explode in the heat of fire (\*DOT 1984).

### SECTION IV -- REACTIVITY DATA

**Stability:** **Unstable:** Not Found

**Stable:** Not Found

**Conditions to Avoid:** Not Found

**Incompatibility** (Materials to Avoid): Not Found

**Hazardous Decomposition or Byproducts:** Reacts with water to release hydrochloric acid (\*Grant 1974).

**Hazardous Polymerization:** **May Occur:** Not Found  
**May Not Occur:** Not Found

**Conditions to Avoid:** Not Found

### SECTION V -- HEALTH HAZARD DATA

**Routes of Entry:** **Inhalation:** Yes (\*DOT 1984)

**Skin:** Yes (\*DOT 1984)

**Ingestion:** Yes (\*DOT 1984)

## BENZAL CHLORIDE

### SECTION V -- HEALTH HAZARD DATA (Continued)

**Health Hazards** (Acute, Delayed, and Chronic): Acute: vapors are highly irritating to eyes (\*Grant 1974). May be fatal if inhaled, swallowed, or absorbed through skin (\*DOT 1984).

**Signs and Symptoms of Exposure:** Eye irritation occurs upon exposure (\*Grant 1974).

**Medical Conditions Generally Aggravated by Exposure:** Not Found

**Emergency and First Aid Procedures:** Move victim to fresh air and call emergency medical care. If not breathing give artificial respiration; if breathing is difficult give oxygen. In case of contact, immediately flush skin or eyes with water for at least 15 minutes. Speedy removal from skin is essential. Remove and isolate contaminated clothing and shoes at the site. Keep victim quiet and maintain normal body temperature. Keep a careful watch since effects may be delayed (\*DOT 1984).

### SECTION VI -- USE INFORMATION

Used in dyes and in the manufacture of benzaldehyde and cinnamic acid (\*Hawley 1981).

### SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE

(Steps to be Taken in Case Material is Released or Spilled)

Do not breathe vapors. Wear eye protection and proper respiratory protection. Wear full protective clothing (see Section V above). For spills or leaks, do not touch material. Stop leak if possible. Use water spray to reduce vapors. For small spills, take up with sand or other noncombustible material and place in containers for later disposal. For small dry spills, place material in clean dry container with shovel and move containers from spill area. For large spills, dike far ahead of spills for later disposal (\*DOT 1984).

EPA CHEMICAL PROFILE

INTERIM

Date: October 31, 1985

Revision: \_\_\_\_\_

CHEMICAL IDENTITY -- NITROBENZENE

CAS Registry Number: 98-95-3

Synonyms: Benzene, Nitro-; Essence of Mirbane; Essence of Myrbane; Mirbane Oil; NCI-C60082; Nitrobenzol; Oil of Mirbane; Oil of Myrbane

Chemical Formula:  $C_6H_5NO_2$

Molecular Weight: 123.11

SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

OSHA PEL: Air: TWA 1 ppm (skin) (\*NIOSH/RTECS 1985)

ACGIH TLV: TWA 1 ppm (5 mg/m<sup>3</sup>); STEL 2 ppm (10 mg/m<sup>3</sup>) (skin) (\*ACGIH 1980)

IDLH: 200 ppm (NIOSH/OSHA 1978, p. 140)

Other Limits Recommended: Not Found

SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

Boiling Point: 411.4°F, 210.8°C (\*Weast 1979)

Specific Gravity (H<sub>2</sub>O=1): 1.2037 at 20°C/4°C (\*Weast 1979)

Vapor Pressure (mmHg): 1 at 44.4°C (\*Sax 1979)

Melting Point: 42°F, 5.7°C (\*Weast 1979)

Vapor Density (AIR=1): 4.3 (NFPA 1984, p. 325M-74)

Evaporation Rate (Butyl acetate=1): Not Found

Solubility in Water: Soluble in about 500 parts water (\*Merck 1976)

Appearance and Odor: Greenish-yellow crystals or yellow, oily liquid (\*Hawley 1977) with an odor of volatile oil almond (\*Merck 1976).

## NITROBENZENE

## SECTION III -- FIRE AND EXPLOSION HAZARD DATA

**Flash Point** (Method Used): 88°C (CC) (\*Sunshine 1969)

**Flammable Limits:**

LEL: 1.8% (\*Encyc Occupat Health and Safety 1971)

UEL: Not Found

**Extinguishing Methods:** Use water spray, dry chemical, foam, or carbon dioxide (NFPA 1984, pp. 49-67).

**Special Fire Fighting Procedures:** Move container from fire area if you can do it without risk. Fight fire from maximum distance. Dike fire control water for later disposal; do not scatter the material. Keep unnecessary people away; isolate hazard area and deny entry. Stay upwind; keep out of low areas. Ventilate closed spaces before entering them. Wear positive pressure breathing apparatus and special protective clothing. Remove and isolate contaminated clothing at the site (DOT 1984, Guide 55).

**Unusual Fire and Explosion Hazards:** Moderate explosion hazard when exposed to heat or flame. Reacts violently with nitric acid, aluminum trichloride plus phenol, aniline plus glycerine, silver perchlorate and nitrogen tetroxide (Sax 1984, p. 2010).

## SECTION IV -- REACTIVITY DATA

**Stability:** Unstable:

Stable: Yes (\*NFPA 1978)

**Conditions to Avoid:** Sunlight (\*Sax 1975), physical damage to container, freezing, and intense heat (NFPA 1984, pp. 49-67).

**Incompatibility** (Materials to Avoid): Aluminum trichloride; aniline; glycerol; sulfuric acid; oxidants; phosphorus pentachloride; potassium; potassium hydroxide (Sax 1984, p. 2010)

**Hazardous Decomposition or Byproducts:** Not Found

**Hazardous Polymerization:** May Occur: Not Found

May Not Occur: Not Found

**Conditions to Avoid:** Not Found

## SECTION V -- HEALTH HAZARD DATA

**Routes of Entry:** Inhalation: Yes (\*Gosselin 1976)

Skin: Yes (\*Gosselin 1976)

Ingestion: Yes (\*Gosselin 1976)

## NITROBENZENE

### SECTION V -- HEALTH HAZARD DATA (Continued)

**Health Hazards** (Acute, Delayed, and Chronic): Can cause death due to respiratory failure (\*Arena 1974). Classified as extremely toxic. The mean lethal oral dose is probably between 1 and 5 grams. Systemic effects may be delayed for a few hours (Gosselin 1984, p. II-214). This compound is rapidly absorbed through the skin (Merck 1983, p. 945). It is a powerful methemoglobin former (\*Patty 1963).

**Signs and Symptoms of Exposure:** Common symptoms include euphoria, flushed face, headache, weakness, dizziness, nausea, vomiting, disturbed vision, lightheadedness, incoordination, shortness of breath, labored breathing, and an alarming bluing of skin, lips, and fingernail bed. Severe exposures can cause stupor, coma and death due to respiratory failure (\*Hamilton 1974, \*Arena 1974).

**Medical Conditions Generally Aggravated by Exposure:** Ethyl alcohol aggravates intoxication caused by nitrobenzene exposure (Gosselin 1984, p. II-214).

**Emergency and First Aid Procedures:** Move victim to fresh air; call emergency medical care. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In case of contact with material, immediately flush skin or eyes with running water for at least 15 minutes. Speed in removing material from skin is of extreme importance. Remove and isolate contaminated clothing and shoes at the site. Keep victim quiet and maintain normal body temperature. Effects may be delayed; keep victim under observation (DOT 1984, Guide 55).

### SECTION VI -- USE INFORMATION

Used as a solvent for cellulose ethers; modifying esterification of cellulose acetate; ingredient of metal polishes (\*Hawley 1977), in soaps and shoe polishes; for refining lubricating oils; manufacturing of pyroxylin compound (\*Merck 1976); a preservative in spray paints; constituent of floor polishes; substitute for almond essence; in perfume industry (\*Browning 1965); chemical intermediate for aniline and dichloroanilines (\*SRI). Registered as an insecticide for use on cadavers (USEPA/Pesticide Index 1985).



## NITROBENZENE

### SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE

(Steps to be Taken in Case Material is Released or Spilled)

Keep unnecessary people away; isolate hazard area and deny entry. Stay upwind; keep out of low areas. Ventilate closed spaces before entering them. Wear positive pressure breathing apparatus and special protective clothing. Remove and isolate contaminated clothing at the site. Do not touch spilled material; stop leak if you can do it without risk. Use water spray to reduce vapors (DOT 1984, Guide 55). Absorb spilled materials in vermiculite, dry sand, earth, or similar material, and place in sealed containers for disposal in secured sanitary landfill (\*NIOSH/OSHA 1981).

EPA CHEMICAL PROFILE

INTERIM

Date: October 31, 1985

Revision: \_\_\_\_\_

CHEMICAL IDENTITY -- DIMETHYL-p-PHENYLENEDIAMINE

CAS Registry Number: 99-98-9

**Synonyms:** N,N-Dimethyl-p-Benzenediamine; 1,4-Benzenediamine, N,N-Dimethyl-; 4-(Dimethylamino)Aniline; 4-Amino-N,N-Dimethylaniline; CI 76075; Dimethyl-para-Phenylenediamine; Dimethyl-paraphenylenediamine; DMPD; N,N-Dimethyl-1,4-Benzenediamine; N,N-Dimethyl-1,4-Phenylenediamine; N,N-Dimethyl-p-Phenylenediamine; p-(Dimethylamino)Aniline; p-Amino-N,N-Dimethylaniline; p-Aminodimethylaniline; p-Dimethylaminophenylamine; p-Phenylenediamine, N,N-Dimethyl-

**Chemical Formula:**  $C_8H_{12}N_2$

**Molecular Weight:** 136.22

SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

OSHA PEL: Not Found

ACGIH TLV: Not Found

IDLH: Not Found

**Other Limits Recommended:** Toxicity information:  $LC_{low}$  inhalation (guinea pig) 0.0013 mg/liter (\*NIOSH/RTECS 1985)

SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

**Boiling Point:** 504°F, 262°C (\*Merck 1976)

**Specific Gravity** ( $H_2O=1$ ): 1.036 at 20/4°C (\*Weast 1979)

**Vapor Pressure** (mmHg): Not Found

**Melting Point:** 127°F, 53°C (\*Merck 1976); also stated as 106°F, 41°C (Merck 1983, p. 474)

**Vapor Density** (AIR=1): Not Found

**Evaporation Rate** (Butyl acetate=1): Not Found

**DIMETHYL-p-PHENYLENEDIAMINE**

**SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS (Continued)**

**Solubility in Water:** Soluble (\*Merck 1976)

**Appearance and Odor:** Colorless to reddish-violet solid (\*Hawley 1977, \*Merck 1976)

**SECTION III -- FIRE AND EXPLOSION HAZARD DATA**

**Flash Point (Method Used):** Not Found

**Flammable Limits:**

LEL: Not Found

UEL: Not Found

**Extinguishing Methods:** Not Found

**Special Fire Fighting Procedures:** Not Found

**Unusual Fire and Explosion Hazards:** When heated to decomposition, it emits toxic fumes of nitrogen oxides (Sax 1984, p. 1190).

**SECTION IV -- REACTIVITY DATA**

**Stability: Unstable:**

Stable: Yes (\*Hawley 1977)

**Conditions to Avoid:** Not Found

**Incompatibility (Materials to Avoid):** Not Found

**Hazardous Decomposition or Byproducts:** When heated to decomposition, it emits toxic fumes of nitrogen oxides (Sax 1984, p. 1190).

**Hazardous Polymerization: May Occur:** Not Found

May Not Occur: Not Found

**Conditions to Avoid:** Not Found

**SECTION V -- HEALTH HAZARD DATA**

**Routes of Entry: Inhalation:** Yes (\*Hawley 1977)

Skin: Yes (Sax 1984, p. 1190)

Ingestion: Yes (\*Hawley 1977)

**DIMETHYL-p-PHENYLENEDIAMINE**

**SECTION V -- HEALTH HAZARD DATA (Continued)**

**Health Hazards** (Acute, Delayed, and Chronic): Lowest toxic dose with skin effect is 14 µg/kg (\*NIOSH/RTECS 1985). Irritant to skin and eyes (\*Hawley 1977).

**Signs and Symptoms of Exposure:** Not Found

**Medical Conditions Generally Aggravated by Exposure:** Not Found

**Emergency and First Aid Procedures:** Treatment is as for general poisoning. Seek medical attention. Establish respiration. Prevent absorption. Induce vomiting. In case of skin contamination decontaminate with water and soap. In case of eye exposure, flush thoroughly with water (\*Rumack 1975 to Present).

**SECTION VI -- USE INFORMATION**

Used in the production of methylene blue and photodeveloper. It is a reagent for hydrogen sulfide, cellulose, organic synthesis (\*Hawley 1977). Chemical intermediate for dyes and diazonium chloride salts; analytical reagent for chloroamine detection in water (\*SRI).

**SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE**  
(Steps to be Taken in Case Material is Released or Spilled)

(Nonspecific -- Phenylenediamine). Do not touch material; stop leak if it can be done without risk. Keep unnecessary people away. Isolate area and deny entry. Stay upwind and out of low areas. Wear self-contained (positive pressure, if available) breathing apparatus and full protective clothing. For small spills, use shovel to place material into clean, dry container and cover; move containers from spill area. For large spills, dike far ahead to collect for later disposal (DOT 1984, Guide 53).

EPA CHEMICAL PROFILE

INTERIM

Date: October 31, 1985

Revision: \_\_\_\_\_

CHEMICAL IDENTITY -- BENZENE, 1-(CHLOROMETHYL)-4-NITRO-

CAS Registry Number: 100-14-1

Synonyms: (NIOSH/RTECS 1983 Synonyms, Volume 3, page 771): p-Nitro-benzyl Chloride; Toluene, alpha-Chloro-p-Nitro-; alpha-Chloro-p-Nitrotoluene

Chemical Formula:  $C_7H_6ClNO_2$

Molecular Weight: 171.59

SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

OSHA PEL: Not Found

ACGIH TLV: Not Found

IDLH: Not Found

Other Limits Recommended: Toxicity information:  $LC_{low}$  inhalation  
(rat) 0.28 mg/liter/4 hours (\*NIOSH/RTECS 1985)

SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

Boiling Point: Not Found

Specific Gravity ( $H_2O=1$ ): Not Found

Vapor Pressure (mmHg): Not Found

Melting Point: 159.8°F, 71°C (Weast 1979, p. C-522)

Vapor Density (AIR=1): Not Found

Evaporation Rate (Butyl acetate=1): Not Found

Solubility in Water: Insoluble (Weast 1979, p. C-522)

Appearance and Odor: Not Found

**BENZENE, 1-(CHLOROMETHYL)-4-NITRO-**

**SECTION III -- FIRE AND EXPLOSION HAZARD DATA**

**Flash Point** (Method Used): Not Found

**Flammable Limits:**

LEL: Not Found

UEL: Not Found

**Extinguishing Methods:** This material may burn but does not ignite readily. Small fires: dry chemical, carbon dioxide, water spray or foam. Large fires: Water spray, fog or foam. Move container from fire area if you can do it without risk (DOT 1984, Guide 53).

**Special Fire Fighting Procedures:** Keep unnecessary people away; isolate hazard area and deny entry. Stay upwind; keep out of low areas. Wear self-contained (positive pressure if available) breathing apparatus and full protective clothing (DOT 1984, Guide 53).

**Unusual Fire and Explosion Hazards:** Not Found

**SECTION IV -- REACTIVITY DATA**

**Stability:** Unstable: Not Found

Stable: Not Found

**Conditions to Avoid:** Not Found

**Incompatibility** (Materials to Avoid): Incompatible with sodium hydroxide (Sax 1984, p. 748).

**Hazardous Decomposition or Byproducts:** Not Found

**Hazardous Polymerization:** May Occur: Not Found  
May Not Occur: Not Found

**Conditions to Avoid:** Not Found

**SECTION V -- HEALTH HAZARD DATA**

**Routes of Entry:** Inhalation: Yes (Sax 1984, p. 748)

Skin: Not Found

Ingestion: Yes (Sax 1984, p. 748)

**Health Hazards** (Acute, Delayed, and Chronic): Poisonous if swallowed or dust is inhaled (DOT 1984, Guide 53).

**BENZENE, 1-(CHLOROMETHYL)-4-NITRO-**

**SECTION V -- HEALTH HAZARD DATA (Continued)**

**Signs and Symptoms of Exposure:** Not Found

**Medical Conditions Generally Aggravated by Exposure:** Not Found

**Emergency and First Aid Procedures:** Move victim to fresh air; call emergency medical care. Remove and isolate contaminated clothing and shoes at the site. In case of contact with material, immediately flush skin and eyes with running water for at least 15 minutes (DOT 1984, Guide 53).

**SECTION VI -- USE INFORMATION**

Not Found

**SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE**

(Steps to be Taken in Case Material is Released or Spilled)

Keep unnecessary people away; isolate hazard area and deny entry. Stay upwind; keep out of low areas. Wear self-contained (positive pressure if available) breathing apparatus and full protective clothing. If water pollution occurs, notify appropriate authorities. Do not touch spilled material; stop leak if you can do so without risk. Small spills: absorb with sand or other noncombustible absorbent material and place into containers for later disposal. Small dry spills: with clean shovel, place material into clean, dry container and cover; move containers from spill area. Large spills: dike far ahead of spill for later disposal (DOT 1984, Guide 53).

**COMMENTS**

Sources searched but no information found:

Hawley 1981  
Merck 1983  
Student 1981  
Weiss 1980  
Doull 1980  
Clayton and Clayton 1981-82  
Gosselin 1984  
Encyc Occupat Health and Safety 1983

## EPA CHEMICAL PROFILE

INTERIM

Date: October 31, 1985

Revision: \_\_\_\_\_

### CHEMICAL IDENTITY -- BENZYL CHLORIDE

CAS Registry Number: 100-44-7

**Synonyms:** (Chloromethyl)Benzene; alpha-Chlorotoluene; Benzene, (Chloromethyl)-; Chloromethylbenzene; Chlorophenylmethane; NCI-CO6360; omega-Chlorotoluene; Toluene, alpha-Chloro-; Toly Chloride

**Chemical Formula:**  $C_7H_7Cl$

**Molecular Weight:** 126.58

### SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

**OSHA PEL:** TWA 1 ppm (5 mg/m<sup>3</sup>) (OSHA 1984, p. 661)

**ACGIH TLV:** TWA 5 mg/m<sup>3</sup> (\*ACGIH 1984)

**IDLH:** 10 ppm (\*Encyc Occupat Health and Safety 1983)

**Other Limits Recommended:** Occupational exposure recommended standard  
-- air: ceiling concentration 5 mg/m<sup>3</sup>/15 minutes (\*NIOSH/RTECS 1985)

### SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

**Boiling Point:** 354°F, 179°C (\*Merck 1983)

**Specific Gravity (H<sub>2</sub>O=1):** 1.100 at 20°C/20°C (\*Merck 1983)

**Vapor Pressure (mmHg):** 1 at 22°C (\*IARC 1985)

**Melting Point:** -45 to -54°F, -43 to -48°C (\*Merck 1983)

**Vapor Density (AIR=1):** 4.4 (\*NFPA 1978)

**Evaporation Rate (Butyl acetate=1):** Not Found

**Solubility in Water:** Insoluble (\*Merck 1983)

**Appearance and Odor:** Colorless to slightly yellow liquid (\*NFPA 1978);  
irritating odor (\*Merck 1983)



BENZYL CHLORIDE

SECTION III -- FIRE AND EXPLOSION HAZARD DATA

**Flash Point (Method Used):** 153°F, 67°C (CC) (\*NFPA 1978)

**Flammable Limits:**

LEL: 1.1% (\*NFPA 1978)

UEL: Not Found

**Extinguishing Methods:** Use water spray, dry chemical, foam, or carbon dioxide (\*NFPA 1978). Use water to keep fire-exposed containers cool (\*NFPA 1978).

**Special Fire Fighting Procedures:** Areas may be entered freely with full-faced mask, self-contained breathing apparatus which provides eye protection, rubber gloves, and hand and arm protection (\*NFPA 1978).

**Unusual Fire and Explosion Hazards:** It burns but does not ignite readily. It may ignite combustibles (DOT 1984, Guide 59).

SECTION IV -- REACTIVITY DATA

**Stability: Unstable:**

**Stable:** Yes (\*NFPA 1978)

**Conditions to Avoid:** Keep separate from oxidizing materials (\*Sax 1979). May become unstable at elevated temperatures and pressures; may react with water resulting in some nonviolent release of energy (\*NFPA 1978).

**Incompatibility (Materials to Avoid):** Incompatible with active metals such as copper, aluminum, magnesium, iron, zinc, and tin and keep from strong oxidizing agents (NIOSH/OSHA 1978, p. 50). Avoid acids or acid fumes (\*Sax 1979).

**Hazardous Decomposition or Byproducts:** When heated to decomposition, it emits toxic and corrosive fumes. Some organic chlorides decompose to yield phosgene (\*Sax 1978).

**Hazardous Polymerization:** **May Occur:** Yes (\*CHRIS 1978)  
**May Not Occur:**

**Conditions to Avoid:** Polymerizes with evolution of heat and hydrogen chloride when in contact with all common metals except nickel and lead (\*CHRIS 1978).

## BENZYL CHLORIDE

### SECTION V -- HEALTH HAZARD DATA

**Routes of Entry:** **Inhalation:** Yes (\*Sax 1975)  
**Skin:** Yes (\*Sax 1975)  
**Ingestion:** Yes (\*Sax 1975)

**Health Hazards** (Acute, Delayed, and Chronic): Intensely irritating to skin, eyes, and mucous membranes (\*Merck 1983). Highly toxic; may cause death or permanent injury after very short exposure to small quantities (\*Sax 1975). Has been listed as a direct-acting or primary carcinogen (\*Doull 1980). Large doses cause central nervous system depression (\*Merck 1983).

**Signs and Symptoms of Exposure:** Inhalation exposure may result in severe irritation of upper respiratory tract with coughing, burning of the throat, headache, dizziness, and weakness. Eye contact may result in immediate and severe eye irritation and prolonged exposure may cause permanent eye damage. Ingestion may cause severe burns of the mouth, throat, and gastrointestinal tract resulting in nausea, vomiting, cramps, and diarrhea (Weiss 1980, p. 155).

**Medical Conditions Generally Aggravated by Exposure:** Not Found

**Emergency and First Aid Procedures:** For inhalation remove from contaminated atmosphere; if not breathing start mouth-to-mouth resuscitation; give oxygen if available; keep patient warm and comfortable; call for medical treatment. Upon eye contact, immediately flush with large quantities of running water for at least 15 minutes and call for medical attention. Immediately flush contaminated areas of skin with water and remove contaminated clothing. After ingestion give large amounts of water and do not induce vomiting (Weiss 1980, p. 155).

### SECTION VI -- USE INFORMATION

It is used in the manufacturing of perfumes, pharmaceutical products, dyes, synthetic tannins, artificial resins, (\*Merck 1983) photographic developer, gasoline gum inhibitors, penicillin precursors (\*Hawley 1981). Also, benzyl chloride is used as an intermediate in the manufacture of other organic chemicals (\*SRI). In the past, it was used as an irritant gas in chemical warfare (\*IARC 1972-1985).

**BENZYL CHLORIDE****SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE**

(Steps to be Taken in Case Material is Released or Spilled)

If leak or spill has not ignited, use water spray to disperse vapors and to provide protection for persons attempting to stop leak. Use water spray to flush spills away from exposures (\*NFPA 1978). Take up small spills with sand or other noncombustible absorbent material and place into containers for later disposal. For larger spills, dike for later disposal. Always wear positive pressure breathing apparatus and special protective clothing (DOT 1984, Guide 59).

EPA CHEMICAL PROFILE

INTERIM

Date: October 31, 1985

Revision: \_\_\_\_\_

CHEMICAL IDENTITY -- ISOCYANIC ACID, 3,4-DICHLOROPHENYL ESTER

CAS Registry Number: 102-36-3

Synonyms: 3,4-Dichlorophenyl Isocyanate; Benzene, 1,2-Dichloro-4-Isocyanato-

Chemical Formula:  $C_7H_3Cl_2NO$

Molecular Weight: 188.01

SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

OSHA PEL: Not Found

ACGIH TLV: Not Found

IDLH: Not Found

Other Limits Recommended: Toxicity information:  $LC_{10\%}$  inhalation (mouse) 0.14 mg/liter/2 hours (\*NIOSH/RTECS 1985)

SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

Boiling Point: 244°F, 118°C at 18 mmHg (Beilstein 1954, Vol. 12/3, p. 1405)

Specific Gravity ( $H_2O=1$ ): Not Found

Vapor Pressure (mmHg): Not Found

Melting Point: 113°F, 45°C (Beilstein 1954, Vol. 12/3, p. 1405)

Vapor Density (AIR=1): Not Found

Evaporation Rate (Butyl acetate=1): Not Found

Solubility in Water: Not Found

Appearance and Odor: White to yellow solid (\*Hawley 1977)

**ISOCYANIC ACID, 3,4-DICHLOROPHENYL ESTER**

**SECTION III -- FIRE AND EXPLOSION HAZARD DATA**

**Flash Point** (Method Used): Not Found

**Flammable Limits:**

LEL: Not Found

UEL: Not Found

**Extinguishing Methods:** Extinguish with dry chemical, carbon dioxide, water spray, fog, or foam. Move container from fire area if you can do so without risk (DOT 1984, Guide 53).

**Special Fire Fighting Procedures:** Keep unnecessary people away; isolate hazard area and deny entry. Stay upwind; keep out of low areas. Wear self-contained (positive pressure if available) breathing apparatus and full protective clothing (DOT 1984, Guide 53).

**Unusual Fire and Explosion Hazards:** Inhalation of dust poisonous; fire may produce irritating or poisonous gases (DOT 1984, Guide 53).

**SECTION IV -- REACTIVITY DATA**

**Stability:** Unstable: Not Found

Stable: Not Found

**Conditions to Avoid:** Not Found

**Incompatibility** (Materials to Avoid): Not Found

**Hazardous Decomposition or Byproducts:** Not Found

**Hazardous Polymerization:** May Occur: Not Found

May Not Occur: Not Found

**Conditions to Avoid:** Not Found

**SECTION V -- HEALTH HAZARD DATA**

**Routes of Entry:** Inhalation: Yes (DOT 1984, Guide 53)

Skin: Not Found

Ingestion: Not Found

**Health Hazards** (Acute, Delayed, and Chronic): Strong irritant to tissue, especially eyes and mucous membranes (\*Hawley 1977)

**Signs and Symptoms of Exposure:** Not Found

ISOCYANIC ACID, 3,4-DICHLOROPHENYL ESTER

SECTION V -- HEALTH HAZARD DATA (Continued)

Medical Conditions Generally Aggravated by Exposure: Not Found

Emergency and First Aid Procedures: Move victim to fresh air; call emergency medical care. Remove and isolate contaminated clothing and shoes at the site. In case of contact with material, immediately flush skin or eyes with running water for at least 15 minutes (DOT 1984, Guide 53).

SECTION VI -- USE INFORMATION

Chemical intermediate; organic synthesis (\*Hawley 1977).

SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE  
(Steps to be Taken in Case Material is Released or Spilled)

Avoid inhalation of dust (see Section V above). Do not touch spilled material; stop leak if you can do so without risk. Small spills: absorb with sand or other noncombustible absorbent material and place into containers for later disposal. Small dry spills: with clean shovel place material into clean, dry container and cover; move containers from spill area. Large spills: dike far ahead of spill for later disposal (DOT 1984, Guide 53).

EPA CHEMICAL PROFILE

INTERIM

Date: October 31, 1985

Revision: \_\_\_\_\_

CHEMICAL IDENTITY -- PHENYLTHIOUREA

CAS Registry Number: 103-85-5

Synonyms: Urea, 1-Phenyl-2-Thio-; 1-Phenyl-2-Thiourea; 1-Phenylthiourea; alpha-Phenylthiourea; N-Phenylthiourea; NCI-C02017; Phenylthiocarbamide; PTC; PTU; Thiouréa, Phenyl-; U6324; USAF EK-1569

Chemical Formula:  $C_7H_8N_2S$

Molecular Weight: 152.22 (\*Merck 1983)

SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

OSHA PEL: Not Found

ACGIH TLV: Not Found

IDLH: Not Found

Other Limits Recommended: Toxicity information: LD<sub>50</sub> oral (rat) 3 mg/kg (\*NIOSH/RTECS 1985)

SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

Boiling Point: Not Found

Specific Gravity (H<sub>2</sub>O=1): 1.3 (\*Merck 1983)

Vapor Pressure (mmHg): Not Found

Melting Point: 309°F, 154°C (\*Merck 1983)

Vapor Density (AIR=1): Not Found

Evaporation Rate (Butyl acetate=1): Not Found

Solubility in Water: Soluble in 400 parts cold water; 17 parts boiling water (\*Merck 1983).

Appearance and Odor: Needle-like crystals (Sax 1984, p. 2205).

**PHENYLTHIOUREA**

**SECTION III -- FIRE AND EXPLOSION HAZARD DATA**

**Flash Point** (Method Used): Not Found

**Flammable Limits:**

LEL: Not Found

UEL: Not Found

**Extinguishing Methods:** Not Found

**Special Fire Fighting Procedures:** Not Found

**Unusual Fire and Explosion Hazards:** Dangerous disaster hazard; emits toxic fumes of oxides of sulfur and nitrogen when heated to decomposition (Sax 1984, p. 2205).

**SECTION IV -- REACTIVITY DATA**

**Stability:** Unstable: Not Found

Stable: Not Found

**Conditions to Avoid:** Not Found

**Incompatibility** (Materials to Avoid): Acid or acid fumes (Sax 1984, p. 2205)

**Hazardous Decomposition or Byproducts:** When heated to decomposition, or on contact with acid or acid fumes it emits highly toxic fumes of sulfur oxides and nitrogen oxides (Sax 1984, p. 2205).

**Hazardous Polymerization:** May Occur: Not Found

May Not Occur: Not Found

**Conditions to Avoid:** Not Found

**SECTION V -- HEALTH HAZARD DATA**

**Routes of Entry:** Inhalation: Yes (\*Rumack 1975 to Present)

Skin: Yes (\*Rumack 1975 to Present)

Ingestion: Yes (Sax 1984, p. 2205)

**Health Hazards** (Acute, Delayed, and Chronic): It is classified as extremely toxic. The probable oral lethal dose is 5-50 mg/kg or between 7 drops and 1 teaspoon for a 70 kg (150 lb.) person (\*Gosselin 1976).



## PHENYLTHIOUREA

### SECTION V -- HEALTH HAZARD DATA (Continued)

**Signs and Symptoms of Exposure:** Exposure may result in vomiting, difficult breathing, noisy breathing, cyanosis, and low body temperature (\*Gosselin 1976).

**Medical Conditions Generally Aggravated by Exposure:** Not Found

**Emergency and First Aid Procedures:** Phenylthiourea is similar to Antu (Gosselin 1984, p. II-350). Dermal exposure: wash exposed area twice with soap and water. Eye exposure: wash copiously with water for 15 minutes. Inhalation: remove to fresh air (\*Rumack 1975 to Present). Oral: Induce vomiting (Gosselin 1984, p. III-41).

### SECTION VI -- USE INFORMATION

Used in the manufacture of rodenticides (\*Gosselin 1976) and in medical genetics (Merck 1983, p. 1794).

### SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE

(Steps to be Taken in Case Material is Released or Spilled)

Avoid inhalation or contact with skin (see Section V above). Use self-contained breathing apparatus in presence of toxic fumes resulting from decomposition (Sax 1984, p. 2205).

## EPA CHEMICAL PROFILE

### INTERIM

Date: October 31, 1985

Revision: \_\_\_\_\_

## CHEMICAL IDENTITY -- EPICHLOROHYDRIN

CAS Registry Number: 106-89-8

**Synonyms:** (Chloromethyl)Ethylene Oxide; (DL)-alpha-Epichlorohydrin; 1,2-Epoxy-3-Chloropropane; 1-Chloro-2,3-Epoxypropane; 2,3-Epoxypropyl Chloride; 3-Chloro-1,2-Epoxypropane; 3-Chloro-1,2-Propylene Oxide; Alpha-Epichlorohydrin; Chloromethyloxirane; Chloropropylene Oxide; ECH; Epichlorophydrin; Epichlorhydrin; gamma-Chloropropylene Oxide; Glycerol Epichlorhydrin; Glycerol Epichlorohydrin; Glycidyl Chloride; NCI-C07001; Oxirane, (Chloromethyl)-; Oxirane, 2-(Chloromethyl); SKEKHG

**Chemical Formula:**  $C_3H_5ClO$

**Molecular Weight:** 92.53

## SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

**OSHA PEL:** Air: TWA 5 ppm (skin) (\*NIOSH/RTECS 1985)

**ACGIH TLV:** TWA 2 ppm (8 mg/m<sup>3</sup>); STEL 5 ppm (19 mg/m<sup>3</sup>) (skin) (\*ACGIH 1980)

**IDLH:** 100 ppm (NIOSH/OSHA 1978, p. 92)

**Other Limits Recommended:** Not Found

## SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

**Boiling Point:** 241.7°F, 116.5°C (\*Weast 1979)

**Specific Gravity (H<sub>2</sub>O=1):** 1.801 at 20°C/4°C (\*Weast 1979); 1.18 at 20°C (Merck 1983, p. 520)

**Vapor Pressure (mmHg):** 10 at 16.6°C (\*Sax 1975)

**Melting Point:** -54.4°F, -48°C (\*Weast 1979); -14.1°F, -25.6°C (Merck 1983, p. 520)

**Vapor Density (AIR=1):** 3.29 (\*Sax 1975)

**Evaporation Rate (Butyl acetate=1):** Not Found

## EPICHLOROHYDRIN

### SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS (Continued)

**Solubility in Water:** Insoluble in water (\*Merck 1976)

**Appearance and Odor:** Colorless liquid (\*Sax 1975) with a pungent, garlic, sweet odor (\*CHRIS 1978).

### SECTION III -- FIRE AND EXPLOSION HAZARD DATA

**Flash Point (Method Used):** 93°F(CC) (\*ACGIH 1980); 105°F(OC) (\*Merck 1983)

**Flammable Limits:**

LEL: 3.8% (\*NFPA 1978)

UEL: 21.0% (\*NFPA 1978)

**Extinguishing Methods:** Use water spray, dry chemical, foam or carbon dioxide. Water spray may be used to dilute spills to non-flammable mixtures. If leak or spill has not ignited, use water spray to disperse the vapors. Keep fire-exposed containers cooled with water (\*NFPA 1978).

**Special Fire Fighting Procedures:** If fire becomes uncontrollable, or containers are exposed to direct flames, evacuate for a radius of 1,500 feet (\*Student 1981). Isolate for one-half mile in all directions if tank car or truck is involved in fire (DOT 1984, Guide 30). Epichlorohydrin may react violently with water (\*NFPA 1978).

**Unusual Fire and Explosion Hazards:** When heated to decomposition, this compound evolves highly toxic fumes of phosgene (\*Sax 1975) and carbon monoxide (\*General Electric Co. MSDS #335B 1979).

### SECTION IV -- REACTIVITY DATA

**Stability:** Unstable: Yes (\*NFPA 1978)

Stable:

**Conditions to Avoid:** Heat and contaminants (\*NFPA 1978).

**Incompatibility (Materials to Avoid):** Reactive and incompatible with strong oxidizers, strong acids, caustics, zinc, aluminum, chlorides of iron and aluminum (NIOSH/OSHA 1978, p. 92), and compounds with an active hydrogen atom, including water (\*ITI 1982).

**Hazardous Decomposition or Byproducts:** When heated, can evolve fumes of phosgene (\*Sax 1975) and carbon monoxide (\*General Electric Co. MSDS #335B 1979).

## EPICHLOROHYDRIN

### SECTION IV -- REACTIVITY DATA (Continued)

**Hazardous Polymerization:** May Occur: Yes (\*CHRIS 1978)  
May Not Occur:

**Conditions to Avoid:** Strong acids and bases (\*CHRIS 1978); certain curing agents such as ethylenediamine (\*General Electric Co. 1979, MSDS #335B).

### SECTION V -- HEALTH HAZARD DATA

**Routes of Entry:** Inhalation: Yes (\*Sax 1975)  
Skin: Yes (\*Sax 1975)  
Ingestion: Yes (\*Sax 1975)

**Health Hazards** (Acute, Delayed, and Chronic): This compound is caustic as both a liquid and gas. Irritation of the eyes and skin, and skin sensitization has been observed (\*LeFaux 1968; \*Sax 1975). Exposure to epichlorohydrin has caused inflammation of the lungs, asthmatic bronchitis, and liver and kidney damage (\*Gosselin 1976; \*Sax 1975). In acute poisonings, death may be caused by respiratory paralysis (\*Sax 1975).

**Signs and Symptoms of Exposure:** Fatigue, gastrointestinal pain, chronic conjunctivitis (\*LeFaux 1968), tearing, asthmatic bronchitis (\*Gosselin 1976), skin sensitization and burns (\*ACGIH 1971-79) have all been described.

**Medical Conditions Generally Aggravated by Exposure:** Not Found

**Emergency and First Aid Procedures:** Move victim to fresh air; call emergency medical care. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In case of contact with material, immediately flush skin or eyes with running water for at least 15 minutes. Speed in removing material from skin is of extreme importance. Remove and isolate contaminated clothing and shoes at the site. Keep victim quiet and maintain normal body temperature. Effects may be delayed; keep victim under observation (DOT 1984, Guide 30).

### SECTION VI -- USE INFORMATION

Insect fumigant, solvent (\*Merck 1976), raw material or intermediate for chemical synthesis, cross-linking agent, heat stabilizer for plastics, comonomer for epoxy resins (\*SRI), papermaking additive (\*Kirk-Othmer 1978). Not registered as a pesticide in the U.S. (USEPA/Pesticide Index 1985).

## EPICHLOROHYDRIN

### SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE

(Steps to be Taken in Case Material is Released or Spilled)

Keep unnecessary people away; isolate hazard area and deny entry. Stay upwind; keep out of low areas. Wear positive pressure breathing apparatus and special protective clothing. Shut off ignition sources; no flares, smoking or flames in hazard area. Do not touch spilled material; stop leak if you can do it without risk. Use water spray to reduce vapors; do not get water inside container. Small spills: flush area with flooding amounts of water. Large spills: dike far ahead of spill for later disposal (DOT 1984, Guide 30). In case of spill or leak from a drum or smaller container or a small leak from a tank, isolate for 40 feet in all directions. In case of a large spill from a tank or many containers, first isolate for 80 feet in all directions, then evacuate in a downwind direction an area 0.2 miles wide and 0.3 miles long (DOT 1984, Table of Isolation and Evacuation Distances).

EPA CHEMICAL PROFILE

INTERIM

Date: October 31, 1985

Revision: \_\_\_\_\_

CHEMICAL IDENTITY -- PROPARGYL BROMIDE

CAS Registry Number: 106-96-7

Synonyms: Propyne, 3-Bromo-; gamma-Bromoallylene; 3-Bromopropyne;  
3-Bromo-1-propyne

Chemical Formula:  $C_3H_3Br$

Molecular Weight: 118.97

SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

OSHA PEL: Not Found

ACGIH TLV: Not Found

IDLH: Not Found

Other Limits Recommended: Toxicity information:  $LD_{low}$  oral (rat) 53  
mg/kg;  $LD_{50}$  oral (guinea pig) 0.029 mg/kg (\*NIOSH/RTECS 1985)

SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

Boiling Point: 190-194°F, 88-90°C (Sax 1984, p. 2295)

Specific Gravity ( $H_2O=1$ ): 1.564-1.570 (Sax 1984, p. 2295)

Vapor Pressure (mmHg): Not Found

Melting Point: -77.9°F, -61.07°C (Sax 1984, p. 2295)

Vapor Density (AIR=1): 6.87 (Sax 1984, p. 2295) (SUSPECT)

Evaporation Rate (Butyl acetate=1): Not Found

Solubility in Water: Not Found

Appearance and Odor: Colorless liquid, sharp odor (Sax 1984, p. 2295)

**PROPARGYL BROMIDE**

**SECTION III -- FIRE AND EXPLOSION HAZARD DATA**

**Flash Point** (Method Used): 149°F, 65°C (CC) (Sax 1984, p. 2295)

**Flammable Limits:**

LEL: 3.0% (\*NFPA 1978)

UEL: Not Found

**Extinguishing Methods:** Use water, foam, carbon dioxide, or dry chemical (Sax 1984, p. 2295)

**Special Fire Fighting Procedures:** Wear self-contained breathing apparatus and full protective clothing. Move container from fire area if you can do it without risk. Do not get water inside container. Cool containers that are exposed to flames with water from the side until well after fire is out. Withdraw immediately in case of rising sound from venting safety device or any discoloration of tank due to fire. Isolate for 1/2 mile in all directions if tank car or truck is involved in fire (DOT 1984, Guide 29).

**Unusual Fire and Explosion Hazards:** This material detonates at 428°F, 220°C or more; ignites by impact. Emits highly toxic fumes of bromides when heated to decomposition (Sax 1984, p. 2295).

**SECTION IV -- REACTIVITY DATA**

**Stability:** **Unstable:** Yes (Sax 1984, p. 2295)

**Stable:**

**Conditions to Avoid:** Heat, flame, shock, and other chemicals (Sax 1984, p. 2295)

**Incompatibility** (Materials to Avoid): Reacts vigorously with oxidizing materials. Becomes shock-sensitive when mixed with chloropicrin (Sax 1984, p. 2295).

**Hazardous Decomposition or Byproducts:** Highly toxic fumes of bromine containing compounds are formed when this material is heated to decomposition (Sax 1984, p. 2295).

**Hazardous Polymerization:** **May Occur:** Not Found  
**May Not Occur:** Not Found

**Conditions to Avoid:** Not Found

## PROPARGYL BROMIDE

### SECTION V -- HEALTH HAZARD DATA

**Routes of Entry:** Inhalation: Yes (\*Sax 1975)  
Skin: Yes (\*Sax 1975)  
Ingestion: Yes (Sax 1984, p. 2295)

**Health Hazards** (Acute, Delayed, and Chronic): This material is very toxic via the oral route (Sax 1984, p. 2295). If inhaled, may be harmful; contact may cause burns to skin and eyes (DOT 1984, Guide 29).

**Signs and Symptoms of Exposure:** Symptoms include skin irritation and tearing of the eyes (\*NFPA 1978).

**Medical Conditions Generally Aggravated by Exposure:** Not Found

**Emergency and First Aid Procedures:** Move victim to fresh air; call emergency medical care. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Remove and isolate contaminated clothing and shoes at the site. In case of contact with material, immediately flush skin or eyes with running water for at least 15 minutes. Keep victim quiet and maintain normal body temperature (DOT 1984, Guide 29).

### SECTION VI -- USE INFORMATION

This material is used as a soil fumigant (Hawley 1981, p. 861). Not registered as a pesticide in the U.S. (USEPA/Pesticide Index 1985).

### SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE (Steps to be Taken in Case Material is Released or Spilled)

Shut off ignition sources; no flames, smoking or flames in hazard area. Do not touch spilled material; stop leak if you can do it without risk. Use water spray to reduce vapors, do not get water inside container. Take up spills with sand or noncombustible absorbent material. For large spills dike far ahead. Wear self-contained breathing apparatus (DOT 1984, Guide 29).



## EPA CHEMICAL PROFILE

INTERIM

Date: October 31, 1985

Revision: \_\_\_\_\_

### CHEMICAL IDENTITY -- BUTADIENE

CAS Registry Number: 106-99-0

**Synonyms:** 1,3-Butadiene; Alpha, Gamma-Butadiene; Alpha-Butadiene; Biethylene; Bivinyll; Buta-1,3-diene; Butadiene-1,3-Uninhibited; Divinyll; Erythrene; NCI-C50602; Pyrrolylene; Vinylyethylene

**Chemical Formula:**  $C_4H_6$

**Molecular Weight:** 54.09

### SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

**OSHA PEL:** Air: TWA 1000 ppm (\*NIOSH/RTECS 1985)

**ACGIH TLV:** TWA 1000 ppm (2200 mg/m<sup>3</sup>); STEL 1250 ppm (2750 mg/m<sup>3</sup>)  
(\*ACGIH 1984)

**IDLH:** 20,000 ppm (NIOSH/OSHA 1978, p. 52)

**Other Limits Recommended:** Maximum air concentration (USSR) 100 mg/m<sup>3</sup> (Encyc Occupat Health and Safety 1983, p. 347). Industrial substance suspected of carcinogenic potential for humans, recommended TLV 10 ppm (ACGIH 1984, p. 41).

### SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

**Boiling Point:** 24°F, -4.5°C (\*Merck 1983)

**Specific Gravity** (H<sub>2</sub>O=1): 0.6211 at 20°C/4°C (\*Weast 1979)

**Vapor Pressure** (mmHg): 910 at 20°C (\*ACGIH 1980)

**Melting Point:** -164°F, -109°C (\*Weast 1979)

**Vapor Density** (AIR=1): 1.87 (\*Sax 1979)

**Evaporation Rate** (Butyl acetate=1): Not Found

**Solubility in Water:** Insoluble (\*Weast 1979); 0.05% (NIOSH/OSHA 1978, p. 52)

## BUTADIENE

### SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS (Continued)

**Appearance and Odor:** Colorless gas (\*Merck 1983) or liquified compressed gas (inhibited) (\*CHRIS 1978) with a mild aromatic (\*ACGIH 1980) or gasoline-like (\*CHRIS 1978) odor.

### SECTION III -- FIRE AND EXPLOSION HAZARD DATA

**Flash Point** (Method Used): -105°F (method not given) (\*Sax 1979)

**Flammable Limits:**

LEL: 2.0% (\*Patty 1963)

UEL: 11.5% (\*Patty 1963)

**Extinguishing Methods:** Let tank car, tank truck or storage tank burn unless leak can be stopped; with smaller tanks or cylinders, extinguish/isolate from other flammables. Small fires: dry chemical or carbon dioxide. Large fires: water spray, fog, or foam. Move container from fire area if you can do so without risk. Stay away from ends of tanks. For massive fire in cargo area, use unmanned hose holder or monitor nozzles; if this is impossible, withdraw from area and let fire burn. Withdraw immediately in case of rising sound from venting safety device or any discoloration of tank due to fire. Cool container with water using unmanned device until well after fire is out (DOT 1984, Guide 17).

**Special Fire Fighting Procedures:** Shut off flow of gas. Use water to keep fire-exposed containers cool and to protect men effecting the shut off. In advanced or massive fires, firefighting should be done from a protected location (\*NFPA 1978). Apply water from as far a distance as possible (Student 1981, p. 78). Keep unnecessary people away; isolate hazard area and deny entry. Stay upwind; keep out of low areas. Ventilate closed spaces before entering them. Wear self-contained (positive pressure if available) breathing apparatus and full protective clothing. Isolate for 1/2 mile in all directions if tank car or truck is involved in fire (DOT 1984, Guide 17).

**Unusual Fire and Explosion Hazards:** Extremely flammable. May be ignited by heat, sparks or flames. Vapors may travel to a source of ignition and flash back. Container may explode violently in heat of fire. Vapor explosion hazard indoors, outdoors or in sewers (DOT 1984, Guide 17). Explosion hazard is high if the material is heated under pressure, in air, or mixed with phenol, chlorine dioxide or crotonaldehyde. It may form explosive peroxides upon exposure to air. It emits acrid fumes when heated (\*Sax 1979). At elevated temperatures, polymerization may take place and containers may rupture (\*NFPA 1978). May travel a considerable distance to a source of ignition and flash back. Butadiene vapors are uninhibited and may form polymers in vents or flame arresters of storage tanks, resulting in stoppage of vents (NFPA 1978, p. 49-22).

## BUTADIENE

### SECTION IV -- REACTIVITY DATA

**Stability:** Unstable: Yes (\*CHRIS 1978)  
Stable:

**Conditions to Avoid:** Heat (\*Sax 1979), mixing with air (\*Clayton and Clayton 1981-82).

**Incompatibility (Materials to Avoid):** Air, phenol, chlorine dioxide, and crotonaldehyde (\*Sax 1979).

**Hazardous Decomposition or Byproducts:** May form explosive peroxides upon exposure to air (\*Sax 1979). Formaldehyde and acrolein are produced when material is exposed to photooxidation with ozone and nitrogen dioxide, as in smog formation (\*Grant 1974).

**Hazardous Polymerization:** May Occur: Yes (\*NFPA 1978)  
May Not Occur:

**Conditions to Avoid:** Heat (\*NFPA 1978). Elevated temperatures may cause polymerization which can cause violent rupture of containers (NFPA 1978, p. 49-22).

### SECTION V -- HEALTH HAZARD DATA

**Routes of Entry:** Inhalation: Yes (\*Lefaux 1968)  
Skin: Yes (Sax 1984, p. 545)  
Ingestion: Not Found

**Health Hazards (Acute, Delayed, and Chronic):** Death can result 23 minutes after inhaling air containing 25% butadiene (\*Lefaux 1968). It is a central nervous system depressant in high concentrations. It may be irritating to skin and mucous membranes (\*Merck 1983). Contact with the liquid may cause frostbite. It can asphyxiate by the displacement of air (Student 1981, p. 78). If inhaled, may be harmful; contact may cause burns to skin and eyes. Vapors may cause dizziness or suffocation. Fire may produce irritating or poisonous gases (DOT 1984, Guide 17). 1,3-Butadiene has suspected carcinogenic potential for humans (\*ACGIH 1984).

**Signs and Symptoms of Exposure:** Initial signs and symptoms include blurred vision, nausea, prickling and dryness of the mouth, throat, and nose, followed by fatigue, headache, vertigo, decreased blood pressure and pulse rate, unconsciousness, and respiratory paralysis (\*Clayton and Clayton 1981-82).

**Medical Conditions Generally Aggravated by Exposure:** Not Found

## BUTADIENE

## SECTION V -- HEALTH HAZARD DATA (Continued)

**Emergency and First Aid Procedures:** Move victim to fresh air; call emergency medical care. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In case of frostbite, thaw frosted parts with water. Keep victim quiet and maintain normal body temperature (DOT 1984, Guide 17).

## SECTION VI -- USE INFORMATION

This material is used primarily as a monomer and comonomer for synthetic rubbers and resins; it is also a chemical intermediate for several compounds (\*SRI).

## SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE

(Steps to be Taken in Case Material is Released or Spilled)

Remove all ignition sources. Ventilate area. Stop flow of gas (\*NIOSH/OSHA 1981). Wear safety goggles, mask, apron, and rubber gloves (\*Lefaux 1968). Keep material out of water sources and sewers. Attempt to stop leak if without hazard. Use water spray to knock down vapors. Avoid breathing vapors. Keep upwind. Do not handle broken packages without protective equipment. If fire becomes uncontrollable or container is exposed to direct flame, evacuate for a radius of 2,500 feet. If material is leaking (not on fire) downwind evacuation must be considered (Student 1981, p. 78). Isolate area until gas has dispersed (DOT 1984, Guide 17).

EPA CHEMICAL PROFILE

INTERIM

Date: October 31, 1985

Revision: \_\_\_\_\_

CHEMICAL IDENTITY -- ACROLEIN

CAS Registry Number: 107-02-8

**Synonyms:** Acraldehyde; Acrylaldehyde; Acrylic Aldehyde; Allyl Aldehyde; Aqualin; Aqualine; Ethylene Aldehyde; Magnacide H; NSC 8819; Propenal; 2-Propenal; Prop-2-en-1-al; 2-Propen-1-one

**Chemical Formula:**  $C_3H_4O$

**Molecular Weight:** 56.06

SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

**OSHA PEL:** TWA 0.1 ppm (\*NIOSH/RTECS 1985)

**ACGIH TLV:** TWA 0.1 ppm (0.25 mg/m<sup>3</sup>); STEL 0.3 ppm (0.8 mg/m<sup>3</sup>)  
(\*ACGIH 1983)

**IDLH:** 5 ppm (\*Encyc Occupat Health and Safety 1983)

**Other Limits Recommended:** Not Found

SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

**Boiling Point:** 126°F, 52.5°C (\*Merck 1983)

**Specific Gravity (H<sub>2</sub>O=1):** 0.8389 at 20°C; 0.8621 at 0°C (\*Merck 1983)

**Vapor Pressure (mmHg):** 210 at 68°F, 20°C; 135.71 at 50°F, 10°C (\*Weed Science Society of America 1974)

**Melting Point:** -126°F, -88°C (\*Merck 1983)

**Vapor Density (AIR=1):** 1.94 (\*Encyc Occupat Health and Safety 1983)

**Evaporation Rate (Butyl acetate=1):** Not Found

**Solubility in Water:** Soluble in 2-3 parts water (\*Merck 1983)

## ACROLEIN

### SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS (Continued)

**Appearance and Odor:** Colorless or yellowish liquid with extremely sharp, disagreeable, acrid, irritating odor (\*Sax 1979, \*CHRIS 1980)

### SECTION III -- FIRE AND EXPLOSION HAZARD DATA

**Flash Point (Method Used):** -15°F, -26°C (CC); less than 0°F, -18°C (OC) (\*NFPA 1978)

**Flammable Limits:**

LEL: 2.8% (\*NFPA 1978)

UEL: 31% (\*NFPA 1978)

**Extinguishing Methods:** Dry chemical, alcohol foam, or carbon dioxide. Water may be ineffective, but can be used to keep containers cool (\*NFPA 1978).

**Special Fire Fighting Procedures:** In advanced or massive fires, fire fighting should be done from safe distance or from protected location. Use dry chemical, alcohol foam, or carbon dioxide. Water may be ineffective, but should be used to keep fire-exposed containers cool. If a leak or spill has not ignited, use water spray to disperse vapors. If it is necessary to stop a leak, use water spray to protect men attempting to do so. Water spray may be used to flush spills away from exposures and to dilute spills to nonflammable mixtures (\*NFPA 1978). Withdraw immediately in case of rising sound from venting safety device or any discoloration of tank due to fire (DOT 1984, Guide 30).

**Unusual Fire and Explosion Hazards:** Under fire conditions, polymerization may occur. If inside a container, violent rupture of the container may take place (\*NFPA 1978).

### SECTION IV -- REACTIVITY DATA

**Stability:** Unstable: Yes (\*Merck 1983)  
Stable:

**Conditions to Avoid:** Exposure to alkalis or strong acids (\*Encyc Occupat Safety and Health 1983) or to oxygen (\*NFPA 1978).

**Incompatibility (Materials to Avoid):** Alkaline or strong acids act as catalysts, causing a condensation reaction and liberating energy. Reaction may be very rapid and violent (\*Encyc Occupat Health and Safety 1983). Readily converted by oxygen to hazardous peroxides and acids (\*NFPA 1978).

## ACROLEIN

### SECTION IV -- REACTIVITY DATA (Continued)

**Hazardous Decomposition or Byproducts:** When heated to decomposition, it emits highly toxic fumes (\*Sax 1975).

**Hazardous Polymerization:** May Occur: Yes (\*NFPA 1978)  
May Not Occur:

**Conditions to Avoid:** Elevated temperatures, such as fire conditions. (Polymerization inside container could cause violent rupture of container under fire conditions.) (\*NFPA 1978)

### SECTION V -- HEALTH HAZARD DATA

**Routes of Entry:** Inhalation: Yes (\*NIOSH/RTECS 1985)  
Skin: Yes (\*NIOSH/RTECS 1985)  
Ingestion: Yes (\*Gosselin 1984)

**Health Hazards (Acute, Delayed, and Chronic):** Extremely toxic; probable oral human lethal dose is 5-50 mg/kg, between 7 drops and one teaspoon for a 70 kg (150 lb.) person (\*Gosselin 1984). Inhalation of air containing 10 ppm of acrolein may be fatal in a few minutes (\*NRC 1981). Death from cardiac failure accompanied by hyperemia and hemorrhage of the lungs and degeneration of the bronchial epithelium is possible. Acrolein causes acute respiratory and eye irritation; severe gastrointestinal distress with slowly developing pulmonary edema (lungs fill up with fluid); and skin irritation (Gosselin 1984, p. II-186).

**Signs and Symptoms of Exposure:** If swallowed, produces acute abdominal pains. Acrolein's irritant properties cause skin blisters and burns, intense tearing, and nasal irritation. If lung edema develops, patient experiences difficulty in breathing, coughing, and fatigue (Gosselin 1984, p. II-186).

**Medical Conditions Generally Aggravated by Exposure:** Not Found

**Emergency and First Aid Procedures:** Move victim to fresh air; call emergency medical care. If not breathing give artificial respiration. If breathing is difficult, give oxygen. Remove and isolate contaminated clothing and shoes at the site. In case of contact with material, immediately flush skin or eyes with running water for at least 15 minutes (DOT 1984, Guide 30). Terminate exposure immediately. Patient should take deep breaths. Complete rest should be enforced for 24-48 hours whether toxic symptoms are recognized or not (Gosselin 1976, pp. 257-8).

## ACROLEIN

### SECTION VI -- USE INFORMATION

Acrolein is used in manufacture of colloidal forms of metals; making plastics, perfumes; as a warning agent in methyl chloride refrigerant; and has been used in military poison gas mixtures (\*Merck 1983). It is also used as an intermediate in the production of glycerine, methionine, acrylic acid, and esters (\*SRI). Acrolein is also an intermediate for glycerol, polyurethane, polyester resins, and pharmaceuticals (\*Hawley 1981). Additionally, acrolein is used as an aquatic herbicide, biocide, slimicide (\*Farm Chemicals Handbook 1984) and molluscicide (\*Kearney and Kaufman 1975).

### SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE

(Steps to be Taken in Case Material is Released or Spilled)

When handling acrolein, full protective clothing including self-contained breathing apparatus, rubber gloves, boots, and band around legs, arms, and waist should be worn. No skin surface should be exposed (\*NFPA 1978). Remove all ignition sources. Ventilate area of spill or leak. For large quantities, cover with sodium bisulfite, add small amount of water and mix. Then, after 1 hour, flush with large amounts of water and wash site with soap solution. Liquid should not be allowed to enter confined space, such as sewer, because of possibility of explosion. Take up spills for disposal by absorbing it in vermiculite, dry sand, or earth and disposing in a secured landfill or combustion chamber (\*NIOSH 1981).



## EPA CHEMICAL PROFILE

### INTERIM

Date: October 31, 1985

Revision: \_\_\_\_\_

## CHEMICAL IDENTITY -- CHLOROETHANOL

CAS Registry Number: 107-07-3

**Synonyms:** 2-Chloroethanol; 2-Chloro-1-ethanol; 2-Chloroethyl Alcohol; 2-Hydroxyethyl Chloride; 2-Monochloroethanol; beta-Chloroethanol; beta-Chloroethyl Alcohol; beta-Hydroxyethyl Chloride; delta-Chloroethanol; Ethanol, 2-Chloro-; Ethene, Chlorohydrin; Ethylchlorohydrin; Ethylene Chlorohydrin; Ethylene Glycol, Chlorohydrin; Glycol Chlorohydrin; Glycol Monochlorohydrin; Glycomonochlorohydrin; NCI-C50135

**Chemical Formula:**  $C_2H_5ClO$

**Molecular Weight:** 80.52

## SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

**OSHA PEL:** TWA 5 ppm (skin) (\*NIOSH/RTECS 1985)

**ACGIH TLV:** Ceiling 3 mg/m<sup>3</sup> (skin) (\*ACGIH 1983)

**IDLH:** 10 ppm (\*Encyc Occupat Health and Safety 1983)

**Other Limits Recommended:** Not Found

## SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

**Boiling Point:** 262°F, 128°C (\*Weast 1979)

**Specific Gravity** (H<sub>2</sub>O=1): 1.197 (\*Merck 1983)

**Vapor Pressure** (mmHg): 4.9 (\*Clayton and Clayton 1981-82)

**Melting Point:** -89.5°F, -67.5°C (\*Weast 1979)

**Vapor Density** (AIR=1): 2.78 (\*Patty 1963)

**Evaporation Rate** (Butyl acetate=1): Not Found

**Solubility in Water:** Freely soluble (\*Weast 1979)

## CHLOROETHANOL

### SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS (Continued)

**Appearance and Odor:** Colorless, glycerine-like liquid (\*Browning 1965); faint ethereal odor (\*Sax 1979); sweet, pleasant odor (\*CHRIS 1978)

### SECTION III -- FIRE AND EXPLOSION HAZARD DATA

**Flash Point** (Method Used): 105°F (OC) (\*Merck 1983); 140°F, 60°C (CC) (\*NFPA 1978)

**Flammable Limits:**

LEL: 4.9% (\*NFPA 1978)

UEL: 15.9% (\*NFPA 1978)

**Extinguishing Methods:** Water spray may be used to extinguish the fire because the material can be cooled below its flash point (\*NFPA 1978). Alcohol foam, carbon dioxide, and dry chemical may be used (\*CHRIS 1978).

**Special Fire Fighting Procedures:** Do not breathe fumes from burning material. Air purifying respirator or self-contained breathing apparatus, coat, pants, gloves, and boots should be worn. No skin surface should be exposed. Bands around legs, arm and waist should be provided (\*NFPA 1978).

**Unusual Fire and Explosion Hazards:** Its decomposition products will react with water or steam to produce toxic and corrosive fumes (\*Sax 1979). Vapors are heavier than air and may flash back to a source of ignition (\*CHRIS 1978).

### SECTION IV -- REACTIVITY DATA

**Stability:** Unstable:

Stable: Yes (\*NFPA 1978)

**Conditions to Avoid:** Not Found

**Incompatibility** (Materials to Avoid): Not Found

**Hazardous Decomposition or Byproducts:** When heated to decomposition it emits highly toxic fumes of phosgene (\*Sax 1979). Hydrogen chloride fumes may be formed (\*CHRIS 1978).

**Hazardous Polymerization:** May Occur: Not Found

May Not Occur: Not Found

**Conditions to Avoid:** Not Found

## CHLOROETHANOL

### SECTION V -- HEALTH HAZARD DATA

**Routes of Entry:** Inhalation: Yes (\*Encyc Occupat Health and Safety 1983)  
Skin: Yes (\*Encyc Occupat Health and Safety 1983)  
Ingestion: Yes (\*Encyc Occupat Health and Safety 1983)

**Health Hazards (Acute, Delayed, and Chronic):** Very toxic; probable oral lethal dose in humans is 50-500 mg/kg or between 1 teaspoon and 1 ounce for a 70 kg (150 lb.) person (\*Gosselin 1976). Poisoning causes liver and kidney degeneration and irritates mucous membranes; it may be cumulative (\*Merck 1983). Several fatal cases with brain edema and lung edema have been reported from industrial exposure by inhalation and skin contact (\*Encyc Occupat Health and Safety 1983). It is more toxic by skin contact than orally (\*Merck 1983).

**Signs and Symptoms of Exposure:** It may cause nausea, vomiting, pains in head and chest, and stupefaction (\*Merck 1983). It can induce dizziness, visual disturbances, weakness, irregular breathing, shock, bluing of skin and coma (\*Encyc Occupat Health and Safety 1983).

**Medical Conditions Generally Aggravated by Exposure:** Not Found

**Emergency and First Aid Procedures:** Move victim to fresh air; call emergency medical care. If not breathing, give oxygen and establish respiration. In case of contact, immediately flush skin or eyes with running water for at least 15 minutes. Speed in removing from skin is of extreme importance. Remove and isolate contaminated clothing and shoes at site. Keep victim quiet and maintain normal body temperature. Effects may be delayed; keep victim under observation (DOT 1984, Guide 55).

### SECTION VI -- USE INFORMATION

Manufacture of insecticides; treating sweet potatoes before planting (\*Merck 1983); introduction of hydroxyethyl group in organic synthesis; used as a solvent (\*Hawley 1981); employed in separating butadiene from hydrocarbon mixtures (\*Clayton and Clayton 1981-82); intermediate for indigo and thiodiethylene glycol (\*SRI); used for removal of tar spots; and cleaning agent for machines (\*Browning 1965)

## CHLOROETHANOL

### SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE

(Steps to be Taken in Case Material is Released or Spilled)

Remove all ignition sources. Ventilate area of spill or leak. For small quantities, absorb on paper towels. Evaporate in a safe place (such as a fume hood). Allow sufficient time for evaporating vapors to completely clear the hood ductwork. Burn the paper in a suitable location away from combustible materials. Large quantities can be collected and atomized in a suitable combustion chamber equipped with an appropriate effluent gas cleaning device. It should not be allowed to enter a confined space, such as a sewer, because of the possibility of an explosion. Absorb it in vermiculite, dry sand, earth or a similar material and dispose in a secured sanitary landfill (\*NIOSH/OSHA 1981). Do not touch material. Rubber gloves offer little protection, since dangerous amounts may rapidly penetrate through rubber. Wear self-contained breathing apparatus and do not expose skin (\*CHRIS 1978; \*Clayton and Clayton 1981-82).

EPA CHEMICAL PROFILE

INTERIM

Date: October 31, 1985

Revision: \_\_\_\_\_

CHEMICAL IDENTITY -- ALLYLAMINE

CAS Registry Number: 107-11-9

Synonyms: 2-Propen-1-amine; 2-Propenylamine; 3-Amino-1-Propene;  
3-Aminopropene; 3-Aminopropylene; Monoallylamine

Chemical Formula:  $C_3H_7N$

Molecular Weight: 57.09

SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

OSHA PEL: Not Found

ACGIH TLV: Not Found

IDLH: Not Found

Other Limits Recommended: Toxicity information:  $LC_{50}$  inhalation  
(rat) 0.66 mg/liter/4 hours;  $LD_{50}$  dermal (rabbit) 35 mg/kg (\*NIOSH/RTECS  
1985)

SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

Boiling Point: 131-136°F, 55-58°C (\*Merck 1976)

Specific Gravity ( $H_2O=1$ ): 0.76 at 20°C/20°C (\*Merck 1976)

Vapor Pressure (mmHg): Not Found

Melting Point: Not Found

Vapor Density (AIR=1): 2.0 (\*NFPA 1978)

Evaporation Rate (Butyl acetate=1): Not Found

Solubility in Water: Miscible (\*Merck 1976)

Appearance and Odor: A colorless to light yellow liquid (\*NFPA 1984),  
strong ammonia odor (\*Merck 1976).

**ALLYLAMINE****SECTION III -- FIRE AND EXPLOSION HAZARD DATA**

**Flash Point** (Method Used): -20°F (CC) (\*NFPA 1978)

**Flammable Limits:**

LEL: 2.2% (\*NFPA 1978)

UEL: 22% (\*NFPA 1978)

**Extinguishing Methods:** Wear self-contained breathing apparatus and full protective clothing (\*NFPA 1978). Use dry chemical, alcohol foam, or carbon dioxide. Water may be used to keep exposed containers cool (\*NFPA 1978). Dike fire control water for later disposal. Withdraw immediately in case of rising sound from venting safety device or discoloration of tank due to fire (\*DOT 1984).

**Special Fire Fighting Procedures:** Keep unnecessary people away and isolate hazard area. Stay upwind and keep away from low areas. Isolate for 1/2 mile in all directions if tank car or truck is involved (\*DOT 1984).

**Unusual Fire and Explosion Hazards:** Flammable when exposed to heat, sparks, or flame (\*Sax 1975). Vapor forms explosive mixtures with air over a wide range. Use caution when approaching fire and applying water (\*NFPA 1978). Vapor explosion and poison hazard indoors, outdoors or in sewers. Runoff to sewer may create fire or explosion hazard (\*DOT 1984). Can react with oxidizing materials. When heated to decomposition, it emits toxic fumes (\*Sax 1975).

**SECTION IV -- REACTIVITY DATA**

**Stability:** Unstable:

Stable: Yes (\*NFPA 1978)

**Conditions to Avoid:** Avoid heating to decomposition (\*Sax 1978). May become unstable at elevated temperatures and pressures or may react with water with non-violent release of energy (\*NFPA 1978).

**Incompatibility** (Materials to Avoid): Oxidizing materials (\*Sax 1975).

**Hazardous Decomposition or Byproducts:** When heated to decomposition, it emits toxic fumes (\*Sax 1975).

**Hazardous Polymerization:** May Occur: Not Found  
May Not Occur: Not Found

**Conditions to Avoid:** Not Found

## ALLYLAMINE

### SECTION V -- HEALTH HAZARD DATA

**Routes of Entry:** Inhalation: Yes (\*NFPA 1978)  
Skin: Yes (\*NFPA 1978)  
Ingestion: Yes (\*Sax 1975)

**Health Hazards** (Acute, Delayed, and Chronic): Acute: an eye, skin, and respiratory tract irritant (\*NFPA 1978) which is highly toxic if inhaled or ingested and moderately toxic if absorbed on skin. Ingestion or inhalation may cause death or permanent injury after very short exposure to small quantities. Skin absorption may cause irreversible and reversible changes (\*Sax 1975). Toxic air concentration (TClo) in humans is 5 ppm over 5 minutes (\*NIOSH/RTECS 1985). Vapors are extremely unpleasant and may ensure voluntary avoidance of dangerous concentrations (\*Grant 1974). Will irritate nose and throat at 2.5 ppm (\*Patty 1963).

**Signs and Symptoms of Exposure:** Symptoms include irritation of nose, eyes, and mouth with tearing, runny nose, and sneezing (\*Patty 1963). Can cause excitement, convulsions, and death (\*Merck 1976).

**Medical Conditions Generally Aggravated by Exposure:** Not Found

**Emergency and First Aid Procedures:** Move victim to fresh air and call emergency medical care. Remove and isolate contaminated clothing and shoes at site. In case of contact, flush skin or eyes with water for 15 minutes. Keep victim quiet and maintain normal body temperature. Keep victim under careful watch since effects may be delayed (DOT 1984, Guide 28).

### SECTION VI -- USE INFORMATION

Used as a chemical intermediate for mercurial diuretics (\*SRI), as a pharmaceutical intermediate and in organic synthesis (\*Hawley 1977).

### SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE

(Steps to be Taken in Case Material is Released or Spilled)

For leaks or spills, use water spray to disperse vapors and protect men attempting to stop leak. Water spray may be used to flush spills away from exposures and to dilute spills to nonflammable mixtures (\*NFPA 1978). Shut off ignition sources and keep away all flames, smoking, or flares. Do not touch spilled material. Take up small spills with sand or other noncombustible absorbent material and place in containers for later disposal. For large spills, dike far ahead for later disposal (\*DOT 1984). Local exhaust or general ventilation methods should be used in enclosed spaces (\*Sax 1975). Do not breathe vapors. Wear proper respiratory protection, protective clothing, and eye protection (See Section V above).

EPA CHEMICAL PROFILE

INTERIM

Date: October 31, 1985

Revision: \_\_\_\_\_

CHEMICAL IDENTITY -- PROPIONITRILE

CAS Registry Number: 107-12-0

Synonyms: Cyanoethane; Ether Cyanatus; Ethyl Cyanide; Hydrocyanic Ether; Propanenitrile; Propionic Nitrile; Propiononitrile; Propyl nitrile

Chemical Formula:  $C_3H_5N$

Molecular Weight: 55.08

SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

OSHA PEL: Not Found

ACGIH TLV: TWA 5 mg (CN)/m<sup>3</sup> (skin) (\*ACGIH 1983)

IDLH: Not Found

**Other Limits Recommended:** Occupational exposure to nitriles recommended standard, air: TWA 14 mg/m<sup>3</sup> (\*NIOSH/RTECS 1985). Maximum allowable concentration (USSR) 0.3 mg/m<sup>3</sup> (as HCN) (Encyc Occupat Health and Safety 1983, p. 1445). Toxicity information: LC<sub>low</sub> inhalation (rat) 1.12 mg/liter/4 hours; LC<sub>50</sub> inhalation (mouse) 0.37 mg/liter/hour (\*NIOSH/RTECS 1985).

SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

Boiling Point: 207°F, 97.2°C (\*Merck 1983)

Specific Gravity (H<sub>2</sub>O=1): 0.8020 at 0°C/4°C (\*Merck 1983)

Vapor Pressure (mmHg): 40 at 22°C (\*Clayton and Clayton 1981-82)

Melting Point: -133°F, -91.8°C (\*Merck 1983)

Vapor Density (AIR=1): 1.9 (\*Clayton and Clayton 1981-82)

Evaporation Rate (Butyl acetate=1): Not Found

Solubility in Water: 11.9 g/100 ml at 40°C (\*Merck 1983)



## PROPIONITRILE

### SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS (Continued)

**Appearance and Odor:** Colorless (\*Clayton and Clayton 1981-82) liquid (Hawley 1981, p. 1428); pleasant, ethereal, sweetish odor (\*Merck 1983)

### SECTION III -- FIRE AND EXPLOSION HAZARD DATA

**Flash Point (Method Used):** 2°C (CC) (\*Bretherick 1979)

**Flammable Limits:**

LEL: 3.1% (\*Bretherick 1979)

UEL: Not Found

**Extinguishing Methods:** Small fires: dry chemical, carbon dioxide, water spray, and foam. Large fires: water spray, fog, or foam. Move containers from fire area if you can do it without risk. Dike fire control water for later disposal; do not scatter the material. Cool containers that are exposed to flames with water from the side until well after fire is out. Withdraw immediately in case of rising sound from venting safety device or any discoloration of tank due to fire (DOT 1984, Guide 28).

**Special Fire Fighting Procedures:** Keep unnecessary people away; isolate hazard area and deny entry. Stay upwind; keep out of low areas. Wear positive pressure breathing apparatus and special protective clothing. Isolate for 1/2 mile in all directions if tank car or truck is involved in fire (DOT 1984, Guide 28).

**Unusual Fire and Explosion Hazards:** When heated to decomposition, it emits toxic fumes of nitrogen oxides and cyanide (Sax 1984, p. 2300). It is a flammable/combustible material and may be ignited by heat, sparks or flames. Vapors may travel to a source of ignition and flash back. Container may explode in heat of fire. Vapor explosion and poison hazard indoors, outdoors or in sewers. Runoff to sewer may create fire or explosion hazard (DOT 1984, Guide 28).

### SECTION IV -- REACTIVITY DATA

**Stability:** Unstable:

Stable: Yes (\*NFPA 1978)

**Conditions to Avoid:** May become unstable at elevated temperatures and pressures (\*NFPA 1978).

**Incompatibility (Materials to Avoid):** Generates cyanide ions (\*Peer Review Committee). Poisonous on contact with acids (\*Merck 1983).

## PROPIONITRILE

### SECTION IV -- REACTIVITY DATA (Continued)

**Hazardous Decomposition or Byproducts:** Poisonous when heated to decomposition (\*Merck 1983). When heated to decomposition, it emits toxic fumes of nitrogen oxides and cyanides (Sax 1984, p. 2300).

**Hazardous Polymerization:** May Occur: Not Found  
May Not Occur: Not Found

**Conditions to Avoid:** Not Found

### SECTION V -- HEALTH HAZARD DATA

**Routes of Entry:** Inhalation: Yes (\*Deichman 1969)  
Skin: Yes (\*Deichman 1969)  
Ingestion: Yes (Sax 1984, p. 2300)

**Health Hazards (Acute, Delayed, and Chronic):** It is highly toxic (\*Encyc Occupat Health and Safety 1981). This super toxic compound has a probable oral lethal dose in humans of less than 5 mg/kg or a taste (less than 7 drops) for a 70 kg (150 lb.) person (\*Gosselin 1976). It is a mild to moderate skin and eye irritant (Weiss 1980, p. 1145).

**Signs and Symptoms of Exposure:** Can cause death (\*NFPA 1978). Exposure results in headache, dizziness, rapid pulse, deep-rapid breathing, nausea, vomiting, unconsciousness, convulsions and sometimes death (\*Rumack 1975 to Present). Chronic exposure over long periods may cause fatigue and weakness (\*Merck 1968). Can cause same general symptoms as hydrogen cyanide but onset of symptoms is likely to be slower (\*Clayton and Clayton 1981-82). Contact may cause burns to skin and eyes (DOT 1984, Guide 28).

**Medical Conditions Generally Aggravated by Exposure:** Not Found

**Emergency and First Aid Procedures:** Move victim to fresh air; call emergency medical care. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Remove and isolate contaminated clothing and shoes at the site. In case of contact with material, immediately flush skin or eyes with running water for at least 15 minutes (DOT 1984, Guide 28).

## PROPIONITRILE

### SECTION VI -- USE INFORMATION

It is used as a setting agent for resins; a raw material for some medicines (\*Rumack 1975 to Present) and a chemical intermediate for di-n-propylamine (\*SRI).

### SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE

(Steps to be Taken in Case Material is Released or Spilled)

Avoid breathing vapors and skin contact (see Section V above). Shut off ignition sources; no flares, smoking or flames in hazard area. Do not touch spilled material; stop leak if you can do it without risk. Use water spray to reduce vapors. Small spills: take up with sand or other noncombustible absorbent material and place into containers for later disposal. Large spills: dike far ahead of spill for later disposal (DOT 1984, Guide 28).

## EPA CHEMICAL PROFILE

### INTERIM

Date: October 31, 1985

Revision: \_\_\_\_\_

### CHEMICAL IDENTITY -- ACRYLONITRILE

CAS Registry Number: 107-13-1

**Synonyms:** 2-Propenenitrile; Acrylon; Acrylonitrile Monomer; Cyanoethylene; ENT 54; Fumigrain; Miller's Fumigrain; NCI-C50215; Propenenitrile; TL 314; VCN; Vinyl Cyanide

**Chemical Formula:**  $C_3H_3N$

**Molecular Weight:** 53.60

### SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

**OSHA PEL:** TWA 2 ppm; 10 ppm/15 minutes (\*NIOSH/RTECS 1985)

**ACGIH TLV:** Recognized carcinogenic or cocarcinogenic potential, with assigned TLV of 2 ppm (skin)(\*ACGIH 1983)

**IDLH:** 500 ppm (NIOSH/OSHA Joint Standards Completion Project, 1975)

**Other Limits Recommended:** Not Found

### SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

**Boiling Point:** 171°F, 77.3°C (\*Merck 1983)

**Specific Gravity ( $H_2O=1$ ):** 0.8004 at 25°C/4°C (\*Merck 1983)

**Vapor Pressure (mmHg):** 100 at 23°C (\*IARC 1972-1985)

**Melting Point:** -116°F, -82.0°C (\*Sax 1979)

**Vapor Density (AIR=1):** 1.9 (\*Clayton and Clayton 1981-82)

**Evaporation Rate (Butyl acetate=1):** Not Found

**Solubility in Water:** 7.35 parts dissolve in 100 parts water at 20°C (\*Merck 1983)

## ACRYLONITRILE

### SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS (Continued)

**Appearance and Odor:** Clear, colorless liquid (some technical grades slightly yellow) with a very slight odor of peach pits (\*Clayton and Clayton 1981-82; \*Lefaux 1968)

### SECTION III -- FIRE AND EXPLOSION HAZARD DATA

**Flash Point (Method Used):** 32°F, 0°C (\*Merck 1983)

**Flammable Limits:**

LEL: 3% (\*NFPA 1978)

UEL: 17% (\*NFPA 1978)

**Extinguishing Methods:** Small fires: dry chemical, carbon dioxide, water spray or foam. Large fires: water spray, fog or foam. Stay away from ends of tanks. Do not get water inside container. Cool containers that are exposed to flames with water from the side until well after fire is out. For massive fire in cargo area, use unmanned hose holder or monitor nozzles; if this is impossible, withdraw from area and let fire burn. Withdraw immediately in case of rising sound from venting safety device or any discoloration of tank due to fire (\*DOT 1984).

**Special Fire Fighting Procedures:** In advanced or massive fires, fire fighting should be done from a safe distance or a protected location (\*NFPA 1978). Isolate for 1/2 mile in all directions if tank car or truck is involved in fire (\*DOT 1984).

**Unusual Fire and Explosion Hazards:** Materials are too dangerous to health to expose fire fighters. A few whiffs of vapor could cause death or vapor or liquid could be fatal on penetrating the fire fighter's normal full protective clothing. The normal full protective clothing and breathing apparatus available to the average fire department will not provide adequate protection against inhalation or skin contact with these materials (\*NFPA 1978). Explosion hazard is moderate. It is flammable and explosive at normal room temperatures (\*Encyc Occupat Health and Safety 1971). Can react violently with strong acids, amines, strong alkalis (\*Sax 1979). Vapors may travel considerable distance to source of ignition and flash back. Dilute solutions are also hazardous (flash point of a solution of 2 percent in water is 70°F) (\*NFPA 1978).

## ACRYLONITRILE

### SECTION IV -- REACTIVITY DATA

**Stability:** Unstable: Yes (\*Clayton and Clayton 1981-82)  
Stable:

**Conditions to Avoid:** Moderate hazard is possible when it is exposed to flames, strong acids, amines and alkalis (\*Sax 1979).

**Incompatibility (Materials to Avoid):** Avoid strong acids, amines, alkalis (\*Sax 1979). Also, incompatible with strong oxidizers (especially bromine) copper and copper alloys (NIOSH/OSHA 1978, p. 42).

**Hazardous Decomposition or Byproducts:** When heated or burned, toxic hydrogen cyanide gas and oxides of nitrogen are formed (\*CHRIS 1978).

**Hazardous Polymerization:** May Occur: Yes (\*NFPA 1978)  
May Not Occur:

**Conditions to Avoid:** May polymerize spontaneously in the container, particularly in absence of oxygen or on exposure to visible light (\*Merck 1983). If polymerization occurs in containers, there is a possibility of violent rupture (\*NFPA 1978).

### SECTION V -- HEALTH HAZARD DATA

**Routes of Entry:** Inhalation: Yes (\*DOT 1984)  
Skin: Yes (\*DOT 1984)  
Ingestion: Yes (\*DOT 1984)

**Health Hazards (Acute, Delayed, and Chronic):** It is classified as very toxic. Probable oral lethal dose for human is 50-500 mg/kg (between 1 teaspoon and 1 oz.) for a 70 kg (150 lb.) person. Irritant skin dose -- 500 mg. Toxic concentrations have been reported at 16 ppm/20 min. (\*Gosselin 1976). Acute toxicity is similar to that due to cyanide poisoning and the level of cyanide ion in blood is related to the level of poisoning (\*Clayton and Clayton 1981-82). Inhalation or ingestion results in collapse and death due to tissue anoxia (lack of oxygen) and cardiac arrest (heart failure) (\*Encyc Occupat Health and Safety 1983).

**Signs and Symptoms of Exposure:** Acrylonitrile reaction causes redness, blisters and some systemic signs (\*Gosselin 1976). Symptoms derive from tissue anoxia in order of onset: limb weakness, dyspnea (difficult breathing), burning sensation in throat, dizziness, impaired judgment, cyanosis (turning blue), nausea, collapse, irregular breathing, convulsions and death. In later stages collapse, irregular breathing or convulsions and cardiac arrest may occur without warning. Some patients appear hysterical or may even be violent (\*Encyc Occupat Health and Safety 1983).

## ACRYLONITRILE

### SECTION V -- HEALTH HAZARD DATA (Continued)

Medical Conditions Generally Aggravated by Exposure: Not Found

**Emergency and First Aid Procedures:** Get emergency medical treatment immediately. If victim has taken the substance by ingestion (orally) and is not showing symptoms, give syrup of ipecac with salt solution or water. If there is exposure through skin contact, wash twice with soap and water. Exposed eyes should be flushed copiously with water for at least 15 minutes. If the victim stops breathing before emergency medical treatment is available, give artificial respiration or oxygen but avoid mouth to mouth resuscitation; also avoid contact with contaminated skin (Gosselin 1984, p. III-127; \*Rumack 1985).

### SECTION VI -- USE INFORMATION

Used primarily in plastics manufacturing as a copolymer and comonomer (\*SRI); to improve dye and working properties of acrylic fibers (\*Hamilton 1974); formerly used as a fumigant for food commodities (\*Farm Chemicals Handbook 1983).

### SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE

(Steps to be Taken in Case Material is Released or Spilled)

Wear proper respiratory protection, impervious protective clothing and proper eye protection (see Section V above). Shut off ignition sources; no flares, smoking or flames in hazard area. Do not touch material; stop leak if you can do so without risk. Use water spray to reduce vapors; do not get water inside container. Small spills: flush area with flooding amounts of water. Large spills: dike far ahead of spill for later disposal (\*DOT 1984). If leak or spill has not ignited, use water spray to disperse vapors (\*NFPA 1978). In case of a spill or leak from a drum or smaller container or a small leak from a tank, isolate for 90 feet in all directions. In case of a large spill from a tank or from many containers, first isolate for 180 feet in all directions, then evacuate in a downwind direction an area 0.4 miles long and 0.6 miles wide (DOT 1984, Table of Isolation and Evacuation Distances).

EPA CHEMICAL PROFILE

INTERIM

Date: October 31, 1985

Revision: \_\_\_\_\_

CHEMICAL IDENTITY -- ETHYLENEDIAMINE

CAS Registry Number: 107-15-3

Synonyms: 1,2-Diaminoethane; 1,2-Ethanediamine; 1,2-Ethylenediamine; beta-Aminoethylamine; Dimethylenediamine; Ethylendiamine

Chemical Formula:  $C_2H_8N_2$

Molecular Weight: 60.12

SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

OSHA PEL: TWA 10 ppm (25 mg/m<sup>3</sup>) (\*NIOSH/OSHA 1978)

ACGIH TLV: TWA 10 ppm (25 mg/m<sup>3</sup>) (\*ACGIH 1983)

IDLH: 2000 ppm (\*NIOSH/OSHA 1978)

Other Limits Recommended: Maximum allowable concentration (USSR):  
2 mg/m<sup>3</sup> (Encyc Occupat Health and Safety 1983, p. 141)

SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

Boiling Point: 241°F, 116°C (\*Merck 1983)

Specific Gravity (H<sub>2</sub>O=1): 0.898 at 25°C/4°C (\*Merck 1983)

Vapor Pressure (mmHg): 10.7 at 20°C (\*Hawley 1981)

Melting Point: 46°F, 8°C (\*Merck 1983)

Vapor Density (AIR=1): 2.07 (\*Sax 1975)

Evaporation Rate (Butyl acetate=1): Not Found

Solubility in Water: Very soluble in water (\*Weast 1979)

Appearance and Odor: Colorless, thick liquid (\*Sax 1975); ammonia-like odor (\*Encyc Occupat Health and Safety 1983)



## ETHYLENEDIAMINE

### SECTION III -- FIRE AND EXPLOSION HAZARD DATA

**Flash Point (Method Used):** 93°F, 34°C (CC); 150°F, 66°C (OC) (\*NFPA 1978)

**Flammable Limits:**

LEL: 4.2% (\*NFPA 1978)

UEL: 14.4% (\*NFPA 1978)

**Extinguishing Methods:** Use water spray, dry chemical, alcohol foam, or carbon dioxide (\*NFPA 1978).

**Special Fire Fighting Procedures:** Wear full protective clothing including gloves and boots. If necessary to enter closed area, wear full-faced gas masks with self-contained breathing apparatus. Do not use water in case of drum or tank fires (\*CHRIS 1978). If a leak or spill has not ignited, use water spray to reduce the vapors and dilute spills to nonflammable mixtures. Use water to keep fire-exposed containers cool (\*NFPA 1978).

**Unusual Fire and Explosion Hazards:** Burning rate: 2.2 mm/minute (\*CHRIS 1978). When exposed to heat or flame, the material has a moderate fire potential. The material can react readily with oxidizing materials (\*Sax 1975). Containers may explode in heat of fire (\*DOT 1984).

### SECTION IV -- REACTIVITY DATA

**Stability:** Unstable:

Stable: Yes (\*NFPA 1978)

**Conditions to Avoid:** Not Found

**Incompatibility (Materials to Avoid):** Carbon disulfide (\*NRC 1981); silver perchlorate (\*NFPA 1978); imines (\*Leleu MJ. 1979. CAH Notes Doc. 94:127-132); oxidizing materials (\*Sax 1975).

**Hazardous Decomposition or Byproducts:** Material emits nitrogen oxides when burned (\*Rumack 1975 to Present).

**Hazardous Polymerization:** May Occur:

May Not Occur: Yes (Weiss 1980, p. 430)

**Conditions to Avoid:** Not Found

## ETHYLENEDIAMINE

### SECTION V -- HEALTH HAZARD DATA

**Routes of Entry:** Inhalation: Yes (\*Arena 1979)  
Skin: Yes (\*Rumack 1975 to Present)  
Ingestion: Yes (\*Rumack 1975 to Present)

**Health Hazards** (Acute, Delayed, and Chronic): Vapor inhalations at a concentration of 200 ppm for 5 to 10 minutes will lead to nasal irritation and produce a tingling sensation. Inhalation at concentrations of 400 ppm or greater leads to severe nasal irritation (\*Clayton and Clayton 1981-82). Respiratory irritation may result (Gosselin 1984, p. II-206). Many individuals are hypersensitive to ethylenediamine exposure; therefore, safe threshold limits are difficult to set (\*ACGIH 1980).

**Signs and Symptoms of Exposure:** For inhalation, wheezing, heaviness in the chest, and severe asthma may result. Ingestion will cause burns of the mouth, esophagus, and stomach. Eye contact will cause serious burns. Short single exposure to skin is likely to produce a skin burn, and prolonged or repeated exposure will cause serious skin burns (\*Rumack 1975 to Present).

**Medical Conditions Generally Aggravated by Exposure:** Not Found

**Emergency and First Aid Procedures:** Move victim to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Remove and isolate contaminated clothing at the site. In case of contact with the material, immediately flush skin or eyes for 15 minutes with running water. Keep victim quiet and maintain body temperature (\*DOT 1984). For oral ingestion, immediately dilute with milk or water (\*Rumack 1975 to Present).

### SECTION VI -- USE INFORMATION

A solvent for casein, albumin, shellac, and sulfur; an emulsifier; stabilizer for rubber latex; inhibitor in antifreeze solutions; pharmaceutical aid (\*Merck 1983); intermediate in synthesis of carbamate fungicides and chelating agents (\*SRI). An algicide and fungicide (USEPA/Pesticide Index 1985).

## ETHYLENEDIAMINE

### SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE

(Steps to be Taken in Case Material is Released or Spilled)

Shut off ignition sources. Stop leak if possible without risk. Do not touch spilled material. Use water spray to reduce vapors. Do not get water inside containers. For small spills, absorb with sand or other noncombustible absorbent material and place into containers for later disposal. For large spills, dike far ahead of spill for later disposal. Keep unnecessary people away and isolate area. Stay upwind and keep out of low areas. Wear self-contained positive-pressure breathing apparatus and full protective clothing. Isolate area for 1/2 mile in all directions if tank car or truck is involved in fire (\*DOT 1984).

EPA CHEMICAL PROFILE

INTERIM

Date: October 31, 1985

Revision: \_\_\_\_\_

CHEMICAL IDENTITY -- FORMALDEHYDE CYANOHYDRIN

CAS Registry Number: 107-16-4

**Synonyms:** Acetonitrile, Hydroxy-; 2-Hydroxyacetonitrile; alpha-Hydroxyacetonitrile; alpha-Hydroxymethylcyanide; Cyanomethanol; Glycolic Nitrile; Glyconitrile; Hydroxyacetonitrile; Hydroxymethylnitrile; Methylene Cyanohydrin; USAF A-8565

**Chemical Formula:**  $C_2H_3NO$

**Molecular Weight:** 57.06

SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

OSHA PEL: Not Found

ACGIH TLV: Not Found

IDLH: Not Found

**Other Limits Recommended:** Recommended NIOSH standard air ceiling concentration is 5 mg/m<sup>3</sup>/15 minutes (\*NIOSH/RTECS 1985). Toxicity information: LC<sub>low</sub> inhalation (rat) 0.58 mg/liter for 4 hours (\*NIOSH/RTECS 1985).

SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

**Boiling Point:** 361°F, 183°C, with slight decomposition (\*Weast 1979)

**Specific Gravity (H<sub>2</sub>O=1):** Not Found

**Vapor Pressure (mmHg):** 1 at 63°C (\*Patty 1963)

**Melting Point:** Less than -98°F, less than -72°C (\*Weast 1979)

**Vapor Density (AIR=1):** 1.96 (\*Patty 1963)

**Evaporation Rate (Butyl acetate=1):** Not Found

**Solubility in Water:** Soluble (\*Patty 1963)

## FORMALDEHYDE CYANOHYDRIN

### SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS (Continued)

**Appearance and Odor:** Colorless oil (\*Sax 1979); odorless (\*Encyc Occupat Health and Safety 1971); sweetish taste (\*Patty 1963)

### SECTION III -- FIRE AND EXPLOSION HAZARD DATA

**Flash Point (Method Used):** Not Found

**Flammable Limits:**

LEL: Not Found

UEL: Not Found

**Extinguishing Methods:** (Non-Specific -- Acetonitrile) Do not extinguish fire if material is leaking and flow cannot be stopped. Use water in flooding quantities as fog. Use alcohol foam, carbon dioxide, or dry chemical (Student 1981, pp. 3-4).

**Special Fire Fighting Procedures:** (Non-Specific -- Acetonitrile) Cool containers with flooding quantities of water. Apply water from as far away as possible. Avoid breathing vapors. Keep upwind. Wear self-contained breathing apparatus. Avoid bodily contact with the material. Wear boots, protective gloves, and goggles (Student 1981, pp. 3-4).

**Unusual Fire and Explosion Hazards:** Moderate explosion hazard when exposed to heat or by spontaneous chemical reaction in the presence of alkalis if uninhibited (\*Sax 1979). When heated to decomposition, it emits toxic fumes of cyanide and nitrogen oxides (Sax 1984, p. 1556).

### SECTION IV -- REACTIVITY DATA

**Stability:** Unstable: Yes (\*Bretherick 1979)  
Stable:

**Conditions to Avoid:** May explode on standing (\*Bretherick 1979).

**Incompatibility (Materials to Avoid):** Not Found

**Hazardous Decomposition or Byproducts:** When heated to decomposition, it emits highly toxic cyanide and nitrogen oxide fumes (Sax 1984, p. 1556)

**Hazardous Polymerization:** May Occur: Yes (\*Sax 1979)  
May Not Occur:

**Conditions to Avoid:** Presence of alkalis, and exposure to heat (\*Sax 1979)

## FORMALDEHYDE CYANOHYDRIN

### SECTION V -- HEALTH HAZARD DATA

**Routes of Entry:** Inhalation: Yes (\*Rumack 1975 to Present)  
Skin: Yes (\*Hawley 1977)  
Ingestion: Yes (\*Rumack 1975 to Present)

**Health Hazards** (Acute, Delayed, and Chronic): Extremely toxic (\*Patty 1963); exposure by any route should be avoided; may have fatal consequences; death from asphyxiation may occur similar to that resulting from hydrogen cyanide (\*Encyc Occupat Health and Safety 1971).

**Signs and Symptoms of Exposure:** Similar to cyanide poisoning. Odor of bitter almonds on patient's breath may or may not be present. Vomiting, palpitations, confusion, anxiety, and vertigo may follow exposure. Respiration may initially be rapid, then slow and labored, followed by coma and convulsions (\*Rumack 1975 to Present).

**Medical Conditions Generally Aggravated by Exposure:** Not Found

**Emergency and First Aid Procedures:** (Non-Specific -- Acetonitrile) Move victim to fresh air; call emergency medical care. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Remove and isolate contaminated clothing and shoes at the site. In case of contact with material, immediately flush skin or eyes with running water for at least 15 minutes. Keep victim quiet and maintain normal body temperature. Effects may be delayed; keep victim under observation (DOT 1984, Guide 28).

### SECTION VI -- USE INFORMATION

This material is used in the manufacture of intermediates in pharmaceutical production and as a component of synthetic resins (\*Encyc of Occupat Health and Safety 1971), as a chemical intermediate for organic compounds, and as a solvent (\*SRI).

### SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE

(Steps to be Taken in Case Material is Released or Spilled)

(Non-Specific -- Acetonitrile) Build dikes to contain flow as necessary. Use water spray to disperse vapors and dilute standing pools of liquid. Avoid breathing vapors. Keep upwind. Wear self-contained breathing apparatus. Avoid bodily contact with the material. Wear boots, protective gloves, and goggles (Student 1981, pp. 3-4).

EPA CHEMICAL PROFILE

INTERIM

Date: October 31, 1985

Revision: \_\_\_\_\_

CHEMICAL IDENTITY -- ALLYL ALCOHOL

CAS Registry Number: 107-18-6

Synonyms:- (NIOSH/RTECS 1983 Synonyms, Volume 1, p. 308) AA; Allyl Al;  
Allylic Alcohol; 2-Propen-1-ol; Vinylcarbinol; Propenyl Alcohol;  
1-Propene-3-ol; 3-Hydroxypropene; Orvinylcarbinol; Propenol; Propen-1-ol-3;  
2-Vinylcarbinol; 2-Propenyl Alcohol; Shell Unkrautt A; Weed Drench

Chemical Formula:  $C_3H_6O$

Molecular Weight: 58.09

SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

OSHA PEL: TWA 2 ppm (skin) (\*NIOSH/RTECS 1985)

ACGIH TLV: TWA 2 ppm; STEL 4 ppm (skin) (\*ACGIH 1983)

IDLH: 150 ppm (NIOSH/OSHA 1978, p.44)

Other Limits Recommended: Not Found

SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

Boiling Point: 206°F, 97°C (\*Merck 1976)

Specific Gravity ( $H_2O=1$ ): 0.854 at 20°C/4°C (\*Merck 1976)

Vapor Pressure (mmHg): 23.8 at 25°C (\*Sunshine 1969)

Melting Point: -200°F, -129°C; freezes at -50°C (Weast 1980, p. C-466)

Vapor Density (AIR=1): 2.0 (\*Patty 1963)

Evaporation Rate (Butyl acetate=1): Not Found

## ALLYL ALCOHOL

### SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS (Continued)

**Solubility in Water:** Soluble (\*Weast 1979)

**Appearance and Odor:** Mobile, colorless liquid with a pungent mustard odor (\*Merck 1976, \*Martin 1974). Forms a glass at  $-190^{\circ}\text{C}$  (\*Worthing 1979).

### SECTION III -- FIRE AND EXPLOSION HAZARD DATA

**Flash Point** (Method Used):  $22^{\circ}\text{C}$  (CC),  $32^{\circ}\text{C}$  (OC) (\*Patty 1963)

**Flammable Limits:**

LEL: 2.5% (\*Sunshine 1969)

UEL: 18% (\*Sunshine 1969)

**Extinguishing Methods:** Extinguish with dry chemical, alcohol foam, or carbon dioxide (\*NFPA 1978). Dike fire control water for later disposal and do not scatter the material (DOT 1984, Guide 28).

**Special Fire Fighting Procedures:** Water may be ineffective on fire. Cool exposed containers with water. Wear goggles, self-contained breathing apparatus, rubber overclothing, gloves (Weiss 1980, p. 63).

**Unusual Fire and Explosion Hazards:** Allyl alcohol vapor may explode if ignited in confined areas. Combustion products may be poisonous. The vapor is heavier than air and flashback along vapor trail may occur (Weiss 1980, p. 63). Gives off toxic fumes when heated (\*NFPA 1978).

### SECTION IV -- REACTIVITY DATA

**Stability:** Unstable:

Stable: Yes (\*NFPA 1978)

**Conditions to Avoid:** Not Found

**Incompatibility** (Materials to Avoid): May react vigorously with oxidizing materials, carbon tetrachloride, acids, oleum, sodium hydroxide, diallyl phosphite, potassium chloride, or tri-n-bromomelamine (Sax 1984, p. 159).

**Hazardous Decomposition or Byproducts:** Gives off toxic fumes when heated (\*NFPA 1978).

**Hazardous Polymerization:** May Occur: Not Found  
May Not Occur: Not Found

**Conditions to Avoid:** Not Found



## ALLYL ALCOHOL

### SECTION V -- HEALTH HAZARD DATA

**Routes of Entry:** Inhalation: Yes (Weiss 1980, p. 63)  
Skin: Yes (Weiss 1980, p. 63)  
Ingestion: Yes (Weiss 1980, p. 63)

**Health Hazards** (Acute, Delayed, and Chronic): Allyl alcohol is an intense irritant to skin, eyes, nose, and throat (Weiss 1980, p. 63). It causes burns on contact, and may cause pulmonary edema if inhaled. It is poisonous in small quantities. The probable oral lethal dose is 50-500 mg/kg, or between 1 teaspoonful and 1 ounce for a 150-lb. person (Gosselin 1984, p. II-98).

**Signs and Symptoms of Exposure:** Allyl alcohol vapor can cause irritation of eyes, nose and throat. Eye irritation may be accompanied by sensitivity to light and pain in eyeball. The pain may not begin until 6 hours after exposure. Contact with the liquid may cause first and second degree burns of skin and blister formation. Areas of contact will become swollen and painful and local muscle spasms may occur (Weiss 1980, p. 63).

**Medical Conditions Generally Aggravated by Exposure:** Not Found

**Emergency and First Aid Procedures:** Move victim to fresh air; call emergency medical care. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Remove and isolate contaminated clothing and shoes at the site. In case of contact with material, immediately flush skin or eyes with running water for at least 15 minutes. Keep victim quiet and maintain normal body temperature. Effects may be delayed; keep victim under observation (DOT 1984, Guide 28).

### SECTION VI -- USE INFORMATION

Allyl alcohol is used in the production of allyl esters, which are used as monomers and prepolymers in the manufacture of resins and plastics. It is also used in the preparation of pharmaceuticals, organic synthesis of glycerol and acrolein, and as a fungicide and herbicide (\*SRI; \*Merck 1976; \*Browning 1965).

## ALLYL ALCOHOL

### SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE

(Steps to be Taken in Case Material is Released or Spilled)

Keep unnecessary people away; isolate hazard area and deny entry. Stay upwind; keep out of low areas. Wear positive pressure breathing apparatus and special protective clothing. Isolate for 1/2 mile in all directions if tank car or truck is involved in fire. Shut off ignition sources; no flares, smoking or flames in hazard area. Do not touch spilled material; stop leak if you can do so without risk. Use water spray to reduce vapors. Small spills: absorb with sand or other noncombustible absorbent material and place into containers for later disposal. Large spills: dike far ahead of spill for later disposal (DOT 1984, Guide 28).

## EPA CHEMICAL PROFILE

### INTERIM

Date: October 31, 1985

Revision: \_\_\_\_\_

## CHEMICAL IDENTITY -- CHLOROACETALDEHYDE

CAS Registry Number: 107-20-0

**Synonyms:** 2-Chloro-1-Ethanal; 2-Chloroacetaldehyde; Acetaldehyde, Chloro-; Chloroacetaldehyde Monomer; Chloroaldehyde; Chloroethanal; Monochloroacetaldehyde

**Chemical Formula:**  $C_2H_3ClO$

**Molecular Weight:** 78.50

## SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

**OSHA PEL:** Air 1 ppm ceiling limit (\*NIOSH/RTECS 1985)

**ACGIH TLV:** 1 ppm ceiling limit (\*ACGIH 1984)

**IDLH:** Not Found

**Other Limits Recommended:** Toxicity information:  $LD_{50}$  oral (mouse)  
21 mg/kg (\*NIOSH/RTECS 1985)

## SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

**Boiling Point:** 185-187°F, 85-86°C (\*Merck 1983)

**Specific Gravity ( $H_2O=1$ ):** 1.19 at 25°C/25°C (Sax 1984, p. 675)

**Vapor Pressure (mmHg):** 100 at 20°C (NIOSH/OSHA 1978, p. 64)

**Melting Point:** Not Found

**Vapor Density (AIR=1):** Not Found

**Evaporation Rate (Butyl acetate=1):** Not Found

**Solubility in Water:** Soluble (ACGIH 1980a, p. 84)

**Appearance and Odor:** Clear, colorless liquid (\*ACGIH 1980a); acrid, penetrating odor (\*Merck 1983).

## CHLOROACETALDEHYDE

## SECTION III -- FIRE AND EXPLOSION HAZARD DATA

**Flash Point (Method Used):** 190°F, 88°C (no method given) (Sax 1984, p. 675)

**Flammable Limits:** Moderate fire hazard when exposed to heat or flame (Sax 1984, p. 676)

**LEL:** Not Found

**UEL:** Not Found

**Extinguishing Methods:** Extinguish with water, foam, carbon dioxide, or dry chemical (Sax 1984, p. 676). Large fires use water spray, fog, or foam (\*DOT 1984).

**Special Fire Fighting Procedures:** Wear positive pressure breathing apparatus and special protective clothing. Dike fire control water for later disposal; do not scatter the material (\*DOT 1984).

**Unusual Fire and Explosion Hazards:** This material may burn but does not ignite easily. Cylinders may explode in the heat of fire (\*DOT 1984).

## SECTION IV -- REACTIVITY DATA

**Stability: Unstable:** Not Found

**Stable:** Not Found

**Conditions to Avoid:** Not Found

**Incompatibility (Materials to Avoid):** Reacts with oxidizing materials (Sax 1984, p. 676).

**Hazardous Decomposition or Byproducts:** When heated to decomposition or on contact with acids or acid fumes, the compound evolves highly toxic chloride fumes. Some organic chlorides decompose to yield phosgene (\*Sax 1979).

**Hazardous Polymerization:** **May Occur:** Yes (\*Merck 1983)  
**May Not Occur:**

**Conditions to Avoid:** Not Found

## SECTION V -- HEALTH HAZARD DATA

**Routes of Entry: Inhalation:** Yes (\*Sax 1975)

**Skin:** Yes (\*Sax 1975)

**Ingestion:** Yes (\*Sax 1975)

## CHLOROACETALDEHYDE

### SECTION V -- HEALTH HAZARD DATA (Continued)

**Health Hazards** (Acute, Delayed, and Chronic): On single, prolonged, or repeated exposure, it presents serious eye hazards. Vapor concentrations which produce eye, nose, and throat irritation are attainable at room conditions. It does have mutagenic effects (ACGIH 1980a, p. 82).

**Signs and Symptoms of Exposure:** Inhalation exposure causes eye, nose and throat irritation (\*ACGIH 1980a). On contact, the material is capable of causing marked to severe burns (ACGIH 1980a, p. 82).

**Medical Conditions Generally Aggravated by Exposure:** Not Found

**Emergency and First Aid Procedures:** Move victim to fresh air; call emergency medical care. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In case of contact with material, immediately flush skin or eyes with running water for at least 15 minutes. Speed in removing material from skin is of extreme importance. Remove and isolate contaminated clothing and shoes at the site (\*DOT 1984). In case of ingestion, dilute with milk or water. Do not induce vomiting (\*Rumack 1975 to Present).

### SECTION VI -- USE INFORMATION

It is used as a chemical intermediate (\*SRI); in the manufacture of 2-aminothiazole (\*Merck 1983) and as a fungicide (\*Hawley 1981).

### SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE

(Steps to be Taken in Case Material is Released or Spilled)

Avoid inhalation of vapors (see Section V above). Do not touch spilled material; stop leak; use water spray to reduce vapors. Small spills: take up with sand or other noncombustible absorbent material and place into containers for later disposal. Large spills: dike far ahead of spill for later disposal. Keep unnecessary people away; isolate hazard area and deny entry. Stay upwind; keep out of low areas. Ventilate closed spaces before entering them. Wear positive pressure breathing apparatus and special protective clothing. Remove and isolate contaminated clothing at the site. In case of contact with material, immediately flush skin or eyes with running water for at least 15 minutes (\*DOT 1984).

## EPA CHEMICAL PROFILE

### INTERIM

Date: October 31, 1985

Revision: \_\_\_\_\_

## CHEMICAL IDENTITY -- CHLOROMETHYL METHYL ETHER

CAS Registry Number: 107-30-2

**Synonyms:** Chlorodimethyl Ether; Chloromethoxymethane; CMME; Dimethyl-chloroether; Ether, Chloromethyl Methyl; Ether Dimethyl Chloro; Methane, Chloromethoxy-; Methoxychloromethane; Methoxymethyl Chloride; Methylchloromethyl Ether; Methylchloromethyl Ether, Anhydrous; Monochlorodimethyl Ether; Monochloromethyl Methyl Ether

**Chemical Formula:**  $C_2H_5ClO$

**Molecular Weight:** 80.52

## SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

OSHA PEL: Not Found

ACGIH TLV: Not Found

IDLH: Not Found

**Other Limits Recommended:** Industrial substance suspect of carcinogenic potential for humans (ACGIH 1984, p. 43). Toxicity information:  $LC_{50}$  inhalation (rat) 0.182 mg/liter/7 hours (\*NIOSH/RTECS 1985).

## SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

**Boiling Point:** 138°F, 59°C (\*IARC 1972-1985)

**Specific Gravity** ( $H_2O=1$ ): 1.0605 at 20/4°C (\*IARC 1972-1985)

**Vapor Pressure** (mmHg): Not Found

**Melting Point:** -154.3°F, -103.5°C (\*Encyc Occupat Health and Safety 1971)

**Vapor Density** (AIR=1): Not Found

**Evaporation Rate** (Butyl acetate=1): Not Found

CHLOROMETHYL METHYL ETHER

SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS (Continued)

**Solubility in Water:** Decomposes (Weast 1979, p. C-300)

**Appearance and Odor:** Colorless liquid with an irritating odor (\*IARC 1972-1985, \*CHRIS 1978)

SECTION III -- FIRE AND EXPLOSION HAZARD DATA

**Flash Point (Method Used):** 0°C (OC) (\*CHRIS 1978); less than 73.4°F (Sax 1984, p. 738)

**Flammable Limits:**

LEL: Not Found

UEL: Not Found

**Extinguishing Methods:** Extinguish with dry chemicals, foam, or carbon dioxide. Water may be ineffective in extinguishing fire (\*CHRIS 1978).

**Special Fire Fighting Procedures:** Move container from fire area. Dike fire control water for later disposal; do not scatter material. Cool containers that are exposed to flames with water. Withdraw immediately in case of rising sound from venting safety device or any discoloration of tank due to fire (\*DOT 1984).

**Unusual Fire and Explosion Hazards:** Flammable/combustible material; may be ignited by heat, sparks, or flames. Vapors may travel to a source of ignition and flash back. Container may explode in heat of fire (\*DOT 1984). In addition to the risk of explosion, when air mixtures of ether vapors are heated or exposed to flame or sparks, they tend to form peroxides. Ethers containing peroxides can detonate when heated (\*Sax 1975). Unburned material may form powerful tear gas. When wet, also forms irritating formaldehyde gas (Weiss 1980, p. 251).

SECTION IV -- REACTIVITY DATA

**Stability:** Unstable:

Stable: Yes (\*CHRIS 1978)

**Conditions to Avoid:** Decomposing heat (Sax 1984, p. 738)

**Incompatibility (Materials to Avoid):** Not Found

**Hazardous Decomposition or Byproducts:** Evolves formaldehyde and hydrogen chloride (\*CHRIS 1978). When heated to decomposition, it emits toxic fumes of chlorides (Sax 1984, p. 738).

## CHLOROMETHYL METHYL ETHER

### SECTION IV -- REACTIVITY DATA (Continued)

**Hazardous Polymerization:** May Occur:  
May Not Occur: Yes (Weiss 1980, p. 251)

**Conditions to Avoid:** Not Found

### SECTION V -- HEALTH HAZARD DATA

**Routes of Entry:** Inhalation: Yes (\*DOT 1984)  
Skin: Yes (\*DOT 1984)  
Ingestion: Yes (\*DOT 1984)

**Health Hazards** (Acute, Delayed, and Chronic): The principal effect is irritation. The liquid causes severe irritation of eyes and skin; and vapor exposure of 100 ppm is severely irritating to eyes and nose. This level is dangerous to life in 4 hours. Pulmonary edema or pneumonia may cause death (\*Encyc Occupat Health and Safety 1971). There was increased death rate from respiratory cancer among exposed victims (\*IARC 1972-1985) and it is a regulated carcinogen (\*Aldrich 1984).

**Signs and Symptoms of Exposure:** Sore throat, fever, chills, difficulty in breathing (\*Patty 1963), pulmonary edema with frothy exudate (\*Gosselin 1976), and severe skin and eye irritation (\*Encyc Occupat Health and Safety 1983) have been reported.

**Medical Conditions Generally Aggravated by Exposure:** Not Found

**Emergency and First Aid Procedures:** Move victim to fresh air; call emergency medical care. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Remove and isolate contaminated clothing and shoes at the site. In case of contact with material, immediately flush skin or eyes with running water for at least 15 minutes (\*DOT 1984).

### SECTION VI -- USE INFORMATION

Intermediate in synthesis of chloromethylated compounds (\*IARC 1972-1985); anion-exchange resins; dodecylbenzyl chloride; and chloromethylating reaction mixtures (\*SRI).



## CHLOROMETHYL METHYL ETHER

### SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE

(Steps to be Taken in Case Material is Released or Spilled)

Wear positive pressure breathing apparatus and full protective clothing. Shut off ignition sources; no flares, smoking, or flames. Do not touch spilled material; stop leak if you can do so without risk. Use water spray to reduce vapors. Absorb small spills with sand or other noncombustible absorbent material and place into containers for later disposal. Dike far ahead of large spills for later disposal (\*DOT 1984). Flood with water. Rinse with sodium bicarbonate or lime solution (\*CHRIS 1978).

EPA CHEMICAL PROFILE

INTERIM

Date: October 31, 1985

Revision: \_\_\_\_\_

CHEMICAL IDENTITY -- SARIN

CAS Registry Number: 107-44-8

Synonyms: (NIOSH/RTECS 1983 Synonyms, Volume 3, p. 122)

Phosphonofluoridic Acid, Methyl-, Isopropyl Ester; GB; IMPF;  
Isopropoxymethylphosphoryl Fluoride; Isopropyl Methanefluorophosphonate;  
Isopropyl Methylfluorophosphate; Isopropyl-Methyl-Phosphoryl Fluoride;  
Methylphosphonofluoridic Acid Isopropyl Ester; MFI; Phosphine Oxide,  
Fluoroisopropoxymethyl; Phosphoric Acid, Methylfluoro-, Isopropyl Ester; Sarin  
II; T-144; T-2106; TL 1618; Trilone 46

Chemical Formula:  $C_4H_{10}FO_2P$

Molecular Weight: 140.11

SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

OSHA PEL: Not Found

ACGIH TLV: Not Found

IDLH: Not Found

Other Limits Recommended: Toxicity information:  $LC_{10\%}$  inhalation  
(guinea pig) 0.128 mg/liter for 2 minutes (\*NIOSH/RTECS 1985)

SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

Boiling Point: 297°F, 147°C (Merck 1983, p. 1204)

Specific Gravity ( $H_2O=1$ ): 1.10 at 20°C/4°C (Merck 1983, p. 1204)

Vapor Pressure (mmHg): 2.9 at 25°C (U.S. Army 1975, p. 3-4)

Melting Point: -71°F, -57°C (Merck 1983, p. 1204)

Vapor Density (AIR=1): 4.86 (U.S. Army 1975, p. 3-4)

Evaporation Rate (Butyl acetate=1): About the same as water (U.S. Army  
1975, p. 3-4)

**SARIN**

**SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS (Continued)**

**Solubility in Water:** Miscible with and hydrolyzed by water (Merck 1983, p. 1204)

**Appearance and Odor:** Liquid (Merck 1983, p. 1204). A colorless liquid and vapor. Almost no odor in pure state (U.S. Army 1975, p. 3-3 to 3-4).

**SECTION III -- FIRE AND EXPLOSION HAZARD DATA**

**Flash Point (Method Used):** Non-flammable (U.S. Army 1975, p. 3-4)

**Flammable Limits:**

LEL: Not Found

UEL: Not Found

**Extinguishing Methods:** Extinguish with foam, carbon dioxide, and dry chemical (Sax 1984, p. 1662)

**Special Fire Fighting Procedures:** Protective clothing and respiratory protection (U.S. Army 1975, p. 3-5).

**Unusual Fire and Explosion Hazards:** Non-flammable (U.S. Army 1975, p. 3-5)

**SECTION IV -- REACTIVITY DATA**

**Stability: Unstable:**

**Stable:** Yes (U.S. Army 1975, p. 3-4)

**Conditions to Avoid:** Not Found

**Incompatibility (Materials to Avoid):** Slightly corrosive to steel (U.S. Army 1975, p. 3-4). Hydrolyzed by water (Merck 1983, p. 1204).

**Hazardous Decomposition or Byproducts:** Acidic conditions produce hydrogen fluoride; alkaline conditions produce isopropyl alcohol and polymers (U.S. Army 1975, p. 3-4). When heated to decomposition or reacted with steam, it emits very toxic fumes of fluorides and oxides of phosphorus (Sax 1984, p. 1662).

**Hazardous Polymerization: May Occur:** Not Found

**May Not Occur:** Not Found

**Conditions to Avoid:** Not Found

## SARIN

### SECTION V -- HEALTH HAZARD DATA

**Routes of Entry:** Inhalation: Yes (U.S. Army 1975, p. 3-4)  
Skin: Yes (U.S. Army 1975, p. 3-4)  
Ingestion: Yes (U.S. Army 1975, p. 3-4)

**Health Hazards (Acute, Delayed, and Chronic):** Extremely toxic; lethal dose in humans may be as low as 0.01 mg/kg. Extremely active cholinesterase inhibitor. Toxic effects similar to, but more severe than those of parathion (Merck 1983, p. 1204). Death within 15 minutes after fatal dose is absorbed (U.S. Army 1975, p. 3-4).

**Signs and Symptoms of Exposure:** Symptoms include difficulty in breathing, drooling, excessive sweating, nausea, vomiting, cramps, involuntary defecation and urination, twitching, jerking, staggering, headache, confusion, drowsiness, coma, convulsion, dimness of vision, and pinpoint pupils (U.S. Army 1975, p. 3-3).

**Medical Conditions Generally Aggravated by Exposure:** Not Found

**Emergency and First Aid Procedures:** Immediate decontamination of the smallest drop is essential. Vapor penetrates the skin (U.S. Army 1975, p. 3-4). Toxic effects are similar to parathion (Sax 1984, p. 1662). Treatment for parathion is as follows: move victim to fresh air; call emergency medical care. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In case of contact with material, immediately flush skin or eyes with running water for at least 15 minutes. Speed in removing material from skin is of extreme importance. Remove and isolate contaminated clothing and shoes at the site. Keep victim quiet and maintain normal body temperature. Effects may be delayed; keep victim under observation (DOT 1984, Guide 55).

### SECTION VI -- USE INFORMATION

Quick-acting military chemical nerve agent (U.S. Army, p. 3-4). Chemical warfare agent (Merck 1983, p. 1204).

### SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE (Steps to be Taken in Case Material is Released or Spilled)

Protective mask with self-contained breathing apparatus and full protective clothing (U.S. Army 1975, p. 3-4). Rapidly hydrolyzed by dilute aqueous sodium hydroxide or sodium carbonate forming relatively non-toxic products. Water alone removes the fluorine atom producing a non-toxic acid (Merck 1983, p. 1204). Decontaminants include bleach slurry, dilute alkali, hot soapy water, steam and ammonia (U.S. Army 1975, p. 3-4).

EPA CHEMICAL PROFILE

INTERIM

Date: October 31, 1985

Revision: \_\_\_\_\_

CHEMICAL IDENTITY -- TEPP

CAS Registry Number: 107-49-3

**Synonyms:** Pyrophosphoric Acid, Tetraethyl Ester (Dry Mixture); Bis-O,O-Diethylphosphoric Anhydride; Bladan; Diphosphoric Acid, Tetraethyl Ester; ENT 18,771; Ethyl Pyrophosphate [ET4P207]; Ethyl Pyrophosphate, Tetra-; Fosvex; Grisol; Hept; Hesamite; Hexamite; Killax; Kilmite 40; Lethalaire G-52; Lirohex; Mortopal; Nifos; Nifos T; Nifost; TEP; Terrasytam; Tetraethyl Diphosphate; Tetraethylpyrophosphate; Tetrastigmine; Tetron; Tetron-100; Vapotone; Vaptone

**Chemical Formula:**  $C_8H_{20}O_7P_2$

**Molecular Weight:** 290.22

SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

**OSHA PEL:** 0.05 mg/m<sup>3</sup> (NIOSH/OSHA 1978, p. 174)

**ACGIH TLV:** TWA 0.004 ppm, 0.05 mg/m<sup>3</sup>; STEL 0.01 ppm, 0.2 mg/m<sup>3</sup> (ACGIH 1983, p. 32)

**IDLH:** 10 mg/m<sup>3</sup> (NIOSH/OSHA 1978, p. 174)

**Other Limits Recommended:** Not Found

SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

**Boiling Point:** 280°F, 138°C at 2.3 mm (\*Merck 1983)

**Specific Gravity (H<sub>2</sub>O=1):** 1.185 at 20°C/4°C (\*Merck 1983)

**Vapor Pressure (mmHg):**  $4.7 \times 10^{-4}$  at 30°C (\*Merck 1976)

**Melting Point:** 32°F, 0°C (NIOSH/OSHA 1978, p. 174)

**Vapor Density (AIR=1):** Not Found

**Evaporation Rate (Butyl acetate=1):** Not Found

TEPP

SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS (Continued)

**Solubility in Water:** Freely soluble (\*Weast 1979); quickly hydrolyzed (Merck 1983, p. 1317)

**Appearance and Odor:** Colorless liquid (\*Spencer 1982); faint fruity odor (\*CHRIS 1978). Technical product is a dark amber-colored liquid (\*Worthing 1979).

SECTION III -- FIRE AND EXPLOSION HAZARD DATA

**Flash Point (Method Used):** Not Found

**Flammable Limits:** Not combustible (NIOSH/OSHA 1978, p. 174)

LEL: Not Found

UEL: Not Found

**Extinguishing Methods:** Extinguish with dry chemical, carbon dioxide, water spray, fog, or foam (\*DOT 1984).

**Special Fire Fighting Procedures:** Wear self-contained breathing apparatus and full protective clothing. Move container from fire area if you can do it without risk. Fight fire from maximum distance. Dike fire control water for later disposal; do not scatter the material (\*DOT 1984).

**Unusual Fire and Explosion Hazards:** Extremely toxic fumes of unburned material and phosphoric acid (\*CHRIS 1978).

SECTION IV -- REACTIVITY DATA

**Stability: Unstable:** Not Found

Stable: Not Found

**Conditions to Avoid:** Not Found

**Incompatibility (Materials to Avoid):** Incompatible with strong oxidizers (NIOSH/OSHA 1978, p. 174).

**Hazardous Decomposition or Byproducts:** Highly toxic gases and vapors of unburned material and phosphoric acid are formed in fires (\*CHRIS 1978).

**Hazardous Polymerization: May Occur:** Not Found

May Not Occur: Not Found

**Conditions to Avoid:** Not Found

TEPP

SECTION V -- HEALTH HAZARD DATA

Routes of Entry: Inhalation: Yes (NIOSH/OSHA 1978, p. 175)  
Skin: Yes (NIOSH/OSHA 1978, p. 175)  
Ingestion: Yes (NIOSH/OSHA 1978, p. 175)

Health Hazards (Acute, Delayed, and Chronic): It is classified as super toxic. Probable oral lethal dose in humans is less than 5 mg/kg (a taste) for a 150 lb. person (\*Gosselin 1976). A small drop in the eye may cause death (\*Clarke 1981). Small doses at frequent intervals are additive (\*Sax 1979). Poisonings always develop at a rapid rate (\*Gosselin 1976). It is a cholinesterase inhibitor (\*Merck 1983).

Signs and Symptoms of Exposure: Symptoms are similar to those for parathion, including nausea, vomiting, abdominal cramps, excessive salivation, headache, giddiness, vertigo, weakness, runny nose, sensation of tightness in the chest, blurring or dimness of vision, weakness and twitching of muscles, confusion, difficulty in breathing, convulsions, and coma (\*Gosselin 1976).

Medical Conditions Generally Aggravated by Exposure: Not Found

Emergency and First Aid Procedures: Move victim to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. If contact with material occurs, flush skin or eyes with running water for at least 15 minutes. Remove and isolate contaminated clothing. Keep victim quiet and maintain normal body temperature. Effects may be delayed. Keep victim under observation (\*DOT 1984).

SECTION VI -- USE INFORMATION

It is used as an insecticide and a rodenticide (\*SRI; \*Hawley 1981). No rodenticide use registered in the U.S. (USEPA/Active Ingredients 1985).

SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE  
(Steps to be Taken in Case Material is Released or Spilled)

In case of spills, stay upwind; stay out of low areas. Use water spray to reduce vapors, but do not put water on spill area. Ventilate closed spaces before entering them. Wear positive pressure breathing apparatus and special protective clothing. Do not touch spilled material; stop leak if possible. Take up spills with noncombustible absorbent material. For large spills dike far ahead (\*DOT 1984).

## EPA CHEMICAL PROFILE

### INTERIM

Date: October 31, 1985

Revision: \_\_\_\_\_

## CHEMICAL IDENTITY -- VINYL ACETATE MONOMER

CAS Registry Number: 108-05-4

**Synonyms:** 1-Acetoxyethylene; Acetic Acid Ethenyl Ester; Acetic Acid Vinyl Ester; Acetic Acid, Ethenyl Ester; Ethenyl Acetate; VAC; Vinyl A Monomer; Vinyl Acetate HQ; Vyac; Zeset T

**Chemical Formula:**  $C_4H_6O_2$

**Molecular Weight:** 86.09

## SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

**OSHA PEL:** Not Found

**ACGIH TLV:** TWA 10 ppm (30 mg/m<sup>3</sup>); STEL 20 ppm (60 mg/m<sup>3</sup>) (\*ACGIH 1980)

**IDLH:** Not Found

**Other Limits Recommended:** NIOSH recommended air ceiling concentration: 15 mg/m<sup>3</sup> for 15 minutes (\*NIOSH 1977-Present). Maximum Air Concentration (USSR): 10 mg/m<sup>3</sup> (Encyc Occupat Health and Safety 1983, p. 2260). Toxicity information: LC<sub>low</sub> inhalation (rat) 14 mg/liter/4 hours; LC<sub>50</sub> inhalation (mouse) 5.4 mg/liter/4 hours (\*NIOSH/RTECS 1985).

## SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

**Boiling Point:** 162-163°F, 72-73°C (\*Merck 1976)

**Specific Gravity** (H<sub>2</sub>O=1): 0.932 at 20/4°C (\*Merck 1976)

**Vapor Pressure** (mmHg): 83 at 20°C; 140 at 30°C (\*Verschueren 1983)

**Melting Point:** -136°F, -93.2°C (\*Weast 1979)

**Vapor Density** (AIR=1): 3.0 (\*NFPA 1978)

**Evaporation Rate** (Butyl acetate=1): Not Found

**Solubility in Water:** 1 g/50 mL at 20°C (\*Merck 1983)



## VINYL ACETATE MONOMER

### SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS (Continued)

**Appearance and Odor:** Colorless to white mobile liquid (unstable) or blue-green (stable) (\*Sax 1975; \*Weast 1979). Sweet, pleasant, fruity characteristic odor in small quantities (\*CHRIS 1978) or a sour, sharp smell (\*Verschuere 1983).

### SECTION III -- FIRE AND EXPLOSION HAZARD DATA

**Flash Point (Method Used):** 18°F, -8°C (CC) (\*NFPA 1978); 0.5-0.9°C (TOC) (\*Kirk-Othmer 1978)

**Flammable Limits:**

LEL: 2.6% (\*Encyc Occupat Health and Safety 1983)

UEL: 13.4% (\*Encyc Occupat Health and Safety 1983)

**Extinguishing Methods:** Small fires: extinguish with dry chemical, carbon dioxide, water spray, fog, or alcohol foam. Large fires: water spray, fog, or alcohol foam (\*DOT 1984).

**Special Fire Fighting Procedures:** Wear self-contained (positive pressure if available) breathing apparatus and full protective clothing. Spray cooling water on containers that are exposed to flames until well after the fire is out. For massive fire in cargo area, use unmanned hose holder or monitor nozzles; if this is impossible, withdraw from area and let fire burn. Withdraw immediately in case of rising sound from venting safety device or any discoloration of tank due to fire (DOT 1984, Guide 26).

**Unusual Fire and Explosion Hazards:** When heated to decomposition, it emits acrid fumes (\*Sax 1975). Highly dangerous when exposed to heat, flames or oxidizers; explosion hazard with strong acids and strong oxidizers (Sax 1984, p. 85).

### SECTION IV -- REACTIVITY DATA

**Stability:** Unstable:

Stable: Yes (\*Merck 1976)

**Conditions to Avoid:** Avoid light or any polymerizing initiator (\*Merck 1976, \*Bretherick 1979).

**Incompatibility (Materials to Avoid):** Incompatible with alumina (\*Bretherick 1979); oxidizing materials (\*Sax 1975); 2-aminoethanol, chlorosulfonic acid; ethyleneimine; 36% hydrochloric acid; 48.7% hydrofluoric acid; 70% nitric acid; oleum; 96% sulfuric acid; ethylene diamine; peroxides (\*NFPA 1978); and silica gel (\*Bretherick 1979).

## VINYL ACETATE MONOMER

### SECTION IV -- REACTIVITY DATA (Continued)

**Hazardous Decomposition or Byproducts:** When heated to decomposition, it burns and emits acrid fumes (\*Sax 1975).

**Hazardous Polymerization:** May Occur: Yes (\*Kirk-Othmer 1978)  
May Not Occur:

**Conditions to Avoid:** Polymerization can be initiated by organic and inorganic peroxides; azo compounds; redox systems (including organometallic components); light; and high energy radiation (\*Kirk-Othmer 1978).

### SECTION V -- HEALTH HAZARD DATA

**Routes of Entry:** Inhalation: Yes (\*Sax 1975)  
Skin: Yes (Sax 1984, p. 85)  
Ingestion: Yes (\*Lefaux 1968)

**Health Hazards** (Acute, Delayed, and Chronic): Vinyl acetate has been related to reproductive abnormalities (\*Talakina 1977). It is a skin and upper respiratory tract irritant (\*ACGIH 1980) and a central nervous system depressant (\*Rumack 1975 to Present). Exposure caused gradual deterioration of heart muscles (\*Agaronyon 1980).

**Signs and Symptoms of Exposure:** Symptoms include abnormal heart beat, fainting spells, pain around the heart area (\*Agaronyan 1980), coughing, hoarseness, blistering (\*ACGIH 1980), cornea burns (\*Grant 1974), dizziness, confusion and defatting of the skin (\*Rumack 1975 to Present).

**Medical Conditions Generally Aggravated by Exposure:** Not Found

**Emergency and First Aid Procedures:** Move victim to fresh air; call emergency medical care. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In case of contact with material, immediately flush eyes with running water for at least 15 minutes. Wash skin with soap and water. Remove and isolate contaminated clothing and shoes at the site (DOT 1984, Guide 26).

## VINYL ACETATE MONOMER

### SECTION VI -- USE INFORMATION

Monomer for making poly (vinyl acetate) and vinyl acetate copolymers, which are used in water based paints, adhesives, paper coatings, or nonwoven binders and applications not requiring service at extreme temperatures (\*Kirk-Othmer 1978). In polymerized form it is used for plastic masses, films, and lacquers (\*Merck 1983). It is also used in the production of emulsion paint ingredients, finishing and impregnation materials and glue (\*Encyc Occupat Health and Safety 1983).

### SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE

(Steps to be Taken in Case Material is Released or Spilled)

When handling use self-contained respirator, chemical safety goggles and/or face shield, rubber gloves, apron and boots. Keep unnecessary people away and stay upwind. Isolate for 1/2 mile in all directions if tank car or truck is involved in fire. For spill or leaks shut off ignition sources; no flares, smoking or flames in hazard area. Use water spray to reduce vapors. Absorb spills with noncombustible absorbent material (DOT 1984, Guide 26).

EPA CHEMICAL PROFILE

INTERIM

Date: October 31, 1985

Revision: \_\_\_\_\_

CHEMICAL IDENTITY -- ISOPROPYL CHLOROFORMATE

CAS Registry Number: 108-23-6

**Synonyms:** Carbonochloride Acid, 1-Methylethyl Ester; Carbonochloridic Acid, 1-Methylethyl Ester; Chloroformic Acid Isopropyl Ester; Formic Acid, Chloro-, Isopropyl Ester; Isopropyl Chlorocarbonate; Isopropyl Chloromethanoate

**Chemical Formula:**  $C_4H_7ClO_2$

**Molecular Weight:** 122.55

SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

OSHA PEL: Not Found

ACGIH TLV: Not Found

IDLH: Not Found

**Other Limits Recommended:** Toxicity information:  $LC_{low}$  inhalation (rat) 1 mg/liter/5 hours (\*NIOSH/RTECS 1985)

SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

**Boiling Point:** 220°F, 104.6°C at 761 mmHg (\*Weast 1979)

**Specific Gravity ( $H_2O=1$ ):** 1.08 (\*Patty 1963)

**Vapor Pressure (mmHg):** Not Found

**Melting Point:** Not Found

**Vapor Density (AIR=1):** 4.2 (\*Patty 1963)

**Evaporation Rate (Butyl acetate=1):** Not Found

**Solubility in Water:** Insoluble in water (\*Weast 1979)

**Appearance and Odor:** Colorless liquid (\*Hawley 1977)

## ISOPROPYL CHLOROFORMATE

### SECTION III -- FIRE AND EXPLOSION HAZARD DATA

**Flash Point** (Method Used): 60.1°F, 15.6°C (\*Clayton and Clayton 1981-1982)

**Flammable Limits:** Flammable; may be ignited by heat, sparks or flame (DOT 1984, Guide 29)

LEL: Not Found

UEL: Not Found

**Extinguishing Methods:** Keep unnecessary people away and isolate hazard area. Stay upwind and keep out of low areas. Wear self-contained (positive pressure if available) breathing apparatus and full protective clothing. For small fires, use dry chemical, carbon dioxide, water spray or foam. For large fires, use water spray, fog or foam. Do not get water inside container. Cool containers exposed to flame with water until well after fire is out. Withdraw immediately in case of rising sound from venting safety device or any discoloration of tank due to fire (DOT 1984, Guide 29).

**Special Fire Fighting Procedures:** Isolate for 1/2 mile in all directions if tank car or truck is involved in fire (DOT 1984, Guide 29).

**Unusual Fire and Explosion Hazards:** Extremely dangerous; this chemical has exploded while stored in refrigerator (\*Sax 1979). Vapor explosion hazard indoors, outdoors or in sewers. Runoff to sewer may create fire or explosion hazard (DOT 1984, Guide 29).

### SECTION IV -- REACTIVITY DATA

**Stability:** Unstable: Yes (\*Patty 1963)  
Stable:

**Conditions to Avoid:** Avoid phosgene (\*Sax 1979)

**Incompatibility** (Materials to Avoid): Reacts violently with phosgene (\*Sax 1979).

**Hazardous Decomposition or Byproducts:** Like other chlorides (Sax 1984, p. 1657) when heated to decomposition or on contact with acids or acrid fumes, they evolve highly toxic chloride fumes (Sax 1984, p. 672).

**Hazardous Polymerization:** May Occur: Not Found  
May Not Occur: Not Found

**Conditions to Avoid:** Not Found

## ISOPROPYL CHLOROFORMATE

### SECTION V -- HEALTH HAZARD DATA

**Routes of Entry:** Inhalation: Yes (Sax 1984, p. 1657)  
Skin: Yes (Sax 1984, p. 1657)  
Ingestion: Yes (Sax 1979, p. 1657)

**Health Hazards** (Acute, Delayed, and Chronic): Acute: highly toxic by inhalation, ingestion and skin absorption (Sax 1984, p. 1657). Delayed: can produce delayed pulmonary edema (2-24 hours after exposure) similar to that produced by phosgene (\*Patty 1963; \*Rumack 1975 to Present). Inhalation of material may cause death or permanent injury (\*Sax 1979).

**Signs and Symptoms of Exposure:** Eye irritation, irritation of upper respiratory tract and surface burns have been observed. Eye irritation may persist after exposure ceases, and skin sensitization may occur (\*Patty 1963). Inhalation exposures at elevated concentrations cause death by immediate lung damage, lower concentrations cause difficult breathing, collapse, and convulsions (Clayton and Clayton 1981-1982, p. 2390).

**Medical Conditions Generally Aggravated by Exposure:** Not Found

**Emergency and First Aid Procedures:** Move victim to fresh air. Obtain emergency medical care immediately. Remove and isolate contaminated clothing and shoes at the site. In case of contact with material, immediately flush skin or eyes with running water for at least 15 minutes (DOT 1984, Guide 29).

### SECTION VI -- USE INFORMATION

Used as a chemical intermediate for free-radical polymerization initiators and in organic synthesis (\*Hawley 1977).

### SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE (Steps to be Taken in Case Material is Released or Spilled)

In case of spills or leaks, shut off ignition sources and keep away flares, smoke or flames. Do not touch spilled material. Wear self-contained (positive pressure if available) breathing apparatus and full protective clothing. Use water to reduce vapors but do not get water inside containers. Take up small spills with sand or other noncombustible absorbent material and place in containers for later disposal. For large spills, dike far ahead of spill for later disposal (DOT 1984, Guide 29).

EPA CHEMICAL PROFILE

INTERIM

Date: October 31, 1985

Revision: \_\_\_\_\_

CHEMICAL IDENTITY -- MESITYLENE

CAS Registry Number: 108-67-8

Synonyms: (NIOSH/RTECS 1983 Synonyms, Volume 2, p. 668) Benzene, 1,3,5-Trimethyl-; Fleet-X; TMB; Sym-Trimethylbenzene; 1,3,5-Trimethylbenzene; Trimethylbenzol

Chemical Formula:  $C_9H_{12}$

Molecular Weight: 120.21

SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

OSHA PEL: Not Found

ACGIH TLV: TWA 25 ppm; STEL 35 ppm (NIOSH/RTECS 1983, Volume 2, p. 668)

IDLH: Not Found

Other Limits Recommended: Toxicity information:  $LC_{50}$  inhalation (rat) 0.024 mg/liter/4 hours (\*NIOSH/RTECS 1985) (SUSPECT)

SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

Boiling Point: 328.5°F, 164.7°C (Sax 1984, p. 1758)

Specific Gravity ( $H_2O=1$ ): 0.8637 at 20°C/4°C (Sax 1984, p. 1758)

Vapor Pressure (mmHg): Not Found

Melting Point: -48.6°F, -44.8°C (Sax 1984, p. 1758)

Vapor Density (AIR=1): Not Found

Evaporation Rate (Butyl acetate=1): Not Found

Solubility in Water: 0.002 g in 100 mL (Merck 1983, p. 844)

Appearance and Odor: Liquid with peculiar odor (Sax 1984, p. 1758)

## MESITYLENE

## SECTION III -- FIRE AND EXPLOSION HAZARD DATA

**Flash Point (Method Used):** Not Found

**Flammable Limits:**

**LEL:** Not Found

**UEL:** Not Found

**Extinguishing Methods:** Small fires: dry chemical, carbon dioxide, water spray, or alcohol foam. Large fires: water spray, fog, or alcohol foam (DOT 1984, Guide 26).

**Special Fire Fighting Procedures:** Move container from fire area if you can do so without risk. Spray cooling water on containers that are exposed to flames until well after fire is out. For massive fire in cargo area, use unmanned hose holder or monitor nozzles; if this is impossible, withdraw from area and let fire burn. Withdraw immediately in case of rising sound from venting safety device or any discoloration of tank due to fire. Isolate for one-half mile in all directions if tank car or truck is involved in fire (DOT 1984, Guide 26).

**Unusual Fire and Explosion Hazards:** When heated to decomposition, it emits acrid smoke and fumes (Sax 1984, p. 1758). Flammable/combustible material; may be ignited by heat, sparks or flames. Vapors may travel to a source of ignition and flash back. Container may explode in heat of fire. Vapor explosion hazard indoors, outdoors or in sewers. Runoff to sewer may create fire or explosion hazard (DOT 1984, Guide 26).

## SECTION IV -- REACTIVITY DATA

**Stability:** Unstable: Not Found

**Stable:** Not Found

**Conditions to Avoid:** Not Found

**Incompatibility (Materials to Avoid):** Nitric acid; violent reaction results (Sax 1984, p. 1758)

**Hazardous Decomposition or Byproducts:** When heated to decomposition it emits acrid smoke and fumes (Sax 1984, p. 1758).

**Hazardous Polymerization:** May Occur: Not Found

**May Not Occur:** Not Found

**Conditions to Avoid:** Not Found



## MESITYLENE

### SECTION V -- HEALTH HAZARD DATA

**Routes of Entry:** Inhalation: Yes (ACGIH 1980, p. 415)  
Skin: Not Found  
Ingestion: Not Found

**Health Hazards** (Acute, Delayed, and Chronic): Acute -- lowest toxic concentration for humans is 10 ppm, resulting in central nervous system effects (Sax 1984, p. 1758). Liquid is primary skin irritant (ACGIH 1980, p. 269). Liquid deposition in lungs causes chemical pneumonitis. Delayed or chronic health hazard is possible asthmatic bronchitis (ACGIH 1980, p. 415).

**Signs and Symptoms of Exposure:** Nervousness, tension, anxiety, asthmatic bronchitis and skin irritation (ACGIH 1980, p. 415).

**Medical Conditions Generally Aggravated by Exposure:** Not Found

**Emergency and First Aid Procedures:** Move victim to fresh air; call emergency medical care. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In case of contact with material, immediately flush eyes with running water for at least 15 minutes. Wash skin with soap and water. Remove and isolate contaminated clothing and shoes at the site (DOT 1984, Guide 26).

### SECTION VI -- USE INFORMATION

Chemical raw materials, paint thinner, solvent, motor fuel component (Clayton and Clayton 1981-82, p. 3300).

### SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE

(Steps to be Taken in Case Material is Released or Spilled)

Keep unnecessary people away; isolate hazard area and deny entry. Stay upwind; keep out of low areas. Wear self-contained (positive pressure if available) breathing apparatus and full protective clothing. If water pollution occurs, notify appropriate authorities. Shut off ignition sources; no flares, smoking or flames in hazard area. Stop leak if you can do so without risk. Use water spray to reduce vapors. Small spills: absorb with sand or other noncombustible absorbent material and place into containers for later disposal. Large spills: dike far ahead of spill for later disposal (DOT 1984, Guide 26).

MESITYLENE

COMMENTS

Sources searched but no information found:

Weiss 1980

Hawley 1981

Hayes 1982

Encyc Occupat Health and Safety 1983

NIOSH/OSHA 1978

Doull 1980

Student 1981

NFPA 1984

Weast 1979

EPA CHEMICAL PROFILE

INTERIM

Date: October 31, 1985

Revision: \_\_\_\_\_

CHEMICAL IDENTITY -- CYCLOHEXYLAMINE

CAS Registry Number: 108-91-8

Synonyms: Aminocyclohexane; Amino-hexahydrobenzene; Benzenamine, Hexahydro-; CHA; Cyclohexanamine; Hexahydroaniline; Hexahydrobenzenamine

Chemical Formula:  $C_6H_{13}N$

Molecular Weight: 99.17

SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

OSHA PEL: Not Found

ACGIH TLV: TWA 10 ppm (40 mg/m<sup>3</sup>) (Skin) (\*ACGIH 1983)

IDLH: Not Found

Other Limits Recommended: Toxicity information: LD<sub>50</sub> oral (rat) 156 mg/kg; LD<sub>50</sub> dermal (rat) 320 mg/kg (NIOSH/RTECS 1983, Volume 1, p. 1010).

SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

Boiling Point: 274.1°F, 134.5°C (\*Merck 1983)

Specific Gravity (H<sub>2</sub>O=1): 0.8047 at 25°C/25°C (\*Merck 1983)

Vapor Pressure (mmHg): Not Found

Melting Point: 0.1°F, -17.7°C (\*Merck 1983)

Vapor Density (AIR=1): 3.42 (\*Clayton and Clayton 1981-82)

Evaporation Rate (Butyl acetate=1): Not Found

Solubility in Water: Miscible (\*Merck 1983)

Appearance and Odor: A colorless to yellow liquid with a strong, fishy, amine odor (\*NFPA 1978; \*Merck 1983).

## CYCLOHEXYLAMINE

### SECTION III -- FIRE AND EXPLOSION HAZARD DATA

**Flash Point (Method Used):** 88°F, 31°C (CC) (\*NFPA 1978)

**Flammable Limits:**

LEL: Not Found

UEL: Not Found

**Extinguishing Methods:** Use dry chemical, alcohol foam or carbon dioxide; water may be ineffective (\*NFPA 1978).

**Special Fire Fighting Procedures:** Move container from fire area if you can do it without risk. Stay away from ends of tanks. Cool containers that are exposed to flames with water from the side until well after fire is out. Withdraw immediately in case of rising sound from venting safety device or any discoloration of tank due to fire. Keep unnecessary people away; isolate hazard area and deny entry. Stay upwind; keep out of low areas. Wear self-contained (positive pressure if available) breathing apparatus and full protective clothing. Isolate for one-half mile in all directions if tank car or truck is involved in fire (DOT 1984, Guide 58).

**Unusual Fire and Explosion Hazards:** When heated to decomposition, it emits highly toxic fumes (Sax 1984, p. 834). Vapor may travel a considerable distance to source of ignition and flash back (\*NFPA 1978). Toxic oxides of nitrogen are produced during combustion (Student 1984, p. 162).

### SECTION IV -- REACTIVITY DATA

**Stability:** Unstable:

Stable: Yes (\*NFPA 1978)

**Conditions to Avoid:** Physical damage, storage with oxidizing material (\*NFPA 1978).

**Incompatibility (Materials to Avoid):** Nitric acid; reacts vigorously with oxidizing materials (Sax 1984, p. 834).

**Hazardous Decomposition or Byproducts:** When heated to decomposition, it emits highly toxic fumes (\*Sax 1975).

**Hazardous Polymerization:** May Occur: Not Found

May Not Occur: Not Found

**Conditions to Avoid:** Not Found

## CYCLOHEXYLAMINE

### SECTION V -- HEALTH HAZARD DATA

**Routes of Entry:** **Inhalation:** Yes (Hawley 1981, p. 298)  
**Skin:** Yes (Hawley 1981, p. 298)  
**Ingestion:** Yes (Hawley 1981, p. 298)

**Health Hazards** (Acute, Delayed, and Chronic): This is classified as very toxic -- probable oral lethal dose is 50-500 mg/kg or between 1 teaspoon and 1 ounce for a 70 kg (150 lb.) person (\*Gosselin 1976). It is considered a nerve poison (\*LeFaux 1968). This is a weak methemoglobin-forming substance (\*ACGIH 1980).

**Signs and Symptoms of Exposure:** Light-headedness, drowsiness, anxiety, apprehension, nausea, slurred speech, vomiting, pupillary dilation, severe skin irritation (\*ACGIH 1980; \*Clayton and Clayton 1981-82).

**Medical Conditions Generally Aggravated by Exposure:** Not Found

**Emergency and First Aid Procedures:** Move victim to fresh air; call emergency medical care. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Remove and isolate contaminated clothing and shoes at the site. In case of contact with material, immediately flush skin or eyes with running water for at least 15 minutes. Keep victim quiet and maintain normal body temperature (DOT 1984, Guide 68).

### SECTION VI -- USE INFORMATION

Used in organic synthesis, manufacturing of pesticides, plasticizers, emulsifying agents, dry-cleaning soaps, acid gas absorbents (\*Merck 1983); corrosion inhibitor in boiler water and oil fields; chemical intermediate for rubber-processing chemicals, dyes, cyclamate artificial sweeteners (non-U.S. use) and for herbicide; processing agent for nylon fiber production (\*SRI). Not registered as a pesticide in the U.S. (USEPA/Pesticide Index 1985).

### SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE

(Steps to be Taken in Case Material is Released or Spilled)

Keep unnecessary people away; isolate hazard area and deny entry. Stay upwind; keep out of low areas. Wear self-contained (positive pressure if available) breathing apparatus and full protective clothing. Shut off ignition sources; no flares, smoking or flames in hazard area. Do not touch spilled material; stop leak if you can do it without risk. Use water spray to reduce vapors. Small spills: take up with sand or other non-combustible absorbent material and place into containers for later disposal. Large spills: dike far ahead of spill for later disposal (DOT 1984, Guide 68).

EPA CHEMICAL PROFILE

INTERIM

Date: October 31, 1985

Revision: \_\_\_\_\_

CHEMICAL IDENTITY -- PHENOL

CAS Registry Number: 108-95-2

**Synonyms:** Benzenol; Carboic Acid; Hydroxybenzene; Izal;  
Monohydroxybenzene; Monophenol; NCI-C50124; Oxybenzene; Phenic Acid; Phenyl  
Alcohol; Phenyl Hydrate; Phenyl Hydroxide; Phenylic Acid; Phenylic Alcohol

**Chemical Formula:**  $C_6H_6O$

**Molecular Weight:** 94.11

SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

**OSHA PEL:** TWA 5 ppm (skin) (\*NIOSH 1977-Present)

**ACGIH TLV:** TWA 5 ppm, 19 mg/m<sup>3</sup>; STEL 10 ppm, 38 mg/m<sup>3</sup> (ACGIH 1983,  
p. 28)

**IDLH:** 100 ppm (NIOSH/OSHA 1978, p. 150)

**Other Limits Recommended:** TWA (air) 20 mg/m<sup>3</sup>, ceiling of  
60 mg/m<sup>3</sup>/15 minutes for occupational exposure (\*NIOSH 1977-Present); TWA  
(skin) 5 ppm (19 mg/m<sup>3</sup>/8 hour) (\*NIOSH 1976).

SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

**Boiling Point:** 359.1°F, 181.75°C (\*Weast 1979)

**Specific Gravity (H<sub>2</sub>O=1):** 1.0722 at 20°/4°C (\*Weast 1979)

**Vapor Pressure (mmHg):** 0.3513 at 25°C (\*Sunshine 1969)

**Melting Point:** 109°F, 43°C (\*Merck 1976)

**Vapor Density (AIR=1):** 3.24 (\*Clayton and Clayton 1981-82)

**Evaporation Rate (Butyl acetate=1):** Not Found

**Solubility in Water:** 93 g/liter at 25°C (\*Morrison 1973)

PHENOL

SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS (Continued)

**Appearance and Odor:** Colorless crystals or white crystalline mass (\*Merck 1976), with aromatic, somewhat sickening sweet and acrid odor (\*Clayton and Clayton 1981-82). It is liquefied by mixing with about 8% water (Merck 1983, p. 1043).

SECTION III -- FIRE AND EXPLOSION HAZARD DATA

**Flash Point (Method Used):** 79°C (CC) (\*Sunshine 1969)

**Flammable Limits:**

LEL: 1.7% (\*CHRIS 1978)

UEL: 8.6% (\*CHRIS 1978)

**Extinguishing Methods:** Small fires: dry chemical, carbon dioxide, water spray or foam (alcohol); large fires: water spray, fog or foam; use water spray to cool containers in fire area (\*Environment Canada 1981).

**Special Fire Fighting Procedures:** Move container from fire area if it can be done without risk; fight fire from maximum distance; dike fire control water for later disposal, do not scatter the material (DOT 1984, Guide 55).

**Unusual Fire and Explosion Hazards:** Flammable vapors when heated (\*NFPA 1978). Runoff from fire control water may give off poisonous gases and cause pollution (\*DOT 1984). Mixtures of 9-10% phenol in air are explosive (\*Clayton and Clayton 1981-82).

SECTION IV -- REACTIVITY DATA

**Stability:** Unstable:

Stable: Yes (\*NFPA 1978)

**Conditions to Avoid:** Decomposes slowly on air contact (\*Merck 1976). Avoid contact with strong oxidizing agents (\*CHRIS 1978).

**Incompatibility (Materials to Avoid):** Aluminum chloride/nitrobenzene mixture, peroxodisulfuric acid, peroxomonosulfuric acid (\*Bretherick 1979), and strong oxidizing agents (\*CHRIS 1978).

**Hazardous Decomposition or Byproducts:** Not Found

**Hazardous Polymerization:** May Occur: Not Found

May Not Occur: Not Found

**Conditions to Avoid:** Not Found

## PHENOL

### SECTION V -- HEALTH HAZARD DATA

**Routes of Entry:** Inhalation: Yes (\*Encyc Occupat Health and Safety 1971)  
Skin: Yes (\*NFPA 1978)  
Ingestion: Yes (\*NFPA 1978)

**Health Hazards** (Acute, Delayed, and Chronic): Toxic hazard rating is very toxic: probable oral lethal dose (human) is 50-500 mg/kg (\*Gosselin 1976). Ingestion of 1 gram has been lethal to humans (\*Encyc Occupat Health and Safety 1971). Lethal amounts may be absorbed through skin or inhaled (\*NFPA 1978). Industrial contact can cause chronic poisoning with kidney and liver damage (\*Merck 1976).

**Signs and Symptoms of Exposure:** Burning pain in mouth and throat, bloody diarrhea, pallor, sweating, weakness, headache, dizziness, ringing in the ears, shock, profound fall in body temperature. Oral: sonorous breathing, frothing at mouth and nose. Skin: pain followed by numbness (\*Gosselin 1976).

**Medical Conditions Generally Aggravated by Exposure:** Persons affected with hepatic or kidney diseases are at a greater risk (\*Clayton and Clayton 1981-82).

**Emergency and First Aid Procedures:** Move victim to fresh air; call emergency medical care. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In case of contact with material, immediately flush skin or eyes with running water for at least 15 minutes. Speed in removing material from skin is of extreme importance. Remove and isolate contaminated clothing at site. Keep victim quiet and maintain normal body temperature. Effects may be delayed. Keep victim under observation (\*DOT 1984).

### SECTION VI -- USE INFORMATION

Disinfectant, antiseptic, bactericide (\*Merck 1976). Chemical intermediate for phenolic resins, medicinals, and many other chemicals; solvent for petroleum refining (\*SRI).

### SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE (Steps to be Taken in Case Material is Released or Spilled)

Spills must be disposed of immediately by properly protected personnel; no others should remain in area. Flush with flooding quantities of water, then use caustic soda solution for neutralization (\*NFPA 1978). Wear positive pressure breathing apparatus and special protective clothing. Remove and isolate contaminated clothing at the site (DOT 1984, Guide 55).



EPA CHEMICAL PROFILE

INTERIM

Date: October 31, 1985

Revision: \_\_\_\_\_

CHEMICAL IDENTITY -- THIOPHENOL

CAS Registry Number: 108-98-5

Synonyms: Benzene, Mercapto-; Benzenethiol; Mercaptobenzene; Phenol, Thio-; Phenyl Mercaptan; Phenylthiol

Chemical Formula:  $C_6H_6S$

Molecular Weight: 110.17

SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

OSHA PEL: Not Found

ACGIH TLV: TWA 0.5 ppm, 2 mg/m<sup>3</sup> (\*ACGIH 1981)

IDLH: Not Found

**Other Limits Recommended:** Occupational exposure to benzenethiol recommended standard: air ceiling concentration 0.5 mg/m<sup>3</sup>/15 minutes.  
Toxicity information: LC<sub>50</sub> inhalation (mouse) 0.126 mg/liter/4 hours (\*NIOSH/RTECS 1985).

SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

Boiling Point: 334.9°F, 168.3°C (\*Merck 1976)

Specific Gravity (H<sub>2</sub>O=1): 1.0728 at 25°C/4°C (\*Merck 1976)

Vapor Pressure (mmHg): 1 at 18.6°C (Weast 1979, p. D-208)

Melting Point: 5.4°F, -14.8°C (\*Weast 1979)

Vapor Density (AIR=1): Not Found

Evaporation Rate (Butyl acetate=1): Not Found

Solubility in Water: Insoluble in water (\*Merck 1976)

Appearance and Odor: Water-white liquid (\*Hawley 1977); repulsive, penetrating, garlic-like odor especially when impure (\*Merck 1976).

## THIOPHENOL

## SECTION III -- FIRE AND EXPLOSION HAZARD DATA

**Flash Point** (Method Used): Not Found

**Flammable Limits:**

LEL: Not Found

UEL: Not Found

**Extinguishing Methods:** Small fires: dry chemical, carbon dioxide, water spray or foam. Large fires: water spray, fog or foam. Move container from fire area if you can do so without risk. Spray cooling water on containers that are exposed to flames until well after fire is out. Fight fire from maximum distance. Dike fire control water for later disposal; do not scatter the material (DOT 1984, Guide 57).

**Special Fire Fighting Procedures:** Keep unnecessary people away; isolate hazard area and deny entry. Stay upwind; keep out of low areas. Ventilate closed spaces before entering them. Wear positive pressure breathing apparatus and special protective clothing (DOT 1984, Guide 57).

**Unusual Fire and Explosion Hazards:** When heated to decomposition or on contact with acids, it emits toxic fumes of sulfur oxides (Sax 1984, p. 368). May be ignited by heat, sparks or flames. Container may explode in heat of fire. Vapor explosion and poison hazard indoors, outdoors or in sewers (DOT 1984, Guide 57).

## SECTION IV -- REACTIVITY DATA

**Stability:** **Unstable:** Yes. Oxidizes in air (\*Merck 1976).  
**Stable:**

**Conditions to Avoid:** Contact with acids (Sax 1984, p. 368).

**Incompatibility** (Materials to Avoid): Not Found

**Hazardous Decomposition or Byproducts:** When heated to decomposition, it emits toxic fumes of sulfur oxides (Sax 1984, p. 368).

**Hazardous Polymerization:** **May Occur:** Not Found  
**May Not Occur:** Not Found

**Conditions to Avoid:** Not Found

## SECTION V -- HEALTH HAZARD DATA

**Routes of Entry:** **Inhalation:** Yes (Sax 1984, p. 368)  
**Skin:** Yes (Sax 1984, p. 368)  
**Ingestion:** Yes (Sax 1984, p. 368)

## THIOPHENOL

## SECTION V -- HEALTH HAZARD DATA (Continued)

**Health Hazards** (Acute, Delayed, and Chronic): Marked potential for causing eye changes (\*Encyc Occupat Health and Safety 1983). May cause death (DASE 1980, p. 189)

**Signs and Symptoms of Exposure:** May cause death by pulmonary edema or central nervous effects. Contact on skin causes redness, pain, skin burns, and dermatitis. Irritation of the eyes is common with pain, redness, and blurred vision. Inhalation causes a sore throat, coughing, shortness of breath, labored breathing, nausea, vomiting, dizziness and headaches. Ingestion causes a sore throat, abdominal pain, nausea vomiting, dizziness and weakness (DASE 1980, p. 189; Encyc Occup Health and Safety 1983, p. 2172; Weiss 1980, p. 1166).

**Medical Conditions Generally Aggravated by Exposure:** Not Found

**Emergency and First Aid Procedures:** Move victim to fresh air; call emergency medical care. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In case of contact with material, immediately flush skin or eyes with running water for at least 15 minutes. Speed in removing material from skin is of extreme importance. Remove and isolate contaminated clothing and shoes at the site. Keep victim quiet and maintain normal body temperature. Effects may be delayed, keep victim under observation (DOT 1984, Guide 57).

## SECTION VI -- USE INFORMATION

Pesticide (\*Rumack 1975 to Present); intermediate for pesticides, alkyl phenyl sulfides, polymers, and other materials (\*SRI); pharmaceutical synthesis (Hawley 1981, p. 1020); mosquito larvicide (Sax 1984, p. 368). Not registered as a pesticide in the U.S. (USEPA/Active Ingredients 1985).

## SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE

(Steps to be Taken in Case Material is Released or Spilled)

Avoid breathing vapors (see Section V above). Shut off ignition sources; no flares, smoking, or flames in hazard area. Do not touch spilled material; stop leak if you can do so without risk. Use water spray to reduce vapors. Small spills: absorb with sand or other non-combustible absorbent material and place into containers for later disposal. Small dry spills: with clean shovel place material into clean, dry container and cover; move containers from spill area. Large spills: dike far ahead of spill for later disposal. Keep unnecessary people away; isolate hazard area and deny entry. Stay upwind; keep out of low areas. Ventilate closed spaces before entering them. Wear positive pressure breathing apparatus and special protective clothing (DOT 1984, Guide 57).

## EPA CHEMICAL PROFILE

### INTERIM

Date: October 31, 1985

Revision: \_\_\_\_\_

## CHEMICAL IDENTITY -- BUTYL ISOVALERATE

CAS Registry Number: 109-19-3

**Synonyms:** (NIOSH/RTECS 1983 Synonyms, Volume 2, p. 586) Isovaleric Acid, Butyl Ester; Butanoic Acid, 3-Methyl-, Butyl Ester; n-Butyl Isopentanoate; n-Butyl Isovalerate; 1-Butyl Isovalerate; Butyl Isovalerianate; Butyl 3-Methylbutyrate

**Chemical Formula:**  $C_9H_{18}O_2$

**Molecular Weight:** 158.27

## SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

OSHA PEL: Not Found

ACGIH TLV: Not Found

IDLH: Not Found

**Other Limits Recommended:** Toxicity information: LD<sub>50</sub> oral (rabbit)  
8.2 mg/kg (\*NIOSH/RTECS 1985) (SUSPECT)

## SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

**Boiling Point:** 347.9°F, 175.5°C at 755 mmHg (Beilstein 1954, p. 698)

**Specific Gravity (H<sub>2</sub>O=1):** 0.87 (Sax 1984, p. 1673)

**Vapor Pressure (mmHg):** Not Found

**Melting Point:** Not Found

**Vapor Density (AIR=1):** 5.45 (Sax 1984, p. 1673)

**Evaporation Rate (Butyl acetate=1):** Not Found

**Solubility in Water:** Not Found

**Appearance and Odor:** Not Found

## BUTYL ISOVALERATE

### SECTION III -- FIRE AND EXPLOSION HAZARD DATA

**Flash Point** (Method Used): Not Found

**Flammable Limits:**

LEL: Not Found

UEL: Not Found

**Extinguishing Methods:** Extinguish with alcohol foam, dry chemical, spray, mist, or fog (Sax 1984, p. 1673).

**Special Fire Fighting Procedures:** Not Found

**Unusual Fire and Explosion Hazards:** A moderate fire hazard via heat, flame (sparks) and oxidizers (Sax 1984, p. 1673).

### SECTION IV -- REACTIVITY DATA

**Stability: Unstable:** Not Found

**Stable:** Not Found

**Conditions to Avoid:** Not Found

**Incompatibility** (Materials to Avoid): Not Found

**Hazardous Decomposition or Byproducts:** Not Found

**Hazardous Polymerization: May Occur:** Not Found

**May Not Occur:** Not Found

**Conditions to Avoid:** Not Found

### SECTION V -- HEALTH HAZARD DATA

**Routes of Entry: Inhalation:** Not Found

**Skin:** Not Found

**Ingestion:** Yes (Sax 1984, p. 1673)

**Health Hazards** (Acute, Delayed, and Chronic): This ester is a skin irritant, and has a high oral toxicity (Sax 1984, p. 1673). Toxicity information of this chemical is grouped with N-butyl acetate. It is classified as moderately toxic. Probable oral lethal dose for humans is 0.5 to 5 g/kg (between 1 ounce and a pint) for a 150 lb. person. It is a mild irritant and central nervous depressant. Also, it is less toxic than the parent alcohol (Gosselin 1984, p. II-201).

BUTYL ISOVALERATE

SECTION V -- HEALTH HAZARD DATA (Continued)

**Signs and Symptoms of Exposure:** Symptoms include headache, muscle weakness, giddiness, nausea, vomiting, confusion, delirium, coughing, labored and difficult breathing, coma and even death (Gosselin 1984, p. III-14).

**Medical Conditions Generally Aggravated by Exposure:** Not Found

**Emergency and First Aid Procedures:** Treat similarly to higher alcohol exposure (Gosselin 1984, p. II-201). Move victim to fresh air; call emergency medical care. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In case of contact with material, immediately flush eyes with running water for at least 15 minutes. Wash skin with soap and water. Remove and isolate contaminated clothing and shoes at the site (DOT 1984, Guide 26).

SECTION VI -- USE INFORMATION

Not Found

SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE  
(Steps to be Taken in Case Material is Released or Spilled)

Avoid skin contact (see Section V above).

COMMENTS

Sources searched but no information found:

Weast 1979  
Hawley 1981  
DASE 1980  
Merck 1983  
Doull 1980  
Encyc Occupat Health and Safety 1983  
Student 1981  
Weiss 1980  
Clayton and Clayton 1981-82  
Verschueren 1983  
NIOSH/OSHA 1978  
ACGIH 1983

EPA CHEMICAL PROFILE

INTERIM

Date: October 31, 1985

Revision: \_\_\_\_\_

CHEMICAL IDENTITY -- PROPYL CHLOROFORMATE

CAS Registry Number: 109-61-5

Synonyms: N-Propyl Chloroformate; Carbonochloridic Acid, Propyl Ester;  
Formic Acid, Chloro-, Propyl Ester; Propyl Chlorocarbonate

Chemical Formula:  $C_4H_7ClO_2$

Molecular Weight: 122.56

SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

OSHA PEL: Not Found

ACGIH TLV: Not Found

IDLH: Not Found

Other Limits Recommended: Toxicity information: LD<sub>50</sub> oral (mouse)  
650 mg/kg; LD<sub>50</sub> dermal (mouse) 10 mg/kg (\*NIOSH/RTECS 1985)

SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

Boiling Point: 237-241°F, 114-116°C (\*Merck 1976)

Specific Gravity (H<sub>2</sub>O=1): 1.090 at 20° (\*Merck 1976)

Vapor Pressure (mmHg): Not Found

Melting Point: Not Found

Vapor Density (AIR=1): 4.2 (\*Clayton and Clayton 1981-82)

Evaporation Rate (Butyl acetate=1): Not Found

Solubility in Water: Insoluble (Sax 1984, p. 2307)

Appearance and Odor: Colorless liquid (\*Merck 1976)

PROPYL CHLOROFORMATE

SECTION III -- FIRE AND EXPLOSION HAZARD DATA

**Flash Point** (Method Used): -58°F, -50°C (\*Clayton and Clayton 1981-82)

**Flammable Limits:**

LEL: Not Found

UEL: Not Found

**Extinguishing Methods:** Small fires: dry chemical, carbon dioxide, water spray and foam. Move container from fire area if you can do so without risk. Dike fire control water for later disposal; do not scatter the material. Spray cooling water on containers that are exposed to flames until after fire is out. Withdraw immediately in case of rising sound from venting safety device or any discoloration of tank due to fire (DOT 1984, Guide 28).

**Special Fire Fighting Procedures:** Keep unnecessary people away; isolate hazard area and deny entry. Stay upwind; keep out of low areas. Wear positive pressure breathing apparatus and special protective clothing. Isolate for 1/2 mile in all directions if tank car or truck is involved in fire (DOT 1984, Guide 28).

**Unusual Fire and Explosion Hazards:** When heated to decomposition, it emits toxic fumes of chlorine containing compounds (Sax 1984, p. 2307). Propyl chloroformate is a flammable/combustible material; it may be ignited by heat, sparks or flames. Vapors may travel to a source of ignition and flash back. Container may explode in heat or fire. Vapor explosion and poison hazard indoors, outdoors or in sewers. Runoff to sewer may create fire or explosion hazard. Runoff from fire control or dilution water may cause pollution (DOT 1984, Guide 28).

SECTION IV -- REACTIVITY DATA

**Stability:** Unstable: Yes (\*Clayton and Clayton 1981-82)

Stable:

**Conditions to Avoid:** Decomposes spontaneously to form hydrochloric acid and other products. Avoid moist air (\*Clayton and Clayton 1981-82).

**Incompatibility** (Materials to Avoid): Gradually decomposes by water and alcohol (Merck 1983, p. 1130)

**Hazardous Decomposition or Byproducts:** Decomposes and forms hydrochloric acid (\*Clayton and Clayton 1981-82).

**Hazardous Polymerization:** May Occur: Not Found  
May Not Occur: Not Found

**Conditions to Avoid:** Not Found



**PROPYL CHLOROFORMATE**

**SECTION V -- HEALTH HAZARD DATA**

**Routes of Entry:** **Inhalation:** Yes (Sax 1984, p. 2307)  
**Skin:** Yes (DOT 1984, Guide 28)  
**Ingestion:** Yes (DOT 1984, Guide 28)

**Health Hazards** (Acute, Delayed, and Chronic): Strongly irritating to eyes and mucous membranes (\*Clayton and Clayton 1981-82). Poisonous; may be fatal if inhaled, swallowed or absorbed through skin (DOT 1984, Guide 28).

**Signs and Symptoms of Exposure:** Contact may cause burns to skin and eyes (DOT 1984, Guide 28). Vapors strongly irritating to eyes and mucous membranes (Merck 1983, p. 1130).

**Medical Conditions Generally Aggravated by Exposure:** Not Found

**Emergency and First Aid Procedures:** Move victim to fresh air; call emergency medical care. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Remove and isolate contaminated clothing and shoes at the site. In case of contact with material, immediately flush skin or eyes with running water for at least 15 minutes. Keep victim quiet and maintain normal body temperature. Effects may be delayed; keep victim under observation (DOT 1984, Guide 28).

**SECTION VI -- USE INFORMATION**

Not Found

**SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE**

(Steps to be Taken in Case Material is Released or Spilled)

Keep unnecessary people away; isolate hazard area and deny entry. Stay upwind; keep out of low areas. Wear positive pressure breathing apparatus and special protective clothing. Spill or leak: shut off ignition sources; no flares, smoking or flames in hazard area. Do not touch spilled material; stop leak if you can do so without risk. Use water spray to reduce vapors. Small spills: absorb with sand or other noncombustible absorbent material and place into containers for later disposal. Large spills: dike far ahead of spill for later disposal (DOT 1984, Guide 28).

EPA CHEMICAL PROFILE

INTERIM

Date: October 31, 1985

Revision: \_\_\_\_\_

CHEMICAL IDENTITY -- MALONONITRILE

CAS Registry Number: 109-77-3

**Synonyms:** Cyanoacetonitrile; Dicyanomethane; Malonic Acid Dinitrile; Malonic Dinitrile; Malonicdinitrile; Malonodinitrile; Methane, Dicyano-; Methylene Cyanide; Methylenedinitrile; Propanedinitrile; USAF A-4600

**Chemical Formula:**  $C_3H_2N_2$

**Molecular Weight:** 66.07

SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

OSHA PEL: Not found

ACGIH TLV: Not found

IDLH: Not found

**Other Limits Recommended:** Occupational exposure to nitriles recommended standard -- air: TWA 8 mg/m<sup>3</sup>. Toxicity information: LD<sub>50</sub> oral (mouse) 19 mg/kg (\*NIOSH/RTECS 1985).

SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

**Boiling Point:** 424-426°F, 218-219°C (\*Weast 1979)

**Specific Gravity** (H<sub>2</sub>O=1): 1.1910 at 20°C/4°C (\*Weast 1979)

**Vapor Pressure** (mmHg): Not Found

**Melting Point:** 90°F, 32°C (\*Weast 1979)

**Vapor Density** (AIR=1): Not Found

**Evaporation Rate** (Butyl acetate=1): Not Found

**Solubility in Water:** 13 g/100 ml (\*Patty 1963)

**Appearance and Odor:** Material is a colorless to white solid (\*Sax 1979, \*Patty 1963)

## MALONONITRILE

### SECTION III -- FIRE AND EXPLOSION HAZARD DATA

**Flash Point** (Method Used): 266°F, 130°C (OC) (\*Sax 1979)

**Flammable Limits:**

LEL: Not Found

UEL: Not Found

**Extinguishing Methods:** Dry chemical, carbon dioxide, water spray, fog, or foam (DOT 1984, Guide 53).

**Special Fire Fighting Procedures:** Move container from fire area if you can do it without risk. Wear positive pressure breathing apparatus and special protective clothing (DOT 1984, Guide 53).

**Unusual Fire and Explosion Hazards:** When heated to decomposition, malononitrile emits highly toxic fumes (\*Sax 1979). May polymerize violently on prolonged heating (\*Bretherick 1979).

### SECTION IV -- REACTIVITY DATA

**Stability:** Unstable: Not Found  
Stable: Not Found

**Conditions to Avoid:** Heat

**Incompatibility** (Materials to Avoid): Not Found

**Hazardous Decomposition or Byproducts:** Highly toxic fumes (cyanide) when heated (\*Sax 1979).

**Hazardous Polymerization:** May Occur: Yes (\*Bretherick 1979)  
May Not Occur:

**Conditions to Avoid:** Prolonged heating at 130°C or contact with strong bases at lower temperatures (\*Bretherick 1979).

### SECTION V -- HEALTH HAZARD DATA

**Routes of Entry:** Inhalation: Yes (\*Patty 1963)  
Skin: Yes (\*Patty 1963)  
Ingestion: Yes (\*Rumack 1975 to Present)

## MALONONITRILE

### SECTION V -- HEALTH HAZARD DATA (Continued)

**Health Hazards** (Acute, Delayed, and Chronic): Metabolized by body to cyanide and thiocyanate; effects of inhalation of toxic fumes will be related to cyanide (\*Rumack 1975 to Present, \*Patty 1963). Causes brain and heart damage related to lack of cellular oxygen (\*Doull 1980). It is classified as extremely toxic. Probable oral lethal dose for humans is 5-50 mg/kg, or between 7 drops and 1 teaspoonful, for a 70 kg (150 lb.) person (Gosselin 1984, p. II-215).

**Signs and Symptoms of Exposure:** See cyanides (\*Rumack 1975 to Present). Symptoms of cyanide poisoning include rapid and irregular breathing, anxiety, confusion, odor of bitter almonds (on breath or vomitus), nausea, vomiting (if oral exposure), irregular heart beat, a feeling of tightness in the chest, bright pink coloration of the skin, unconsciousness followed by convulsions, involuntary urination and defecation, paralysis and respiratory arrest (heart will beat after breathing stops) (Gosselin 1984, p. III-126-127).

**Medical Conditions Generally Aggravated by Exposure:** Not Found

**Emergency and First Aid Procedures:** See cyanides. Get emergency medical treatment immediately. If the victim stops breathing before emergency medical treatment is available, give artificial respiration or oxygen, but avoid mouth to mouth respiration; also avoid contact with contaminated skin. If there is exposure through skin contact, wash immediately with soap and water. Exposed eyes should be flushed with copious amounts of water for at least 15 minutes (\*Rumack 1975 to Present).

### SECTION VI -- USE INFORMATION

It is used in organic synthesis, and as a leaching agent for gold (\*Hawley 1977).

### SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE (Steps to be Taken in Case Material is Released or Spilled)

When handling material, wear self-contained positive pressure breathing apparatus and special protective clothing. Take up small spills with sand or other noncombustible material. Dike far ahead of large spills for later disposal. Do not touch spilled material; stop leak if you can do so without risk. Stay upwind and out of low areas. Isolate area and deny entry (DOT 1984, Guide 53).

EPA CHEMICAL PROFILE

INTERIM

Date: October 31, 1985

Revision: \_\_\_\_\_

CHEMICAL IDENTITY -- FURAN

CAS Registry Number: 110-00-9

Synonyms: 1,4-Epoxy-1,3-Butadiene; Divinylene Oxide; Furfuran; NCI-C56202; Oxacyclopentadiene; Oxole; Tetrole; Axole

Chemical Formula:  $C_4H_4O$

Molecular Weight: 68.08

SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

OSHA PEL: Not Found

ACGIH TLV: Not Found

IDLH: Not Found

Other Limits Recommended: Exposure concentration limit: 10 ppm (\*Sax 1979). Toxicity information:  $LC_{50}$  inhalation (mouse) 0.12 mg/liter/1 hour (\*NIOSH/RTECS 1985)

SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

Boiling Point: 90°F, 32°C at 758 mmHg (\*Merck 1983)

Specific Gravity ( $H_2O=1$ ): 0.9371 at 19.4°C/4°C (\*Merck 1976)

Vapor Pressure (mmHg): Not Found

Melting Point: -123°F, -86°C (\*Sax 1979)

Vapor Density (AIR=1): 2.3 (\*NFPA 1978)

Evaporation Rate (Butyl acetate=1): Not Found

Solubility in Water: Insoluble (\*Merck 1976); 10 g/liter at 25°C (Verschuere 1983, p. 686)

## FURAN

### SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS (Continued)

**Appearance and Odor:** Clear colorless liquid turning brown upon standing (Hawley 1981, p. 483)

### SECTION III -- FIRE AND EXPLOSION HAZARD DATA

**Flash Point (Method Used):** Less than 32°F, less than 0°C (CC) (\*NFPA 1978)

**Flammable Limits:**

LEL: 2.3% (\*NFPA 1978)

UEL: 14.3% (\*NFPA 1978)

**Extinguishing Methods:** Water may be ineffective (\*NFPA 1978). Small fires: dry chemical, carbon dioxide, water spray, or alcohol foam. Large fires: water spray, fog, or alcohol foam (DOT 1984, Guide 26).

**Special Fire Fighting Procedures:** Move container from fire area if this can be accomplished without risk. Spray cooling water on containers that are exposed to flames until well after fire is out. For massive fires in cargo area, use unmanned hose holder or monitor nozzles; if this is impossible withdraw from area and let fire burn. Withdraw immediately in case of rising sound from venting safety device or any discoloration of tank due to fire. Isolate for 1/2 mile in all directions if a tank car or truck is involved (DOT 1984, Guide 26).

**Unusual Fire and Explosion Hazards:** Very dangerous, upon exposure to heat or flame. It may form unstable peroxides on exposure to air. Contact with acids can initiate a violent, heat producing reaction (\*Sax 1979).

### SECTION IV -- REACTIVITY DATA

**Stability: Unstable:** Yes (\*Sax 1979)  
**Stable:**

**Conditions to Avoid:** Upon standing in air, it may form unstable peroxides (\*Sax 1979).

**Incompatibility (Materials to Avoid):** Acids, oxidizing agents (\*Sax 1979).

**Hazardous Decomposition or Byproducts:** Formation of unstable peroxides upon standing in air (\*Sax 1979).

## FURAN

### SECTION IV -- REACTIVITY DATA (Continued)

Hazardous Polymerization: May Occur: Not Found  
May Not Occur: Not Found

Conditions to Avoid: Not Found

### SECTION V -- HEALTH HAZARD DATA

Routes of Entry: Inhalation: Yes (\*Sax 1975)  
Skin: Yes (\*Sax 1975)  
Ingestion: Yes (\*Sax 1975)

**Health Hazards** (Acute, Delayed, and Chronic): The vapors are narcotic (Merck 1983, p. 613). Acute exposure to furan by inhalation may involve both reversible and irreversible changes. Acute exposure by ingestion or skin absorption, as well as chronic exposure, are associated with high toxicity (\*Sax 1975).

**Signs and Symptoms of Exposure:** Vapors are a central nervous system depressant (\*Merck 1976). Irritation and burning eyes and skin, dizziness, suffocation (DOT 1984, Guide 26).

**Medical Conditions Generally Aggravated by Exposure:** Not Found

**Emergency and First Aid Procedures:** Move victim to fresh air; if not breathing give artificial respiration or if breathing is difficult give oxygen. In case of contact with the material, immediately flush eyes with running water for at least 15 minutes. Wash skin with soap and water. Remove and isolate contaminated clothing and shoes at the site (DOT 1984, Guide 26).

### SECTION VI -- USE INFORMATION

Chemical intermediate for tetrahydrofuran (\*SRI); formation of lacquers, solvent for resins (\*Browning 1965); organic synthesis, especially for pyrrole, thiophene (\*Hawley 1981).

## FURAN

### SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE

(Steps to be Taken in Case Material is Released or Spilled)

Keep unnecessary people away; isolate hazard area and deny entry. Avoid breathing vapors; wear a positive pressure self-contained breathing apparatus. Keep upwind. Wear boots, protective gloves and goggles. Do not handle broken packages without protective equipment. Wash away any material which may have contacted the body with copious amounts of water or soap and water. Shut off ignition sources; no flares, smoking, or flames in hazard area. Stop leak if you can do so without risk. Use water spray to reduce vapors. Small spills: absorb with sand or other noncombustible absorbent material and place into containers for later disposal. Large spills: dike far ahead of spill for later disposal (Student 1984, p. 259; DOT 1984, Guide 26). The exposure concentration limit of 10 ppm together with the low boiling point of furan requires that adequate ventilation be provided in areas handling this chemical. Contact with liquid must be avoided since this chemical can be absorbed through the skin. Thorough washing with soap and water followed by prolonged rinsing should be done immediately after accidental contact (Sax 1984, p. 1462).



**EPA CHEMICAL PROFILE**

INTERIM

Date: October 31, 1985

Revision: \_\_\_\_\_

**CHEMICAL IDENTITY -- TRANS-1,4-DICHLOROBUTENE**

CAS Registry Number: 110-57-6

**Synonyms:** 1,4-Dichloro-~~trans~~-2-Butene; 1,4-Dichloro-2-Butene;  
1,4-Dichlorobutene; 1,4-Dichlorobutene-2 (trans); 2-Butene, 1,4-Dichloro-,  
(E)-; 2-Butene, 1,4-Dichloro-, trans-; 2-Butylene Dichloride;  
Trans-1,4-Dichloro-2-Butene

**Chemical Formula:**  $C_4H_6Cl_2$

**Molecular Weight:** 125.00

**SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION**

OSHA PEL: Not Found

ACGIH TLV: Not Found

IDLH: Not Found

**Other Limits Recommended:** Toxicity information:  $LC_{50}$  inhalation  
(rat) 0.44 mg/liter/4 hours (\*NIOSH/RTECS 1985)

**SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS**

**Boiling Point:** 312°F, 155.5°C at 758 mmHg (\*Weast 1979)

**Specific Gravity** ( $H_2O=1$ ): 1.183 at 25°/4°C (\*Weast 1979)

**Vapor Pressure** (mmHg): Not Found

**Melting Point:** 34-37°F, 1-3°C (\*Weast 1979)

**Vapor Density** (AIR=1): 4 (Weiss 1980, p. 322)

**Evaporation Rate** (Butyl acetate=1): Not Found

**Solubility in Water:** Insoluble in water (\*Weast 1979)

**Appearance and Odor:** Colorless liquid with a distinct odor (\*IARC  
1972-85).

**TRANS-1,4-DICHLOROBUTENE**

**SECTION III -- FIRE AND EXPLOSION HAZARD DATA**

**Flash Point (Method Used):** Not Found

**Flammable Limits:**

LEL: 1.5% (Weiss 1980, p. 330)

UEL: 4% (Weiss 1980, p. 330)

**Extinguishing Methods:** For small fires, use dry chemical, carbon dioxide, spray or foam. For large fires, use water spray, fog, or foam (DOT 1984, Guide 29).

**Special Fire Fighting Procedures:** Wear positive pressure breathing apparatus and full protective clothing. Move containers from fire area if you can do so without risk. Spray containers with cooling water until well after fire is out. Isolate for one-half mile in all directions if tank car or truck is involved in a fire (DOT 1984, Guide 29).

**Unusual Fire and Explosion Hazards:** The material will burn, though it may require some effort to ignite (Student 1981, p. 184). Fire produces irritating and poisonous gases (DOT 1984, Guide 29). When heated to decomposition, it emits toxic fumes of chlorine-containing compounds (Sax 1984, p. 583).

**SECTION IV -- REACTIVITY DATA**

**Stability:** Unstable:

Stable: Yes (Weiss 1980, p. 322)

**Conditions to Avoid:** Not Found

**Incompatibility (Materials to Avoid):** Not Found

**Hazardous Decomposition or Byproducts:** When heated to decomposition, it emits toxic fumes of chlorine-containing compounds (Sax 1984, p. 583).

**Hazardous Polymerization:** May Occur: Not Found  
May Not Occur: Not Found

**Conditions to Avoid:** Not Found

**SECTION V -- HEALTH HAZARD DATA**

**Routes of Entry:** Inhalation: Yes (\*IARC 1972-85)  
Skin: Yes (\*Grant 1974)  
Ingestion: Yes (\*Rumack 1975 to Present)

## TRANS-1,4-DICHLOROBUTENE

### SECTION V -- HEALTH HAZARD DATA (Continued)

**Health Hazards** (Acute, Delayed, and Chronic): (Non-Specific -- Dichlorobutene) Liquid and vapors from the material are highly corrosive and may damage skin, eyes, lungs, and internal organs (\*IARC 1972-85).

**Signs and Symptoms of Exposure:** Respiratory distress and burns to skin and eyes (DOT 1984, Guide 29). Inhalation of vapor irritates nose and throat. Contact with eyes causes intense irritation and tears. Contact of liquid with skin causes severe blistering. Ingestion causes severe irritation of mouth and stomach (Weiss 1980, p. 322).

**Medical Conditions Generally Aggravated by Exposure:** Not Found

**Emergency and First Aid Procedures:** Move victim to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Remove and isolate contaminated clothing. In case of contact, immediately flush skin and eyes with running water for 15 minutes. Keep victim quiet and maintain normal body temperature (DOT 1984, Guide 29).

### SECTION VI -- USE INFORMATION

It is a chemical intermediate for hexamethylenediamine and chloroprene (\*SRI).

### SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE

(Steps to be Taken in Case Material is Released or Spilled)

Keep unnecessary people away; isolate hazard area. Stay upwind; keep out of low areas. Wear positive pressure breathing apparatus. Shut off ignition sources. Do not touch spilled material. Use water spray to reduce vapors, but do not get water inside containers. For small spills, absorb with sand or other non-combustible absorbent material. For large spills, dike far ahead of spill for later disposal (DOT 1984, Guide 29).

## EPA CHEMICAL PROFILE

INTERIM

Date: October 31, 1985

Revision: \_\_\_\_\_

### CHEMICAL IDENTITY -- PIPERIDINE

CAS Registry Number: 110-89-4

Synonyms: Azacyclohexane; Cyclopentimine; Cypentil; Hexahydropyridine; Hexazane; Pentamethyleneimine; Pentamethylenimine; Pyridine, Hexahydro-

Chemical Formula:  $C_5H_{11}N$

Molecular Weight: 85.15

### SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

OSHA PEL: Not Found

ACGIH TLV: Not Found

IDLH: Not Found

Other Limits Recommended: Toxicity information:  $LC_{low}$  inhalation (rat) 13.9 mg/liter/4 hours;  $LD_{50}$  oral (mammal) 22.4 mg/kg (\*NIOSH/RTECS 1985)

### SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

Boiling Point: 223°F, 106°C (\*Merck 1976)

Specific Gravity ( $H_2O=1$ ): 0.8622 at 20°C/4°C (\*Merck 1976)

Vapor Pressure (mmHg): 40 at 29.2°C (\*Patty 1963)

Melting Point: 19°F, -7°C (\*Merck 1976), 16°F, -9°C (Weast 1980, p. C-441)

Vapor Density (AIR=1): 3.0 (\*Sax 1979)

Evaporation Rate (Butyl acetate=1): Not Found

Solubility in Water: Soluble in all proportions (\*Weast 1979)

## PIPERIDINE

### SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS (Continued)

**Appearance and Odor:** Piperidine is a clear colorless liquid with an amine-like odor (Sax 1984, p. 2236). A pepper-like odor has also been reported (Hawley 1981, p. 819).

### SECTION III -- FIRE AND EXPLOSION HAZARD DATA

**Flash Point (Method Used):** 61°F (no method given) (\*Patty 1963); 37.4°F (no method given) (Sax 1984, p. 2236)

**Flammable Limits:**

LEL: Not Found

UEL: Not Found

**Extinguishing Methods:** Small fires: dry chemical, carbon dioxide, water spray, or alcohol foam. Large fires: water spray, fog, or alcohol foam. Move container from fire area if you can do it without risk. Do not get water inside container. Cool containers that are exposed to flames with water from the side until well after fire is out. Withdraw immediately in case of rising sound from venting safety device or any discoloration of tank due to fire (DOT 1984, Guide 29).

**Special Fire Fighting Procedures:** Keep unnecessary people away; isolate hazard area and deny entry. Stay upwind; keep out of low area. Wear self-contained (positive pressure if available) breathing apparatus and full protective clothing. Isolate for 1/2 mile in all directions if tank car or truck is involved in fire (DOT 1984, Guide 29).

**Unusual Fire and Explosion Hazards:** Piperidine evolves explosive concentrations of vapor at normal room temperatures (\*Encyc Occupat Health and Safety 1971). When heated to decomposition, it emits highly toxic fumes of nitrogen oxides (\*Sax 1979). Dangerous, when exposed to heat, flame, or oxidizers (Sax 1984, p. 2236).

### SECTION IV -- REACTIVITY DATA

**Stability:** Unstable: Not Found  
Stable: Not Found

**Conditions to Avoid:** It evolves explosive concentrations of vapor at normal room temperatures (\*Encyc Occupat Health and Safety 1971). Keep away from igniting sources and heat (\*NFPA 1978).

## PIPERIDINE

### SECTION IV -- REACTIVITY DATA Continued)

**Incompatibility (Materials to Avoid):** Avoid 1-Perchlorylpiperidine (Sax 1984, p. 2236) and oxidizing materials (\*Sax 1979). Piperidine is a reactive compound and forms complexes with the salts of heavy metals (Merck 1983, p. 1077).

**Hazardous Decomposition or Byproducts:** When heated to decomposition, it emits highly toxic fumes of nitrogen oxides (Sax 1984, p. 2236).

**Hazardous Polymerization:** May Occur: Not Found  
May Not Occur: Not Found

**Conditions to Avoid:** Not Found

### SECTION V -- HEALTH HAZARD DATA

**Routes of Entry:** Inhalation: Yes (\*Encyc Occupat Health and Safety 1971)  
Skin: Yes (\*Encyc Occupat Health and Safety 1971)  
Ingestion: Yes (\*Encyc Occupat Health and Safety 1971)

**Health Hazards (Acute, Delayed, and Chronic):** Strong local irritant and may cause permanent injury after short exposure to small amounts. Ingestion may involve both irreversible and reversible changes (\*Sax 1975). 30 to 60 mg/kg may cause symptoms in humans (Clayton and Clayton 1981, pp. 2689-90).

**Signs and Symptoms of Exposure:** Symptoms upon oral administration include weakness, nausea, vomiting, salivation, labored respiration, muscular paralysis, and asphyxiation (Clayton and Clayton 1981, pp. 2689-90). Redness, pain, and burns occur upon contact with skin. Corrosive effects seen when contact is made with the eyes. Sore throat, coughing, labored breathing, and dizziness occur after inhalation (DASE 1980, p. 757).

**Medical Conditions Generally Aggravated by Exposure:** Not Found

**Emergency and First Aid Procedures:** Move victim to fresh air; call emergency medical care. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Remove and isolate contaminated clothing and shoes at the site. In case of contact with material, immediately flush skin or eyes with running water for at least 15 minutes. Keep victim quiet and maintain normal body temperature (DOT 1984, Guide 29).

## PIPERIDINE

### SECTION VI -- USE INFORMATION

Solvent and intermediate; curing agent for rubber and epoxy resins; catalyst for condensation reactions; ingredient in oils and fuels; complexing agent (Hawley 1981, p. 818); manufacture of local anesthetics, analgesics, pharmaceuticals, wetting agents, and germicides (\*Encyc Occupat Health and Safety 1971); synthetic flavoring (\*Fenaroli 1975). Not registered as a pesticide in the U.S. (USEPA/Pesticide Index 1985).

### SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE (Steps to be Taken in Case Material is Released or Spilled)

Avoid inhalation (see Section V). Shut off ignition sources; no flares, smoking, or flames in hazard area. Do not touch spilled material; stop leak if you can do so without risk. Wear positive pressure breathing apparatus and full protective clothing. Use water spray to reduce vapors; do not get water inside container. Small spills: absorb with sand or other noncombustible absorbent material and place into containers for later disposal. Large spills: dike far ahead of spill for later disposal (DOT 1984, Guide 29).

EPA CHEMICAL PROFILE

INTERIM

Date: October 31, 1985

Revision: \_\_\_\_\_

CHEMICAL IDENTITY -- BUTYL VINYL ETHER

CAS Registry Number: 111-34-2

Synonyms: (NIOSH/RTECS 1983 Synonyms, Volume 2, page 263):

Butoxyethene; Butane, 1-(Ethenyloxy)-; Vinyl Butyl Ether; Ether, Butyl Vinyl;  
Vinyl n-Butyl Ether

Chemical Formula:  $C_6H_{12}O$

Molecular Weight: 100.18

SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

OSHA PEL: Not Found

ACGIH TLV: Not Found

IDLH: Not Found

Other Limits Recommended: Toxicity information:  $LC_{50}$  inhalation  
(mouse) 0.062 mg/liter/2 hours (\*NIOSH/RTECS 1985)

SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

Boiling Point: 201°F, 94.1°C (Hawley 1981, p. 1084)

Specific Gravity ( $H_2O=1$ ): 0.7803 at 20°C (Hawley 1981, p. 1084)

Vapor Pressure (mmHg): Not Found

Melting Point: -171°F, -113°C (Hawley 1981, p. 1084)

Vapor Density (AIR=1): 3.45 (Sax 1984, p. 2727)

Evaporation Rate (Butyl acetate=1): Not Found

Solubility in Water: Slightly soluble (Hawley 1981, p. 1084)

Appearance and Odor: Liquid (Hawley 1981, p. 1084)



## BUTYL VINYL ETHER

## SECTION III -- FIRE AND EXPLOSION HAZARD DATA

**Flash Point** (Method Used): 15°F, -9.4°C (OC) (Hawley 1981, p. 1084)

**Flammable Limits:** Flammable liquid (Hawley 1981, p. 1084)

LEL: Not Found

UEL: Not Found

**Extinguishing Methods:** Dangerous fire risk (Hawley 1981, p. 1084).

Small fires: dry chemical, carbon dioxide, water spray, or alcohol foam.

Large fires: water spray, fog, or alcohol foam. Move container from fire area if you can do so without risk. Spray cooling water on containers that are exposed to flames until well after fire is out. For massive fire in cargo area, use unmanned hose holder and monitor nozzles; if this is impossible, withdraw from area and let fire burn. Withdraw immediately in case of rising sound from venting safety device or any discoloration of tank due to fire (DOT 1984, Guide 26).

**Special Fire Fighting Procedures:** Keep unnecessary people away; isolate hazard area and deny entry. Stay upwind; keep out of low areas. Wear self-contained (positive pressure if available) breathing apparatus and full protective clothing. Isolate for 1/2 mile in all directions if tank car or truck is involved in fire (DOT 1984, Guide 26).

**Unusual Fire and Explosion Hazards:** Flammable/combustible material; may be ignited by heat, sparks or flames. Vapors may travel to a source of ignition and flash back. Container may explode in heat of fire. Vapor explosion hazard indoors, outdoors, or in sewers. Runoff to sewer may create fire or explosion hazard (DOT 1984, Guide 26).

## SECTION IV -- REACTIVITY DATA

**Stability:** Unstable: Not Found

Stable: Not Found

**Conditions to Avoid:** Heat or flame (Sax 1984, p. 2727)

**Incompatibility** (Materials to Avoid): Oxidizing materials (Sax 1984, p. 2727).

**Hazardous Decomposition or Byproducts:** Not Found

**Hazardous Polymerization:** May Occur: Not Found

May Not Occur: Not Found

**Conditions to Avoid:** Not Found

BUTYL VINYL ETHER

SECTION V -- HEALTH HAZARD DATA

**Routes of Entry:** Inhalation: Yes (DOT 1984, Guide 26)  
Skin: Yes (Sax 1984, p. 2727)  
Ingestion: Not Found

**Health Hazards** (Acute, Delayed, and Chronic): May be poisonous if inhaled or absorbed through skin (DOT 1984, Guide 26).

**Signs and Symptoms of Exposure:** Vapors may cause dizziness or suffocation. Contact may irritate or burn skin and eyes (DOT 1984, Guide 26).

**Medical Conditions Generally Aggravated by Exposure:** Not Found

**Emergency and First Aid Procedures:** Move victim to fresh air; call emergency medical care. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In case of contact with material, immediately flush eyes with running water for at least 15 minutes. Wash skin with soap and water. Remove and isolate contaminated clothing and shoes at the site (DOT 1984, Guide 26).

SECTION VI -- USE INFORMATION

Synthesis; copolymerization (Hawley 1981, p. 1084)

SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE

(Steps to be Taken in Case Material is Released or Spilled)

Do not touch spilled material and avoid breathing vapors (see Section V above). Stay upwind. Wear self-contained (positive pressure if available) breathing apparatus and full protective clothing. Shut off ignition sources; no flares, smoking, or flames in hazard area. Stop leak if you can do so without risk. Use water spray to reduce vapors. Small spills: absorb with sand or other noncombustible absorbent material and place into containers for later disposal. Large spills: dike far ahead of spill for later disposal (DOT 1984, Guide 26).

COMMENTS:

Sources searched but no information found:

Weast 1979  
Merck 1983  
NFPA 1984  
Student 1981  
Weiss 1980  
Doul 1980  
Gosselin 1984

EPA CHEMICAL PROFILE

INTERIM

Date: October 31, 1985

Revision: \_\_\_\_\_

CHEMICAL IDENTITY -- DICHLOROETHYL ETHER

CAS Registry Number: 111-44-4

**Synonyms:** -Bis(2-Chloroethyl) Ether; 1,1'-Oxybis(2-Chloroethane); 1,5-Dichloro-3-Oxapentane; 1-Chloro-2-(beta-Chloroethoxy)Ethane; 2,2'-Dichloroethyl Ether; 2,2'-Dichlorodiethyl Ether; 2,2'-Dichlorethyl Ether; 2-Chloroethyl Ether; beta,beta'-Dichlorodiethyl Ether; beta,beta'-Dichloroethyl Ether; beta,beta-Dichlorodiethyl Ether; bis(2-Chloroethyl)Ether; bis(beta-Chloroethyl) Ether; bis(Chloro-2-Ethyl) Oxide; Chlorex; Chloroethyl Ether; Clorex; DCEE; Di(2-Chloroethyl) Ether; Di(beta-Chloroethyl)Ether; Dichloroether; Dichloroethyl Oxide; ENT 4,504; Ether, bis(2-Chloroethyl); sym-Dichloroethyl Ether

**Chemical Formula:**  $C_4H_8Cl_2O$

**Molecular Weight:** 143.02

SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

**OSHA PEL:** Ceiling concentration: 15 ppm (skin) (\*NIOSH/RTECS 1985)

**ACGIH TLV:** TWA 5 ppm (30 mg/m<sup>3</sup>); STEL 10 ppm (60 mg/m<sup>3</sup>) (skin) (\*ACGIH 1982)

**IDLH:** 250 ppm (NIOSH/OSHA 1978, p. 82)

**Other Limits Recommended:** Maximum air concentration (USSR) 2 mg/m<sup>3</sup> (Encyc Occupat Health and Safety 1983, p. 122)

SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

**Boiling Point:** 352°F, 178°C (\*Merck 1976)

**Specific Gravity** (H<sub>2</sub>O=1): 1.22 at 20°/20°C (\*Merck 1976)

**Vapor Pressure** (mmHg): 0.7 at 20°C (\*Sax 1979)

**Melting Point:** -58°F, -50°C (Merck 1983, p. 445)

## DICHLOROETHYL ETHER

### SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS (Continued)

**Vapor Density** (AIR=1): 4.93 (\*Browning 1965)

**Evaporation Rate** (Butyl acetate=1): Not Found

**Solubility in Water:** Slightly soluble in hot water (\*Weast 1979)

**Appearance and Odor:** Colorless, clear liquid with pungent (\*Merck 1976) or nauseating (\*ACGIH 1980) or sweet, pleasant odor (\*CHRIS 1978). At the vapor concentration necessary to cause respiratory tract damage, the odor is easily detectable and usually intolerable (\*Patty 1963)

### SECTION III -- FIRE AND EXPLOSION HAZARD DATA

**Flash Point** (Method Used): 180°F, 82°C (OC); 131°F, 55°C (CC) (Weiss 1980, p. 325)

**Flammable Limits:**

LEL: Not Found

UEL: Not Found

**Extinguishing Methods:** Use water, foam, mist, fog, spray, or dry chemical (\*Sax 1979). Use water in flooding quantities as fog (Student 1981, p. 185). Small fires: dry chemical, carbon dioxide, water spray, or foam. Large fires: water spray, fog, or foam. Move container from fire area if you can do so without risk. Spray cooling water on containers that are exposed to flames until well after fire is out. Fight fire from maximum distance. Dike fire control water for later disposal; do not scatter the material (DOT 1984, Guide 57).

**Special Fire Fighting Procedures:** Wear full protective clothing (\*NFPA 1978). Do not extinguish fire unless flow can be stopped. Cool all affected containers with flooding quantities of water. Apply water from as far a distance as possible (Student 1981, p. 185).

**Unusual Fire and Explosion Hazards:** May form phosgene or hydrogen chloride in fires (\*CHRIS 1978). There is danger of explosion when ethers are heated or exposed to flames or sparks. Ethers tend to form peroxides; when ethers containing peroxides are heated, they can detonate (\*Sax 1979). May be ignited by heat, sparks, or flames. Container may explode in heat of fire. Vapor explosion and poison hazard indoors, outdoors or in sewers (DOT 1984, Guide 57).

## DICHLOROETHYL ETHER

### SECTION IV -- REACTIVITY DATA

**Stability:** Unstable:

**Stable:** Yes (Weiss 1980, p. 325)

**Conditions to Avoid:** Ethers tend to form peroxides upon standing. Heating peroxide-containing ethers can cause detonation (\*Sax 1979).

**Incompatibility (Materials to Avoid):** Reacts vigorously with oleum and chlorosulfonic acid (\*Sax 1979).

**Hazardous Decomposition or Byproducts:** Decomposes in the presence of moisture to form hydrochloric acid (\*Martin 1974). Emits toxic fumes when heated to decomposition (\*Sax 1979); may form phosgene or hydrochloric acid in fires (\*CHRIS 1978).

**Hazardous Polymerization:** **May Occur:** Not Found  
**May Not Occur:** Not Found

**Conditions to Avoid:** Not Found

### SECTION V -- HEALTH HAZARD DATA

**Routes of Entry:** **Inhalation:** Yes (\*Browning 1965)  
**Skin:** Yes (\*Encyc Occupat Health and Safety 1971)  
**Ingestion:** Yes (\*Gosselin 1976)

**Health Hazards (Acute, Delayed, and Chronic):** This material is very toxic; the probable oral lethal dose is 50-500 mg/kg, or between 1 teaspoonful and 1 ounce for a 150 pound person (\*Gosselin 1976). It can be a central nervous system depressant in high concentrations. It is extremely irritating to the eyes, nose, and respiratory passages (\*Browning 1965). It can penetrate the skin to cause serious and even fatal poisoning (\*Encyc Occupat Health and Safety 1971). Poisonous; may be fatal if inhaled, swallowed or absorbed through skin (DOT 1984, Guide 57).

**Signs and Symptoms of Exposure:** At concentrations above 500 ppm, coughing, retching, and vomiting may occur (\*Browning 1965), as well as profuse tearing (\*Grant 1974). There can be irritation at lower concentrations (\*Browning 1965). Contact may cause burns to skin and eyes (DOT 1984, Guide 57).

**Medical Conditions Generally Aggravated by Exposure:** Not Found

**DICHLOROETHYL ETHER****SECTION V -- HEALTH HAZARD DATA (Continued)**

**Emergency and First Aid Procedures:** Move victim to fresh air; call emergency medical care. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In case of contact with material, immediately flush skin or eyes with running water for at least 15 minutes. Speed in removing material from skin is of extreme importance. Remove and isolate contaminated clothing and shoes at the site. Keep victim quiet and maintain normal body temperature. Effects may be delayed; keep victim under observation (DOT 1984, Guide 57).

**SECTION VI -- USE INFORMATION**

This material is used as a chemical intermediate for organic compounds and polymers (\*SRI), in the treatment of textiles (\*Merck 1976) and in dry cleaning (\*Hawley 1977), as a pesticide (\*NRC 1977; \*Farm Chemicals Handbook 1977), as an anesthetic (\*IARC 1972-1985), and for various other applications.

**SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE**

(Steps to be Taken in Case Material is Released or Spilled)

Remove all ignition sources. Ventilate area of spill or leak. Do not allow this material to enter a confined space, such as a sewer, because of the possibility of an explosion. Absorb spills in vermiculite, dry sand, earth, or similar material (\*NIOSH/OSHA 1981). Keep material out of water sources and sewers. Build dikes to contain flow as necessary. Use water spray to knock down vapors (Student 1981, p. 185). Spill or leak: shut off ignition sources; no flares, smoking or flames in hazard area. Do not touch spilled material; stop leak if you can do so without risk. Use water spray to reduce vapors. Small spills: absorb with sand or other noncombustible absorbent material and place into containers for later disposal. Large spills: dike far ahead of spill for later disposal. Keep unnecessary people away; isolate hazard area and deny entry. Stay upwind; keep out of low areas. Ventilate closed spaces before entering them. Wear positive pressure breathing apparatus and special protective clothing (DOT 1984, Guide 57).

EPA CHEMICAL PROFILE

INTERIM

Date: October 31, 1985

Revision: \_\_\_\_\_

CHEMICAL IDENTITY -- ADIPONITRILE

CAS Registry Number: 111-69-3

Synonyms (NIOSH/RTECS 1983 Synonyms, Volume 1, p. 287): Adipic Acid Dinitrile; Adipic Acid Nitrile; Adipodinitrile; 1,4-Dicyanobutane; Hexanedinitrile; Hexanedioic Acid, Dinitrile; Tetramethylene Cyanide

Chemical Formula:  $C_6H_8N_2$

Molecular Weight: 108.16

SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

OSHA PEL: Not Found

ACGIH TLV: Not Found

IDLH: Not Found

Other Limits Recommended: Occupational exposure to nitriles, recommended standard air: TWA 18 mg/m<sup>3</sup>. Toxicity information: LC<sub>50</sub> inhalation (rat) 1.7 mg/liter/4 hours (NIOSH/RTECS 1983, Volume 1, p. 287).

SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

Boiling Point: 563°F, 295°C (Sax 1984, p. 143)

Specific Gravity (H<sub>2</sub>O=1): 0.965 at 20°/4°C (Sax 1984, p. 143)

Vapor Pressure (mmHg): Not Found

Melting Point: 36.1°F, 2.3°C (Sax 1984, p. 143)

Vapor Density (AIR=1): 3.73 (Sax 1984, p. 143)

Evaporation Rate (Butyl acetate=1): Not Found

Solubility in Water: Slightly soluble (Hawley 1981, p. 21)

Appearance and Odor: Water white liquid, practically odorless (Sax 1984, p. 143).

## ADIPONITRILE

### SECTION III -- FIRE AND EXPLOSION HAZARD DATA

**Flash Point (Method Used):** 199.4°F (OC) (Sax 1984, p. 143)

**Flammable Limits:**

LEL: 1.0% at 200°C (Weiss 1980, p. 60)

UEL: Not Found

**Extinguishing Methods:** Dry chemical, carbon dioxide, water spray, fog or foam (DOT 1984, Guide 55).

**Special Fire Fighting Procedures:** Wear chemical protective suit with self-contained breathing apparatus. Cool exposed containers with water (Weiss 1980, p. 60).

**Unusual Fire and Explosion Hazards:** Combustion products may contain hydrocyanic acid (HCN) (Sax 1984, p. 143). Vapor may explode if ignited in an enclosed area (Weiss 1980, p. 60).

### SECTION IV -- REACTIVITY DATA

**Stability:** Unstable:

Stable: Yes (Weiss 1980, p. 60)

**Conditions to Avoid:** Not Found

**Incompatibility (Materials to Avoid):** Oxidizing material (Sax 1984, p. 143).

**Hazardous Decomposition or Byproducts:** When heated to decomposition, it emits highly toxic fumes (Sax 1984, p. 143).

**Hazardous Polymerization:** May Occur:

May Not Occur: Yes (Weiss 1980, p. 60)

**Conditions to Avoid:** Not Found

### SECTION V -- HEALTH HAZARD DATA

**Routes of Entry:** Inhalation: Yes (Sax 1984, p. 143)

Skin: Yes (DOT 1984, Guide 55)

Ingestion: Yes (Sax 1984, p. 143)

**Health Hazards (Acute, Delayed, and Chronic):** This material is toxic by ingestion and inhalation (Hawley 1981, p. 21). It produces disturbances of the respiration and circulation, irritation of the stomach and intestine, and loss of weight (Sax 1984, p. 143). It is irritating to skin and eyes (Weiss 1980, p. 60).



## ADIPONITRILE

### SECTION V -- HEALTH HAZARD DATA (Continued)

**Signs and Symptoms of Exposure:** Ingestion of a few milliliters may cause weakness, mental confusion, vomiting, rapid respiration, fast heart-beat, and convulsions. Exposure to vapor may cause headache and convulsions (Weiss 1980, p. 60).

#### **Medical Conditions Generally Aggravated by Exposure:**

**Emergency and First Aid Procedures:** Move victim to fresh air; call emergency medical care. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In case of contact with material, immediately flush skin or eyes with running water for at least 15 minutes. Speed in removing material from skin is of extreme importance. Remove and isolate contaminated clothing and shoes at the site. Keep victim quiet and maintain normal body temperature. Effects may be delayed; keep victim under observation (DOT 1984, Guide 55).

### SECTION VI -- USE INFORMATION

This material is used as an intermediate in the manufacture of nylon and in organic synthesis (Hawley 1981, p. 21).

### SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE

(Steps to be Taken in Case Material is Released or Spilled)

Keep unnecessary people away; isolate hazard area and deny entry. Stay upwind; keep out of low areas. Ventilate closed spaces before entering them. Wear positive pressure breathing apparatus and special protective clothing. Remove and isolate contaminated clothing at the site. Do not touch spilled material; stop leak if you can do it without risk. Use water spray to reduce vapors. Small spills: take up with sand or other non-combustible absorbent material and place into containers for later disposal. Large spills: dike far ahead of spill for later disposal (DOT 1984, Guide 55).

EPA CHEMICAL PROFILE

INTERIM

Date: October 31, 1985

Revision: \_\_\_\_\_

CHEMICAL IDENTITY -- TRICHLOROETHYLSILANE

CAS Registry Number: 115-21-9

**Synonyms:** Silane, Ethyltrichloro-; Ethyl Silicon Trichloride;  
Ethyltrichlorosilane; Silane, Ethyl(Trichloro)-; Silane, Trichloroethyl-;  
Silicane, Trichloroethyl-; Trichloroethylsilicane; Trichloroethylsilicon

**Chemical Formula:**  $C_2H_5Cl_3Si$

**Molecular Weight:** 163.51

SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

OSHA PEL: Not Found

ACGIH TLV: Not Found

IDLH: Not Found

**Other Limits Recommended:** Toxicity information:  $LC_{low}$  inhalation  
(rat) 3.34 mg/liter/4 hours (\*NIOSH/RTECS 1985)

SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

**Boiling Point:** 208°F, 97.9°C (\*Weast 1979)

**Specific Gravity** ( $H_2O=1$ ): 1.2381 at 20°C/4°C (\*Weast 1979)

**Vapor Pressure** (mmHg): Not Found

**Melting Point:** -158°F, -105.6°C (\*Weast 1979)

**Vapor Density** (AIR=1): 5.6 (\*Sax 1979)

**Evaporation Rate** (Butyl acetate=1): Not Found

**Solubility in Water:** Decomposes in water (\*Weast 1979)

**Appearance and Odor:** Trichloroethylsilane is a colorless liquid  
(\*Hawley 1981).

TRICHLOROETHYLSILANE

SECTION III -- FIRE AND EXPLOSION HAZARD DATA

**Flash Point** (Method Used): 72°F, 22.2°C (OC) (\*Sax 1979)

**Flammable Limits:** May be ignited under almost all normal temperature conditions (\*NFPA 1978)

LEL: Not Found

UEL: Not Found

**Extinguishing Methods:** (Caution: reacts with water to produce heat and toxic and corrosive fumes -- see Section IV below.) Use dry chemical, alcohol foam, or carbon dioxide; water may be ineffective, but water should be used to keep fire-exposed containers cool. If a leak or spill has not ignited, use water spray to disperse the vapors and to protect men attempting to stop a leak. Water spray may be used to flush spills away from exposure and to dilute spills to non-flammable mixtures (\*NFPA 1978).

**Special Fire Fighting Procedures:** Enter fire areas with extreme care. Full protective clothing must be worn including self-contained breathing apparatus, rubber gloves, boots, and bands around arms, legs, and waist. No skin surface should be exposed (\*NFPA 1978). Isolate for 1/2 mile in all directions if tank car or truck is involved in fire (\*DOT 1984).

**Unusual Fire and Explosion Hazards:** Trichloroethylsilane may form explosive mixtures with air (\*Hawley 1981). Its vapors are heavier than air and may travel a considerable distance to a source of ignition and flash back (\*NFPA 1978).

SECTION IV -- REACTIVITY DATA

**Stability:** Unstable: Yes (\*Sax 1979)  
Stable:

**Conditions to Avoid:** Decomposing heat (\*Sax 1979)

**Incompatibility** (Materials to Avoid): Will react with water or steam to produce heat and toxic and corrosive fumes. Will react vigorously with oxidizing materials (\*Sax 1979).

**Hazardous Decomposition or Byproducts:** Toxic and corrosive fumes including phosgene when heated to decomposition (\*Sax 1979); hydrochloric acid in presence of water (\*Hawley 1981).

**Hazardous Polymerization:** May Occur: Not Found  
May Not Occur: Not Found

**Conditions to Avoid:** Not Found

## TRICHLOROETHYLSILANE

### SECTION V -- HEALTH HAZARD DATA

**Routes of Entry:** Inhalation: Yes (\*Rumack 1975 to Present)  
Skin: Yes (\*Rumack 1975 to Present)  
Ingestion: Yes (\*Rumack 1975 to Present)

**Health Hazards** (Acute, Delayed, and Chronic): Vapor and liquid cause burns. Do not inhale or expose eyes to vapor. Vapor may damage eyes even if not immediately painful (NFPA 1984, pp. 49-89).

**Signs and Symptoms of Exposure:** By mouth (oral) -- corrosion of membranes (grayish-white to black areas of discoloration) of mouth, throat, and esophagus; abdominal pain, difficulty in swallowing; nausea and vomiting; intense thirst; shock with cold skin, rapid pulse, shallow respiration leading to death. By inhalation -- severe difficulty in breathing with swelling of larynx (throat); skin burns on exposed skin (\*Rumack 1975 to Present); eyes -- irritation, pain and tearing (\*Grant 1974).

**Medical Conditions Generally Aggravated by Exposure:** Not Found

**Emergency and First Aid Procedures:** Move victim to fresh air; call emergency medical care. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Remove and isolate contaminated clothing and shoes at site, being careful not to get corrosive material on your skin. In case of skin contact, immediately flush skin or eyes with running water for at least 15 minutes (\*DOT 1984). If chemical has been taken by mouth (oral), do not induce vomiting. Give victim copious amounts of water to rinse out mouth and esophagus and dilute stomach by having victim drink 1-2 large glassfuls of water or milk (\*Rumack 1975 to Present).

### SECTION VI -- USE INFORMATION

Chemical intermediate for silicones (\*SRI).

### SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE (Steps to be Taken in Case Material is Released or Spilled)

Avoid breathing vapors or contact with eyes or skin (see Section V above). Wear self-contained (positive pressure if available) breathing apparatus and full protective clothing. Shut off ignition sources; no flares, flames, or smoking. Do not touch spilled material; stop leak if you can do it without risk. Use water spray to reduce vapor but do not get water inside container. Small spills: take up with sand or other noncombustible absorbent material and containerize. Large spills: dike ahead of spill for later disposal (\*DOT 1984).

## EPA CHEMICAL PROFILE

## INTERIM

Date: October 31, 1985

Revision: \_\_\_\_\_

## CHEMICAL IDENTITY -- DIMEFOX

CAS Registry Number: 115-26-4

**Synonyms:** Phosphorodiamidic Fluoride, Tetramethyl-; BFP; BFPO; bis(Dimethylamido)Phosphoryl Fluoride; N,N,N',N'- Tetramethylphosphorodiamidic Fluoride; Dimefox; Tetramethylphosphorodiamidic Fluoride; bis(Dimethylamido)Fluorophosphate; bis(Dimethylamino)Fluorophosphate; Bisdimethylaminofluorophosphine Oxide; CR 409; DIFO; DMF; Fluorophosphoric acid Di(Dimethylamide); Hanane; Pestox 14; Pestox IV; Pestox XIV; Phosphine Oxide, bis(Dimethylamino)Fluoro-; Phosphorodiamidic Fluoride, Tetramethyl-; S-14; T-2002; Terra-sytam; Terrasytum; Tetrasytam; Tetramethyldiamidophosphoric Fluoride; TL 792; Wacker S 14/10

Chemical Formula:  $C_4H_{12}FN_2OP$ 

Molecular Weight: 154.13

## SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

OSHA PEL: Not Found

ACGIH TLV: Not Found

IDLH: Not Found

**Other Limits Recommended:** Toxicity information: LD<sub>50</sub> oral (rat) 1.0 mg/kg (\*NIOSH/RTECS 1985)

## SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

**Boiling Point:** 187°F, 86°C at 15 mmHg (\*Merck 1976)**Specific Gravity (H<sub>2</sub>O=1):** 1.115 at 20°C/4°C (\*Merck 1976)**Vapor Pressure (mmHg):** 0.36 at 25°C (\*Martin 1974)**Melting Point:** Not Found**Vapor Density (AIR=1):** Not Found**Evaporation Rate (Butyl acetate=1):** Not Found

**DIMEFOX**

**SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS (Continued)**

**Solubility in Water:** Freely soluble (\*Merck 1976)

**Appearance and Odor:** Colorless liquid (\*Martin 1974) with a fishy odor (\*Merck 1976)

**SECTION III -- FIRE AND EXPLOSION HAZARD DATA**

**Flash Point (Method Used):** Not Found

**Flammable Limits:**

LEL: Not Found

UEL: Not Found

**Extinguishing Methods:** (Non-Specific -- Insecticide, Liquid, Poisonous, n.o.s.) Extinguish with dry chemical, carbon dioxide, water spray, fog, or foam (DOT 1984, Guide 55).

**Special Fire Fighting Procedures:** (Non-Specific -- Insecticide, Liquid, Poisonous, n.o.s.) Stay upwind; keep out of low areas. Wear positive pressure breathing apparatus and special protective clothing. Ventilate closed spaces before entering them. Move container from fire area if you can do so without risk. Dike fire control water for later disposal; do not scatter the material (DOT 1984, Guide 55).

**Unusual Fire and Explosion Hazards:** Highly toxic fumes are given off upon decomposition with heat (\*Sax 1975). (Non-Specific -- Insecticide, Liquid, Poisonous, n.o.s.) Container may explode in heat of fire (DOT 1984, Guide 55).

**SECTION IV -- REACTIVITY DATA**

**Stability: Unstable:**

Stable: Yes (\*Sunshine 1969)

**Conditions to Avoid:** Decomposing heat (\*Sax 1975); contact with chlorine (\*Sunshine 1969).

**Incompatibility (Materials to Avoid):** Decomposes rapidly in the presence of chlorine. Oxidizes slowly in strong oxidizing agents (\*Sunshine 1969).

**Hazardous Decomposition or Byproducts:** Highly toxic fumes are given off when material is heated to decomposition (\*Sax 1975).

**DIMEFOX**

**SECTION IV -- REACTIVITY DATA (Continued)**

**Hazardous Polymerization:** May Occur: Not Found  
May Not Occur: Not Found

**Conditions to Avoid:** Not Found

**SECTION V -- HEALTH HAZARD DATA**

**Routes of Entry:** Inhalation: Yes (\*Martin 1974)  
Skin: Yes (\*Rumack 1975 to Present)  
Ingestion: Yes (\*Rumack 1975 to Present)

**Health Hazards (Acute, Delayed, and Chronic):** This material is extremely toxic; the probable oral lethal dose (human) is 5-50 mg/kg, or 7 drops to 1 teaspoonful for a 150-lb. person. Death may occur from respiratory arrest (\*Gosselin 1976). Hazards of vapor toxicity are high (\*Martin 1974).

**Signs and Symptoms of Exposure:** Symptoms include headache, blurred vision, nausea, cramps, difficulty in breathing, slurring of speech, and excessive salivation (\*Gosselin 1976).

**Medical Conditions Generally Aggravated by Exposure:** Not Found

**Emergency and First Aid Procedures:** (Non-Specific -- Insecticide, Liquid, Poisonous, n.o.s.) Move victim to fresh air; call emergency medical care. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In case of contact with material, immediately flush skin or eyes with running water for at least 15 minutes. Speed in removing material from the skin is of extreme importance. Remove and isolate contaminated clothing and shoes at the site. Keep victim quiet and maintain normal body temperature. Effects may be delayed; keep victim under observation (DOT 1984, Guide 55).

**SECTION VI -- USE INFORMATION**

This material is used as an insecticide; it is neither produced nor used in the U.S. (\*SRI). Not registered as a pesticide in the U.S. (USEPA/Pesticide Index 1985).

**DIMEFOX**

**SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE**

(Steps to be Taken in Case Material is Released or Spilled)

Avoid inhalation (see Section V above). (Non-Specific -- Insecticide, Liquid, Poisonous, n.o.s.) Do not touch spilled material; stop leak if you can do so without risk. Wear positive pressure breathing apparatus and special protective clothing. Use water spray to reduce vapors. Small spills: absorb with sand or other noncombustible absorbent material and place into containers for later disposal. Large spills: dike far ahead of spill for later disposal (DOT 1984, Guide 55).



EPA CHEMICAL PROFILE

INTERIM

Date: October 31, 1985

Revision: \_\_\_\_\_

CHEMICAL IDENTITY -- ENDOSULFAN

CAS Registry Number: 115-29-7

**Synonyms:** 5-Norbornene-2,3-Dimethanol, 1,4,5,6,7,7-Hexachloro-, Cyclic Sulfite; 1,2,3,4,7,7-Hexachlorobicyclo[2.2.1]Hepten-5,6-Bioxymethylenesulfite; 1,2,3,4,7,7-Hexachlorobicyclo-[2.2.1]-Hepten-5,6-Bisoxymethylene Sulfite; 1,2,3,4,7,7-Hexachlorobicyclo[2.2.1]-2-Heptene-5,6-Bisoxymethylene Sulfite; 1,4,5,6,7,7-Hexachloro-5-Norbornene-2,3-Dimethanol Cyclic Sulfite; 1,4,5,6,7,7-Hexachloro-8,9,10-Trinorborn-5-en-2,3-ylenedimethyl Sulphite; 6,7,8,9,10,10-Hexachloro-1,5,5A,6,9,9A-Hexahydro-6,9-Methano-2,4,3-Benzodioxathiepin-3-Oxide; 6,9-Methano-2,4,3-Benzodioxathiepin, 6,7,8,9,10,10-Hexachloro-1,5,5A,6,9,9A-Hexahydro-, 3-Oxide; alpha, beta-1,2,3,4,7,7-Hexachlorobicyclo[2.2.1]-2-Heptene-5,6-Bisoxymethylene Sulfite; AS 4314; Benzoepin; Beosit; BIO 5,462; Chlorthiepin; Crisulfan; Cyclodan; Devisulphan; Endocel; Endosol; Endosulphan; Ensure; ENT 23,979; FMC 5462; Hexachlorohexahydromethano-2,4,3-Benzodioxathiepin-3-Oxide; Hildan; HOE 2,671; Insectophene; Kop-Thiodan; Malix; NCI C00566; NIA 5462; Niagara 5,462; OMS 570; Sulfurous Acid, Cyclic Ester with 1,4,5,6,7,7-Hexachloro-5-Norbornene-2,3-Dimethanol; Thifor; Thimul; Thiodan; Thiofor; Thiomul Thionex; Thiosulfan; Thiosulfan Tionel; Thiotox [Insecticide]; Tionex; Tiovel; 6,7,8,9,10,10-Hexachloro-1,5,5a,6,9,9a-Hexahydro-6,9-Methano-2,4,3-Benzodioxathiepin-3-Oxide

**Chemical Formula:**  $C_9H_6Cl_6O_3S$

**Molecular Weight:** 406.95

SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

OSHA PEL: Not Found

ACGIH TLV: TWA 0.1 mg/m<sup>3</sup>; STEL 0.3 mg/m<sup>3</sup> (skin) (\*ACGIH 1983)

IDLH: Not Found

**Other Limits Recommended:** Maximum air concentration (USSR) 0.1 mg/m<sup>3</sup> (Encyc Occupat Health and Safety 1983, p. 1634). Toxicity information: LC<sub>50</sub> inhalation (rat) 0.08 mg/liter for 4 hours (\*NIOSH/RTECS 1985).

## ENDOSULFAN

## SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS (Continued)

**Boiling Point:** Not Found

**Specific Gravity** ( $H_2O=1$ ): 1.745 at 20°C (Farm Chemicals Handbook 1984, p. C-92)

**Vapor Pressure** (mmHg):  $1 \times 10^{-5}$  at 77°F, 25°C (\*Worthing 1979)

**Melting Point:**  $\alpha$  isomer 228.7°F, 109.2°C;  $\beta$  isomer 415.9°F, 213.3°C (Farm Chemicals Handbook 1984, p. C-92). Mixture 158-212°F, 70-100°C (Buchel 1983, p. 47; Hayes 1982, p. 252)

**Vapor Density** (AIR=1): Not Found

**Evaporation Rate** (Butyl acetate=1): Not Found

**Solubility in Water:** Practically insoluble (Merck 1983, p. 516)

**Appearance and Odor:** Brown crystals (\*Merck 1983); colorless crystals (\*Spencer 1982); smells like sulfur dioxide (Hayes 1982, p. 252)

## SECTION III -- FIRE AND EXPLOSION HAZARD DATA

**Flash Point** (Method Used): Not Found

**Flammable Limits:**

LEL: Not Found

UEL: Not Found

**Extinguishing Methods:** Extinguish fire using agent suitable for type of surrounding fire. (Material itself does not burn or burns with difficulty.) Use water in flooding quantities as fog. Use alcohol foam, carbon dioxide or dry chemical (Student 1981, p. 220).

**Special Fire Fighting Procedures:** Keep unnecessary people away; isolate hazard area and deny entry. Stay upwind; keep out of low areas. Ventilate closed spaces before entering them. Wear positive pressure breathing apparatus and special protective clothing. Remove and isolate contaminated clothing at the site (DOT 1984, Guide 55).

**Unusual Fire and Explosion Hazards:** Container may explode in heat of fire. Fire or run off from fire control water may release irritating or poisonous gases (DOT 1984, Guide 55).

ENDOSULFAN

SECTION IV -- REACTIVITY DATA

**Stability:** Unstable:

**Stable:** Yes (\*White-Stevens 1971)

**Conditions to Avoid:** Slowly oxidizes in air (\*White-Stevens 1971). Do not store at temperature below 20°F (Farm Chemicals Handbook 1984, p. C-92).

**Incompatibility (Materials to Avoid):** Not Found

**Hazardous Decomposition or Byproducts:** Not Found

**Hazardous Polymerization:** May Occur: Not Found  
May Not Occur: Not Found

**Conditions to Avoid:** Not Found

SECTION V -- HEALTH HAZARD DATA

**Routes of Entry:** Inhalation: Yes (Hawley 1984, p. 410)  
Skin: Yes (Sax 1984, p. 377)  
Ingestion: Yes (Sax 1984, p. 377)

**Health Hazards (Acute, Delayed, and Chronic):** It is very toxic. The probable oral lethal dose is 50 to 500 mg/kg, or 1 teaspoonful to 1 ounce for a 150 lb. person (\*Gosselin 1976).

**Signs and Symptoms of Exposure:** Can cause death. Symptoms include gagging, vomiting, diarrhea, agitation, convulsions, foaming at the mouth, dyspnea, apnea, bluing of skin and loss of consciousness (Hayes 1982, p. 253).

**Medical Conditions Generally Aggravated by Exposure:** Not Found

**Emergency and First Aid Procedures:** Move victim to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In case of contact with material, immediately flush skin or eyes with running water for at least 15 minutes. Speed in removing material from skin is of extreme importance. Remove and isolate contaminated clothing and shoes at the site. Keep victim quiet and maintain normal body temperature. Effects may be delayed; keep victim under observation (DOT 1984, Guide 55).

## ENDOSULFAN

### SECTION VI -- USE INFORMATION

This material is used as an insecticide for vegetable crops, fruits, and nuts (\*SRI).

### SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE

(Steps to be Taken in Case Material is Released or Spilled)

In case of spills, stay upwind; stay out of low areas. Use water spray to reduce vapors. Ventilate closed spaces before entering them. Wear positive pressure breathing apparatus and special protective clothing. Do not touch spilled material; stop leak if you can do it without risk. Small spills: take up with sand or other noncombustible absorbent material and place into containers for later disposal. Small dry spills: with clean shovel place material into clean, dry container and cover; move containers from spill area. Large spills: dike far ahead of spill for later disposal (DOT 1984, Guide 55).

## EPA CHEMICAL PROFILE

### INTERIM

Date: October 31, 1985  
Revision: \_\_\_\_\_

### CHEMICAL IDENTITY -- FENSULFOTHION

CAS Registry Number: 115-90-2

**Synonyms:** Phosphorothioic Acid, O,O-Diethyl O-(p-(Methylsulfinyl)Phenyl) Ester; Agricur; B 25141; Bay 25141; Bayer 25141; Bayer S767; Chemagro 25141; Daconit; Dasanit; Dazanit; Desanit; Diethyl p-Methylsulfinylphenyl Thiophosphate; DMSP; ENT 24,945; O,O-Diethyl O-(4-(Methylsulfinyl)Phenyl) Phosphorothioate; O,O-Diethyl O-(p-(Methylsulfinyl)Phenyl) Phosphorothioate; Phenol, p-(Methylsulfinyl)-, O-Ester With O,O-Diethyl Phosphorothioate; Phosphorothioic Acid, O,O-Diethyl-O-(4-(Methylsulfinyl)Phenyl) Ester; S 767; Terracur P; VUAGT; VUAGT 108; VUAGT 96

**Chemical Formula:**  $C_{11}H_{17}O_4PS_2$

**Molecular Weight:** 308.35

### SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

**OSHA PEL:** Not Found

**ACGIH TLV:** TWA 0.1 mg/m<sup>3</sup> (\*ACGIH 1980)

**IDLH:** Not Found

**Other Limits Recommended:** Toxicity information: LD<sub>low</sub> oral (guinea pig) 9 mg/kg (\*NIOSH/RTECS 1985)

### SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

**Boiling Point:** 280-286°F, 138-141°C at 0.01 mmHg (\*Merck 1976)

**Specific Gravity (H<sub>2</sub>O=1):** 1.202 (\*Spencer 1973)

**Vapor Pressure (mmHg):** Not Found

**Melting Point:** Not Found

**Vapor Density (AIR=1):** Not Found

**Evaporation Rate (Butyl acetate=1):** Not Found

## FENSULFOTHION

**Solubility in Water:** 1.54 g/liter (\*Worthing 1979)

**Appearance and Odor:** Oily yellow liquid (\*Worthing 1979); brown liquid (\*Spencer 1973)

### SECTION III -- FIRE AND EXPLOSION HAZARD DATA

**Flash Point (Method Used):** Not Found

**Flammable Limits:**

LEL: Not Found

UEL: Not Found

**Extinguishing Methods:** (Non-Specific -- Organophosphorus Pesticide, Liquid, n.o.s.) Extinguish with dry chemical, carbon dioxide, water spray, fog or foam (DOT 1984, Guide 55).

**Special Fire Fighting Procedures:** (Non-Specific -- Organophosphorus Pesticide, Liquid, n.o.s.) Wear positive pressure breathing apparatus and special protective clothing. Move container from fire area. Fight fire from maximum distance. Dike fire control water for later disposal; do not scatter the material (DOT 1984, Guide 55).

**Unusual Fire and Explosion Hazards:** (Non-Specific -- Organophosphorus Pesticide, Liquid, n.o.s.) This material may burn but may not ignite readily. Containers may explode in heat of fire (DOT 1984, Guide 55). When heated highly toxic fumes of phosphorus and sulfur oxides are emitted (\*Sax 1979).

### SECTION IV -- REACTIVITY DATA

**Stability:** Unstable:

Stable: Yes (\*Menzie 1969)

**Conditions to Avoid:** Hydrolyzes in alkali, isomerizes in air (\*Menzie 1969).

**Incompatibility (Materials to Avoid):** Incompatible with alkali chemicals (\*Menzie 1969).

**Hazardous Decomposition or Byproducts:** Sulfur oxides and phosphorous oxides are formed when heated to decomposition (\*Sax 1979).

**Hazardous Polymerization:** May Occur: Not Found  
May Not Occur: Not Found

**Conditions to Avoid:** Not Found

## FENSULFOTHION

### SECTION V -- HEALTH HAZARD DATA

**Routes of Entry:** **Inhalation:** Yes (Non-Specific -- Organic Phosphorus Pesticides) (Hayes 1982, p. 301)  
**Skin:** Yes (Non-Specific -- Organic Phosphorus Pesticides) (Hayes 1982, p. 301)  
**Ingestion:** Yes (Non-Specific -- Organic Phosphorus Pesticides) (Hayes 1982, p. 301)

**Health Hazards** (Acute, Delayed, and Chronic): It displays cholinesterase inhibiting properties (\*ACGIH 1980). Death results primarily from respiratory arrest stemming from failure of the respiratory center, paralysis of respiratory muscles and intense bronchoconstriction (\*Gosselin 1976).

**Signs and Symptoms of Exposure:** This material may cause nausea, vomiting, abdominal cramps, diarrhea, headache, giddiness, vertigo, weakness, lack of muscle control, tearing, slurring of speech, difficult breathing, convulsions, excessive salivation, tightness in chest, and death from respiratory arrest (\*Gosselin 1976).

**Medical Conditions Generally Aggravated by Exposure:** Not Found

**Emergency and First Aid Procedures:** (Non-Specific -- Organophosphorus Pesticide, Liquid, n.o.s.) Move victim to fresh air; call emergency medical care. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In case of contact with the material, immediately flush skin or eyes with running water for at least 15 minutes. Speed in removing material from skin is of extreme importance. Remove and isolate contaminated clothing and shoes at the site. Keep victim quiet and maintain normal body temperature. Effects may be delayed; keep victim under observation (DOT 1984, Guide 55).

### SECTION VI -- USE INFORMATION

This material is used as an insecticide, nematocide (\*SRI), and mosquito larvicide (\*Spencer 1973).

### SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE (Steps to be Taken in Case Material is Released or Spilled)

(Non-Specific -- Organophosphorus Pesticide, Liquid, n.o.s.) Wear self-contained breathing apparatus and special protective clothing. Keep unnecessary people away; stay upwind. Do not touch spilled material; stop leak if possible. Use water spray to reduce vapors. Take up with noncombustible absorbent material. For large spills, dike far ahead of spill (DOT 1984, Guide 55).

EPA CHEMICAL PROFILE

INTERIM

Date: October 31, 1985

Revision: \_\_\_\_\_

CHEMICAL IDENTITY -- ALDICARB

CAS Registry Number: 116-06-3

**Synonyms:** Propionaldehyde, 2-Methyl-2-(Methylthio)-, O-(Methylcarbamoyl)Oxime; 2-Methyl-2-(Methylthio)Propanal, O-((Methylamino)Carbonyl)Oxime; 2-Methyl-2-(Methylthio)Propionaldehyde O-(Methylcarbamoyl)Oxime; Aldecarb; Carbamic Acid, Methyl-, O-((2-Methyl-2-(Methylthio)Propylidene)Amino) Derivative; Carbamyl; Carbanolate; ENT 27,093; NCI-C08640; OMS 771; Propanal, 2-Methyl-2-(Methylthio)-, O-((Methylamino)Carbonyl)Oxime; Propionaldehyde, 2-Methyl-2-(Methylthio)-, O-(Methylcarbamoyl)Oxime; UC 21149; Union Carbide 21149; Union Carbide UC-21149; Temik TSK; Sulfone aldoxycarb; Temic; Ambush; Propanal, 2-Methyl-2-(Methylthio)-, O-((Methylamino)Carbonyl)Oxime; Temic; Temik; Temik 10 G; Temik G 10

**Chemical Formula:**  $C_7H_{14}N_2O_2S$

**Molecular Weight:** 190.23

SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

OSHA PEL: Not Found

ACGIH TLV: Not Found

IDLH: Not Found

**Other Limits Recommended:** Toxicity information: LD<sub>50</sub> oral (mouse)  
0.3 mg/kg (\*NIOSH/RTECS 1985)

SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

**Boiling Point:** Not Found

**Specific Gravity** (H<sub>2</sub>O=1): 1.1950 at 25°C (\*Farm Chemicals Handbook 1983)

**Vapor Pressure** (mmHg): Less than 0.5 at 20°C (\*Sunshine 1969)

**Melting Point:** 210-214°F, 99-101°C (\*Merck 1983)



ALDICARB

SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS (Continued)

Vapor Density (AIR=1): Not Found

Evaporation Rate (Butyl acetate=1): Not Found

Solubility in Water: 6 g/liter at 25°C (\*Merck 1983)

Appearance and Odor: White crystals, slightly sulfurous odor (\*Spencer 1982); commercial formulations are granular (\*Farm Chemicals Handbook 1985)

SECTION III -- FIRE AND EXPLOSION HAZARD DATA

Flash Point (Method Used): Not Found

Flammable Limits:

LEL: Not Found

UEL: Not Found

Extinguishing Methods: (Non-Specific -- Carbamate Pesticide, Solid)  
Some of these materials may burn but none of them ignite readily. Small fires: dry chemical, carbon dioxide, water spray, or foam. Large fires: water spray, fog or foam (DOT 1984, Guide 55).

Special Fire Fighting Procedures: (Non-Specific -- Carbamate Pesticide, Solid) Stay upwind; keep out of low areas. Ventilate closed spaces before entering them. Wear positive pressure breathing apparatus and special protective clothing. Move container from fire area if you can do it without risk. Fight fire from maximum distance. Dike fire control water for later disposal; do not scatter the material (DOT 1984, Guide 55).

Unusual Fire and Explosion Hazards: When heated to decomposition, it emits very toxic fumes of nitrogen oxides and sulfur oxides (\*Sax 1984).

SECTION IV -- REACTIVITY DATA

Stability: Unstable:

Stable: Yes (\*NIH 1979)

Conditions to Avoid: Unstable in alkali; poor stability at 122°F, 50°C (\*Sunshine 1969).

## ALDICARB

### SECTION IV -- REACTIVITY DATA

**Incompatibility (Materials to Avoid):** Incompatible with highly alkaline substances (\*Farm Chemicals Handbook 1983).

**Hazardous Decomposition or Byproducts:** When heated, aldicarb emits very toxic fumes of nitrogen oxides and sulfur oxides (\*Sax 1984).

**Hazardous Polymerization:** May Occur: Not Found  
May Not Occur: Not Found

**Conditions to Avoid:** Not Found

### SECTION V -- HEALTH HAZARD DATA

**Routes of Entry:** Inhalation: Not Found  
Skin: Yes (\*Doull 1980)  
Ingestion: Yes (\*Doull 1980)

**Health Hazards (Acute, Delayed, and Chronic):** Aldicarb is a carbamate pesticide (Hayes 1981, p. 447). This material is super toxic; the probable oral lethal dose for humans is less than 5 mg/kg, or a taste (less than 7 drops) for a 150-lb. person (\*Gosselin 1976); it is extremely toxic by both oral and dermal routes (\*Doull 1980).

**Signs and Symptoms of Exposure:** Symptoms include headache, blurred vision, nausea, vomiting, diarrhea, and abdominal pain. In severe cases, unconsciousness and convulsions may occur (\*Rumack 1975 to Present).

**Medical Conditions Generally Aggravated by Exposure:** Not Found

**Emergency and First Aid Procedures:** (Non-Specific -- Carbamate Pesticide, Solid) Move victim to fresh air; call emergency medical care. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In case of contact with material, immediately flush skin or eyes with running water for at least 15 minutes. Speed in removing material from skin is of extreme importance. Remove and isolate contaminated clothing and shoes at the site. Keep victim quiet and maintain normal body temperature. Effects may be delayed; keep victim under observation (DOT 1984, Guide 55).

### SECTION VI -- USE INFORMATION

This material is used as an insecticide, acaricide, and nematocide (\*SRI).

ALDICARB

**SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE**

(Steps to be Taken in Case Material is Released or Spilled)

(Non-Specific -- Carbamate Pesticide, solid) Keep unnecessary people away; isolate hazard area and deny entry. Stay upwind; keep out of low areas. Ventilate closed spaces before entering them. Wear positive pressure breathing apparatus and special protective clothing. Remove and isolate contaminated clothing at the site. Do not touch spilled material; stop leak if you can do it without risk. Use water spray to reduce vapors. Small spills: take up with sand or other noncombustible absorbent material and place into containers for later disposal. Small dry spills: with clean shovel place material into clean, dry container and cover; move containers from spill area. Large spills: dike far ahead of spill for later disposal (DOT 1984, Guide 55).

EPA CHEMICAL PROFILE

INTERIM

Date: October 31, 1985

Revision: \_\_\_\_\_

CHEMICAL IDENTITY -- COUMAFURYL

CAS Registry Number: 117-52-2

Synonyms: (NIOSH/RTECS 1983 Synonyms, Volume 1, p. 964) Coumarin, 3-(alpha-Acetonalfurfuryl)-4-Hydroxy-; 3-(alpha-Acetonalfurfuryl)-4-Hydroxycoumarin; 2H-1-Benzopyran-2-one, 3-(1-(2-Furanyl)-3-Oxobutyl)-4-Hydroxy- (9CI); Foumarin; Fumarin; Fumasol; Furmarin; 3-(1-Furyl-3-Acetyethyl)-4-Hydroxycoumarin; Krumkil; Lurat; Ratafin; Rat-A-Way; Tomarin

Chemical Formula:  $C_{17}H_{14}O_5$

Molecular Weight: 298.31

SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

OSHA PEL: Not Found

ACGIH TLV: Not Found

IDLH: Not Found

Other Limits Recommended: Toxicity information: LD<sub>50</sub> oral (mouse)  
14.7 mg/kg (\*NIOSH/RTECS 1985)

SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

Boiling Point: Not Found

Specific Gravity (H<sub>2</sub>O=1): Not Found

Vapor Pressure (mmHg): Not Found

Melting Point: 255°F, 124°C (Hayes 1982, p. 512; Merck 1983, p. 366)

Vapor Density (AIR=1): Not Found

Evaporation Rate (Butyl acetate=1): Not Found

Solubility in Water: Not Found

Appearance and Odor: Crystalline substance (Encyc Occupat Health and Safety 1983, p. 560)

**COUMAFURYL**

**SECTION III -- FIRE AND EXPLOSION HAZARD DATA**

**Flash Point** (Method Used): Not Found

**Flammable Limits:**

LEL: Not Found

UEL: Not Found

**Extinguishing Methods:** (Non-Specific -- Coumarin Pesticide, Solid, n.o.s.) Small fires: dry chemical, carbon dioxide, water spray or foam. Large fires: water spray, fog or foam. Move container from fire area if you can do so without risk. Fight fire from maximum distance. Dike fire control water for later disposal; do not scatter the material (DOT 1984, Guide 55).

**Special Fire Fighting Procedures:** (Non-Specific -- Coumarin Pesticide, Solid, n.o.s.) Keep unnecessary people away; isolate hazard area and deny entry. Stay upwind; keep out of low areas. Ventilate closed spaces before entering them. Wear positive pressure breathing apparatus and special protective clothing. Remove and isolate contaminated clothing at the site. If water pollution occurs, notify the appropriate authorities (DOT 1984, Guide 55).

**Unusual Fire and Explosion Hazards:** Not Found

**SECTION IV -- REACTIVITY DATA**

**Stability:** Unstable: Not Found

Stable: Not Found

**Conditions to Avoid:** Not Found

**Incompatibility** (Materials to Avoid): Not Found

**Hazardous Decomposition or Byproducts:** Not Found

**Hazardous Polymerization:** May Occur: Not Found

May Not Occur: Not Found

**Conditions to Avoid:** Not Found

## COUMAFURYL

### SECTION V -- HEALTH HAZARD DATA

**Routes of Entry:** Inhalation: No (Encyc Occupat Health and Safety 1983, p. 560)  
Skin: Yes (Non-Specific Warfarin) (Hayes 1982, p. 511)  
Ingestion: Yes (Encyc Occupat Health and Safety 1983, P. 560)

**Health Hazards (Acute, Delayed, and Chronic):** Coumafuryl is very similar to warfarin (Hayes 1982, p. 512). With a single large ingested dose or chronic exposure, may cause hemorrhagic accidents (Encyc Occupat Health and Safety 1983, p. 560).

**Signs and Symptoms of Exposure:** (Non-Specific -- Warfarins) May cause death by hemorrhagic shock. After a few days or few weeks of repeated ingestion, may cause nose bleeds and bleeding gums, small reddish spots like a rash, bruises of the elbows, knees and buttocks, blood in urine and stools, occasional paralysis due to a stroke (Gosselin 1984, p. III-395).

**Medical Conditions Generally Aggravated by Exposure:** Not Found

**Emergency and First Aid Procedures:** Treatment is as for warfarin (Hayes 1982, p. 512). (Non-Specific -- Coumarin) Move victim to fresh air; call emergency medical care. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In case of contact with material, immediately flush skin or eyes with running water for at least 15 minutes. Speed in removing material from skin is of extreme importance. Remove and isolate contaminated clothing and shoes at the site. Keep victim quiet and maintain normal body temperature. Effects may be delayed, keep victim under observation (DOT 1984, Guide 55).

### SECTION VI -- USE INFORMATION

Anticoagulant rodenticide (Farm Chemicals Handbook 1984, p. C-108).

### SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE

(Steps to be Taken in Case Material is Released or Spilled)

(Non-Specific -- Coumarin Pesticide, Solid, n.o.s.) Do not touch spilled material; stop leak if you can do so without risk. Use water spray to reduce vapors. For small spills, absorb with sand or other noncombustible absorbent material and place into containers for later disposal. For small dry spills, with clean shovel place material into clean, dry container and cover; move containers from spill area. For large spills, dike far ahead of spill for later disposal (DOT 1984, Guide 55).

COUMAFURYL

COMMENTS

Sources searched but no information found:

Weast 1979  
Hawley 1981  
Sax 1984  
DASE 1980  
Gilman 1985  
NIOSH/OSHA 1978  
ACGIH 1984

## EPA CHEMICAL PROFILE

## INTERIM

Date: October 31, 1985

Revision: \_\_\_\_\_

## CHEMICAL IDENTITY -- DIOCTYL PHTHALATE

CAS Registry Number: 117-84-0

**Synonyms:** Di-n-Octyl Phthalate; 1,2-Benzenedicarboxylic Acid Dioctyl Ester; 1,2-Benzenedicarboxylic Acid, Dioctyl Ester; Celluflex DOP; Dinopol NOP; Dioctyl O-Benzenedicarboxylate; DNOP; n-Dioctyl Phthalate; n-Octyl Phthalate; O-Benzenedicarboxylic Acid, Dioctyl Ester; Octyl Phthalate; Phthalic Acid Dioctyl Ester; Phthalic Acid, Dioctyl Ester; Polycizer 162; PX-138; Vinicizer 85; Benzenedicarboxylic Acid Di-n-Octylester; Dinopol NOP

**Chemical Formula:**  $C_{24}H_{38}O_4$ **Molecular Weight:** 390.62

## SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

**OSHA PEL:** Not Found**ACGIH TLV:** Not Found**IDLH:** Not Found

**Other Limits Recommended:** Toxicity information:  $LC_{50}$  inhalation (mouse) 0.005 mg/liter (\*NIOSH/RTECS 1985)

## SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

**Boiling Point:** 446°F, 230°C at 5 mmHg (\*Clayton and Clayton 1981-82)**Specific Gravity ( $H_2O=1$ ):** 0.9861 (\*Clayton and Clayton 1981-82)**Vapor Pressure (mmHg):**  $\leq 0.2$  at 150°C (\*Clayton and Clayton 1981-82)**Melting Point:** -22°F, -30°C (\*Clayton and Clayton 1981-82)**Vapor Density (AIR=1):** 16.0 (\*Clayton and Clayton 1981-82)**Evaporation Rate (Butyl acetate=1):** Not Found



## DIOCTYL PHTHALATE

### SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS (Continued)

**Solubility in Water:** Insoluble (\*Clayton and Clayton 1981-82)

**Appearance and Odor:** Liquid (\*USEPA/ECAO 1980)

### SECTION III -- FIRE AND EXPLOSION HAZARD DATA

**Flash Point (Method Used):** 426°F, 219°C (\*Clayton and Clayton 1981-82)

**Flammable Limits:**

LEL: 0.3% (NFPA 1984, p. 325M-44)

UEL: Not Found

**Extinguishing Methods:** Water or foam may cause frothing. Water spray carefully applied has been successful in extinguishing fires (NFPA 1984, p. 325M-6).

**Special Fire Fighting Procedures:** Normal firefighting procedures. When on fire, these materials offer no health hazard beyond that presented by ordinary combustible materials (\*NFPA 1978).

**Unusual Fire and Explosion Hazards:** Normal firefighting procedures (\*NFPA 1978)

### SECTION IV -- REACTIVITY DATA

**Stability:** Unstable:

Stable: Yes (\*NFPA 1978)

**Conditions to Avoid:** Not Found

**Incompatibility (Materials to Avoid):** Not Found

**Hazardous Decomposition or Byproducts:** When heated to decomposition, it emits acrid smoke and fumes (Sax 1984, p. 1224).

**Hazardous Polymerization:** May Occur: Not Found

May Not Occur: Not Found

**Conditions to Avoid:** Not Found

**DIOCTYL PHTHALATE****SECTION V -- HEALTH HAZARD DATA**

**Routes of Entry:** **Inhalation:** No (\*Patty 1963)  
**Skin:** No (Clayton and Clayton 1981-82, p. 2349)  
**Ingestion:** Yes (\*Gosselin 1976)

**Health Hazards** (Acute, Delayed, and Chronic): This chemical is rated as slightly to moderately toxic, with a probable oral lethal dose for humans of 0.5-15 g/kg body weight, or between 1 ounce and 1 quart dose for a 70 kg (150 lb) person (\*Gosselin 1976). This chemical rarely causes skin difficulties and its low vapor pressure precludes the inhalation of any significant amounts (\*Encyc Occupat Health and Safety 1971).

**Signs and Symptoms of Exposure:** The chemical might cause mucous membrane irritation and central nervous system depression if absorbed (\*Gosselin 1976). Human dermal patch testing showed no irritation and sensitization (\*Clayton and Clayton 1981-82).

**Medical Conditions Generally Aggravated by Exposure:** Not Found

**Emergency and First Aid Procedures:** Procedures are those for general poisoning. After oral exposure, establish respiration and prevent absorption. After skin exposure, the skin should be washed thoroughly with soap and water. After eye exposure, eyes should be irrigated with tap water (\*Rumack 1975 to Present).

**SECTION VI -- USE INFORMATION**

It is used as a plasticizer for plastics; rubber materials (\*Clayton and Clayton 1981-82); cellulose ester resins; polystyrene resins; and vinyl resins (\*SRI).

**SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE**

(Steps to be Taken in Case Material is Released or Spilled)

The synthesis of phthalates requires good ventilation in order to prevent contamination of air with phthalic anhydride or alcohols. There maybe some need for skin protection (\*Encyc Occupat Health and Safety 1971).

EPA CHEMICAL PROFILE

INTERIM

Date: October 31, 1985

Revision: \_\_\_\_\_

CHEMICAL IDENTITY -- ISOPROPYLMETHYLPYRAZOLYL DIMETHYLCARBAMATE

CAS Registry Number: 119-38-0

**Synonyms:** Carbamic Acid, Dimethyl-, 1-Isopropyl-3-Methylpyrazol-5-yl Ester; 1-Isopropyl-3-Methyl-5-Pyrazolyl Dimethylcarbamate; 5-Methyl-2-Isopropyl-3-Pyrazolyl Dimethylcarbamate; Carbamic Acid, Dimethyl-, 1-Isopropyl-3-Methylpyrazol-5-yl Ester; Carbamic Acid, Dimethyl-, 3-Methyl-1-(1-Methylethyl)-1H-Pyrazol-5-yl Ester; Dimethyl-5-(1-Isopropyl-3-Methyl-Pyrazolyl)-Carbamate; Dimethylcarbamic Acid 1-Isopropyl-3-Methylpyrazol-5-yl Ester; Dimethylcarbamic Acid 3-Methyl-1-(1-Methylethyl)-1H-Pyrazol-5-yl Ester; ENT 19,060; G 23611; Primin; Pyrazol-5-ol, 1-Isopropyl-3-Methyl-, Dimethylcarbamate; Saolan; Isolan

**Chemical Formula:**  $C_{10}H_{17}N_3O_2$

**Molecular Weight:** 211.27

SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

OSHA PEL: Not Found

ACGIH TLV: Not Found

IDLH: Not Found

**Other Limits Recommended:** Toxicity information: LD<sub>50</sub> oral (mouse)  
9.8 mg/kg (\*NIOSH/RTECS 1985)

SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

**Boiling Point:** 217°F, 103°C at 0.7 mm (\*Sax 1979)

**Specific Gravity (H<sub>2</sub>O=1):** 1.07 at 20°C (\*Sax 1979)

**Vapor Pressure (mmHg):** 0.001 at 20°C (\*Sunshine 1969)

**Melting Point:** Not Found

**Vapor Density (AIR=1):** Not Found

**Evaporation Rate (Butyl acetate=1):** Not Found

ISOPROPYLMETHYLPYRAZOLYL DIMETHYLCARBAMATE

SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS (Continued)

**Solubility in Water:** Miscible in water (\*Hawley 1977)

**Appearance and Odor:** Colorless liquid (Hayes 1982, p. 454)

SECTION III -- FIRE AND EXPLOSION HAZARD DATA

**Flash Point (Method Used):** Not Found

**Flammable Limits:**

LEL: Not Found

UEL: Not Found

**Extinguishing Methods:** Use methods for liquid carbamate pesticides (Hayes 1982, p. 454). Small fires: dry chemical, carbon dioxide, water spray, or foam. Large fires: water spray, fog, or foam. Move container from fire area if you can do it without risk. Fight fire from maximum distance. Dike fire control water for later disposal; do not scatter the material (DOT 1984, Guide 55).

**Special Fire Fighting Procedures:** As with other liquid carbamate pesticides (Hayes 1982, p. 454), keep unnecessary people away; isolate hazard area and deny entry. Stay upwind; keep out of low areas. Ventilate closed spaces before entering them. Wear positive pressure breathing apparatus and special protective clothing. Remove and isolate contaminated clothing at the site (DOT 1984, Guide 55).

**Unusual Fire and Explosion Hazards:** When heated to decomposition, it emits toxic fumes of nitrogen oxides (Sax 1984, p. 1170).

SECTION IV -- REACTIVITY DATA

**Stability:** **Unstable:** Not Found

**Stable:** Not Found

**Conditions to Avoid:** Not Found

**Incompatibility (Materials to Avoid):** Not Found

**Hazardous Decomposition or Byproducts:** When heated to decomposition, it emits toxic fumes of nitrogen oxides (Sax 1984, p. 1170).

**Hazardous Polymerization:** **May Occur:** Not Found

**May Not Occur:** Not Found

**Conditions to Avoid:** Not Found

## ISOPROPYLMETHYLPYRAZOLYL DIMETHYLCARBAMATE

### SECTION V -- HEALTH HAZARD DATA

**Routes of Entry:** **Inhalation:** Yes (Gosselin 1984, p. II-306)  
**Skin:** Yes (Sax 1984, p. 1170)  
**Ingestion:** Yes (Sax 1984, p. 1170)

**Health Hazards** (Acute, Delayed, and Chronic): It is classified as extremely toxic. Probable oral lethal dose in humans is 5-50 mg/kg or between 7 drops and 1 teaspoonful for a 150-lb. person (\*Gosselin 1976). A cholinesterase inhibitor; although it is not an organic phosphate, it resembles that group in action (\*Sax 1979).

**Signs and Symptoms of Exposure:** Can cause death due to respiratory arrest. Symptoms include cool extremities; trembling; fixed pinpoint pupils; nausea; vomiting; slight bluing of skin; lips and nailbeds; tearing; diarrhea; excessive salivation; sweating; slurring of speech; jerky movements; loss of bladder control; convulsions; coma and death (\*Gosselin 1976, Gosselin 1984, p. II-306).

**Medical Conditions Generally Aggravated by Exposure:** Not Found

**Emergency and First Aid Procedures:** A liquid carbamate pesticide (Hayes 1982, p. 454). Move victim to fresh air; call emergency medical care. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In case of contact with material, immediately flush skin or eyes with running water for at least 15 minutes. Speed in removing material from skin is of extreme importance. Remove and isolate contaminated clothing and shoes at the site. Keep victim quiet and maintain normal body temperature. Effects may be delayed; keep victim under observation (DOT 1984, Guide 55).

### SECTION VI -- USE INFORMATION

Systemic aphicide used in Europe (Buchel 1983, p. 128); insecticide (Merck 1983, p. 744). Currently of little commercial interest (\*Worthing 1979). Not registered as a pesticide in the U.S. (USEPA/Pesticide Index 1985).

### SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE (Steps to be Taken in Case Material is Released or Spilled)

Avoid breathing vapors (see Section V above). Treat as a liquid carbamate pesticide (Hayes 1982, p. 454). Do not touch spilled material; stop leak if you can do it without risk. Use water spray to reduce vapors. Small spills: take up with sand or other noncombustible absorbent material and place into containers for later disposal. Large spills: dike far ahead of spill for later disposal (DOT 1984, Guide 55).

## EPA CHEMICAL PROFILE

## INTERIM

Date: October 31, 1985

Revision: \_\_\_\_\_

## CHEMICAL IDENTITY -- FENITROTHION

CAS Registry Number: 122-14-5

**Synonyms:** 8057HC; 80557HC; AC 47,300; Accothion; Aceothion; Agrothion; Akotion; Bay 41831; Bayer 41831; Bayer S 5660; CL 47300; CP 47114; Cyfen; Cytel; ENT 25,715; Falithion; Fentrothione; Folithion; m-Cresol, 4-Nitro-, O-Ester with O,O-Dimethyl Phosphorothioate; MEP (Pesticide); Metathio E-50; Metathion; Metathione; Metathionine; Metathionine E50; Metation; Methathion; Methylnitrophos; Nitrophos; Novathion; Nuvanol; O,O-Dimethyl O-(3-Methyl) Phosphorothioate; O,O-Dimethyl O-(3-Methyl-4-Nitrophenyl) Thiophosphate; O,O-Dimethyl O-(4-Nitro-3-Methylphenyl)Thiophosphate; O,O-Dimethyl O-4-Nitro-m-Tolyl Phosphorothioate; Oleosumifene; OMS 43; Ovadofos; Phenitrothion; Phosphorothioic Acid, O,O-Dimethyl O-(3-Methyl-4-Nitrophenyl) Ester; Phosphorothioic Acid, O,O-Dimethyl O-(4-Nitro-m-Tolyl) Ester; S 112A; S 5660; S-1102A; Sumithian; Sumithion

**Chemical Formula:**  $C_9H_{12}NO_5PS$ **Molecular Weight:** 277.25

## SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

OSHA PEL: Not Found

ACGIH TLV: Not Found

IDLH: Not Found

**Other Limits Recommended:** Toxicity information:  $LC_{50}$  inhalation (rat) 0.378 mg/liter/4 hours (\*NIOSH/RTECS 1985)

## SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

**Boiling Point:** 244°F, 118°C at 0.05 mmHg (\*Merck 1976)**Specific Gravity** ( $H_2O=1$ ): 1.32 at 25°/4°C (\*Martin 1974)**Vapor Pressure** (mmHg):  $6 \times 10^{-6}$  at 20°C (\*Martin 1974)

**FENITROTHION**

**SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS (Continued)**

**Melting Point:** Not Found

**Vapor Density (AIR=1):** Not Found

**Evaporation Rate (Butyl acetate=1):** Not Found

**Solubility in Water:** Practically insoluble (\*Merck 1976)

**Appearance and Odor:** Brownish-yellow oil (\*Martin 1974; \*Merck 1976)

**SECTION III -- FIRE AND EXPLOSION HAZARD DATA**

**Flash Point (Method Used):** Not Found

**Flammable Limits:**

LEL: Not Found

UEL: Not Found

**Extinguishing Methods:** This compound is an organophosphate insecticide (Encyc Occupat Health and Safety 1983, p. 1623). Small fires: dry chemical, carbon dioxide, water spray, or foam. Large fires: water spray, fog or foam (DOT 1984, Guide 55).

**Special Fire Fighting Procedures:** (Non-Specific -- Organophosphate Pesticide n.o.s.) Move containers from fire area if you can do so without risk. Fight fire from maximum distance. Dike fire control water for later disposal; do not scatter the material. Wear positive pressure breathing apparatus and special protective clothing (DOT 1984, Guide 55).

**Unusual Fire and Explosion Hazards:** Not Found

**SECTION IV -- REACTIVITY DATA**

**Stability:** Unstable:

Stable: Yes, for 2 years if stored at 20-25°C (Hayes 1982, p. 365)

**Conditions to Avoid:** Unstable in alkaline media. Do not store above 40°C (Hayes 1982, p. 365).

**Incompatibility (Materials to Avoid):** Unstable in alkaline media (Hayes 1982, p. 365)

## FENITROTHION

### SECTION IV -- REACTIVITY DATA (Continued)

**Hazardous Decomposition or Byproducts:** When heated to decomposition, it emits very toxic fumes of oxides of nitrogen, phosphorus and sulfur (Sax 1984, p. 1174). Decomposition at 100-140°C produces a mixture of organophosphorus polymers (\*Menzie 1969).

**Hazardous Polymerization:** May Occur: Not Found  
May Not Occur: Not Found

**Conditions to Avoid:** Not Found

### SECTION V -- HEALTH HAZARD DATA

**Routes of Entry:** Inhalation: Not Found  
Skin: Yes (Sax 1984, p. 1174)  
Ingestion: Yes (Sax 1984, p. 1174)

**Health Hazards (Acute, Delayed, and Chronic):** This compound is an organophosphate insecticide. It is a highly toxic cholinesterase inhibitor (Hawley 1981, p. 452) that acts on the nervous system (Doull 1980, p. 367). Does not cause delayed neurotoxicity and contact produces little irritation (Hayes 1982, p. 365).

**Signs and Symptoms of Exposure:** Nausea is often the first symptom, followed by vomiting; abdominal cramps; diarrhea; excessive salivation; headache; giddiness; dizziness; weakness; tightness in the chest; loss of muscle coordination; slurring of speech, muscle twitching (particularly the tongue and eyelid); respiratory difficulty; blurring or dimness of vision; pinpoint pupils; profound weakness; mental confusion; disorientation and drowsiness (\*Gosselin 1976).

**Medical Conditions Generally Aggravated by Exposure:** Not Found

**Emergency and First Aid Procedures:** (Non-Specific -- Organophosphate Pesticide n.o.s) Move victim to fresh air; call emergency medical care. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In case of contact with material, immediately flush skin or eyes with running water for at least 15 minutes. Speed in removing material from skin is of extreme importance. Remove and isolate contaminated clothing and shoes at the site. Keep victim quiet and maintain normal body temperature (DOT 1984, Guide 55).



## FENITROTHION

### SECTION VI -- USE INFORMATION

It is a selective acaricide (\*Martin 1974) and a contact and stomach insecticide (\*Spencer 1973). Used to control chewing and sucking insects on rice, orchard fruits, vegetables, cereals, cotton and forest. Also protects against flies, mosquitoes, and cockroaches (Farm Chemicals Handbook 1984, p. C-101).

### SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE

(Steps to be Taken in Case Material is Released or Spilled)

(Non-Specific -- Organophosphate Pesticide n.o.s.) Keep unnecessary people away; isolate hazard area and deny entry. Stay upwind; keep out of low areas. Ventilate closed spaces before entering them. Wear positive pressure breathing apparatus and special protective clothing. Remove and isolate contaminated clothing at the site. Do not touch spilled material; stop leak if you can do so without risk. Use water spray to reduce vapors. Small spills: absorb with sand or other noncombustible absorbent material and place into containers for later disposal. Large spills: dike far ahead of spill for later disposal (DOT 1984, Guide 55).

EPA CHEMICAL PROFILE

INTERIM

Date: October 31, 1985

Revision: \_\_\_\_\_

CHEMICAL IDENTITY -- HYDROQUINONE

CAS Registry Number: 123-31-9

**Synonyms:** 1,4-Benzenediol; 1,4-Dihydroxybenzene; 4-Hydroxyphenol; Alpha-Hydroquinone; Arctuvine; Benzoquinone; Benzoquinol; Beta-Quinol; Black and White Bleaching Cream; Diak 5; Dihydroxybenzene; Eldopaque; Eldoquin; HE 5; Hydroquinol; Hydroquinone; NCI-C55834; p-Benzenediol; p-Dihydroxybenzene; p-Dioxobenzene; p-Hydroquinone; p-Hydroxyphenol; para-Dihydroxybenzene; para-Dioxybenzene; para-Hydroquinone; Phiaquin; Quinol; Tecquinol; Tenox HQ; Tequinol; USAF EK-356

**Chemical Formula:**  $C_6H_6O_2$

**Molecular Weight:** 110.11

SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

OSHA PEL: Air: TWA 2 mg/m<sup>3</sup> (\*NIOSH/RTECS 1985)

ACGIH TLV: TWA 2 mg/m<sup>3</sup>; STEL 4 mg/m<sup>3</sup> (\*ACGIH 1980)

IDLH: 200 mg/m<sup>3</sup> (NIOSH/OSHA 1978, p. 114)

Other Limits Recommended: Not Found

SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

**Boiling Point:** 545-549°F, 285-287°C (\*Merck 1976)

**Specific Gravity** (H<sub>2</sub>O=1): 1.332 at 15°C (Merck 1983, p. 699)

**Vapor Pressure** (mmHg): 4 at 150°C (\*Clayton and Clayton 1981-82)

**Melting Point:** 338-340°F, 170-171°C (\*Merck 1976)

**Vapor Density** (AIR=1): 3.81 (\*Sax 1975)

**Evaporation Rate** (Butyl acetate=1): Not Found

**Solubility in Water:** Soluble in 14 parts water (\*Merck 1976)

## HYDROQUINONE

## SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS (Continued)

**Appearance and Odor:** Colorless (\*Sax 1975) to white crystals (\*IARC 1972-1985).

## SECTION III -- FIRE AND EXPLOSION HAZARD DATA

**Flash Point (Method Used):** 329°F (CC) (\*Sax 1975)

**Flammable Limits:**

LEL: Not Found

UEL: Not Found

**Extinguishing Methods:** For small fires use dry chemical, carbon dioxide, water spray or foam. Move container from fire area if you can do so without risk (\*DOT 1984). This compound is a slight fire or explosion hazard (\*NFPA 1978).

**Special Fire Fighting Procedures:** Wear self-contained (positive pressure if available) breathing apparatus and full protective clothing (\*DOT 1984).

**Unusual Fire and Explosion Hazards:** Dust cloud may explode if ignited in an enclosed area (\*CHRIS 1978).

## SECTION IV -- REACTIVITY DATA

**Stability:** Unstable:

Stable: Yes (\*NFPA 1978)

**Conditions to Avoid:** Oxidizes in air (Merck 1983, p. 699)

**Incompatibility (Materials to Avoid):** It can react with oxidizing materials (\*Sax 1975) and is rapidly oxidized in the presence of alkaline materials (\*Merck 1976).

**Hazardous Decomposition or Byproducts:** Not Found

**Hazardous Polymerization:** May Occur: Not Found

May Not Occur: Not Found

**Conditions to Avoid:** Not Found

## SECTION V -- HEALTH HAZARD DATA

**Routes of Entry:** Inhalation: Yes (\*DOT 1984)

Skin: Yes (\*IARC 1972-1985)

Ingestion: Yes (\*IARC 1972-1985)

## HYDROQUINONE

### SECTION V -- HEALTH HAZARD DATA (Continued)

**Health Hazards** (Acute, Delayed, and Chronic): This material is very toxic; the probable oral lethal dose for humans is 50-500 mg/kg, or between 1 teaspoon and 1 ounce for a 150 lb. person. It is irritating but not corrosive. Fatal human doses have ranged from 5-12 grams, but 300-500 mg have been ingested daily for 3-5 months without ill effects (\*Gosselin 1976). Death is apparently initiated by respiratory failure or anoxia (\*Encyc Occupat Health and Safety 1971).

**Signs and Symptoms of Exposure:** Ingestion has caused dizziness, a sense of suffocation, increased rate of respiration, vomiting, pallor, muscular twitching, headache, labored breathing, cyanosis and collapse. Urine is usually green or brownish-green in color (\*Encyc Occupat Health and Safety 1971). Vapors produce irritation, tearing and corneal ulceration of the eyes (\*Grant 1974).

**Medical Conditions Generally Aggravated by Exposure:** Not Found

**Emergency and First Aid Procedures:** Move victim to fresh air; call emergency medical care. Remove and isolate contaminated clothing and shoes at the site. In case of contact with material, immediately flush skin or eyes with running water for at least 15 minutes (\*DOT 1984).

### SECTION VI -- USE INFORMATION

Photographic developer and reducer; antioxidant for fats and oils; polymerization inhibitor; stabilizer in paints, varnishes, motor fuels, and oils; in human medicine for skin blemishes; chemical intermediate for dyes; reagent in phosphate analysis (\*SRI; \*Merck 1976).

### SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE (Steps to be Taken in Case Material is Released or Spilled)

Keep unnecessary people away; isolate hazard area and deny entry. Stay upwind; keep out of low areas. Wear self-contained (positive pressure if available) breathing apparatus and full protective clothing. Do not touch spilled material; stop leak if you can do it without risk. Small spills: take up with sand or other non-combustible absorbent material and place into containers for later disposal. Small dry spills: with clean shovel place material into clean, dry container and cover; move containers from spill area. Large spills: dike far ahead of spill for later disposal (\*DOT 1984).

EPA CHEMICAL PROFILE

INTERIM

Date: October 31, 1985

Revision: \_\_\_\_\_

CHEMICAL IDENTITY -- CROTONALDEHYDE

CAS Registry Number: 123-73-9

**Synonyms:** (E)-Crotonaldehyde; 2-Butenal (trans); 2-Butenal, (E)-; beta-Methyl Acrolein; Crotenaldehyde; Crotonal; Crotonaldehyde, (E)-; Crotonic Aldehyde; E-2-Butenal; NCI-C56279; Propylene Aldehyde; Topanel; Topanel CA; trans-2-Butenal; trans-Crotonaldehyde

**Chemical Formula:**  $C_4H_6O$

**Molecular Weight:** 70.10

SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

**OSHA PEL:** Air: TWA 2 ppm (NIOSH/OSHA 1978, p. 72)

**ACGIH TLV:** TWA 2 ppm (6 mg/m<sup>3</sup>); STEL 6 ppm (18 mg/m<sup>3</sup>) (ACGIH 1983, p. 16)

**IDLH:** 400 mg/m<sup>3</sup> (NIOSH/OSHA 1978, p. 72)

**Other Limits Recommended:** Not Found

SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

**Boiling Point:** 219.2°F, 104°C (\*Sunshine 1969)

**Specific Gravity (H<sub>2</sub>O=1):** 0.853 at 20°C/20°C (Merck 1983, p. 372)

**Vapor Pressure (mmHg):** 19 at 20°C (\*Sunshine 1969)

**Melting Point:** -101°F, -74°C (\*Weast 1979)

**Vapor Density (AIR=1):** 2.41 (Merck 1983, p. 372)

**Evaporation Rate (Butyl acetate=1):** Not Found

## CROTONALDEHYDE

### SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS (Continued)

**Solubility in Water:** 18.1 g/100 mL at 20°C (Merck 1983, p. 372)

**Appearance and Odor:** Crotonaldehyde is a water-white to straw-colored liquid (\*NFPA 1978) with a pungent, suffocating odor (ACGIH 1980, p. 107).

### SECTION III -- FIRE AND EXPLOSION HAZARD DATA

**Flash Point (Method Used):** 13°C (OC) (Merck 1983, p. 372)

**Flammable Limits:**

LEL: 2.1% (\*Sunshine 1969)

UEL: 15.5% (\*Sunshine 1969)

**Extinguishing Methods:** Use dry chemical, foam, or carbon dioxide; water may be ineffective but should be used to keep fire-exposed containers cool. If leak or spill has not ignited, use water spray to disperse vapors. Water spray may be used to flush spills away from exposures (\*NFPA 1978).

**Special Fire Fighting Procedures:** All exposed skin surfaces should be covered. Wear protective clothing including self-contained breathing apparatus, coat, pants, gloves, boots, and bands around arms, wrists, legs, and waist. Massive or advanced fires should be fought from a safe distance or protected location (\*NFPA 1978). Isolate area for one-half mile in all directions if tank car or truck involved in fire (DOT 1984, Guide 28).

**Unusual Fire and Explosion Hazards:** Vapors form explosive mixtures in air (\*NFPA 1978) or in sewers (\*NIOSH/OSHA 1981).

### SECTION IV -- REACTIVITY DATA

**Stability:** Unstable: Yes (\*NFPA 1978)

Stable:

**Conditions to Avoid:** Oxygen, heat, elevated pressures (\*NFPA 1978)

**Incompatibility (Materials to Avoid):** Nitric acid (Sax 1984, p. 817).

**Hazardous Decomposition or Byproducts:** Hazardous peroxides and acids (\*NFPA 1978).

## CROTONALDEHYDE

### SECTION IV -- REACTIVITY DATA (Continued)

**Hazardous Polymerization:** May Occur: Yes (\*NFPA 1978)  
May Not Occur:

**Conditions to Avoid:** Contact with alkaline materials such as caustic ammonia or amines, or at elevated temperatures (\*NFPA 1978).

### SECTION V -- HEALTH HAZARD DATA

**Routes of Entry:** Inhalation: Yes (\*Rumack 1975 to Present)  
Skin: Yes (\*NFPA 1978)  
Ingestion: Yes (\*Rumack 1975 to Present)

**Health Hazards (Acute, Delayed, and Chronic):** Although slightly less toxic, crotonaldehyde is similar chemically and toxicologically to acrolein (\*Gosselin 1976) which is rated as extremely toxic (Gosselin 1984, p. VI-186). Toxic concentrations for human inhalation have been reported at 12 mg/m<sup>3</sup>/10 minutes. Irritant dose to human eye is 45 ppm (\*NIOSH/RTECS 1985). As with acrolein, vapor exposures cause severe and painful eye irritation, damage to cornea, lacrimation (tearing), irritation of nasal membranes, pulmonary edema (filling of lungs with fluid) (\*NFPA 1978, \*Rumack 1975 to Present) and gastrointestinal distress when ingested (\*Rumack 1975 to Present).

**Signs and Symptoms of Exposure:** Irritation of eyes causes reddening and intense lacrimation (tearing) and pain, irritation to nasal membranes and difficulty in breathing (\*Rumack 1975 to Present, \*ACGIH 1980); abdominal distress when ingested (\*Rumack 1975 to Present).

**Medical Conditions Generally Aggravated by Exposure:** Not Found

**Emergency and First Aid Procedures:** Move victim to fresh air; call emergency medical care. If not breathing, give artificial respiration; if breathing is difficult, give oxygen. Remove and isolate contaminated clothing and shoes at site if possible. In case of contact with liquid material, immediately flush skin or eyes with running water for at least 15 minutes (DOT 1984, Guide 28).

### SECTION VI -- USE INFORMATION

Chemical intermediate for several compounds in a variety of industrial processes (surfactants, textiles, paper, fuels, insecticides, leather tanning, etc.) (\*SRI). Used in chemical warfare (Merck 1983, p. 372).

## CROTONALDEHYDE

### SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE

(Steps to be Taken in Case Material is Released or Spilled)

Remove all ignition sources and ventilate area of spill (\*NIOSH/OSHA 1981). No flares, smoking, or flames in hazard area. Do not touch spilled material; stop leak if you can do so without risk. Wear positive pressure breathing apparatus and special protective clothing (DOT 1984, Guide 28).



EPA CHEMICAL PROFILE

INTERIM

Date: October 31, 1985

Revision: \_\_\_\_\_

CHEMICAL IDENTITY -- SODIUM CACODYLATE

CAS Registry Number: 124-65-2

**Synonyms:** Arsine Oxide, Dimethylhydroxy-, Sodium Salt; Alkarsodyl; Ansar 160; Ansar 560; Arsecodile; Arsicodile; Arsine Oxide, Hydroxydimethyl-, Sodium Salt; Arsinic Acid, Dimethyl-, Sodium Salt; Arsycondile; Arsycodila; Cacodylic Acid Sodium Salt; Cacodylic Acid, Sodium Salt; Chemaide; Hydroxydimethylarsine Oxide, Sodium Salt; Rad-E-Cate; Silvisar; Sodium Dimethylarsinate; Sodium Dimethylarsonate; Sodium Salt of Cacodylic Acid; [(Dimethylarsino)oxy]Sodium As-Oxide

**Chemical Formula:**  $C_2H_7AsO_2Na$

**Molecular Weight:** 159.98

SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

**OSHA PEL:** TWA 500  $\mu g$  (As)/m<sup>3</sup> (NIOSH/RTECS 1983, Volume 1, p. 444)

**ACGIH TLV:** Not Found

**IDLH:** Not Found

**Other Limits Recommended:** Toxicity information: LD<sub>50</sub> oral (mouse) 4 mg/kg (\*NIOSH/RTECS 1985)

SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

**Boiling Point:** Not Found

**Specific Gravity** (H<sub>2</sub>O=1): Not Found

**Vapor Pressure** (mmHg): Not Found

**Melting Point:** 140°F, 60°C for trihydrate (\*Weast 1979); liquifies in water of hydration at 140°F, 60°C and becomes anhydrous at 284°F, 120°C for trihydrate (\*Merck 1976)

**Vapor Density** (AIR=1): Not Found

**Evaporation Rate** (Butyl acetate=1): Not Found

## SODIUM CACODYLATE

### SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS (Continued)

**Solubility in Water:** Soluble; 2000 g/liter at 15-20°C for trihydrate (\*Weast 1979)

**Appearance and Odor:** White, amorphous crystals or powder (\*Hawley 1977) with a slight odor (\*Merck 1976)

### SECTION III -- FIRE AND EXPLOSION HAZARD DATA

**Flash Point (Method Used):** Not Found

**Flammable Limits:**

LEL: Not Found

UEL: Not Found

**Extinguishing Methods:** (Non-Specific -- Pesticide, Solid, n.o.s.)  
Extinguish with dry chemical, carbon dioxide, water spray, fog, or foam (DOT 1984, Guide 53).

**Special Fire Fighting Procedures:** (Non-Specific -- Pesticide, Solid, n.o.s.) Keep unnecessary people away; isolate hazard area. Stay upwind; keep out of low areas. Wear self-contained breathing apparatus and full protective clothing. Move container from fire area, if you can do so without risk (DOT 1984, Guide 53).

**Unusual Fire and Explosion Hazards:** Poisoning potential is high when heated to decomposition (\*Sax 1979).

### SECTION IV -- REACTIVITY DATA

**Stability:** Unstable: Not Found

Stable: Not Found

**Conditions to Avoid:** Not Found

**Incompatibility (Materials to Avoid):** Water solution in contact with active metals (iron, aluminum, zinc) (\*Sax 1979)

**Hazardous Decomposition or Byproducts:** Dangerous when heated to decomposition or on contact with acids or acid fumes, because it emits highly toxic fumes of arsenic (\*Sax 1975).

**Hazardous Polymerization:** May Occur: Not Found

May Not Occur: Not Found

**Conditions to Avoid:** Not Found

## SODIUM CACODYLATE

### SECTION V -- HEALTH HAZARD DATA

**Routes of Entry:** Inhalation: Not Found  
Skin: Not Found  
Ingestion: Yes (Hayes 1982, p. 42)

**Health Hazards** (Acute, Delayed, and Chronic): Moderately toxic; probable oral lethal dose in humans is 0.5-5 g/kg or between 1 ounce and 1 pint (or 1 lb.) for a 70 kg (150 lb.) person (\*Gosselin 1976). It may cause disturbances of the blood, kidneys, and nervous system (\*Sax 1975).

**Signs and Symptoms of Exposure:** Exposure results in marked irritation of the stomach and intestines with nausea, vomiting, and diarrhea. In severe cases, patient goes into collapse and shock with weak, rapid pulse, cold sweat, coma, and death (\*Sax 1975).

**Medical Conditions Generally Aggravated by Exposure:** Not Found

**Emergency and First Aid Procedures:** (Non-Specific -- Pesticide, Solid, n.o.s.) Move victim to fresh air; call emergency medical care. Remove and isolate contaminated clothing and shoes at the site. In case of contact with material, immediately flush skin or eyes with running water for at least 15 minutes (DOT 1984, Guide 53).

### SECTION VI -- USE INFORMATION

This material has been used as a nonselective herbicide and for general weed control (\*Farm Chemicals Handbook 1961).

### SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE (Steps to be Taken in Case Material is Released or Spilled)

(Non-Specific -- Pesticide, Solid, n.o.s.) Wear self-contained breathing apparatus and full protective clothing. Do not touch spilled material; stop leak if you can do so without risk. Small spills: absorb with sand or other noncombustible absorbent material and place into containers for later disposal. Small dry spills: with clean shovel place material into clean, dry container and cover; move containers from spill area. Large spills: dike far ahead of spill for later disposal (DOT 1984, Guide 53).

EPA CHEMICAL PROFILE

INTERIM

Date: October 31, 1985

Revision: \_\_\_\_\_

CHEMICAL IDENTITY -- PICROTOXIN

CAS Registry Number: 124-87-8

**Synonyms:** (NIOSH/RTECS 1983 Synonyms, Volume 3, p. 175) Cocculin; Cocculus; Cocculus Solid; Fish Berry; Indian Berry; Oriental Berry; Picrotin, compound with Picrotoxinin (1:1); Picrotoxine; 3,6-Methano-8H-1,5,7-Trioxacyclopenta[ij]Cycloprop[a]Azulene-4,8(3H)-Dione, Hexahydro-2a-Hydroxy-9-(1-Hydroxy-1-Methylethyl)-8b-Methyl-, [1aR-(1a.alpha.,2a.beta.,3.beta.,6.beta.,6a.beta.,8aS\*,8b.beta.,9S\*)]-, compound with [1aR-(1a.alpha.,2a.beta.,3.beta.,6.beta.,6a.beta.,8aS\*,8b.beta.,9R\*)]-Hexahydro-2a-Hydroxy-8b-Methyl-9-(1-Methylethenyl)-3,6-Methano-8H-1,5,7-Trioxacyclopenta[ij] Cycloprop[a] Azulene-4,8(3H)-Dione(1:1)

**Chemical Formula:**  $C_{30}H_{34}O_{13}$  (Weast 1983, p. C456)

**Molecular Weight:** 602.60 (Weast 1983, p. C456)

SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

OSHA PEL: Not Found

ACGIH TLV: Not Found

IDLH: Not Found

**Other Limits Recommended:** Toxicity information:  $LD_{low}$  oral (cat)  
1.75 mg/kg (\*NIOSH/RTECS 1985)

SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

Boiling Point: Not Found

Specific Gravity ( $H_2O=1$ ): Not Found

Vapor Pressure (mmHg): Not Found

Melting Point: 397°F, 203°C (Merck 1983, p. 1069)

Vapor Density (AIR=1): Not Found

Evaporation Rate (Butyl acetate=1): Not Found

## PICROTOXIN

### SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS (Continued)

**Solubility in Water:** 1 g/350 mL (Merck 1983, p. 1069)

**Appearance and Odor:** Shiny leaflets with intensely bitter taste (Merck 1983, p. 1069); microcrystalline powder. Odorless (Hawley 1981, p. 816)

### SECTION III -- FIRE AND EXPLOSION HAZARD DATA

**Flash Point (Method Used):** Not Found

**Flammable Limits:**

LEL: Not Found

UEL: Not Found

**Extinguishing Methods:** (Non-Specific -- Alkaloid) Use dry chemical, carbon dioxide, water spray, or foam for small fires. Use water spray, fog, or foam for large fires. Move container from fire area if this can be done without risk (DOT 1984, Guide 55).

**Special Fire Fighting Procedures:** (Non-Specific -- Alkaloid) Isolate hazard area and deny entry. Wear positive pressure breathing apparatus and special protective clothing (DOT 1984, Guide 55).

**Unusual Fire and Explosion Hazards:** When heated to decomposition it emits acrid smoke and fumes (Sax 1984, p. 2231).

### SECTION IV -- REACTIVITY DATA

**Stability:** Unstable:

Stable: Yes (Hawley 1981, p. 816)

**Conditions to Avoid:** Decomposing heat (Sax 1984, p. 2231)

**Incompatibility (Materials to Avoid):** Not Found

**Hazardous Decomposition or Byproducts:** Acrid smoke and fumes when heated to decomposition (Sax 1984, p. 2231)

**Hazardous Polymerization:** May Occur: Not Found

May Not Occur: Not Found

**Conditions to Avoid:** Not Found

## PICROTOXIN

### SECTION V -- HEALTH HAZARD DATA

**Routes of Entry:** Inhalation: Yes (Gilman 1985, p. 585)  
Skin: Yes (Gilman 1985, p. 585)  
Ingestion: Yes (Sax 1984, p. 2231)

**Health Hazards** (Acute, Delayed, and Chronic): Highly toxic and a dose of 20 mg may produce symptoms of severe poisoning (Gilman 1985, p. 585). A human lethal dose of 1.5 mg/kg has been reported (NIOSH/RTECS 1983, Volume 3, p. 175). It is an alkaloid convulsant poison (Sax 1984, p. 2231).

**Signs and Symptoms of Exposure:** PicROTOXIN is a powerful stimulant and affects all portions of the central nervous system. At doses approaching convulsant levels, signs and symptoms include salivation, elevated blood pressure, frequent vomiting, rapid breathing (Gilman 1985, p. 584).

**Medical Conditions Generally Aggravated by Exposure:** Not Found

**Emergency and First Aid Procedures:** (Non-Specific -- Alkaloid) Move victim to fresh air; call emergency medical care. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. If case of contact with material, immediately flush skin or eyes with running water for at least 15 minutes. Speed in removing material from skin is of extreme importance. Remove and isolate contaminated clothing and shoes at the site. Keep victim quiet and maintain normal body temperature. Effects may be delayed, keep victim under observation (DOT 1984, Guide 55).

### SECTION VI -- USE INFORMATION

Used in medicine as a central nervous system stimulant and antidote for barbiturate poisoning (Hawley 1981, p. 816). Reportedly, this material is not currently regarded as a useful therapeutic agent since it is not a selective respiratory stimulant (Gilman 1985, p. 585).

### SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE

(Steps to be Taken in Case Material is Released or Spilled)

(Non-Specific -- Alkaloid) Keep unnecessary people away; isolate hazard area and deny entry. Stay upwind; keep out of low areas. Ventilate closed spaces before entering them. Wear positive pressure breathing apparatus and special protective clothing. Remove and isolate contaminated clothing at the site. If water pollution occurs, notify appropriate authorities. Do not touch spilled material; stop leak if you can do it without risk. Use water spray to reduce vapors. Small spills: take up with sand or other noncombustible absorbent material and place into containers for later disposal. Small dry spills: with clean shovel place material into clean, dry container and cover; move containers from spill area. Large spills: dike far ahead of spill for later disposal (DOT 1984, Guide 55).

## EPA CHEMICAL PROFILE

### INTERIM

Date: October 31, 1985

Revision: \_\_\_\_\_

## CHEMICAL IDENTITY -- METHACRYLONITRILE

CAS Registry Number: 126-98-7

**Synonyms:** 2-Cyano-1-Propene; 2-Cyanopropene; 2-Cyanopropene-1; 2-Methyl-2-Propenenitrile; 2-Methylacrylonitrile; 2-Methylpropenenitrile; 2-Propenenitrile, 2-Methyl-; alpha-Methacrylonitrile; alpha-Methylacrylonitrile; Isopropene Cyanide; Isopropenyl nitrile; USAF ST-40

**Chemical Formula:**  $C_4H_5N$

**Molecular Weight:** 67.10

## SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

**OSHA PEL:** Not Found

**ACGIH TLV:** TWA 1 ppm (3 mg/m<sup>3</sup>) (skin); STEL 2 ppm (6 mg/m<sup>3</sup>) (skin) (\*ACGIH 1980)

**IDLH:** Not Found

**Other Limits Recommended:** Toxicity information: LD<sub>low</sub> oral (mouse)  
15 mg/kg (\*NIOSH/RTECS 1985)

## SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

**Boiling Point:** 194°F, 90.3°C (\*Merck 1976)

**Specific Gravity (H<sub>2</sub>O=1):** 0.8001 at 20/4°C (\*Merck 1976)

**Vapor Pressure (mmHg):** 40 at 12.8°C (\*Clayton and Clayton 1981-82)

**Melting Point:** -32.4°F, -35.8°C (Merck 1983, p. 850)

**Vapor Density (AIR=1):** 2.31 (\*Clayton and Clayton 1981-82)

**Evaporation Rate (Butyl acetate=1):** Not Found

**Solubility in Water:** 2.57% by weight in water at 20°C; 2.69% by weight in water at 50°C (\*Merck 1976)

## METHACRYLONITRILE

### SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS (Continued)

**Appearance and Odor:** Colorless liquid with an odor similar to bitter almond (\*Clayton and Clayton 1981-82; \*Encyc Occupat Safety and Health 1971)

### SECTION III -- FIRE AND EXPLOSION HAZARD DATA

**Flash Point (Method Used):** 55°F, 13°C (\*Merck 1976)

**Flammable Limits:**

LEL: Not Found

UEL: Not Found

**Extinguishing Methods:** Usual precautions for flammable liquid should be applied (\*Encyc Occupat Health and Safety 1971).

**Special Fire Fighting Procedures:** Not Found

**Unusual Fire and Explosion Hazards:** Methacrylonitrile evolves flammable concentrations of vapor at temperatures down to 12.8°C. Thus, at room temperatures, flammable concentrations are liable to be present. Toxic fumes are released when the material burns. Also, the chemical will explode due to its tendency to polymerize violently (\*Encyc Occupat Health and Safety 1971).

### SECTION IV -- REACTIVITY DATA

**Stability:** **Unstable:** Yes (\*Encyc Occupat Health and Safety 1971)  
**Stable:**

**Conditions to Avoid:** Heat (Sax 1984, p. 1795)

**Incompatibility (Materials to Avoid):** Not Found

**Hazardous Decomposition or Byproducts:** Toxic fumes of nitrogen oxides are formed upon heating to decomposition (Sax 1984, p. 1795).

**Hazardous Polymerization:** **May Occur:** Yes (\*Encyc Occupat Health and Safety 1971)  
**May Not Occur:**

**Conditions to Avoid:** Not Found



## METHACRYLONITRILE

### SECTION V -- HEALTH HAZARD DATA

**Routes of Entry:** Inhalation: Yes (\*Hawley 1977)  
Skin: Yes (\*Hawley 1977)  
Ingestion: Yes (\*Hawley 1977)

**Health Hazards (Acute, Delayed, and Chronic):** A lacrimator (causes tearing); an insidious poison which causes delayed skin reactions (\*Merck 1976). Very readily absorbed through skin (\*ACGIH 1980). Highly toxic (\*Hawley 1977).

**Signs and Symptoms of Exposure:** Intense lacrimation (tearing) with reddening of eyes and pain, difficulty in breathing; choking sensation; pain and reddening of exposed skin (\*Rumack 1975 to Present).

**Medical Conditions Generally Aggravated by Exposure:** Not Found

**Emergency and First Aid Procedures:** Establish respiration. Prevent absorption. Remove people from contaminated atmosphere as rapidly as possible. Remove contaminated clothing. Wash exposed areas of the body with soap and water. Warn emergency room personnel that there is possible exposure to lacrimators and they should wear masks, aprons and gloves to avoid contamination (\*Rumack 1975 to Present).

### SECTION VI -- USE INFORMATION

Used in the preparation of homopolymers and copolymers; as intermediate in preparation of acids, amides, amines, nitriles (\*Merck 1976). Also used in the manufacture of elastomers, coatings, plastics (\*Hawley 1977).

### SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE

(Steps to be Taken in Case Material is Released or Spilled)

Wear eye protection (see Section V above). Methacrylonitrile cannot be detected by its smell even at concentrations which are already dangerous for humans. Hence, special attention must be given to ventilation and estimations of the amount of poison present must be carried out frequently (\*Lefaux 1968). Suitable respiratory protective equipment (positive pressure) and clothing should be used (\*Encyc Occupat Health and Safety 1971).

EPA CHEMICAL PROFILE

INTERIM

Date: October 31, 1985  
Revision: \_\_\_\_\_

CHEMICAL IDENTITY -- SODIUM ANTHRAQUINONE-1-SULFONATE

CAS Registry Number: 128-56-3

Synonyms: (NIOSH/RTECS 1983 Synonyms, Volume 1, p. 407) 1-Anthracen-sulfonic Acid, 9,10-Dihydro-9,10-Dioxo-, Sodium Salt

Chemical Formula:  $C_{14}H_7O_5S \cdot Na$

Molecular Weight: 310.26

SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

OSHA PEL: Not Found

ACGIH TLV: Not Found

IDLH: Not Found

Other Limits Recommended: Toxicity information:  $LD_{50}$  oral (rabbit)  
14 mg/kg (\*NIOSH/RTECS 1985) (SUSPECT)

SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

Boiling Point: Not Found

Specific Gravity ( $H_2O=1$ ): Not Found

Vapor Pressure (mmHg): Not Found

Melting Point: Not Found

Vapor Density (AIR=1): Not Found

Evaporation Rate (Butyl acetate=1): Not Found

Solubility in Water: Not Found

Appearance and Odor: Not Found

**SODIUM ANTHRAQUINONE-1-SULFONATE**

**SECTION III -- FIRE AND EXPLOSION HAZARD DATA**

**Flash Point** (Method Used): Not Found

**Flammable Limits:**

LEL: Not Found

UEL: Not Found

**Extinguishing Methods:** Not Found

**Special Fire Fighting Procedures:** Not Found

**Unusual Fire and Explosion Hazards:** Not Found

**SECTION IV -- REACTIVITY DATA**

**Stability: Unstable:** Not Found

**Stable:** Not Found

**Conditions to Avoid:** Not Found

**Incompatibility** (Materials to Avoid): Not Found

**Hazardous Decomposition or Byproducts:** Not Found

**Hazardous Polymerization: May Occur:** Not Found

**May Not Occur:** Not Found

**Conditions to Avoid:** Not Found

**SECTION V -- HEALTH HAZARD DATA**

**Routes of Entry: Inhalation:** Not Found

**Skin:** Not Found

**Ingestion:** Not Found

**Health Hazards** (Acute, Delayed, and Chronic): Not Found

**Signs and Symptoms of Exposure:** Not Found

**Medical Conditions Generally Aggravated by Exposure:** Not Found

**Emergency and First Aid Procedures:** Not Found

## SODIUM ANTHRAQUINONE-1-SULFONATE

### SECTION VI -- USE INFORMATION

Not Found

### SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE

(Steps to be Taken in Case Material is Released or Spilled)

Not Found

### COMMENTS

Sources searched but no information found:

- Sax 1984
- DOT 1984
- NFPA 1984
- Student 1981
- Weiss 1980
- Merck 1983
- CHRIS 1978
- Doull 1980
- Clayton and Clayton 1981-82
- ACGIH 1983
- NIOSH/OSHA 1978
- Hawley 1981
- Weast 1979
- Gosselin 1984
- Farm Chemicals Handbook 1984
- Encyc Occupat Health and Safety 1983

EPA CHEMICAL PROFILE

INTERIM

Date: October 31, 1985

Revision: \_\_\_\_\_

CHEMICAL IDENTITY -- PYRENE

CAS Registry Number: 129-00-0

Synonyms: Benzo[d,e,f]Phenanthrene; Benzo[def]Phenanthrene; beta-Pyrene

Chemical Formula:  $C_{16}H_{10}$

Molecular Weight: 202.26

SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

OSHA PEL: Not Found

ACGIH TLV: Not Found

IDLH: Not Found

**Other Limits Recommended:** TLV for coal tar pitch volatiles, as benzene solubles: TWA 0.2 mg/m<sup>3</sup>. Coal tar pitch volatiles are suspected human carcinogens (ACGIH 1985, p. 41). Toxicity information: LC<sub>50</sub> inhalation (rat) 0.17 mg/liter (\*NIOSH/RTECS 1985) (SUSPECT)

SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

Boiling Point: 759°F, 404°C (\*Merck 1976) (SUSPECT)

Specific Gravity (H<sub>2</sub>O=1): 1.27 at 23°C (\*Merck 1976)

Vapor Pressure (mmHg): Not Found

Melting Point: 313°F, 156°C (\*Merck 1976)

Vapor Density (AIR=1): Not Found

Evaporation Rate (Butyl acetate=1): Not Found

Solubility in Water: 0.135 mg/liter in water (\*MacKay 1977)

**Appearance and Odor:** Colorless solid (Sax 1984, p. 2324); solid and solutions have a slight blue fluorescence (Merck 1983, p. 1149)

PYRENE

SECTION III -- FIRE AND EXPLOSION HAZARD DATA

Flash Point (Method Used): Not Found

Flammable Limits:

LEL: Not Found

UEL: Not Found

Extinguishing Methods: Not Found

Special Fire Fighting Procedures: Not Found

Unusual Fire and Explosion Hazards: When heated to decomposition, it emits acrid smoke and fumes (Sax 1984, p. 2324).

SECTION IV -- REACTIVITY DATA

Stability: Unstable: Not Found

Stable: Not Found

Conditions to Avoid: Not Found

Incompatibility (Materials to Avoid): Not Found

Hazardous Decomposition or Byproducts: When heated to decomposition, it emits acrid smoke and fumes (Sax 1984, p. 2324)

Hazardous Polymerization: May Occur: Not Found

May Not Occur: Not Found

Conditions to Avoid: Not Found

SECTION V -- HEALTH HAZARD DATA

Routes of Entry: Inhalation: Yes (Clayton and Clayton 1981-82, p. 3361)

Skin: Yes (Hawley 1981, p. 872)

Ingestion: Not Found

Health Hazards (Acute, Delayed, and Chronic): Pyrene is a carcinogenic agent and is absorbed by the skin (Hawley 1981, p. 872). It is a skin irritant, a suspected mutagen, and an equivocal tumor-causing agent (Sax 1984, p. 2324). Workers exposed to 3 to 5 mg/m<sup>3</sup> of pyrene exhibited some teratogenic effects (Clayton and Clayton 1981-82, p. 3361). Pyrene is a polycyclic aromatic hydrocarbon (PAH). The acute toxicity of pure PAHs appears low when administered orally or dermally to rats or mice (Encyc Occupat Health and Safety 1983, p. 1758). Human exposure to PAHs

## PYRENE

### SECTION V -- HEALTH HAZARD DATA (Continued)

is almost exclusively via the gastrointestinal and respiratory tracts, and approximately 99 percent is ingested in the diet. Despite the high concentrations of pyrene to which humans may be exposed through food, there is currently little information available to implicate diet-derived PAHs as the cause of serious health effects (NRC 1983, p. ES-6).

**Signs and Symptoms of Exposure:** Not Found

**Medical Conditions Generally Aggravated by Exposure:** Not Found

**Emergency and First Aid Procedures:** Establish open airway and respiration. If conscious, induce vomiting with syrup of ipecac. Dermal exposure should be minimized by washing the exposed surface with soap and water. Irrigate the eyes with plain tap water (\*Rumack 1975 to Present).

### SECTION VI -- USE INFORMATION

Biochemical research (Hawley 1981, p. 872).

### SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE

(Steps to be Taken in Case Material is Released or Spilled)

Avoid inhalation and skin contact. Wear self-contained breathing apparatus and full protective clothing (see Section V).

### COMMENTS

Sources searched but no information found:

- ACGIH 1983
- NIOSH/OSHA 1978
- DOT 1984
- NFPA 1984
- Student 1981
- Weiss 1980
- CHRIS 1978
- Arena 1979
- Gosselin 1984
- Buchel 1983
- Farm Chemicals Handbook 1984
- Hayes 1982
- Physicians' Desk Reference 1985
- Gilman 1985

EPA CHEMICAL PROFILE

INTERIM

Date: October 31, 1985

Revision: \_\_\_\_\_

CHEMICAL IDENTITY -- WARFARIN SODIUM

CAS Registry Number: 129-06-6

Synonyms: (NIOSH/RTECS 1983 Synonyms, Volume 1, p. 964) Coumarin, 3-(alpha-Acetylbenzyl)-4-Hydroxy-, Sodium Salt; 3-(alpha-Acetylbenzyl)-4-HydroxyCoumarin Sodium Salt; Athrombin; 2H-1-Benzopyran-2-one, 4-Hydroxy-3-(3-Oxo-1-Phenylbutyl)-, Sodium Salt; Coumadin Sodium; Coumafene Sodium; Cumadin; Marevan; Marevan (Sodium Salt); Panivarfin; Panwarfin; Prothromadin; Ratsul Soluble; Sodium, ((3-(alpha-Acetylbenzyl)-2-Oxo-2H-1-Benzopyran-4-yl)oxy)-; Sodium Coumadin; Sodium Warfarin; Tintorane; Varfine; Waran; Warcoumin; Warfarin, Sodium deriv.; Warfarin, Sodium Salt; Warfilone

Chemical Formula:  $C_{19}H_{15}O_4Na$

Molecular Weight: 330.33

SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

OSHA PEL: Not Found

ACGIH TLV: Not Found

IDLH: Not Found

Other Limits Recommended: Toxicity information:  $LD_{low}$  oral (human)  
15 mg/kg (\*NIOSH/RTECS 1985)

SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

Boiling Point: Not Found

Specific Gravity ( $H_2O=1$ ): Not Found

Vapor Pressure (mmHg): Not Found

Melting Point: Not Found

Vapor Density (AIR=1): Not Found



## WARFARIN SODIUM

### SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS (Continued)

**Evaporation Rate** (Butyl acetate=1): Not Found

**Solubility in Water:** Freely soluble (Merck 1983, p. 1441)

**Appearance and Odor:** Slightly bitter crystalline powder (Merck 1983, p. 1441)

### SECTION III -- FIRE AND EXPLOSION HAZARD DATA

**Flash Point** (Method Used): Not Found

**Flammable Limits:**

LEL: Not Found

UEL: Not Found

**Extinguishing Methods:** (Non-Specific -- Coumarin Derivative Pesticide, Solid, n.o.s.) Extinguish fires with dry chemical, carbon dioxide, water spray, fog, or foam (DOT 1984, Guide 55).

**Special Fire Fighting Procedures:** (Non-Specific -- Coumarin Derivative Pesticide, Solid, n.o.s.) Keep unnecessary people away; isolate hazard area and deny entry. Stay upwind; keep out of low areas. Ventilate closed spaces before entering them. Wear positive pressure breathing apparatus and special protective clothing. Remove and isolate contaminated clothing at the site. Move container from fire area if you can do it without risk. Fight fire from maximum distance. Dike fire control water for later disposal; do not scatter the material (DOT 1984, Guide 55).

**Unusual Fire and Explosion Hazards:** When heated to decomposition, it emits toxic fumes of sodium oxide (Sax 1984, p. 813).

### SECTION IV -- REACTIVITY DATA

**Stability: Unstable:** Not Found

**Stable:** Not Found

**Conditions to Avoid:** Not Found

**Incompatibility** (Materials to Avoid): Not Found

**Hazardous Decomposition or Byproducts:** When heated to decomposition, it emits toxic fumes of sodium oxide (Sax 1984, p. 812).

## WARFARIN SODIUM

### SECTION IV -- REACTIVITY DATA (Continued)

Hazardous Polymerization: May Occur: Not Found  
May Not Occur: Not Found

Conditions to Avoid: Not Found

### SECTION V -- HEALTH HAZARD DATA

Routes of Entry: Inhalation: Not Found  
Skin: Not Found  
Ingestion: Yes (Sax 1984, p. 812)

Health Hazards (Acute, Delayed, and Chronic): This material is highly toxic orally in humans (Sax 1984, p. 812).

Signs and Symptoms of Exposure: (Non-Specific -- Warfarins) May cause death by hemorrhagic shock. Onset of symptoms occur after a few days or weeks of repeated ingestion which may cause nose bleeds, bleeding gums, small reddish spots like a rash, easy bruising, especially of the elbows, knees, and buttocks, blood in urine and stools, and occasional paralysis due to a stroke (Gosselin 1984, p. III-395).

Medical Conditions Generally Aggravated by Exposure: Not Found

Emergency and First Aid Procedures: (Non-Specific -- Coumarin Derivative Pesticide, Solid, n.o.s.) Move victim to fresh air; call emergency medical care. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In case of contact with material, immediately flush skin or eyes with running water for at least 15 minutes. Speed in removing material from skin is of extreme importance. Remove and isolate contaminated clothing and shoes at the site. Keep victim quiet and maintain normal body temperature. Effects may be delayed, keep victim under observation (DOT 1984, Guide 55).

### SECTION VI -- USE INFORMATION

(Non-Specific -- Coumarins) Anticoagulants used as rodenticides (Encyc Occupat Health and Safety 1983, p. 560)

## WARFARIN SODIUM

### SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE

(Steps to be Taken in Case Material is Released or Spilled)

(Non-Specific -- Coumarin Derivative Pesticide, Solid, n.o.s.) Do not touch spilled material; stop leak if you can do it without risk. Use water spray to reduce vapors. For small spills, take up with sand or other noncombustible absorbent material and place into containers for later disposal. For small dry spills, with clean shovel place material into clean, dry container and cover; move containers from spill area. For large spills, dike far ahead of spill for later disposal (DOT 1984, Guide 55).

### COMMENTS

Sources searched but no information found:

Weast 1979  
Hawley 1981  
Hayes 1980  
Merck 1983  
Farm Chemicals Handbook 1984  
NIOSH/OSHA 1978  
ACGIH 1983  
Gilman 1985

EPA CHEMICAL PROFILE

INTERIM

Date: October 31, 1985

Revision: \_\_\_\_\_

CHEMICAL IDENTITY -- DIMETHYL PHTHALATE

CAS Registry Number: 131-11-3

**Synonyms:** 1,2-Benzenedicarboxylic Acid Dimethyl Ester;  
1,2-Benzenedicarboxylic Acid, Dimethyl Ester; Avolin; Dimethyl  
1,2-Benzenedicarboxylate; Dimethyl Benzeneorthodicarboxylate; Dimethyl-  
phthalate; DMF (Insect Repellent); DMP; ENT 262; Fermine; Methyl Phthalate;  
Mipax; NTM; Palatinol M; Phthalic Acid Methyl Ester; Phthalic Acid, Dimethyl  
Ester; Repeftal; Solvanom; Solvarone; Unimoll DM

**Chemical Formula:**  $C_{10}H_{10}O_4$

**Molecular Weight:** 194.19

SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

**OSHA PEL:** TWA 5 mg/m<sup>3</sup> (\*NIOSH/RTECS 1985)

**ACGIH TLV:** TWA 5 mg/m<sup>3</sup>; STEL 10 mg/m<sup>3</sup> (\*ACGIH 1982)

**IDLH:** 9,300 mg/m<sup>3</sup> (\*NIOSH/OSHA 1981)

**Other Limits Recommended:** Toxicity information: LC<sub>50</sub> inhalation  
(mouse) 0.0043 mg/liter (\*NIOSH/RTECS 1985) (SUSPECT)

SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

**Boiling Point:** 543°F, 283.7°C (\*Merck 1976)

**Specific Gravity (H<sub>2</sub>O=1):** 1.196 at 15.6°C/15.6°C (\*Merck 1976)

**Vapor Pressure (mmHg):** Less than 0.01 at 20°C (\*Merck 1976)

**Melting Point:** 42°F, 5.5°C (\*Merck 1976); 32°F-36°F, 0-2°C for the  
commercial product (\*Merck 1983)

**Vapor Density (AIR=1):** 6.69 (\*Merck 1976)

**Evaporation Rate (Butyl acetate=1):** Compared to methyl acetate:  
almost zero (\*NIOSH/OSHA 1981)

**DIMETHYL PHTHALATE**

**SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS (Continued)**

**Solubility in Water:** 0.43 g/100 ml (\*Merck 1976)

**Appearance and Odor:** It is an oily liquid, with slightly aromatic odor (\*Merck 1976) or colorless to pale yellow, viscous liquid, with slight ester odor (\*NIOSH/OSHA 1981).

**SECTION III -- FIRE AND EXPLOSION HAZARD DATA**

**Flash Point (Method Used):** 295°F (\*Merck 1976)

**Flammable Limits:**

LEL: 1.2% at 295°F (\*NIOSH 1981)

UEL: Not Found

**Extinguishing Methods:** Extinguish with dry chemicals, foam, or carbon dioxide (\*NIOSH/OSHA 1981).

**Special Fire Fighting Procedures:** Use water to cool fire-exposed containers (\*General Electric Co. 1980, MSDS #430).

**Unusual Fire and Explosion Hazards:** Water or foam may cause frothing (\*NFPA 1978).

**SECTION IV -- REACTIVITY DATA**

**Stability: Unstable:**

Stable: Yes (\*Osol 1975)

**Conditions to Avoid:** Slowly affected by light (\*Osol 1975).

**Incompatibility (Materials to Avoid):** Incompatible with nitrates, strong oxidizers, strong alkalies, and strong acids (\*NIOSH/OSHA 1981).

**Hazardous Decomposition or Byproducts:** When heated to decomposition, it emits acrid smoke and fumes (Sax 1984, p. 1194).

**Hazardous Polymerization: May Occur:**

May Not Occur: Yes (\*General Electric Co. 1980, MSDS #430)

**Conditions to Avoid:** Not Found

## DIMETHYL PHTHALATE

### SECTION V -- HEALTH HAZARD DATA

**Routes of Entry:** Inhalation: Yes (\*Rumack 1975 to Present)  
Skin: No (\*Merck 1976)  
Ingestion: Yes (\*Dreisbach 1977)

**Health Hazards (Acute, Delayed, and Chronic):** It is classified as slightly toxic. Probable oral lethal dose for humans is 5-15 g/kg, or between one pint and one quart for a 70 kg (150-lb) person (\*Gosselin 1976). It is an eye and gastrointestinal irritant (\*Grant 1974, \*Rumack 1975 to Present).

**Signs and Symptoms of Exposure:** Symptoms include burning sensation of the lips, tongue, and mouth; vomiting; diarrhea; coughing; conjunctivitis; paralysis and coma (\*Dreisbach 1977, \*Merck 1976, \*Rumack 1975 to Present). Irritating to mucous membranes; may cause central nervous system depression after ingestion (\*Merck 1976).

**Medical Conditions Generally Aggravated by Exposure:** Not Found

**Emergency and First Aid Procedures:** Treat as for insect repellants. Establish respiration. Prevent absorption. Wash exposed areas twice with soap and water (\*Rumack 1975 to Present).

### SECTION VI -- USE INFORMATION

Solvent and plasticizer (\*Merck 1976); in solid rocket propellants, lacquers, coating agents, safety glass, molding powders, perfumes (\*Hawley 1977); in chemical lights (\*Rumack 1975 to Present); dispersing medium, plasticizer, hair spray ingredient, insect repellent (\*SRI); cosmetic ingredient (\*NIOSH; Current Awareness Listing 1984).

### SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE (Steps to be Taken in Case Material is Released or Spilled)

Do not touch spill material. Avoid inhalation. Wear proper respiratory protection and eye protection (see Section V above). Remove all ignition sources; ventilate area of spill or leak. Take up spills by absorbing in vermiculite, dry sand, earth or a similar material and disposing of in a secured landfill, or atomizing in a suitable combustion chamber (\*NIOSH/OSHA 1981).

EPA CHEMICAL PROFILE

INTERIM

Date: October 31, 1985

Revision: \_\_\_\_\_

CHEMICAL IDENTITY -- SODIUM PENTACHLOROPHENATE

CAS Registry Number: 131-52-2

**Synonyms:** Dow Dormant Fungicide; Dowicide G; Dowicide G-ST; Mystox D; Napclor-G; PCP Sodium Salt; PCP-Sodium; Pentachlorophenate Sodium; Pentachlorophenol Sodium Salt; Pentachlorophenol, Sodium Salt; Pentachlorophenoxy Sodium; Pentaphenate; Phenol, Pentachloro-, Sodium Salt; PKHFN; Santobrite; SAPCO 25; Sodium PCP; Sodium Pentachlorophenol; Sodium Pentachlorophenolate; Sodium Pentachlorophenoxide; Sodium Pentachlorophenate; Sodium, (Pentachlorophenoxy)-; Weedbeads

**Chemical Formula:**  $C_6Cl_5O \cdot Na$

**Molecular Weight:** 288.30

SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

OSHA PEL: Not Found

ACGIH TLV: Not Found

IDLH: Not Found

**Other Limits Recommended:** Toxicity information: LD<sub>low</sub> oral (mouse) 164 mg/kg; LC<sub>50</sub> inhalation (mouse) 0.24 mg/liter/2 hours (\*NIOSH/RTECS 1985)

SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

Boiling Point: Not Found

Specific Gravity (H<sub>2</sub>O=1): Not Found

Vapor Pressure (mmHg): Not Found

Melting Point: Not Found

Vapor Density (AIR=1): Not Found

Evaporation Rate (Butyl acetate=1): Not Found

## SODIUM PENTACHLOROPHENATE

### SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

**Solubility in Water:** 330 g/L at 25°C (\*Worthing 1979); 21.0 % wt/vol at 5°C; 29.0% wt/vol at 40°C (\*Clayton and Clayton 1981-82)

**Appearance and Odor:** Tan powder (\*Sax 1975); powder, pellets, and briquettes (\*Hawley 1977) with a phenolic odor (\*Worthing 1979)

### SECTION III -- FIRE AND EXPLOSION HAZARD DATA

**Flash Point (Method Used):** Not Found

**Flammable Limits:**

LEL: Not Found

UEL: Not Found

**Extinguishing Methods:** It is noncombustible (Student 1981, p. 394). For small fires, use dry chemical, carbon dioxide, water spray, or foam. For large fires, use water spray, fog, or foam (DOT 1984, Guide 53).

**Special Fire Fighting Procedures:** Wear self-contained (positive pressure) breathing apparatus and full protective clothing. Move container from fire area if possible. Runoff from fire control or dilution water may cause pollution (DOT 1984, Guide 53).

**Unusual Fire and Explosion Hazards:** Fire may produce irritating or poisonous gases (DOT 1984, Guide 53).

### SECTION IV -- REACTIVITY DATA

**Stability: Unstable:** Not Found

**Stable:** Not Found

**Conditions to Avoid:** Not Found

**Incompatibility (Materials to Avoid):** Not Found

**Hazardous Decomposition or Byproducts:** When heated to decomposition, it emits toxic fumes of chlorides and sodium oxide (Sax 1984, p. 2446).

**Hazardous Polymerization: May Occur:** Not Found

**May Not Occur:** Not Found

**Conditions to Avoid:** Not Found



## SODIUM PENTACHLOROPHENATE

### SECTION V -- HEALTH HAZARD DATA

**Routes of Entry:** Inhalation: Yes (\*Clayton and Clayton 1981-82)  
Skin: Yes (\*Clayton and Clayton 1981-82)  
Ingestion: Yes (\*Clayton and Clayton 1981-82)

**Health Hazards** (Acute, Delayed, and Chronic): Fine dusts and sprays are irritating to the eyes and upper respiratory tract. Severe intoxications, including fatalities, have been reported from uncontrolled use. This compound causes inflamed gastric mucosa, congestion of the lungs, edema in the brain, cardiac dilatation, degeneration of the liver and kidneys (\*Encyc Occupat Health and Safety 1971).

**Signs and Symptoms of Exposure:** Exposure to fine dusts or sprays cause burning in eyes and painful irritation in upper respiratory tract. If inhaled, it will induce violent coughing and sneezing. Skin irritation results from brief exposures (\*Clayton and Clayton 1981-82). Symptoms of severe systemic intoxication include loss of appetite, respiratory difficulties, anesthesia, fever, sweating, difficulty in breathing and rapidly progressive coma (\*Encyc Occupat Health and Safety 1971).

**Medical Conditions Generally Aggravated by Exposure:** Individuals suffering from kidney and liver diseases have a lowered resistance and should not be exposed (\*Clayton and Clayton 1981-82).

**Emergency and First Aid Procedures:** Move victim to fresh air; call emergency medical care. Remove and isolate contaminated clothing and shoes at the site (DOT 1984, Guide 53). Bathe and shampoo with soap and water. Flush chemicals from eyes with copious amounts of water. Prevent absorption. If the material is ingested, the stomach must be emptied (\*Morgan 1976).

### SECTION VI -- USE INFORMATION

Wood preservative (\*SRI); preservation of cellulose products, textiles, paints, adhesives, leather, pulp, paper and industrial waste systems (\*Clayton and Clayton 1981-82); contact and pre-emergence herbicide (\*Farm Chemicals Handbook 1981); general disinfectant (\*Worthing 1979) and control of the intermediate snail host of schistosomiasis (Buchel 1983, p. 220)

## SODIUM PENTACHLOROPHENATE

### SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE

(Steps to be Taken in Case Material is Released or Spilled)

Ventilate area of spill. Collect spilled material in most convenient manner and deposit in sealed containers for later disposal. Liquids should be absorbed in vermiculite, dry sand, earth, or similar material (\*NIOSH/OSHA 1981). Protective clothing and rubber gloves should be worn. Nose and mouth must be protected with respirator. Protect eyes with tight-fitting goggles (\*Clayton and Clayton 1981-82). Keep unnecessary people away; isolate hazard area and deny entry. Stay upwind; keep out of low areas. Wear self-contained (positive pressure if available) breathing apparatus and full protective clothing. Do not touch spilled material; stop leak if you can do so without risk. Small spills: absorb with sand or other noncombustible absorbent material and place into containers for later disposal. Small dry spills: with clean shovel, place material into clean, dry container and cover; move containers from spill area. Large spills: dike far ahead of spill for later disposal (DOT 1984, Guide 53).

EPA CHEMICAL PROFILE

INTERIM

Date: October 31, 1985

Revision: \_\_\_\_\_

CHEMICAL IDENTITY -- BENZYL CYANIDE

CAS Registry Number: 140-29-4

**Synonyms:** (Cyanomethyl)Benzene; 2-Phenylacetonitrile; Acetic acid, Phenyl-Nitrile; Acetonitrile, Phenyl-; alpha-Cyanotoluene; alpha-Tolunitrile; Benzeneacetonitrile; Benzyl Nitrile; omega-Cyanotoluene; Phenylacetonitrile; Toluene, alpha-Cyano; USAF KF-21

**Chemical Formula:**  $C_8H_7N$

**Molecular Weight:** 117.14

SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

OSHA PEL: Not Found

ACGIH TLV: Not Found

IDLH: Not Found

**Other Limits Recommended:** Toxicity information:  $LC_{low}$  inhalation (mouse) 0.10 mg/liter (\*NIOSH/RTECS 1985)

SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

**Boiling Point:** 451.4°F, 233.5°C (\*Merck 1976)

**Specific Gravity** ( $H_2O=1$ ): 1.0214 at 15°C (\*Merck 1976)

**Vapor Pressure** (mmHg): 1 at 60°C (\*Sax 1979)

**Melting Point:** -10.8°F, -23.8°C (\*Merck 1976)

**Vapor Density** (AIR=1): Not Found

**Evaporation Rate** (Butyl acetate=1): Not Found

**Solubility in Water:** Insoluble (\*Weast 1979)

**Appearance and Odor:** Benzyl cyanide is a colorless, oily liquid with an aromatic odor (\*Hawley 1977; \*Merck 1976)

**BENZYL CYANIDE**

**SECTION III -- FIRE AND EXPLOSION HAZARD DATA**

**Flash Point** (Method Used): Not Found

**Flammable Limits:**

LEL: Not Found

UEL: Not Found

**Extinguishing Methods:** Small fires: dry chemical, carbon dioxide, water spray, or foam. Large fires: water spray, fog, or foam. Move container from fire area if you can do it without risk. Fight fire from maximum distance. Dike fire control water for later disposal; do not scatter the material (DOT 1984, Guide 55).

**Special Fire Fighting Procedures:** Keep unnecessary people away; isolate hazard area and deny entry. Stay upwind; keep out of low areas. Ventilate closed spaces before entering them. Wear positive pressure breathing apparatus and special protective clothing. Remove and isolate contaminated clothing at the site (DOT 1984, Guide 55).

**Unusual Fire and Explosion Hazards:** When heated to decomposition, it emits very toxic fumes of cyanide and nitrogen oxides (Sax 1984, p. 2171). Container may explode in heat of fire. Runoff from fire control water may give off poisonous gases (DOT 1984, Guide 55).

**SECTION IV -- REACTIVITY DATA**

**Stability: Unstable:** Not Found

**Stable:** Not Found

**Conditions to Avoid:** Not Found

**Incompatibility** (Materials to Avoid): Sodium hypochlorite (Sax 1984, p. 2171)

**Hazardous Decomposition or Byproducts:** When heated to decomposition, it emits very toxic fumes of cyanide and nitrogen oxides (Sax 1984, p. 2171).

**Hazardous Polymerization: May Occur:** Not Found

**May Not Occur:** Not Found

**Conditions to Avoid:** Not Found

## BENZYL CYANIDE

### SECTION V -- HEALTH HAZARD DATA

**Routes of Entry:** Inhalation: Yes (Sax 1984, p. 2171)  
Skin: Yes (Hawley 1981, p. 122)  
Ingestion: Yes (Sax 1984, p. 2171)

**Health Hazards** (Acute, Delayed, and Chronic): Poisonous. May be fatal if inhaled, swallowed, or absorbed through skin. Contact may cause burns to skin and eyes (DOT 1984, Guide 55).

**Signs and Symptoms of Exposure:** Not Found

**Medical Conditions Generally Aggravated by Exposure:** Not Found

**Emergency and First Aid Procedures:** Move victim to fresh air; call emergency medical care. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In case of contact with material, immediately flush skin or eyes with running water for at least 15 minutes. Speed in removing material from skin is of extreme importance. Remove and isolate contaminated clothing and shoes at the site. Keep victim quiet and maintain normal body temperature. Effects may be delayed; keep victim under observation (DOT 1984, Guide 55).

### SECTION VI -- USE INFORMATION

Organic synthesis, especially penicillin precursors (\*Hawley 1977).  
Chemical intermediate for amphetamines, phenobarbital, the stimulant, methyl phenidylacetate, esters as perfumes and flavors (\*SRI).

### SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE

(Steps to be Taken in Case Material is Released or Spilled)

Avoid breathing vapors. Wear protective clothing (see Section V above). Do not touch spilled materials; stop leak if you can do it without risk. Use water spray to reduce vapors. Small spills: take up with sand or other noncombustible absorbent material and place into containers for later disposal. Large spills: dike far ahead of spill for later disposal (DOT 1984, Guide 55).

EPA CHEMICAL PROFILE

INTERIM

Date: October 31, 1985

Revision: \_\_\_\_\_

CHEMICAL IDENTITY -- PYRIDINE, 2-METHYL-5-VINYL-

CAS Registry Number: 140-76-1

Synonyms: (NIOSH/RTECS 1983 Synonyms, Volume 3, p. 423): 2-Methyl-5-Ethenylpyridine; Pyridine, 5-Ethenyl-2-Methyl-; 2-Methyl-5-Vinylpyridine; 2-Picoline, 5-Vinyl-

Chemical Formula:  $C_8H_9N$

Molecular Weight: 119.18

SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

OSHA PEL: Not Found

ACGIH TLV: Not Found

IDLH: Not Found

Other Limits Recommended: Toxicity information:  $LC_{50}$  inhalation (rat) 0.189 mg/liter/2 hours (\*NIOSH/RTECS 1985)

SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

Boiling Point: 358°F, 181°C (Hawley 1981, p. 692)

Specific Gravity ( $H_2O=1$ ): 0.978-0.982 20°C/20°C (Hawley 1981, p. 692)

Vapor Pressure (mmHg): Not Found

Melting Point: Freezing point: 6.3°F, -14.3°C (anhydrous) (Hawley 1981, p. 692)

Vapor Density (AIR=1): Not Found

Evaporation Rate (Butyl acetate=1): Not Found

Solubility in Water: Not Found

Appearance and Odor: Clear to faintly opalescent liquid (Hawley 1981, p. 692)

**PYRIDINE, 2-METHYL-5-VINYL-**

**SECTION III -- FIRE AND EXPLOSION HAZARD DATA**

**Flash Point** (Method Used): 165°F, 73.9°C (TOC) (Hawley 1981, p. 692)

**Flammable Limits:**

LEL: Not Found

UEL: Not Found

**Extinguishing Methods:** It is combustible (Hawley 1981, p. 692).  
(Non-Specific -- Combustible Liquid, n.o.s.) Extinguish with dry chemical, carbon dioxide, water spray, fog, or foam (DOT 1984, Guide 27).

**Special Fire Fighting Procedures:** (Non-Specific -- Combustible Liquid, n.o.s.) Wear self-contained (positive pressure if available) breathing apparatus and full protective clothing. Isolate for 1/2 mile in all directions if tank car or truck is involved in fire. Move container from fire area if you can do so without risk. Spray cooling water on containers that are exposed to flames until well after fire is out. For massive fire in cargo area, use unmanned hose holder or monitor nozzles; if this is impossible, withdraw from area and let fire burn. Withdraw immediately in case of rising sound from venting safety device or any discoloration of tank due to fire (DOT 1984, Guide 27).

**Unusual Fire and Explosion Hazards:** When heated to decomposition, it emits toxic fumes of nitrogen oxides (Sax 1984, p. 1944). (Non-Specific -- Combustible Liquid, n.o.s.) Flammable/combustible material; may be ignited by heat, sparks, or flames. Vapors may travel to a source of ignition and flash back. Container may explode in heat of fire (DOT 1984, Guide 27).

**SECTION IV -- REACTIVITY DATA**

**Stability:** Unstable: Not Found

Stable: Not Found

**Conditions to Avoid:** Not Found

**Incompatibility** (Materials to Avoid): Not Found

**Hazardous Decomposition or Byproducts:** When heated to decomposition, it emits toxic fumes of nitrogen oxide (Sax 1984, p. 1944).

**Hazardous Polymerization:** May Occur: Not Found

May Not Occur: Not Found

**Conditions to Avoid:** Not Found

PYRIDINE, 2-METHYL-5-VINYL-

SECTION V -- HEALTH HAZARD DATA

**Routes of Entry:** Inhalation: Yes (Sax 1984, p. 1944)  
Skin: Yes (Sax 1984, p. 1944)  
Ingestion: Yes (Sax 1984, p. 1944)

**Health Hazards** (Acute, Delayed, and Chronic): This material is moderately toxic by ingestion, inhalation, and absorption through the skin (Sax 1984, p. 1944).

**Signs and Symptoms of Exposure:** (Non-Specific -- Combustible Liquid, n.o.s.) Vapors may cause dizziness or suffocation (DOT 1984, Guide 27).

**Medical Conditions Generally Aggravated by Exposure:** Not Found

**Emergency and First Aid Procedures:** (Non-Specific -- Combustible Liquid, n.o.s.) Move victim to fresh air; call emergency medical care. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In case of contact with material, immediately flush eyes with running water for at least 15 minutes. Wash skin with soap and water. Remove and isolate contaminated clothing and shoes at the site (DOT 1984, Guide 27).

SECTION VI -- USE INFORMATION

Used as a monomer for resins; oil additive, ore flotation agent; and dye acceptor (Hawley 1981, p. 692).

SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE

(Steps to be Taken in Case Material is Released or Spilled)

(Non-Specific -- Combustible Liquid, n.o.s.) Keep unnecessary people away; isolate hazard area and deny entry. Stay upwind; keep out of low areas. Wear self-contained breathing apparatus and full protective clothing. Shut off ignition sources; no flares, smoking, or flames in hazard area. Stop leak if you can do so without risk. Use water spray to reduce vapors. Absorb spills with sand or noncombustible absorbent material. For large spills dike far ahead (DOT 1984, Guide 27).



PYRIDINE, 2-METHYL-5-VINYL-

COMMENTS

Sources searched but no information found:

ACGIH 1983  
NIOSH/OSHA 1978  
Weast 1979  
Merck 1983  
Student 1981  
CHRIS 1978  
Doull 1980  
Arena 1979  
Gosselin 1984  
Encyc Occupat Health and Safety 1983  
Buchel 1983  
Farm Chemicals Handbook 1984  
Hayes 1982  
Physicians' Desk Reference 1985  
Gilman 1985  
Clayton and Clayton 1981-82  
NFPA 1984  
Weiss 1980

## EPA CHEMICAL PROFILE

### INTERIM

Date: October 31, 1985  
Revision: \_\_\_\_\_

### CHEMICAL IDENTITY -- DICROTOPHOS

CAS Registry Number: 141-66-2

**Synonyms:** 3-(Dimethoxyphosphinyloxy)-N,N-Dimethyl-cis-Crotonamide; 3-(Dimethylamino)-1-Methyl-3-Oxo-1-Propenyl Dimethyl Phosphate (E)-Isomer; 3-Dimethoxyphosphinyloxy-N,N-Dimethylisocrotonamide; 3-Hydroxy-N,N-Dimethyl-cis-Crotonamide Dimethyl Phosphate; 3-Hydroxydimethyl Crotonamide Dimethyl Phosphate; Bidrin; C 709; Carbicron; Carbomicron; Ciba 709, Cis-2-Dimethylcarbamoyl-1-Methylvinyl Dimethylphosphate; Crotonamide, 3-Hydroxy-N,N-Dimethyl-, cis-, Dimethyl Phosphate; Dimethyl (E)-2-Dimethyl-Carbamoyl-1-Methylvinyl Phosphate; Dimethyl 1-Dimethylcarbamoyl-1-Propen-2-yl Phosphate; Dimethyl 2-Dimethylcarbamoyl-1-Methylvinyl Phosphate; Phosphoric Acid, Dimethyl Ester, Ester with cis-3-Hydroxy-N,N-Dimethylcrotonamide; Dimethyl Phosphate Ester with 3-Hydroxy-N,N-Dimethylcrotonamide; Dimethyl Phosphate of 3-Hydroxy-N,N-Dimethyl-cis-Crotonamide; Ektafos; ENT 24,482; Karbicron; O,O-Dimethyl O-(N,N-Dimethylcarbamoyl-1-Methylvinyl) Phosphate; O,O-Dimethyl O-(1,4-Dimethyl-3-Oxo-4-Azapent-1-enyl) Phosphate; Oleobidrin; Phosphoric acid, Dimethyl Ester, Ester with (E)-3-Hydroxy-N,N-Dimethyl-crotonamide; SD 3562; Shell SD-3562; Phosphoric Acid, 3-(Dimethylamino)-1-Methyl-3-oxo-1-Propenyl Dimethyl Ester, (E)-; Crotonamide, 3-Hydroxy-N,N-Dimethyl-, Dimethyl Phosphate, cis-; Crotonamide, 3-Hydroxy-N,N-Dimethyl-, Dimethyl Phosphate, (E)-

**Chemical Formula:**  $C_8H_{16}NO_5P$

**Molecular Weight:** 237.21

### SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

**OSHA PEL:** Not Found

**ACGIH TLV:** TWA 0.25 mg/m<sup>3</sup> (skin) (\*ACGIH 1980)

**IDLH:** Not Found

**Other Limits Recommended:** Toxicity information: LC<sub>50</sub> inhalation (rat) 0.09 mg/liter/4 hours (\*NIOSH/RTECS 1985)

## DICROTOPHOS

### SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

**Boiling Point:** 752°F, 400°C (\*Merck 1976)

**Specific Gravity** ( $H_2O=1$ ): 1.216 at 15°C/15°C (\*Merck 1976)

**Vapor Pressure** (mmHg):  $1 \times 10^{-5}$  at 20°C (Worthing 1983, p. 190)

**Melting Point:** Not Found

**Vapor Density** (AIR=1): Not Found

**Evaporation Rate** (Butyl acetate=1): Not Found

**Solubility in Water:** Miscible (\*Sax 1979)

**Appearance and Odor:** Dicrotophos is a yellow to brown liquid with a mild ester odor (\*Spencer 1973; \*Worthing 1979).

### SECTION III -- FIRE AND EXPLOSION HAZARD DATA

**Flash Point** (Method Used): Above 175°F (\*Farm Chemicals Handbook 1981)

**Flammable Limits:**

LEL: Not Found

UEL: Not Found

**Extinguishing Methods:** (Non-Specific -- Organophosphorus Pesticide, Liquid, n.o.s.) Extinguish with dry chemical, carbon dioxide, water spray, fog, or foam (DOT 1984, Guide 55).

**Special Fire Fighting Procedures:** (Non-Specific -- Organophosphorus Pesticide, Liquid, n.o.s.) Move container from fire area if you can do so without risk. Fight fire from maximum distance. Dike fire control water for later disposal; do not scatter the material. Wear positive pressure breathing apparatus and special protective clothing (DOT 1984, Guide 55).

**Unusual Fire and Explosion Hazards:** (Non-Specific -- Organophosphorus Pesticide, Liquid, n.o.s.) This material may burn but does not ignite readily. Container may explode in heat of fire. Fire and runoff from fire control water may produce irritating or poisonous gases (DOT 1984, Guide 55).

## DICROTOPHOS

### SECTION IV -- REACTIVITY DATA

**Stability:** **Unstable:** Not Found  
**Stable:** Not Found

**Conditions to Avoid:** Keep away from heat and open flame (\*Farm Chemicals Handbook 1981).

**Incompatibility (Materials to Avoid):** Rapidly hydrolyzes in acid or alkali (\*Sunshine 1969).

**Hazardous Decomposition or Byproducts:** Not Found

**Hazardous Polymerization:** **May Occur:** Not Found  
**May Not Occur:** Not Found

**Conditions to Avoid:** Not Found

### SECTION V -- HEALTH HAZARD DATA

**Routes of Entry:** **Inhalation:** Yes (Hayes 1982, pp. 361-362)  
**Skin:** Yes (Hayes 1982, pp. 361-362)  
**Ingestion:** Yes (Hayes 1982, pp. 361-362)

**Health Hazards (Acute, Delayed, and Chronic):** It is extremely toxic. Probable human oral lethal dose is 5 to 50 mg/kg, 7 drops to one teaspoonful for a 70 kg (150 lb.) person. Closely related in toxicity to azodrin (\*Gosselin 1976).

**Signs and Symptoms of Exposure:** Typical symptoms of organophosphate poisoning include nausea, vomiting, abdominal cramps, diarrhea, excessive salivation, headache, giddiness, blurring and dimness of vision, loss of muscle coordination, weakness, difficulty breathing, convulsion, coma, and death (\*Gosselin 1976).

**Medical Conditions Generally Aggravated by Exposure:** Not Found

**Emergency and First Aid Procedures:** (Non-Specific -- Organophosphorus Pesticide, Liquid, n.o.s.) Move victim to fresh air; call emergency medical care. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In case of contact with material, immediately flush skin or eyes with running water for at least 15 minutes. Speed in removing material from skin is of extreme importance. Remove and isolate contaminated clothing and shoes at the site. Keep victim quiet and maintain normal body temperature. Effects may be delayed; keep victim under observation (DOT 1984, Guide 55).

## DICROTOPHOS

### SECTION VI -- USE INFORMATION

Used to control sucking, boring, and chewing pests on rice, cotton, coffee, apples, and other crops. Effective on ornamentals, trees, and shrubs for aphids, leaf hoppers, and scale insects (\*Worthing 1979; \*Spencer 1973; \*SRI).

### SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE

(Steps to be Taken in Case Material is Released or Spilled)

(Non-Specific -- Organophosphorus Pesticide, Liquid, n.o.s.) Do not touch spilled material; stop leak if you can do so without risk. Use water spray to reduce vapors. Small spills: absorb with sand or other noncombustible absorbent material and place into containers for later disposal. Small dry spills: with clean shovel place material into clean, dry container and cover; move containers from spill area. Large spills: dike far ahead of spill for later disposal. Keep unnecessary people away; isolate hazard area and deny entry. Stay upwind; keep out of low areas. Ventilate closed spaces before entering them. Wear positive pressure breathing apparatus and special protective clothing. Remove and isolate contaminated clothing at the site (DOT 1984, Guide 55).

EPA CHEMICAL PROFILE

INTERIM

Date: October 31, 1985

Revision: \_\_\_\_\_

CHEMICAL IDENTITY -- SODIUM CYANIDE (Na(CN))

CAS Registry Number: 143-33-9

Synonyms: Cyanide of Sodium; Cyanogran; Cymag; Hydrocyanic Acid, Sodium salt; Sodium Cyanide, Solid (DOT)

Chemical Formula: NaCN

Molecular Weight: 49.01

SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

OSHA PEL: TWA 5 mg (Cyanide)/m<sup>3</sup> (Skin) (\*NIOSH/RTECS 1985)

ACGIH TLV: TWA 5 mg (Cyanide)/m<sup>3</sup> (\*ACGIH 1983)

IDLH: 50 mg/m<sup>3</sup> (NIOSH/OSHA 1978, p. 74)

Other Limits Recommended: The recommended upper limit for occupational exposure to cyanide salts is 5 mg (Cyanide)/m<sup>3</sup>/10 min (\*NIOSH/RTECS 1985).

SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

Boiling Point: 2725°F, 1496°C (\*Weast 1979)

Specific Gravity (H<sub>2</sub>O=1): Not Found

Vapor Pressure (mmHg): 1 at 817°C (\*Clayton and Clayton 1981-82)

Melting Point: 1047°F, 564°C (\*Weast 1979)

Vapor Density (AIR=1): Not Found

Evaporation Rate (Butyl acetate=1): Not Found

Solubility in Water: 82 g/100 cc at 35°C (\*Weast 1979)

Appearance and Odor: White solid in form of granules, flakes, or eggs (resembling chicken eggs) (\*NFPA 1978); colorless cubes (\*Weast 1979); odorless when perfectly dry but emits odor of hydrogen cyanide when damp (\*Merck 1983)

**SODIUM CYANIDE (Na(CN))****SECTION III -- FIRE AND EXPLOSION HAZARD DATA**

**Flash Point** (Method Used): Not combustible (NFPA 1984, p. 49-81)

**Flammable Limits:**

LEL: Not Found

UEL: Not Found

**Extinguishing Methods:** Use water (\*NFPA 1978). Use dry chemical, carbon dioxide, water spray, or foam for small fires, water spray, fog, or foam for large fires (\*DOT 1984).

**Special Fire Fighting Procedures:** Full protective clothing including self-contained breathing apparatus, rubber gloves, boots, and bands around legs, arms, and waist should be provided. No skin surface should be exposed. Normal fire fighting procedures may be used (\*NFPA 1978). Fight fire from maximum distance. Move container from area if you can do it without risk. Dike fire control water for later disposal. Do not scatter the material (\*DOT 1984).

**Unusual Fire and Explosion Hazards:** Sodium cyanide is not combustible itself, but contact with acids releases highly flammable hydrogen cyanide gas (\*NFPA 1978). Fire may produce irritating or poisonous gases. Runoff from fire control water may give off poisonous gases. Container may explode in the heat of fire (\*DOT 1984).

**SECTION IV -- REACTIVITY DATA**

**Stability:** Unstable:

Stable: Yes (\*NFPA 1978)

**Conditions to Avoid:** Avoid contact with acids (\*NFPA 1978).

Aqueous solutions rapidly decompose (\*Hawley 1977).

**Incompatibility** (Materials to Avoid): Strong oxidizers such as nitrates and chlorates; acids and acid salts (NIOSH/OSHA 1978, p. 74)

**Hazardous Decomposition or Byproducts:** Hydrogen cyanide (\*NFPA 1978)

**Hazardous Polymerization:** May Occur: Not Found

May Not Occur: Not Found

**Conditions to Avoid:** Not Found

**SODIUM CYANIDE (Na(CN))****SECTION V -- HEALTH HAZARD DATA (Continued)**

**Routes of Entry:** Inhalation: Yes (\*Clayton and Clayton 1981-82)  
Skin: Yes (\*Clayton and Clayton 1981-82)  
Ingestion: Yes (\*Clayton and Clayton 1981-82)

**Health Hazards** (Acute, Delayed, and Chronic): Super toxic; probable oral lethal dose in humans is less than 5 mg/kg or a taste (less than 7 drops) for a 70 kg (150 lb.) person (\*Gosselin 1976). Sodium cyanide is poisonous and may be fatal if inhaled, swallowed or absorbed through the skin. Contact with sodium cyanide may cause burns to skin and eyes (\*DOT 1984).

**Signs and Symptoms of Exposure:** Sodium cyanide produces all typical symptoms of other sources of cyanide ion. Acute symptoms can be produced by inhalation, skin absorption, and ingestion (\*Clayton and Clayton 1981-82). Massive doses may produce sudden loss of consciousness and prompt death from respiratory arrest. Smaller doses may still be lethal but illness may be prolonged for 1-2 hours. Upon ingestion, a bitter, acrid, burning taste is sometimes noted, followed by a feeling of constriction or numbness in the throat (\*Gosselin 1976).

**Medical Conditions Generally Aggravated by Exposure:** Individuals with chronic diseases of the kidneys, respiratory tract, skin, or thyroid are at greater risk of developing toxic cyanide effects (\*Encyc Occupat Health and Safety 1983).

**Emergency and First Aid Procedures:** Avoid mouth-to-mouth resuscitation (\*Rumack 1975 to Present). Move victim to fresh air; call emergency medical care. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In case of contact with material, immediately flush skin or eyes with running water for at least 15 minutes. Speed in removing material from skin is of extreme importance. Remove and isolate contaminated clothing and shoes at the site. Keep victim quiet and maintain normal body temperature. Effects may be delayed; keep victim under observation (\*DOT 1984).

**SECTION VI -- USE INFORMATION**

Sodium cyanide is used as a fumigant (\*Merck 1983), a rodenticide (\*Morgan 1982), in cleaning metals, and in the manufacturing of dyes and pigments, as a chelating compound (\*Hawley 1977), as a component of electroplating solutions, as a component of salts for case hardening steel, and as an agent for extraction of gold and silver from ores (\*SRI).



SODIUM CYANIDE (Na(CN))

**SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE**  
(Steps to be Taken in Case Material is Released or Spilled)

Evacuate the area immediately. Impervious protective clothing as well as suitable respiratory protective equipment are required to enter spill areas (\*Encyc Occupat Health and Safety 1983). Do not touch spilled material; stop leak if you can do it without risk. Use water spray to reduce vapors. Small spills: take up with sand or other noncombustible absorbent material and place into containers for later disposal. Small dry spills: with clean shovel place material into clean, dry container and cover; move containers from spill area. Large spills: dike far ahead of spill for later disposal (\*DOT 1984).

EPA CHEMICAL PROFILE

INTERIM

Date: October 31, 1985

Revision: \_\_\_\_\_

CHEMICAL IDENTITY -- FLUOROACETIC ACID

CAS Registry Number: 144-49-0

**Synonyms:** Acetic Acid, Fluoro-; 2-Fluoroacetic Acid; alpha-Fluoroacetic Acid; Cymonic Acid; FAA; Fluoroethanoic Acid; Gifblaar Poison; HFA; MFA; Monofluoroacetic Acid

**Chemical Formula:**  $C_2H_3FO_2$

**Molecular Weight:** 78.04

SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

**OSHA PEL:** Air: TWA 0.05 mg/m<sup>3</sup> (for sodium salt) (OSHA 1984, p. 663)

**ACGIH TLV:** TWA 0.05 mg/m<sup>3</sup>; STEL 0.15 mg/m<sup>3</sup> (for sodium salt)  
(\*ACGIH 1980)

**IDLH:** Not Found

**Other Limits Recommended:** IDLH for sodium salt: 5 mg/m<sup>3</sup> (NIOSH/OSHA 1978, p. 166). Toxicity information: LD<sub>50</sub> oral (guinea pig) 0.468 mg/kg (\*NIOSH/RTECS 1985)

SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

**Boiling Point:** 329°F, 165°C (\*Weast 1979)

**Specific Gravity (H<sub>2</sub>O=1):** 1.3693 at 97°F, 36°C (\*Weast 1979)

**Vapor Pressure (mmHg):** Not Found

**Melting Point:** 95.4°F, 35.2°C (\*Weast 1979)

**Vapor Density (AIR=1):** Not Found

**Evaporation Rate (Butyl acetate=1):** Not Found

**Solubility in Water:** Soluble (Weast 1983, p. 597)

**Appearance and Odor:** Colorless crystals (\*Hawley 1977)

## FLUOROACETIC ACID

### SECTION III -- FIRE AND EXPLOSION HAZARD DATA

**Flash Point** (Method Used): Not Found  
**Flammable Limits:** Burns (\*Merck 1976)  
LEL: Not Found  
UEL: Not Found

**Extinguishing Methods:** Small fires: use dry chemical, carbon dioxide, water spray, or foam. For large fires, use water spray, fog, or foam (DOT 1984, Guide 59).

**Special Fire Fighting Procedures:** Stay upwind; keep out of low areas. Wear self-contained, positive pressure breathing apparatus and full protective clothing. Move container from fire area. Cool containers that are exposed to flames with water from the side until well after fire is out (DOT 1984, Guide 59).

**Unusual Fire and Explosion Hazards:** When heated to decomposition, it emits highly toxic fumes of fluorine containing compounds (\*Sax 1979). Some of these materials may burn but none ignite readily. These materials may ignite combustibles (wood, paper, oil, etc.) (DOT 1984, Guide 59).

### SECTION IV -- REACTIVITY DATA

**Stability:** Unstable:  
Stable: Yes (\*Encyc Occupat Health and Safety 1971)

**Conditions to Avoid:** Not Found

**Incompatibility** (Materials to Avoid): Not Found

**Hazardous Decomposition or Byproducts:** When heated to decomposition, it emits highly toxic fumes of fluorine containing compounds (\*Sax 1979).

**Hazardous Polymerization:** May Occur: Not Found  
May Not Occur: Not Found

**Conditions to Avoid:** Not Found

### SECTION V -- HEALTH HAZARD DATA

**Routes of Entry:** Inhalation: Yes (\*Sax 1975)  
Skin: Yes (\*Rumack 1975 to Present)  
Ingestion: Yes (\*Sax 1975)

## FLUOROACETIC ACID

### SECTION V -- HEALTH HAZARD DATA (Continued)

**Health Hazards** (Acute, Delayed, and Chronic): This material is very toxic; ingestion of small quantities may cause death (\*Sax 1975).

**Signs and Symptoms of Exposure:** The major symptoms of fluoroacetic acid poisoning include severe epileptiform convulsions alternating with coma and depression; death may result from asphyxia during convulsion or from respiratory failure. Cardiac irregularities, such as ventricular fibrillation and sudden cardiac arrest, nausea, vomiting, excessive salivation, numbness, tingling sensations, epigastric pain, mental apprehension, muscular twitching, low blood pressure, and blurred vision may also occur (\*Encyc Occupat Health and Safety 1971).

**Medical Conditions Generally Aggravated by Exposure:** Not Found

**Emergency and First Aid Procedures:** Move victim to fresh air; call emergency medical care. If not breathing give artificial respiration. If breathing is difficult, give oxygen. In case of contact with material, immediately flush skin or eyes with running water for at least 15 minutes. Remove and isolate contaminated clothing and shoes at the site. Keep victim quiet and maintain normal body temperature (DOT 1984, Guide 59).

### SECTION VI -- USE INFORMATION

Rodenticide (Hawley 1981, p. 470). The sodium salt of this material is used as a rodent poison (\*Patty 1963).

### SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE

(Steps to be Taken in Case Material is Released or Spilled)

Do not touch spilled material. Stop leak if you can do so without risk. Stay upwind; keep out of low areas. Use water spray to reduce vapors. Wear self-contained, positive pressure breathing apparatus and full protective clothing. For small spills, take up with sand or other noncombustible absorbent material and place into containers for later disposal. For large spills, dike spill for later disposal (DOT 1984, Guide 59).

EPA CHEMICAL PROFILE

INTERIM

Date: October 31, 1985

Revision: \_\_\_\_\_

CHEMICAL IDENTITY -- DICHLOROMETHYLPHENYLSILANE

CAS Registry Number: 149-74-6

Synonyms: Methylphenyldichlorosilane; Phenylmethyldichlorosilane; Silane, Dichloromethylphenyl-

Chemical Formula:  $C_7H_8Cl_2Si$

Molecular Weight: 191.14

SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

OSHA PEL: Not Found

ACGIH TLV: Not Found

IDLH: Not Found

Other Limits Recommended: Toxicity information:  $LC_{low}$  inhalation  
(mouse) 0.2 mg/liter/2 hours (\*NIOSH/RTECS 1985)

SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

Boiling Point: 401°F, 205°C (Hawley 1981, p. 688)

Specific Gravity ( $H_2O=1$ ): 1.19 (\*Hawley 1977)

Vapor Pressure (mmHg): Not Found

Melting Point: Not Found

Vapor Density (AIR=1): Not Found

Evaporation Rate (Butyl acetate=1): Not Found

Solubility in Water: Not Found

Appearance and Odor: Colorless liquid (\*Hawley 1977)

DICHLOROMETHYLPHENYLSILANE

SECTION III -- FIRE AND EXPLOSION HAZARD DATA

**Flash Point** (Method Used): 83°F (28°C) (\*Hawley 1977) (SUSPECT)

**Flammable Limits:**

LEL: Not Found

UEL: Not Found

**Extinguishing Methods:** For small fires, use dry chemical, carbon dioxide, water spray or foam. For large fires, use water spray, fog, or foam (DOT 1984, Guide 29).

**Special Fire Fighting Procedures:** Isolate for 1/2 mile in all directions if tank car or truck is involved in a fire. Wear self-contained (positive pressure) breathing apparatus with full protective clothing. Do not get water inside container (DOT 1984, Guide 29).

**Unusual Fire and Explosion Hazards:** When heated to decomposition, it emits toxic fumes of chlorine-containing compounds (Sax 1984, p. 951). Flammable/combustible material; may be ignited by heat, sparks, or flames. Vapors may travel to a source of ignition and flash back. Container may explode in heat of fire. Vapor explosion hazard indoors, outdoors or in sewers. Runoff to sewer may create fire or explosion hazard. Fire may produce irritating or poisonous gases (DOT 1984, Guide 29).

SECTION IV -- REACTIVITY DATA

**Stability:** Unstable: Not Found  
Stable: Not Found

**Conditions to Avoid:** Not Found

**Incompatibility** (Materials to Avoid): Reacts strongly with oxidizing materials (\*Hawley 1977)

**Hazardous Decomposition or Byproducts:** When heated to decomposition, it emits toxic fumes of chlorine-containing compounds (Sax 1984, p. 951).

**Hazardous Polymerization:** May Occur: Not Found  
May Not Occur: Not Found

**Conditions to Avoid:** Not Found

## DICHLOROMETHYLPHENYLSILANE

### SECTION V -- HEALTH HAZARD DATA

**Routes of Entry:** Inhalation: Yes (\*Rumack 1975 to Present)  
Skin: Yes (\*Rumack 1975 to Present)  
Ingestion: Yes (\*Rumack 1975 to Present)

**Health Hazards** (Acute, Delayed, and Chronic): The chemical is toxic and is an irritant (\*Hawley 1977). Contact may cause burns to the skin and eyes. (DOT 1984, Guide 29).

**Signs and Symptoms of Exposure:** Not Found

**Medical Conditions Generally Aggravated by Exposure:** Not Found

**Emergency and First Aid Procedures:** Move victim to fresh air; call emergency medical care. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Remove and isolate contaminated clothing and shoes at the site. In case of contact with material; immediately flush skin or eyes with running water for at least 15 minutes. Keep victim quiet and maintain normal body temperature (DOT 1984, Guide 29).

### SECTION VI -- USE INFORMATION

Used in the manufacture of silicones (\*Hawley 1977); and as a chemical intermediate for silicone fluids, resins and elastomers (\*SRI).

### SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE

(Steps to be Taken in Case Material is Released or Spilled)

Keep unnecessary people away. Stay upwind. Stay out of low areas. Wear self-contained (positive pressure if available) breathing apparatus and full protective clothing. Shut off ignition sources; no flares, smoking or flames in hazard area. Do not touch spilled material; stop leak if you can do so without risk. Use water spray to reduce vapors; do not get water inside container. Small spills: absorb with sand or other noncombustible absorbent material and place into containers for later disposal. Large spills: dike far ahead of spill for later disposal (DOT 1984, Guide 29).

EPA CHEMICAL PROFILE

INTERIM

Date: October 31, 1985

Revision: \_\_\_\_\_

CHEMICAL IDENTITY -- METHOXYETHYLMERCURIC ACETATE

CAS Registry Number: 151-38-2

Synonyms: (NIOSH/RTECS 1983 Synonyms, Volume 2, p. 657) Mercury, (Acetato)(2-Methoxyethyl)-; Acetato(2-Methoxyethyl)Mercury; Landisan; MeEHg; MEMA; Mercuran; Mercury, Acetoxy(2-Methoxyethyl)-; Radosan; Methoxyethyl Mercuric Acetate  
(Farm Chemicals Handbook 1984, p. C148) Panogen

Chemical Formula:  $C_5H_{10}HgO_3$

Molecular Weight: 318.74

SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

OSHA PEL: TWA 10  $\mu g$  (Hg)/m<sup>3</sup>; Ceiling 40  $\mu g$  (Hg)/m<sup>3</sup>  
(NIOSH/RTECS 1983, p. 657)

ACGIH TLV: TWA 10  $\mu g$  (Hg)/m<sup>3</sup>; STEL 30  $\mu g$  (Hg)/m<sup>3</sup> (skin)  
(NIOSH/RTECS 1983, p. 657)

IDLH: Not Found

Other Limits Recommended: Toxicity information: LD<sub>50</sub> oral (rat) 16 mg/kg (\*NIOSH/RTECS 1985)

SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

Boiling Point: Not Found

Specific Gravity (H<sub>2</sub>O=1): Not Found

Vapor Pressure (mmHg): Not Found

Melting Point: Not Found

Vapor Density (AIR=1): Not Found

Evaporation Rate (Butyl acetate=1): Not Found



**METHOXYETHYLMERCURIC ACETATE**

**SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS (Continued)**

**Solubility in Water:** Soluble (Sax 1984, p. 1776)

**Appearance and Odor:** Crystals (Sax 1984, p. 1776)

**SECTION III -- FIRE AND EXPLOSION HAZARD DATA**

**Flash Point (Method Used):** Not Found

**Flammable Limits:**

LEL: Not Found

UEL: Not Found

**Extinguishing Methods:** This is an alkyl mercury pesticide (Hayes 1982, p. 20). Small fires: dry chemical, carbon dioxide, water spray, or foam. Large fires: water spray, fog, or foam. Move container from fire area if you can do so without risk. Fight fire from maximum distance. Dike fire control water for later disposal; do not scatter the material. Fire may produce irritating or poisonous gases. Runoff from fire control water may give off poisonous gases. Runoff from fire control or dilution water may cause pollution (DOT 1984, Guide 55).

**Special Fire Fighting Procedures:** This is an alkyl mercury pesticide (Hayes 1982, p. 20). Keep unnecessary people away; isolate hazard area and deny entry. Stay upwind; keep out of low areas. Ventilate closed spaces before entering them. Wear positive pressure breathing apparatus and special protective clothing. Remove and isolate contaminated clothing at the site. If water pollution occurs, notify appropriate authorities (DOT 1984, Guide 55).

**Unusual Fire and Explosion Hazards:** When heated to decomposition, it emits toxic fumes of mercury (Sax 1984, p. 1776). This material may burn but does not ignite readily. Container may explode in heat of fire (DOT 1984, Guide 55).

**SECTION IV -- REACTIVITY DATA**

**Stability:** Unstable: Not Found

Stable: Not Found

**Conditions to Avoid:** Not Found

**Incompatibility (Materials to Avoid):** Not Found

**METHOXYETHYLMERCURIC ACETATE**

**SECTION IV -- REACTIVITY DATA (Continued)**

**Hazardous Decomposition or Byproducts:** When heated to decomposition it emits toxic fumes of mercury (Sax 1984, p. 1776).

**Hazardous Polymerization:** May Occur: Not Found  
May Not Occur: Not Found

**Conditions to Avoid:** Not Found

**SECTION V -- HEALTH HAZARD DATA**

**Routes of Entry:** Inhalation: Yes (Encyc Occupat Health and Safety 1983, p. 1337)  
Skin: Yes (Non-Specific -- Mercury Compounds) (Hayes 1982, pp. 15-16)  
Ingestion: Yes (Encyc Occupat Health and Safety 1983, p. 1337)

**Health Hazards (Acute, Delayed, and Chronic):** Highly toxic (Hawley 1981, p. 664). Target organs are brain and central nervous system (Hayes 1982, pp. 18-19). Inhalation can cause lung damage; ingestion can cause kidney damage. Women of childbearing age should avoid exposure (Encyc Occupat Health and Safety 1983, p. 1337).

**Signs and Symptoms of Exposure:** This is an alkyl mercury pesticide. Patients complain of headache, paresthesia of tongue, lips, fingers, and toes, a metallic taste in mouth, gastrointestinal disturbances, gas, and diarrhea. Nervous system symptoms may appear first after a relatively slight exposure or have a latency period of several weeks. These symptoms include fine tremors of extended hands, loss of side vision, slight loss of coordination, loss of coordination of speech, writing and gait. Uncoordination may progress to loss of ability to control voluntary movements. Irritability and bad temper may progress to mania. Stupor or coma may develop. Blisters or dermatitis may be present on skin. Symptoms persist for years even in cases of mild exposure (Hayes 1982, pp. 20-21).

**Medical Conditions Generally Aggravated by Exposure:** Women of childbearing age and persons with eczema, renal or neurological disorders should not be exposed to mercurials (Encyc Occupat Health and Safety, 1983, p. 1337).

## METHOXYETHYLMERCURIC ACETATE

### SECTION V -- HEALTH HAZARD DATA (Continued)

**Emergency and First Aid Procedures:** This is an alkyl mercury pesticide (Hayes 1982, p. 20). Move victim to fresh air; call emergency medical care. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In case of contact with material, immediately flush skin or eyes with running water for at least 15 minutes. Speed in removing material from skin is of extreme importance. Remove and isolate contaminated clothing and shoes at the site. Keep victim quiet and maintain normal body temperature. Effects may be delayed; keep victim under observation (DOT 1984, Guide 55).

### SECTION VI -- USE INFORMATION

Used as a pesticide in seed treatment for cotton and small grains. It is no longer approved for this use (Farm Chemicals Handbook 1984, pp. C144-148). It exhibits high fungicidal activity against leaf stripe of barley, stinking smut of wheat, snow mold of rye; against seedling diseases in beets and legumes, and for dressing "seed" potatoes, bulbs, and tubers (Buchel 1983, pp. 250-51). Not registered as a pesticide in the U.S. (USEPA/Pesticide Index 1985).

### SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE

(Steps to be Taken in Case Material is Released or Spilled)

This is an alkyl mercury pesticide (Hayes 1982, p. 20). Wear protective clothing and positive pressure breathing apparatus. Do not touch spilled material; stop leak if you can do so without risk. Use water spray to reduce vapors. Small spills: absorb with sand or other noncombustible absorbent material and place into containers for later disposal. Small dry spills: with clean shovel place material into clean, dry container and cover; move containers from spill area. Large spills: dike far ahead of spill for later disposal (DOT 1984, Guide 55).

### COMMENTS

Sources searched but no information found:

Weast 1979  
ACGIH 1983  
NIOSH/OSHA 1978  
Weiss 1980  
Merck 1983  
Clayton and Clayton 1981-82  
Student 1981

EPA CHEMICAL PROFILE

INTERIM

Date: October 31, 1985

Revision: \_\_\_\_\_

CHEMICAL IDENTITY -- POTASSIUM CYANIDE

CAS Registry Number: 151-50-8

Synonyms: Cyanide of Potassium; Hydrocyanic Acid, Potassium Salt;  
Potassium Cyanide (KCN)

Chemical Formula: KCN

Molecular Weight: 65.11

SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

OSHA PEL: TWA 5 mg/m<sup>3</sup> as cyanide (\*NIOSH/RTECS 1985)

ACGIH TLV: TWA 5 mg/m<sup>3</sup> as cyanide (skin) (\*ACGIH 1980)

IDLH: 50 mg/m<sup>3</sup> (NIOSH/OSHA 1978, p. 74)

Other Limits Recommended: NIOSH Occupational Exposure Recommended  
Standard -- Air Ceiling 5 mg/m<sup>3</sup> as cyanide, 10 minutes (\*NIOSH/RTECS  
1985)

SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

Boiling Point: Not Found

Specific Gravity (H<sub>2</sub>O=1): 1.52 at 16°C (Weast 1978, p. B150)

Vapor Pressure (mmHg): Not Found

Melting Point: 1173°F, 634°C (\*Merck 1976)

Vapor Density (AIR=1): Not Found

Evaporation Rate (Butyl acetate=1): Not Found

Solubility in Water: Soluble in 2 parts cold water or 1 part boiling  
water (\*Merck 1976)

Appearance and Odor: White granular powder or lumps with faint odor of  
bitter almonds (\*Merck 1976,\* Hawley 1977)

POTASSIUM CYANIDE

SECTION III -- FIRE AND EXPLOSION HAZARD DATA

**Flash Point (Method Used):** Not flammable (\*NFPA 1978)

**Flammable Limits:**

LEL: Not Found

UEL: Not Found

**Extinguishing Methods:** Water may be used on fire in an area containing potassium cyanide (\*NFPA 1978). Extinguish with dry chemical, carbon dioxide, water spray, fog, or foam (DOT 1984, Guide 55).

**Special Fire Fighting Procedures:** Wear full protective clothing (\*NFPA 1978). Wear positive pressure breathing apparatus and special protective clothing. Move container from fire area if you can do it without risk. Fight fire from maximum distance. Dike fire control water for later disposal; do not scatter the material (DOT 1984, Guide 55).

**Unusual Fire and Explosion Hazards:** Contact with acid releases highly flammable hydrogen cyanide gas (\*NFPA 1978). Moisture may cause this material to volatilize as hydrogen cyanide (\*Peer Review Committee).

SECTION IV -- REACTIVITY DATA

**Stability:** Unstable:

Stable: Yes (Weiss 1980, p. 766)

**Conditions to Avoid:** Avoid contact with acids (see Section III above)

**Incompatibility (Materials to Avoid):** Reacts with acids to produce hydrogen cyanide gas (\*NFPA 1978). Reacts with strong oxidizers such as nitrates and chlorates (NIOSH/OSHA 1978, p. 74); nitrogen trichloride; perchloryl fluoride; sodium nitrate; acids; alkaloids; chloral hydrate; iodine (Sax 1984, p. 2273).

**Hazardous Decomposition or Byproducts:** When heated to decomposition, it emits very toxic fumes of cyanide and nitrogen oxides (Sax 1984, p. 2273).

**Hazardous Polymerization:** May Occur: Not Found  
May Not Occur: Not Found

**Conditions to Avoid:** Not Found

## POTASSIUM CYANIDE

### SECTION V -- HEALTH HAZARD DATA

**Routes of Entry:** Inhalation: Not Found  
Skin: Yes (\*Merck 1976)  
Ingestion: Yes (\*Merck 1976)

**Health Hazards (Acute, Delayed, and Chronic):** It is classified as super toxic. Probable oral lethal dose in humans is less than 5 mg/kg or less than a taste (7 drops) for a 150 lb. person (\*Gosselin 1976). It is an eye and skin irritant (\*Grant 1974, \*Encyc Occupat Health and Safety 1971). Poisonous in very small quantities; a taste is lethal (\*Gosselin 1984).

**Signs and Symptoms of Exposure:** Exposure to potassium cyanide can cause weakness, headache, confusion, nausea, vomiting, increased rate of respiration or slow, gasping respiration, scarlet rash, itching, blindness, odor of bitter almonds, rise in blood pressure, irregular pulse, giddiness, and anxiety (\*Clayton and Clayton 1981-82, \*Gosselin 1976, \*Encyc Occupat Health and Safety 1971, \*Grant 1979).

**Medical Conditions Generally Aggravated by Exposure:** Not Found

**Emergency and First Aid Procedures:** Move victim to fresh air; call emergency medical care. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In case of contact with material, immediately flush skin or eyes with running water for at least 15 minutes. Speed in removing material from skin is of extreme importance. Remove and isolate contaminated clothing and shoes at the site. Keep victim quiet and maintain normal body temperature. Effects may be delayed; keep victim under observation (DOT 1984, Guide 55).

### SECTION VI -- USE INFORMATION

Potassium cyanide is used for electroplating, steel hardening, extraction of gold and silver from ores, manufacture of some chemicals, and fumigation (\*Encyc Occupat Health and Safety 1971).

## POTASSIUM CYANIDE

### SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE

(Steps to be Taken in Case Material is Released or Spilled)

Avoid water. Cover spilled material with alkali or sodium thiosulfate (\*Rumack 1975 to Present). Wear full protective clothing (\*NFPA 1978). Keep unnecessary people away; isolate hazard area and deny entry. Stay upwind; keep out of low areas. Ventilate closed spaces before entering them. Wear positive pressure breathing apparatus. Do not touch spilled material; stop leak if you can do it without risk. Use water spray to reduce vapors. Small spills: take up with sand or other noncombustible absorbent material and place into containers for later disposal. Small dry spills: with clean shovel place materials into clean, dry container and cover; move containers from spill area. Large spills: dike far ahead of spill for later disposal (DOT 1984, Guide 55).

EPA CHEMICAL PROFILE

INTERIM

Date: October 31, 1985

Revision: \_\_\_\_\_

CHEMICAL IDENTITY -- ETHYLENEIMINE

CAS Registry Number: 151-56-4

Synonyms: (NIOSH/RTECS 1983 Synonyms, Volume 2, p. 291) Aminoethylene; Azacyclopropane; Azirane; Aziridine; 1H-Azirine, dihydro-; Dihydroazirene; Dimethyleneimine; Dimethylenimine; EI; Ethylenimine; ENT-50324, Ethylimine.

Chemical Formula:  $C_2H_5N$

Molecular Weight: 43.07

SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

OSHA PEL: TWA 1 mg/m<sup>3</sup> (skin) (NIOSH 1983, p. 292)

ACGIH TLV: TWA 1.0 mg/m<sup>3</sup> (skin) (ACGIH 1983, p. 20)

IDLH: Not Found

Other Limits Recommended: Toxicity information: LC<sub>low</sub> inhalation (guinea pig) 0.044 mg/liter/8 hours (\*NIOSH/RTECS 1985)

SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

Boiling Point: 131-133°F, 55-56°C (Clayton and Clayton 1981-82, p. 2673)

Specific Gravity (H<sub>2</sub>O=1): 0.8321 at 20°C (Clayton and Clayton 1981-82, p. 2673)

Vapor Pressure (mmHg): 160 at 20°C (Clayton and Clayton 1981-82, p. 2673)

Melting Point: -98°F, -72°C (Freezing Point) (Clayton and Clayton 1981-82, p. 2673)

Vapor Density (AIR=1): 1.48 (Clayton and Clayton 1981-82, p. 2673)

Evaporation Rate (Butyl acetate=1): Not Found

Solubility in Water: Miscible (Merck 1983, p. 3744)



## ETHYLENEIMINE

### SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS (Continued)

**Appearance and Odor:** Colorless, mobile fluid with a strong ammoniacal odor (Clayton and Clayton 1981-82, p. 2673; Merck 1983, p. 3744)

### SECTION III -- FIRE AND EXPLOSION HAZARD DATA

**Flash Point** (Method Used): 12°F (CC) (NFPA 1984, p. 325M-51)

**Flammable Limits:**

LEL: 3.6% (NFPA 1984, p. 325M-51)

UEL: 46% (NFPA 1984, p. 325M-51)

**Extinguishing Methods:** Dry chemical, alcohol foam, or carbon dioxide are useful for small fires. For large fires: water spray, fog or foam (DOT 1984, Guide 30).

**Special Fire Fighting Procedures:** Do not extinguish fire unless flow can be stopped; use water in flooding quantities as a fog. Solid streams of water may be ineffective. Apply water from as far a distance as possible (Student 1981, p. 236). If tank car or truck is involved in fire, isolate the surrounding area in a 1/2 mile radius (DOT 1984, Guide 30).

**Unusual Fire and Explosion Hazards:** Irritating vapors are generated when heated. Vapor is heavier than air and may travel a considerable distance to a source of ignition and flash back. May polymerize in fires with evolution of heat and container rupture (Weiss 1980, p. 443). Runoff to sewer may create fire or explosion hazard (DOT 1984, Guide 30). Ethyleneimine vapors are not inhibited and may form polymers in vents or flame arresters, resulting in stopping of the vents (\*NFPA 1978).

### SECTION IV -- REACTIVITY DATA

**Stability:** Unstable:

Stable: Yes (Weiss 1980, p. 443)

**Conditions to Avoid:** If heated under pressure, instability may result (Weiss 1980, p. 443).

**Incompatibility** (Materials to Avoid): Acids (Weiss 1980, p. 443); sodium hypochlorite (\*Bretherick 1979).

**Hazardous Decomposition or Byproducts:** Toxic oxides of nitrogen are produced during combustion (Student 1981, p. 236). Upon treatment with sodium hypochlorite, it gives off the explosive compound 1-chloroazidine (\*Bretherick 1979).

## ETHYLENEIMINE

### SECTION IV -- REACTIVITY DATA (Continued)

**Hazardous Polymerization:** May Occur: Yes (Merck 1983, p. 551)  
May Not Occur:

**Conditions to Avoid:** Avoid contact with silver or aluminum.  
Explosive polymerization may occur upon contact with acids (Weiss 1980, p. 443). Polymerization is catalyzed by carbon dioxide (\*Bretherick 1979).

### SECTION V -- HEALTH HAZARD DATA

**Routes of Entry:** Inhalation: Yes (Weiss 1980, p. 443)  
Skin: Yes (Weiss 1980, p. 443)  
Ingestion: Yes (Weiss 1980, p. 443)

**Health Hazards (Acute, Delayed, and Chronic):** Ethyleneimine is classified as extremely toxic with a probable oral lethal dose of 5-50 mg/kg which is approximately 7 drops to 1 teaspoonful for a 70 kg (150 lb.) person (\*Gosselin 1976). Ethyleneimine gives inadequate warning when over-exposure is by inhalation or skin absorption. It is a severe blistering agent, causing third degree chemical burns of the skin. Also, it has a corrosive effect on mucous membranes and may cause scarring of the esophagus. It is corrosive to eye tissue and may cause permanent corneal opacity and conjunctival scarring (Weiss 1980, p. 443). Severe exposure may result in overwhelming pulmonary edema. Renal damage has been described (Gosselin 1984, p. II-207). Hemorrhagic congestion of all internal organs has been observed (Clayton and Clayton 1981-82, p. 2674).

**Signs and Symptoms of Exposure:** Symptoms include tearing and burning of the eyes, sore throat, nausea, vomiting, coughing (may persist for weeks or months) and a slow healing dermatitis due to severe blistering (Gosselin 1984, p. II-207; Weiss 1980, p. 443).

**Medical Conditions Generally Aggravated by Exposure:** Not Found

**Emergency and First Aid Procedures:** Move victim to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Remove and isolate contaminated clothing and shoes at the site. In case of contact with ethyleneimine, immediately flush skin or eyes with running water for at least 15 minutes (DOT 1984, Guide 30).

## ETHYLENEIMINE

### SECTION VI -- USE INFORMATION

Products of polymerization of ethyleneimine are used in the paper industry and as flocculation aids (\*Encyc Occupat Health and Safety 1971). Used in textile chemicals, adhesives, binders, petroleum refining chemicals, fuels and lubricants, coating resins, varnishes, lacquers, agricultural chemicals, cosmetics, ion exchange resins, photographic chemicals and surfactants (\*Clayton and Clayton 1981-82).

### SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE

(Steps to be Taken in Case Material is Released or Spilled)

Wear full protective clothing (NFPA 1984, p. 325M-48). Avoid breathing vapors. Keep upwind. Avoid bodily contact with the material. Do not handle broken packages without protective equipment. Wash away any material which may have contacted the body with copious amounts of water or soap and water (Student 1981, p. 237). Keep unnecessary people away, isolate hazard area and deny entry. Stay upwind, keep out of low areas. Wear positive pressure breathing apparatus and full protecting clothing (DOT 1984, Guide 30).

EPA CHEMICAL PROFILE

INTERIM

Date: October 31, 1985

Revision: \_\_\_\_\_

CHEMICAL IDENTITY -- DIPHOSPHORAMIDE, OCTAMETHYL-

CAS Registry Number: 152-16-9

**Synonyms:** Pyrophosphoramidate, Octamethyl-; Bis(bisdimethylaminophosphonous) anhydride; Bis(dimethylamino)phosphoric anhydride; Bis-N,N,N',N'-tetramethylphosphorodiamidic anhydride; Lethalaire G-59; Octamethyl pyrophosphortetramide; Octamethyl tetramido pyrophosphate; Octamethyldiphosphoramidate; Octamethylpyrophosphoramidate; Octamethylpyrophosphoric acid tetramide; OMPA; Ompacide; Ompatox; Ompax; Pestox III; Schradan; Pyrophosphoric acid octamethyltetraamide; Pyrophosphoryltetrakisdimethylamide; Scharadan; Systam; Systophos; Sytam; Tetrakisdimethylaminophosphonous anhydride

**Chemical Formula:**  $C_8H_{24}N_4P_2O_3$

**Molecular Weight:** 286.26

SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

OSHA PEL: Not Found

ACGIH TLV: Not Found

IDLH: Not Found

**Other Limits Recommended:** Maximum permissible atmospheric concentration of this compound in work places is estimated to be 0.5 mg/m<sup>3</sup> (\*Clarke 1975). Toxicity information: LC<sub>low</sub> inhalation (rat) 0.008 mg/liter for 4 hours (\*NIOSH/RTECS 1985).

SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

**Boiling Point:** 248-257°F, 120-125°C at 0.5 mmHg (\*Merck 1976)

**Specific Gravity (H<sub>2</sub>O=1):** 1.09 at 25°C/4°C (\*Merck 1976)

**Vapor Pressure (mmHg):** 0.001 at 25°C (\*Worthing 1979)

**Melting Point:** 57-68°F, 14-20°C (\*Worthing 1979)

**Vapor Density (AIR=1):** Not Found

**DIPHOSPHORAMIDE, OCTAMETHYL-**

**SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS (Continued)**

**Evaporation Rate** (Butyl acetate=1): Not Found

**Solubility in Water:** Miscible (\*Merck 1976)

**Appearance and Odor:** Viscous liquid (\*Merck 1976); dark brown viscous liquid (\*Worthing 1979). Odor information was not found.

**SECTION III -- FIRE AND EXPLOSION HAZARD DATA**

**Flash Point** (Method Used): Not Found

**Flammable Limits:**

LEL: Not Found

UEL: Not Found

**Extinguishing Methods:** (Non-Specific -- Organophosphorous Liquid Pesticides) Do not extinguish fire unless flow can be stopped. Use water in flooding quantities as fog. Solid streams of water may be ineffective. Cool all affected containers with flooding quantities of water. Apply water from as far a distance as possible. Use alcohol foam, carbon dioxide, or dry chemical (\*Student 1981).

**Special Fire Fighting Procedures:** Not Found

**Unusual Fire and Explosion Hazards:** When heated to decomposition, it can emit highly toxic fumes of oxides of phosphorous (\*Sax 1979).

**SECTION IV -- REACTIVITY DATA**

**Stability:** Unstable:

Stable: Yes (\*Worthing 1979)

**Conditions to Avoid:** Hydrolyzed under acid conditions to dimethylamine and orthophosphoric acid (\*Worthing 1979)

**Incompatibility** (Materials to Avoid): Decomposes when mixed with acid (\*Worthing 1979).

**Hazardous Decomposition or Byproducts:** Decomposes when mixed with acid (\*Worthing 1979). Emits highly toxic fumes of oxides of phosphorous when heated to decomposition (\*Sax 1979).

**Hazardous Polymerization:** May Occur: Not Found  
May Not Occur: Not Found

**Conditions to Avoid:** Not Found

DIPHOSPHORAMIDE, OCTAMETHYL-

SECTION V -- HEALTH HAZARD DATA

**Routes of Entry:** Inhalation: Yes (\*Encyc Occupat Health and Safety 1971)  
Skin: Yes (\*Sax 1975)  
Ingestion: Yes (\*Sax 1975)

**Health Hazards** (Acute, Delayed, and Chronic): Extremely toxic; probable oral lethal dose in humans is 5-50 mg/kg, between 7 drops and 1 teaspoonful for a 150 lb. person (\*Gosselin 1976). It is highly toxic when inhaled (\*Encyc Occupat Health and Safety 1971). Material is a cholinesterase inhibitor (\*Hayes, 1975). It is similar in action to other organophosphorous pesticides in its toxicity. It is slightly less toxic than parathion (\*Gosselin 1976). Gastrointestinal, neurologic and respiratory symptoms may accompany poisoning with this material. High doses may cause a toxic psychosis similar to acute alcoholism (\*Rumack 1975 to Present).

**Signs and Symptoms of Exposure:** Clinical signs and symptoms of poisoning by this material are similar to that of poisoning by other organophosphorous pesticides, but damage to the central nervous system is appreciably less (\*Encyc Occupat Health and Safety 1971). Poisoning victims may display the following symptoms: reduction in cholinesterase levels (\*Hayes 1975); neurologic signs: headache, dizziness, chest pain, muscle twitching and spasms, profound weakness, psychotic behavior, incoordination, unconsciousness; gastrointestinal signs: nausea, vomiting, diarrhea, abdominal pain, increased salivation, incontinence of feces; and cardiovascular signs: chest pain, slow heart beat, dyspnea (difficulty in breathing) (\*Rumack 1975 to Present).

**Medical Conditions Generally Aggravated by Exposure:** Persons taking phenobarbital and phenaglycodol together, glutethimide, chlorpromazine hydrochloride, or meprobamate may be at greater risk. These drugs appear to enhance the toxicity of the material markedly (\*Kato 1967).

**Emergency and First Aid Procedures:** (Non-Specific -- Organophosphorous Liquid Pesticides) Move patient to fresh air. Monitor for respiratory distress. Establish respiration using artificial respiration if necessary. If patient is dermally exposed remove contaminated clothing and wash skin and hair 3 times (initially soap, then alcohol and soap again). If the eyes are exposed, flush with copious amounts of water for at least 15 minutes (\*Rumack 1975 to Present).

**DIPHOSPHORAMIDE, OCTAMETHYL-**

**SECTION VI -- USE INFORMATION**

Material is used as a systemic insecticide for plants and as an acaricide (\*Merck 1976). Not registered as a pesticide in the U.S. (USEPA/Pesticide Index 1985).

**SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE**

(Steps to be Taken in Case Material is Released or Spilled)

(Non-Specific -- Organophosphorus Liquid Pesticides) Use water spray to knock down vapors. Attempt to stop leak if it can be done without hazard. Avoid breathing vapors. Keep upwind. Wear self-contained breathing apparatus. Avoid bodily contact with material. Wear full protective clothing. Do not handle broken packages without protective equipment. Wash away any material which may have contacted the body with copious amounts of water or soap and water (\*Student 1981).

EPA CHEMICAL PROFILE

INTERIM

Date: October 31, 1985

Revision: \_\_\_\_\_

CHEMICAL IDENTITY -- CYCLOPENTANE

CAS Registry Number: 287-92-3

Synonyms: Pentamethylene

Chemical Formula:  $C_5H_{10}$

Molecular Weight: 70.13

SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

OSHA PEL: Not Found

ACGIH TLV: TWA 600 ppm (1,720 mg/m<sup>3</sup>); STEL 900 ppm (2,580 mg/m<sup>3</sup>)  
(ACGIH 1983, p. 16)

IDLH: Not Found

Other Limits Recommended: Toxicity information: LC<sub>low</sub> inhalation  
(mouse) 0.00011 mg/liter (\*NIOSH/RTECS 1985); LC<sub>low</sub> inhalation (mouse)  
110,000 mg/m<sup>3</sup> (NIOSH/RTECS 1983, Volume 1, p. 1018). (SUSPECT)

SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

Boiling Point: 120.7°F, 49.26°C (\*Weast 1979)

Specific Gravity (H<sub>2</sub>O=1): 0.7457 at 20°C/4°C (\*Weast 1979)

Vapor Pressure (mmHg): 400 at 31°C (\*Sax 1979)

Melting Point: -137°F, -93.9°C (\*Weast 1979)

Vapor Density (AIR=1): 2.42 (\*Sax 1979)

Evaporation Rate (Butyl acetate=1): Not Found

Solubility in Water: Insoluble (\*Merck 1976)

Appearance and Odor: Colorless liquid (\*Hawley 1977) with a mild,  
sweet odor like gasoline (Weiss 1980, p. 5)



## CYCLOPENTANE

### SECTION III -- FIRE AND EXPLOSION HAZARD DATA

**Flash Point** (Method Used): -35°F (\*Hawley 1977)

**Flammable Limits:**

LEL: 1.5% (NFPA 1984, p. 325M-30)

UEL: 8.7% (Weiss 1980, p. 295)

**Extinguishing Methods:** This chemical is flammable and a dangerous fire risk (\*Hawley 1977). Use dry chemical, foam or carbon dioxide. Water may be ineffective because of low flash point, but should be used to keep fire-exposed containers cool (NFPA 1984, p. 49-95). Apply water from as far a distance as possible. Do not extinguish fire unless flow of chemical can be stopped (Student 1981, p. 162).

**Special Fire Fighting Procedures:** Water may be ineffective because of low flash point (\*NFPA 1978). Isolate for one-half mile in all directions if tank car or truck is involved in fire (DOT 1984, Guide 27).

**Unusual Fire and Explosion Hazards:** Flammable and a dangerous fire risk (\*Hawley 1977). Flashback along vapor trail may occur (Weiss 1980, p. 295).

### SECTION IV -- REACTIVITY DATA

**Stability:** Unstable:

Stable: Yes (Weiss 1980, p. 295)

**Conditions to Avoid:** Heat (\*NFPA 1978)

**Incompatibility** (Materials to Avoid): Not Found

**Hazardous Decomposition or Byproducts:** Not Found

**Hazardous Polymerization:** May Occur: Not Found

May Not Occur: Not Found

**Conditions to Avoid:** Not Found

### SECTION V -- HEALTH HAZARD DATA

**Routes of Entry:** Inhalation: Yes (Weiss 1980, p. 295)

Skin: Not Found

Ingestion: Yes (Weiss 1980, p. 295)

## CYCLOPENTANE

### SECTION V -- HEALTH HAZARD DATA (Continued)

**Health Hazards** (Acute, Delayed, and Chronic): This compound is moderately toxic by ingestion and inhalation (\*Hawley 1977). Ingestion causes irritation of the stomach, and aspiration produces severe lung irritation and rapidly developing pulmonary edema. Contact with liquid irritates eyes and skin. Cyclopentane is a nervous system depressant (Weiss 1980, p. 295).

**Signs and Symptoms of Exposure:** Vapors are irritating to eyes, nose and throat. If inhaled, will cause dizziness, nausea, vomiting, difficult breathing or loss of consciousness. Ingestion irritates the stomach. Contact with the liquid is irritating to eyes and skin (Weiss 1980, p. 295).

**Medical Conditions Generally Aggravated by Exposure:** Not Found

**Emergency and First Aid Procedures:** Move victim to fresh air; call emergency medical care. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In case of contact with material, immediately flush eyes with running water for at least 15 minutes. Wash skin with soap and water. Remove and isolate contaminated clothing and shoes at site (DOT 1984, Guide 27). Do not induce vomiting, guard against aspiration (Weiss 1980, p. 295).

### SECTION VI -- USE INFORMATION

Used as a solvent; starting material for synthesis in the chemical industry; solvent for cellulose ethers, motor fuel and azeotropic distillation agent; and a chemical intermediate in production of cyclopentadiene (\*SRI; \*Hawley 1977; \*Patty 1963).

### SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE

(Steps to be Taken in Case Material is Released or Spilled)

Keep unnecessary people away; isolate hazard area and deny entry. Stay upwind; keep out of low areas. Wear self-contained (positive pressure if available) breathing apparatus and full protective clothing. Shut off ignition sources; no flares, smoking or flames in hazard area. Stop leak if you can do so without risk. Use water spray to reduce vapors. Small spills: absorb with sand or other noncombustible absorbent material and place into containers for later disposal. Large spills: dike far ahead of spill for later disposal (DOT 1984, Guide 27).

EPA CHEMICAL PROFILE

INTERIM

Date: October 31, 1985

Revision: \_\_\_\_\_

CHEMICAL IDENTITY -- ISOBENZAN

CAS Registry Number: 297-78-9

Synonyms: (NIOSH/RTECS 1983 Synonyms, Volume 2, p. 697)

4,7-Methanoisobenzofuran, 1,3,4,5,6,7,8,8-Octachloro-1,3,3a,4,7,7a-Hexahydro-;  
CP 14,957; ENT 25,545; ENT 25,545-X; 1,3,4,5,6,7,8,8-Octachloro-1,3,3a,4,7,7a-  
hexahydro-4,7-methanoisobenzofuran; 1,3,4,5,6,7,8,8-Octachloro-2-oxa-3a,4,7,7a-  
tetrahydro-4,7-methanoindene; 1,3,4,5,6,7,10,10-Octachloro-4,7-endo-methylene-  
4,7,8,9-tetrahydrophthalan; Omtan; SD 4402; Shell 4402; Shell WL 1650;  
Telodrin; WL 1650

Chemical Formula:  $C_9H_4Cl_8O$

Molecular Weight: 411.73

SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

OSHA PEL: Not Found

ACGIH TLV: Not Found

IDLH: Not Found

Other Limits Recommended: Toxicity information:  $LD_{50}$  oral (dog) 1  
mg/kg (\*NIOSH/RTECS 1985)

SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

Boiling Point: Not Found

Specific Gravity ( $H_2O=1$ ): 1.87 (Hayes 1982, p. 251)

Vapor Pressure (mmHg):  $1 \times 10^{-5}$  at 77°F, 25°C (Hayes 1982, p. 251)

Melting Point: 248-252°F, 120-122°C (Merck 1983, pp. 738-739)

Vapor Density (AIR=1): Not Found

Evaporation Rate (Butyl acetate=1): Not Found

## ISOBENZAN

**Solubility in Water:** Insoluble (Hayes 1982, p. 251)

**Appearance and Odor:** Crystals (Merck 1983, pp. 738-739). The technical product is a whitish to light-brown crystalline powder with a mild chemical odor (Hayes 1982, p. 251)

### SECTION III -- FIRE AND EXPLOSION HAZARD DATA

**Flash Point** (Method Used): Not Found

**Flammable Limits:** Non-flammable and non-explosive (Hayes 1982, p. 251)

LEL: Not Found

UEL: Not Found

**Extinguishing Methods:** (Non-Specific -- Dry Insecticide) Use agent suitable for type of surrounding fire. Use water in flooding quantities as fog. Use alcohol foam, carbon dioxide, or dry chemical (Student 1981, p. 290).

**Special Fire Fighting Procedures:** (Non-Specific -- Dry Insecticide) Avoid breathing dusts and fumes from burning material. Keep upwind. Avoid bodily contact with the material. Wear full protective clothing including boots, protective gloves, goggles, and wear self-contained breathing apparatus (Student 1981, p.290).

**Unusual Fire and Explosion Hazards:** Chlorine is evolved when this material is heated above 410°F, 210°C (Hayes 1982, 251).

### SECTION IV -- REACTIVITY DATA

**Stability:** Unstable: Not Found

Stable: Not Found

**Conditions to Avoid:** Not Found

**Incompatibility** (Materials to Avoid): Acids, certain metal salts, and catalytically active carriers (Hayes 1982, p. 251)

**Hazardous Decomposition or Byproducts:** Chlorine is evolved if material is heated above 410°F, 210°C (Hayes 1982, p. 251).

**Hazardous Polymerization:** May Occur: Not Found  
May Not Occur: Not Found

**Conditions to Avoid:** Not Found

## ISOBENZAN

### SECTION V -- HEALTH HAZARD DATA

**Routes of Entry:** Inhalation: Yes (Hayes 1982, p. 251)  
Skin: Yes (Hayes 1982, p. 251)  
Ingestion: Yes (Hayes 1982, p. 251)

**Health Hazards** (Acute, Delayed, and Chronic): This material is highly toxic. It is absorbed by the skin as well as by the respiratory and gastrointestinal tract. Symptoms may last for a long time because the material is eliminated slowly; its half-life in human blood is 2.77 years (Hayes 1982, p. 251).

**Signs and Symptoms of Exposure:** Symptoms of exposure include headache, dizziness, drowsiness, irritability, and numbness of the legs. Convulsions may occur (Hayes 1982, p. 251).

**Medical Conditions Generally Aggravated by Exposure:** Not Found

**Emergency and First Aid Procedures:** (Non-Specific -- Insecticide, Dry, n.o.s.) Move victim to fresh air; call emergency medical care. Remove and isolate contaminated clothing and shoes at the site. In case of contact with material, immediately flush skin or eyes with running water for at least 15 minutes (DOT 1984, Guide 53).

### SECTION VI -- USE INFORMATION

This material is used as an insecticide (Merck 1983, pp. 738-739). Not registered as a pesticide in the U.S. (USEPA/Pesticide Index 1985).

### SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE (Steps to be Taken in Case Material is Released or Spilled)

(Non-Specific -- Dry Insecticide) Keep upwind. Avoid bodily contact with the material. Wear boots, protective gloves, and goggles (Student 1981, p. 290). (Non-Specific -- Insecticide, Dry, n.o.s.) Keep unnecessary people away; isolate hazard area and deny entry. Wear self-contained (positive pressure if available) breathing apparatus. Small spills: absorb with sand or other noncombustible absorbent material and place into containers for later disposal. Small dry spills: with clean shovel place material into clean, dry container and cover; move containers from spill area. Large spills: dike far ahead of spill for later disposal (DOT 1984, Guide 53).

EPA CHEMICAL PROFILE

INTERIM

Date: October 31, 1985

Revision: \_\_\_\_\_

CHEMICAL IDENTITY -- THIONAZIN

CAS Registry Number: 297-97-2

**Synonyms:** Phosphorothioic Acid, O,O-Diethyl O-Pyrazinyl Ester; AC 18133; ACC 18133; American Cyanamid 18133; CL 18133; Cynem; O,O-Diethyl O-2-Pyrazinyl Phosphorothioate; Diethyl O-2-Pyrazinyl Phosphorothionate; O,O-Diethyl O-2-Pyrazinyl Phosphothionate; O,O-Diethyl O-Pyrazinyl Thiophosphate; EN 18133; ENT 26,680; Ethyl Pyrazinyl Phosphorothioate; Experimental Nematocide 18,133; Nemafos; Nemaphos; Nematocide; Phosphorothioic Acid, O,O-Diethyl O-2-Pyrazinyl Ester; Pyrazinol, O-Ester with O,O-Diethyl Phosphorothioate; Zinophos

**Chemical Formula:**  $C_8H_{13}N_2O_3PS$

**Molecular Weight:** 248.26

SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

OSHA PEL: Not Found

ACGIH TLV: Not Found

IDLH: Not Found

**Other Limits Recommended:** Toxicity information:  $LD_{50}$  oral (rat) 3.5 mg/kg (\*NIOSH/RTECS 1985)

SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

**Boiling Point:** 176°F, 80°C at 0.001 mmHg (Hawley 1981, p. 1019)

**Specific Gravity** ( $H_2O=1$ ): Not Found

**Vapor Pressure** (mmHg):  $3 \times 10^{-3}$  at 30°C (Merck 1983, p. 1338)

**Melting Point:** 29°F, -1.7°C (Hawley 1981, p. 1019)

**Vapor Density** (AIR=1): Not Found

**Evaporation Rate** (Butyl acetate=1): Not Found

## THIONAZIN

### SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS (Continued)

**Solubility in Water:** Slightly soluble (Hawley 1981, p. 1019), 1140 ppm at 24.8°C (\*Spencer 1982)

**Appearance and Odor:** Amber liquid (Hawley 1981, p. 1019); pure compound is almost colorless liquid and technical product is light brown to tan mobile liquid (\*Spencer 1982)

### SECTION III -- FIRE AND EXPLOSION HAZARD DATA

**Flash Point (Method Used):** Not Found

**Flammable Limits:**

LEL: Not Found

UEL: Not Found

**Extinguishing Methods:** (Non-Specific -- Organic Phosphate Compound, Liquid, Poison B). Extinguish with dry chemical, carbon dioxide, water spray, or foam. Fight fire from maximum distance. Dike fire control water for later disposal; do not scatter the material (DOT 1984, Guide 55). (Non-Specific -- Parathion) Extinguish fire using agent suitable for type of surrounding fire. Use water in flooding quantities as fog. Use foam, carbon dioxide, or dry chemicals (Student 1981, p. 392).

**Special Fire Fighting Procedures:** (Non-Specific -- Organic Phosphate Compound, Liquid, Poison B). Keep unnecessary people away; stay upwind; wear positive pressure breathing apparatus and special protective clothing; remove and isolate contaminated clothing (DOT 1984, Guide 55). (Non-Specific -- Organic Phosphate Mixture, Liquid, Poison B). Do not extinguish fire unless flow can be stopped (Student 1981, p. 392). (Non-Specific -- Parathion) Avoid breathing dusts, and fumes from burning materials. Avoid body contact with materials. Wear full protective clothing (Student 1981, p. 392).

**Unusual Fire and Explosion Hazards:** (Non-Specific -- Organic Phosphate Compound, Liquid, Poison B). This material may burn but does not ignite readily (DOT 1984, Guide 55).

### SECTION IV -- REACTIVITY DATA

**Stability:** Unstable: Not Found

Stable: Not Found

**Conditions to Avoid:** Not Found

**Incompatibility (Materials to Avoid):** Not Found

## THIONAZIN

### SECTION IV -- REACTIVITY DATA (Continued)

**Hazardous Decomposition or Byproducts:** (Non-Specific -- Organic Phosphate Compound, Liquid, Poison B). Fire may produce irritating or poisonous gases (DOT 1984, Guide 55).

**Hazardous Polymerization:** May Occur: Not Found  
May Not Occur: Not Found

**Conditions to Avoid:** Not Found

### SECTION V -- HEALTH HAZARD DATA

**Routes of Entry:** Inhalation: Yes (Hawley 1981, p. 1019)  
Skin: Yes (Hawley 1981, p. 1019)  
Ingestion: Yes (Hawley 1981, p. 1019)

**Health Hazards** (Acute, Delayed, and Chronic): Cholinesterase inhibitor (Hawley 1981, p. 1019). (Non-Specific -- Organic Phosphate Compound, Liquid, Poison B). Poisonous; may be fatal if inhaled, swallowed or absorbed through skin. Contact may cause burns to skin and eyes (DOT 1984, Guide 55).

**Signs and Symptoms of Exposure:** (Non-Specific -- Parathion). Acute effects include loss of appetite, nausea, vomiting, diarrhea, excessive salivation, pupillary constriction, bronchoconstriction, muscle twitching, convulsions, and coma (Merck 1983, p. 1010).

**Medical Conditions Generally Aggravated by Exposure:** Not Found

**Emergency and First Aid Procedures:** (Non-Specific -- Organic Phosphate Compound, Liquid, Poison B). Move victim to fresh air; call emergency medical care. If not breathing give artificial respiration; if breathing is difficult give oxygen. In case of contact with material, immediately flush skin or eyes with running water for at least 15 minutes; speed in removing material from skin is of extreme importance. Remove and isolate contaminated clothing and shoes at the site (DOT 1984, Guide 55). (Non-Specific -- Organic Phosphate Mixture, Liquid, Poison B). Wash away any material which may have contacted the body with copious amounts of water or soap and water (Student 1981, p. 381).

### SECTION VI -- USE INFORMATION

It is used in insecticides, fungicides, and nematocides (Hawley 1981, p. 1019). Not registered as a pesticide in the U.S. (USEPA/Pesticide Index 1985).



## THIONAZIN

### SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE

(Steps to be Taken in Case Material is Released or Spilled)

(Non-Specific -- Organic Phosphate Compound, Liquid, Poison B). Do not touch spilled material; stop leak if possible; use water spray to reduce vapors. Small spill: take up with sand or other noncombustible absorbent material and place into container for later disposal. Large spills: dike far ahead of spill for later disposal (DOT 1984, Guide 55). (Non-Specific -- Parathion) Avoid breathing vapors. Avoid bodily contact with materials. Do not handle broken packages without protective equipment. Wash away any material which may have contacted the body with copious amounts of water or soap and water (Student 1981, p. 392).

### COMMENTS:

Sources searched and no information found:

Hayes 1982

Weast 1979

Sax 1984

Clayton and Clayton 1981-82

NFPA 1984

NIOSH/OSHA 1978

EPA CHEMICAL PROFILE

INTERIM

Date: October 31, 1985

Revision: \_\_\_\_\_

CHEMICAL IDENTITY -- PARATHION-METHYL

CAS Registry Number: 298-00-0

**Synonyms:** Phosphorothioic Acid, O,O-Dimethyl O-(p-Nitrophenyl) Ester (Dry Mixture); Methyl Parathion; Azofos; Azophos; BAY 11405; Bladan-M; Dalf; Dimethylfenitrothion; Dimethyl 4-Nitrophenyl Phosphorothionate; Dimethyl p-Nitrophenyl Phosphorothionate; Dimethyl p-Nitrophenyl Thiophosphate; Dimethyl Parathion; E 601; ENT 17,292; Folidol M; Folidol M-40; Gearphos; M-Parathion; Meptox; Metacid 50; Metacide; Metafos; Metafos (Pesticide); Metaphos; Methyl-E 605; Methylthiophos; Metron; Metron (Pesticide); NCI-C02971; Nitrox; Nitrox 80; O,O-Dimethyl O-(p-Nitrophenyl) Phosphorothioate; O,O-Dimethyl O-(p-Nitrophenyl) Thionophosphate; O,O-Dimethyl O-(p-Nitrophenyl) Thiophosphate; Oleovofotox; Parathion Methyl Homolog; Partron M; Penncap M; Penncap MLS; Phenol, p-Nitro-, O-Ester with O,O-Dimethyl Phosphorothioate; Phosphorothioic Acid, O,O-Dimethyl O-(4-Nitrophenyl) Ester; Quinophos; Sinafid M-48; Thiophenit; Vofatox; Wofatox; Wofotox; 8056 HC

**Chemical Formula:**  $C_8H_{10}NO_5PS$

**Molecular Weight:** 263.23

SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

**OSHA PEL:** TWA 0.2 mg/m<sup>3</sup> (\*NIOSH/RTECS 1985)

**ACGIH TLV:** TWA 0.2 mg/m<sup>3</sup>; STEL 0.6 mg/m<sup>3</sup> (skin) (\*ACGIH 1983)

**IDLH:** Not Found

**Other Limits Recommended:** Toxicity information: LC<sub>50</sub> inhalation (rat) 0.034 mg/liter/4 hours (\*NIOSH/RTECS 1985)

SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

**Boiling Point:** Not Found

**Specific Gravity** (H<sub>2</sub>O=1): 1.358 at 20°C (\*Merck 1983)

**Vapor Pressure** (mmHg):  $9.7 \times 10^{-6}$  at 20°C (\*Worthing 1979)

## PARATHION-METHYL

### SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS (Continued)

**Melting Point:** 99-100°F, 37-38°C (\*Merck 1983)

**Vapor Density (AIR=1):** Not Found

**Evaporation Rate (Butyl acetate=1):** Not Found

**Solubility in Water:** 50 mg/liter (\*Merck 1983)

**Appearance and Odor:** White crystalline solid or powder (\*NFPA 1978); odor like rotten eggs or garlic (\*CHRIS 1978). Commercial product is a liquid consisting of 80 percent methyl parathion and 20 percent xylene (NFPA 1984, pp. 49-64); light to dark tan (\*Worthing 1979).

### SECTION III -- FIRE AND EXPLOSION HAZARD DATA

**Flash Point (Method Used):** Not flammable at normal temperatures (\*Clayton and Clayton 1982); commercial product, containing xylene, has flashpoint of 115°F (OC) (NFPA 1984, pp. 49-64).

**Flammable Limits:**

LEL: Not Found

UEL: Not Found

**Extinguishing Methods:** For small fires, use dry chemical, carbon dioxide, water spray, or foam. For large fires, use water spray, fog, or foam (\*DOT 1984).

**Special Fire Fighting Procedures:** Fight fire from maximum distance. Dike fire control water for later disposal; do not scatter the material (\*DOT 1984). Wear special protective clothing (\*NFPA 1978).

**Unusual Fire and Explosion Hazards:** Poisonous gases are produced in fire and when heated (\*CHRIS 1978). Decomposition may lead to sufficient internal pressure to cause the container to rupture violently (NFPA 1984, pp. 49-64).

### SECTION IV -- REACTIVITY DATA

**Stability:** Unstable: Yes (\*NFPA 1978)  
Stable:

**Conditions to Avoid:** High temperatures (120°F) cause decomposition (NFPA 1984, pp. 49-64).

**PARATHION-METHYL**

**SECTION IV -- REACTIVITY DATA (Continued)**

**Incompatibility (Materials to Avoid):** Oxidizing materials (NFPA 1984, pp. 49-64).

**Hazardous Decomposition or Byproducts:** Decomposition may lead to rupture of containers (NFPA 1984, pp. 49-64).

**Hazardous Polymerization:** May Occur: Not Found  
May Not Occur: Not Found

**Conditions to Avoid:** Not Found

**SECTION V -- HEALTH HAZARD DATA**

**Routes of Entry:** Inhalation: Yes (\*DOT 1984)  
Skin: Yes (\*DOT 1984)  
Ingestion: Yes (\*DOT 1984)

**Health Hazards (Acute, Delayed, and Chronic):** This material is extremely toxic; the probable oral lethal dose is 5-50 mg/kg, or between 7 drops and 1 teaspoonful for a 150-lb. person (\*Gosselin 1984). Chronic toxicity does not appear to be a major consideration (\*NRC 1977).

**Signs and Symptoms of Exposure:** Symptoms may include nausea, vomiting, abdominal cramps, diarrhea, excessive salivation, headache, giddiness, dizziness, weakness, muscle twitching, difficult breathing, blurring or dimness of vision, and loss of muscle coordination. Death may occur from failure of the respiratory center, paralysis of the respiratory muscles, intense bronchoconstriction, or all three (\*Gosselin 1984).

**Medical Conditions Generally Aggravated by Exposure:** Not Found

**Emergency and First Aid Procedures:** Move victim to fresh air; call emergency medical care. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In case of contact with material, immediately flush skin or eyes with running water for at least 15 minutes. Speed in removing material from skin is of extreme importance. Remove and isolate contaminated clothing and shoes at the site. Keep victim quiet and maintain normal body temperature. Effects may be delayed; keep victim under observation (\*DOT 1984).

## PARATHION-METHYL

### SECTION VI -- USE INFORMATION

This material is used as an insecticide on over 50 crops, primarily cotton, and on several ornamentals (\*SRI).

### SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE

(Steps to be Taken in Case Material is Released or Spilled)

Do not touch spilled material; stop leak if you can do it without risk. Use water spray to reduce vapors. Small spills: take up with sand or other non-combustible absorbent material and place into containers for later disposal. Small dry spills: with clean shovel place material into clean, dry containers and cover; move containers from spill area. Large spills: dike far ahead of spill for later disposal. Wear positive pressure breathing apparatus and special protective clothing (\*DOT 1984).

## EPA CHEMICAL PROFILE

### INTERIM

Date: October 31, 1985

Revision: \_\_\_\_\_

## CHEMICAL IDENTITY -- PHORATE

CAS Registry Number: 298-02-2

**Synonyms:** Phosphorodithioic Acid, O,O-Diethyl S-(Ethylthio)Methyl Ester; Methanethiol, (Ethylthio)-, S-Ester with O,O-Diethylphosphorodithioate; O,O-Diethyl S-Ethylmercaptomethyl Dithiophosphonate; O,O-Diethyl S-Ethylthiomethyl Dithiophosphonate; O,O-Diethyl S-(Ethylthio)methyl Dithiophosphonate; Experimental Insecticide 3911; L 11/6; Thimet; American Cyanamid 3,911; AC 3911; American Cyanamid 3911; EI 3911; ENT 24,042, ENT 24042; Granutox; O,O-Diethyl Ethylthiomethyl Phosphorodithioate; O,O-Diethyl S-Ethylmercaptomethyl Dithiophosphate; O,O-Diethyl S-Ethylthiomethyl Thiotionophosphate; Phorate 10G; Rampart; Thimet 10G; Timet; Vegfru; Vergfru Foratox; VUAgT 182

**Chemical Formula:**  $C_7H_{17}O_2PS_3$

**Molecular Weight:** 260.39

## SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

**OSHA PEL:** Not Found

**ACGIH TLV:** TWA 0.05 mg/m<sup>3</sup> (skin); STEL 0.2 mg/m<sup>3</sup> (skin) (\*ACGIH 1983)

**IDLH:** Not Found

**Other Limits Recommended:** Toxicity information: LC<sub>50</sub> inhalation (rat) 0.011 mg/liter for 1 hour (\*NIOSH/RTECS 1985)

## SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

**Boiling Point:** 257-261°F, 125-127°C at 2 mmHg (\*Merck 1983)

**Specific Gravity (H<sub>2</sub>O=1):** 1.156 at 25°C (\*Merck 1983)

**Vapor Pressure (mmHg):**  $8.4 \times 10^{-4}$  at 20°C (\*Merck 1983)

**Melting Point:** -45°F, -42.9°C (\*Spencer 1982)

PHORATE

SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

Vapor Density (AIR=1): Not Found

Evaporation Rate (Butyl acetate=1): Not Found

Solubility in Water: 50 mg/liter (\*Merck 1983)

Appearance and Odor: Clear liquid (\*Merck 1983); objectionable odor (\*Osol 1980)

SECTION III -- FIRE AND EXPLOSION HAZARD DATA

Flash Point (Method Used): Not Found

Flammable Limits:

LEL: Not Found

UEL: Not Found

Extinguishing Methods: (Non-Specific -- Organophosphorous Pesticide)  
Extinguish with dry chemical, carbon dioxide, water spray, fog, or foam (DOT 1984, Guide 55)

Special Fire Fighting Procedures: (Non-Specific -- Organophosphorous Pesticide) Wear positive pressure self-contained breathing apparatus. Move container from fire area if you can do it without risk. Fight fire from maximum distance. Dike fire control water for later disposal; do not scatter the material (DOT 1984, Guide 55).

Unusual Fire and Explosion Hazards: Shock can shatter containers, releasing the contents. When heated to decomposition, toxic fumes of sulfur oxides, phosphorus oxides, and nitrogen oxides are emitted (Sax 1984, p. 2208).

SECTION IV -- REACTIVITY DATA

Stability: Unstable:

Stable: Yes (\*Merck 1983)

Conditions to Avoid: Not Found

Incompatibility (Materials to Avoid): Hydrolyzed in water and alkalies (\*Merck 1983).

Hazardous Decomposition or Byproducts: When heated to decomposition, sulfur oxides, phosphorus oxides, and nitrogen oxides are emitted (Sax 1984, p. 2208)

## PHORATE

### SECTION IV -- REACTIVITY DATA (Continued)

Hazardous Polymerization: May Occur: Not Found  
May Not Occur: Not Found

Conditions to Avoid: Not Found

### SECTION V -- HEALTH HAZARD DATA

Routes of Entry: Inhalation: Yes (\*ACGIH 1980)  
Skin: Yes (\*ACGIH 1980)  
Ingestion: Yes (\*ACGIH 1980)

**Health Hazards** (Acute, Delayed, and Chronic): This material is one of the more toxic organophosphorus insecticides (\*Osol 1980). It is a cholinesterase inhibitor that acts on the nervous system, and produces toxicity similar to Parathion. The probable oral lethal dose for humans is less than 5 mg/kg, i.e. a taste (less than 7 drops) for a 70 kg (150 lb.) person (\*Gosselin 1976).

**Signs and Symptoms of Exposure:** Exposure results in tension; anxiety; restlessness; insomnia; headache; emotional instability; excessive dreaming and nightmares; apathy and confusion (\*Doull 1980); nausea; vomiting; diarrhea; pinpoint pupils and sensation of tightness in the chest (\*Gosselin 1976).

**Medical Conditions Generally Aggravated by Exposure:** Not Found

**Emergency and First Aid Procedures:** Establish clear airway. Wash thoroughly in case of skin contamination (\*Morgan 1982). (Non-Specific -- Organophosphorous Pesticide) Move victim to fresh air; call emergency medical care. If not breathing, give artificial respiration; if breathing is difficult, give oxygen. In case of contact with material, immediately flush skin or eyes with running water for at least 15 minutes; speed in removing material from skin is of extreme importance. Remove and isolate contaminated clothing and shoes at the site (DOT 1984, Guide 55).

### SECTION VI -- USE INFORMATION

This material is used as an insecticide and acaricide; it is applied to plants and soil (\*SRI).



## PHORATE

### SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE

(Steps to be Taken in Case Material is Released or Spilled)

(Non-Specific -- Organophosphorus Pesticide) Keep unnecessary people away; isolate hazard area and deny entry. Stay upwind; keep out of low areas. Ventilate closed spaces before entering them. Wear positive pressure breathing apparatus and special protective clothing. Remove and isolate contaminated clothing at the site. Do not touch spilled material; stop leak if you can do it without risk. Use water spray to reduce vapors. Small spills: take up with sand or other noncombustible absorbent material and place into containers for later disposal. Large spills: dike far ahead of spill for later disposal (DOT 1984, Guide 55).

EPA CHEMICAL PROFILE

INTERIM

Date: October 31, 1985

Revision: \_\_\_\_\_

CHEMICAL IDENTITY -- DISULFOTON

CAS Registry Number: 298-04-4

**Synonyms:** Phosphorodithioic Acid, O,O-Diethyl S-(2-(Ethylthio)Ethyl) Ester; Bay 19639; Bayer 19639; Di-syston; Di-syston G; Dimaz; Disulfaton; Disystox; Dithiodemeton; Dithiosystox; Dution; Ekatin TD; ENT 23,437; ENT-23437; Ethyl Thiometon; Ethylthiometon B; Frumin; Frumin AL; Frumin G; Glebofos; M 74 (Pesticide); M-74; O,O-Diethyl 2-Ethylthioethyl Phosphorodithioate; O,O-Diethyl S-(2-(Ethylthio)Ethyl) Phosphorodithioate; O,O-Diethyl S-(2-Eththioethyl) Phosphorodithioate; O,O-Diethyl S-(2-Eththioethyl)Thiothionophosphate; O,O-Diethyl S-(2-Ethylmercaptoethyl) Dithiophosphate; O,O-Diethyl S-2-(Ethylthio)Ethyl Phosphorodithioate; O,O-Ethyl S-2(Ethylthio)Ethyl Phosphorodithioate; Phosphorodithioic Acid, O,O-Diethyl S-(2-(Ethylthio)Ethyl) Ester; Phosphorodithionic Acid, S-2-(Ethylthio)Ethyl O,O-Diethyl Ester; S 276; S-2-(Ethylthio)Ethyl O,O-Diethyl Ester of Phosphorodithioic Acid; Solvirex; Thiodemeton; Thiodemetron; Vuagt 1-4; Vuagt 1964

**Chemical Formula:**  $C_8H_{19}O_2PS_3$

**Molecular Weight:** 274.38

SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

OSHA PEL: Not Found

ACGIH TLV: TWA 0.1 mg/m<sup>3</sup>; STEL 0.3 mg/m<sup>3</sup> (skin) (\*ACGIH 1980)

IDLH: Not Found

**Other Limits Recommended:** An airborne limit of 0.1 mg/m<sup>3</sup> should serve to limit general room contamination (\*ACGIH 1980). Toxicity information: LD<sub>50</sub> oral (rat) 2 mg/kg (\*NIOSH/RTECS 1985).

SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

**Boiling Point:** 270-271°F, 132-133°C at 1.5 mmHg (\*Merck 1976)

**Specific Gravity (H<sub>2</sub>O=1):** 1.144 (\*Merck 1976)

**Vapor Pressure (mmHg):**  $1.8 \times 10^{-4}$  at 20°C (\*Spencer 1973)

## DISULFOTON

## SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS (Continued)

**Melting Point:** Greater than -13°F, -25°C (\*Sunshine 1969)

**Vapor Density (AIR=1):** Not Found

**Evaporation Rate (Butyl acetate=1):** Not Found

**Solubility in Water:** 25 mg/liter at 23°C (\*NRC 1977)

**Appearance and Odor:** Oily, colorless liquid when pure; technical product is dark yellowish oil (\*Spencer 1973). It has a characteristic sulfur odor (\*Sax 1975).

## SECTION III -- FIRE AND EXPLOSION HAZARD DATA

**Flash Point (Method Used):** Not Found

**Flammable Limits:**

LEL: Not Found

UEL: Not Found

**Extinguishing Methods:** Extinguish with dry chemical, carbon dioxide, water spray, fog, or foam (DOT 1984, Guide 55).

**Special Fire Fighting Procedures:** Fight fire from maximum distance. Dike fire control water for later disposal; do not scatter the material. Wear positive pressure breathing apparatus and special protective clothing (DOT 1984, Guide 55).

**Unusual Fire and Explosion Hazards:** Material may burn but does not ignite easily. Cylinder may explode in the heat of fire. Poisonous gases may be generated from the fire or runoff water (DOT 1984, Guide 55).

## SECTION IV -- REACTIVITY DATA

**Stability:** Unstable:

Stable: Oxidizable in air (\*Sunshine 1969).

**Conditions to Avoid:** Not Found

**Incompatibility (Materials to Avoid):** Not Found

**Hazardous Decomposition or Byproducts:** When heated poisonous gases may be given off (DOT 1984, Guide 55).

## DISULFOTON

### SECTION IV -- REACTIVITY DATA (Continued)

Hazardous Polymerization: May Occur: Not Found  
May Not Occur: Not Found

Conditions to Avoid: Not Found

### SECTION V -- HEALTH HAZARD DATA

Routes of Entry: Inhalation: Yes (\*DOT 1984)  
Skin: Yes (\*DOT 1984)  
Ingestion: Yes (\*DOT 1984)

**Health Hazards** (Acute, Delayed, and Chronic): It is classified as super toxic. Probable oral lethal dose in humans is less than 5 mg/kg or a taste (less than 7 drops) for a 70 kg (150 lb.) person (\*Gosselin 1976). It is poisonous and may be fatal if inhaled, swallowed, or absorbed through the skin. Contact may cause burns to skin and eyes (\*DOT 1984).

**Signs and Symptoms of Exposure:** Similar to parathion. Exposure can cause nausea, vomiting, abdominal cramps, diarrhea, excessive salivation, headache, giddiness, vertigo, and weakness. Death occurs primarily due to respiratory failure (\*Gosselin 1976).

**Medical Conditions Generally Aggravated by Exposure:** Not found

**Emergency and First Aid Procedures:** Move victim to fresh air; call emergency medical care. If not breathing give artificial respiration. If breathing is difficult, give oxygen. In case of contact with material, immediately flush skin or eyes with running water for at least 15 minutes. Speed in removing material from skin is of extreme importance. Remove and isolate contaminated clothing and shoes at the site. Keep victim quiet and maintain normal body temperature. Effects may be delayed; keep victim under observation (DOT 1984, Guide 55).

### SECTION VI -- USE INFORMATION

Major uses include insecticide for mites and aphids on small grains, corn, sorghum, cotton, and other field crops, fruits, nuts, and ornamentals (\*SRI).

## DISULFOTON

### SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE

(Steps to be Taken in Case Material is Released or Spilled)

Do not touch spill material. Exposure by skin contact is likely to be more significant than inhalation (\*ACGIH 1980). Small spills: take up with sand or other noncombustible absorbent materials and place into containers for later disposal. Large spills: dike far ahead of spill for later disposal (DOT 1984, Guide 55).

EPA CHEMICAL PROFILE

INTERIM

Date: October 31, 1985  
Revision: \_\_\_\_\_

CHEMICAL IDENTITY -- AMPHETAMINE

CAS Registry Number: 300-62-9

**Synonyms:** Phenethylamine, alpha-Methyl; (+-)-alpha-Methylbenzene-ethanamine; (+-)-alpha-Methyl Phenethylamine; (+-)-alpha-Methylphenylethylamine; (+-)-beta-Phenylisopropylamine; (+-)-Desoxynorephedrine; (Phenylisopropyl)amine; 1-Phenyl-2-aminopropane; Acetedron; Adipan; Allodene; Anorexide; Anorexine; Benzobar; Benzedrine; Benzeneethanamine, alpha-Methyl-, (+-); Benzolone; beta-Aminopropylbenzene; DL-1-Phenyl-2-Aminopropane; DL-alpha-Methylphenethylamine; DL-Amphetamine; DL-Benzedrine; Elastonon; Finam; Isoamyl; Isomyl; Mecodrin; Norephedrine; Norephedrine, deoxy-; Novydrine; Oktedrin; Ortedrine; Percomon; Phenedrine; Profamina; Propisamine; Psychedrine; Racemic desoxy-nor-ephedrine; Raphetamine; Rhinalator; Simpatedrin; Simpamina; Sympamine; Sympatedrine; Weckamine

**Chemical Formula:**  $C_9H_{13}N$

**Molecular Weight:** 135.20

SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

OSHA PEL: Not Found

ACGIH TLV: Not Found

IDLH: Not Found

**Other Limits Recommended:** Toxicity information:  $LD_{low}$  oral (rat) 5 mg/kg (\*NIOSH/RTECS 1985)

SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

**Boiling Point:** 392-397°F, 200-203°C (\*Merck 1976)

**Specific Gravity ( $H_2O=1$ ):** 0.913 at 25°C/4°C (\*Merck 1976)

**Vapor Pressure (mmHg):** Not Found

**Melting Point:** Not Found

**Vapor Density (AIR=1):** 4.65 (Sax 1984, p. 271)

## AMPHETAMINE

### SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS (Continued)

**Evaporation Rate** (Butyl acetate=1): Evaporates slowly at room temperature (\*Merck 1976).

**Solubility in Water:** Slightly soluble (\*Merck 1976).

**Appearance and Odor:** Colored liquid; amine odor (\*Merck 1976).

### SECTION III -- FIRE AND EXPLOSION HAZARD DATA

**Flash Point** (Method Used): 80°F, 26.6°C (no method given) (Hawley 1981, p. 65)

**Flammable Limits:** It is flammable (Hawley 1981, p. 65)

LEL: Not Found

UEL: Not Found

**Extinguishing Methods:** Extinguish with carbon dioxide or dry chemical (\*Sax 1975).

**Special Fire Fighting Procedures:** Not Found

**Unusual Fire and Explosion Hazards:** Dangerous when exposed to heat or flames (\*Sax 1975).

### SECTION IV -- REACTIVITY DATA

**Stability:** Unstable: Not Found

Stable: Not Found

**Conditions to Avoid:** Not Found

**Incompatibility** (Materials to Avoid): Can react with oxidizing materials (\*Sax 1975).

**Hazardous Decomposition or Byproducts:** Upon decomposition, nitrogen oxides are emitted (\*Sax 1975).

**Hazardous Polymerization:** May Occur: Not Found

May Not Occur: Not Found

**Conditions to Avoid:** Not Found

## AMPHETAMINE

### SECTION V -- HEALTH HAZARD DATA

**Routes of Entry:** Inhalation: Yes (\*Sax 1975)  
Skin: Not Found  
Ingestion: Yes (\*Sax 1975)

**Health Hazards** (Acute, Delayed, and Chronic): It is classified as extremely hazardous. Probable lethal dose in humans is 5-50 mg/kg or 7 drops to 1 teaspoon for a 70 kg (150 lb.) person (\*Gosselin 1976). Habit forming drug which affects the central nervous system (Hawley 1981, p. 65).

**Signs and Symptoms of Exposure:** Dry mouth, metallic taste, loss of appetite, nausea, vomiting, diarrhea, abdominal cramps, headache, chilliness, flushing or pallor, palpitation, restlessness, dizziness, tremor, hyperactive reflexes, talkativeness, tenseness, irritability, weakness, insomnia, fever, confusion. With large doses, irregular heartbeat, pain and difficulty in urination (\*Goodman 1975). Convulsions, coma, circulatory collapse (Gosselin 1976, p. II-369).

**Medical Conditions Generally Aggravated by Exposure:** Excessive use may lead to tolerance and physical dependence (\*Merck 1976). Death is possible (Gosselin 1976, p. II-369).

**Emergency and First Aid Procedures:** (Non-Specific -- Drugs, n.o.s.) Move victim to fresh air; call emergency medical care. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In case of contact with material, immediately flush skin or eyes with running water for at least 15 minutes. Remove and isolate contaminated clothing and shoes at the site. Keep victim quiet and maintain normal body temperature (DOT 1984, Guide 11).

### SECTION VI -- USE INFORMATION

Amphetamine is used as a pharmaceutical (Hawley 1981, p. 65). It is a central nervous system stimulant (\*Rossoff 1974).

### SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE (Steps to be Taken in Case Material is Released or Spilled)

(Non-Specific -- Drugs, n.o.s.) Keep unnecessary people away; isolate hazard area and deny entry. Stay upwind; keep out of low areas. Wear self-contained (positive pressure if available) breathing apparatus and full protective clothing. Shut off ignition sources; no flares, smoking or flames in hazard area. Keep combustibles (wood, paper, oil, etc.) away from spilled material. Do not touch spilled material. Small spills: absorb with sand or other noncombustible absorbent material and place into containers for later disposal. Large spills: dike far ahead of spill for later disposal (DOT 1984, Guide 11).



EPA CHEMICAL PROFILE

INTERIM

Date: October 31, 1985

Revision: \_\_\_\_\_

CHEMICAL IDENTITY -- HYDRAZINE

CAS Registry Number: 302-01-2

Synonyms: Diamine; Hydrazine Anhydrous; Hydrazine Base; Hydrazine, Anhydrous; Levoxine

Chemical Formula:  $H_4N_2$

Molecular Weight: 32.05

SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

OSHA PEL: TWA 1 ppm (skin) (\*NIOSH/RTECS 1985)

ACGIH TLV: TWA 0.1 ppm (skin) (\*ACGIH 1983)

IDLH: 80 ppm (\*Encyc Occupat Health and Safety 1983)

**Other Limits Recommended:** Short-term inhalation limits - 1 ppm for 30 minutes (Weiss 1980, p. 509); Occupational Exposure to Hydrazines Recommended Standard Air Ceiling 0.04 mg/m<sup>3</sup>/2 hours (\*NIOSH/RTECS 1985). Industrial Substance Suspect of Carcinogenic Potential for Humans -- Recommended TLV 0.1 ppm (skin) (ACGIH 1984, p. 42).

SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

Boiling Point: 236.3°F, 113.5°C (\*Merck 1983)

Specific Gravity ( $H_2O=1$ ): 1.011 at 15°C/4°C (\*Merck 1983)

Vapor Pressure (mmHg): 14.4 at 25°C (\*Sunshine 1969)

Melting Point: 36°F, 2.0°C (\*Merck 1983)

Vapor Density (AIR=1): Not Found

Evaporation Rate (Butyl acetate=1): Not Found

Solubility in Water: Miscible (\*Merck 1983)

## HYDRAZINE

### SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS (Continued)

**Appearance and Odor:** Colorless, oily liquid with penetrating ammonia-like odor (\*Merck 1983).

### SECTION III -- FIRE AND EXPLOSION HAZARD DATA

**Flash Point** (Method Used): 52°C (\*Merck 1983)

**Flammable Limits:**

LEL: 4.7% (\*NFPA 1978)

UEL: 100% (\*NFPA 1978)

**Extinguishing Methods:** Small fires: dry chemical, carbon dioxide, water spray or foam. Large fires: water spray, fog, or foam (DOT 1984, Guide 28).

**Special Fire Fighting Procedures:** Stay upwind; keep out of low areas. Wear positive pressure breathing apparatus and protective clothing. Isolate for one-half mile in all directions if tank car or truck is involved in fire. Move container from fire area if you can do so without risk. Dike fire control water for later disposal; do not scatter material. Spray cooling water on containers that are exposed to flames until well after fire is out (DOT 1984, Guide 28).

**Unusual Fire and Explosion Hazards:** It is a flammable/combustible material and may be ignited by heat, sparks, or flames. Vapor may travel to a source of ignition and flash back. Container may explode in heat of fire. Vapor explosion and poison hazard indoors, outdoors, or in sewers. Runoff to sewer may create fire or explosion hazard (DOT 1984, Guide 28). Vapors form explosive mixtures with air (NFPA 1984, pp. 49-52). May continue to burn in the absence of air (\*Bretherick 1979).

### SECTION IV -- REACTIVITY DATA

**Stability:** Unstable: Yes (\*NFPA 1978)

Stable:

**Conditions to Avoid:** Not Found

**Incompatibility** (Materials to Avoid): Can catch fire when in contact with porous materials such as wood, asbestos, cloth, earth, and rusty metals (Weiss 1980, p. 509). Incompatible with oxidizers, hydrogen peroxide, nitric acid, metal oxides, and strong acids (NIOSH/OSHA 1978, p. 110).

## HYDRAZINE

### SECTION IV -- REACTIVITY DATA (Continued)

**Hazardous Decomposition or Byproducts:** Decomposition gives off toxic nitrogen compound fumes (\*Rumack 1975 to Present).

**Hazardous Polymerization:** May Occur:  
May Not Occur: Yes (Weiss 1980, p. 509)

**Conditions to Avoid:** Not Found

### SECTION V -- HEALTH HAZARD DATA

**Routes of Entry:** Inhalation: Yes (NIOSH/OSHA 1978, p. 110)  
Skin: Yes (NIOSH/OSHA 1978, p. 110)  
Ingestion: Yes (NIOSH/OSHA 1978, p. 110)

**Health Hazards (Acute, Delayed, and Chronic):** Target organs affected include central nervous system; respiratory system; skin and eyes (NIOSH/OSHA 1978, p. 110). Chronic exposure in humans may cause pneumonia, liver and kidney damage. Liver damage may be more severe than kidney damage (Gosselin 1976, p. II-247). It is a suspected human carcinogen (ACGIH 1984, p. 42).

**Signs and Symptoms of Exposure:** Symptoms include irritation of eyes, nose, and throat; temporary blindness; dizziness; nausea; dermatitis and burning skin (NIOSH/OSHA 1978, p. 110). Inhalation may cause nausea, headache, facial numbness, twitching, sore throat, and pulmonary edema. Acute exposure may cause seizures and coma, and increased blood sugar levels (\*Rumack 1975 to Present). Chemical burns result from skin contact (\*ACGIH 1980).

**Medical Conditions Generally Aggravated by Exposure:** Not Found

**Emergency and First Aid Procedures:** Move victim to fresh air; call emergency medical care. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Remove and isolate contaminated clothing and shoes at the site. In case of contact with material immediately flush skin or eyes with running water for at least 15 minutes. Keep victim quiet and maintain normal body temperature. Effects may be delayed; keep victim under observation (DOT 1984, Guide 28).

## HYDRAZINE

### SECTION VI -- USE INFORMATION

Chemical intermediate for pesticides, blowing agents, photography chemicals, pharmaceuticals, antituberculants, textile dyes (\*SRI).

### SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE

(Steps to be Taken in Case Material is Released or Spilled)

Avoid inhalation of vapors (see Section V above). Shut off ignition sources; no flares, smoking or flames in hazard area. Do not touch spilled material; stop leak if you can do so without risk. Use water spray to reduce vapors. Small spills: absorb with sand or other noncombustible absorbent material and place into containers for later disposal. Large spills: dike far ahead of spill for later disposal. Keep unnecessary people away; isolate hazard area and deny entry. Stay upwind; keep out of low areas. Wear positive pressure breathing apparatus and special protective clothing. In case of contact with material, immediately flush skin or eyes with running water for at least 15 minutes (DOT 1984, Guide 28).

## EPA CHEMICAL PROFILE

### INTERIM

Date: October 31, 1985

Revision: \_\_\_\_\_

### CHEMICAL IDENTITY -- ALDRIN

CAS Registry Number: 309-00-2

**Synonyms:** (NIOSH/RTECS 1983 Synonyms, Volume 2, p. 113) 1,4:5,8-Dimethanonaphthalene, 1,2,3,4,10,10-Hexachloro-1,4,4a,5,8,8a-Hexahydro-; Aldrex; Aldrite; Aldrosol; Aldrin, Cast Solid; Aldrin Mixture, Dry; Aldrin Mixture, Liquid; Compound 118; Drinox; ENT 15,949; Hexachlorohexahydro-endo-exo-Dimethanonaphthalene; 1,2,3,4,10,10-Hexachloro-1,4,4a,5,8,8a-Hexahydro-1,4,5,8-Dimethanonaphthalene; 1,2,3,4,10,10-Hexachloro-1,4,4a,5,8,8a-Hexahydro-exo-1,4-endo-5,8-Dimethanonaphthalene; 1,2,3,4,10,10-Hexachloro-1,4,4a,5,8,8a-Hexahydro-1,4-endo-exo-5,8-Dimethanonaphthalene; HHDN; NCI-C00044; Octalene; Seedrin; 1,4:5,8-Dimethanonaphthalene, 1,2,3,4,10,10-Hexachloro-1,4,4a,5,8,8a-Hexahydro-, (1 alpha, 4 alpha, 4a beta, 5 alpha, 8 alpha, 8a beta)-

**Chemical Formula:**  $C_{12}H_8Cl_6$

**Molecular Weight:** 364.90

### SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

**OSHA PEL:** 0.25 mg/m<sup>3</sup> (NIOSH/OSHA 1978, p. 42)

**ACGIH TLV:** 0.25 mg/m<sup>3</sup> (ACGIH 1984, p. 11)

**IDLH:** 100 mg/m<sup>3</sup> (NIOSH/OSHA 1978, p. 42)

**Other Limits Recommended:** Not Found

### SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

**Boiling Point:** 293°F, 145°C at 2 mmHg (Hayes 1982, p. 234); decomposes (NIOSH/OSHA 1978, p. 42)

**Specific Gravity (H<sub>2</sub>O=1):** 1.70 at 20°C (Hayes 1982, p. 234)

**Vapor Pressure (mmHg):**  $6 \times 10^{-6}$  at 25°C (Hayes 1982, p. 234)

**Melting Point:** (Pure) 219°F, 104°C; (Technical) 120-140°F, 49-60°C (Hayes 1982, p. 234)

ALDRIN

SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS (Continued)

Vapor Density (AIR=1): Not Found

Evaporation Rate (Butyl acetate=1): Not Found

Solubility in Water: 0.027 mg/liter (Hayes 1982, p. 234)

Appearance and Odor: (Pure) Odorless, white solid. (Technical) Tan to dark brown solid with a mild "chemical" odor (Hayes 1982, p. 234).

SECTION III -- FIRE AND EXPLOSION HAZARD DATA

Flash Point (Method Used): Approximately 150°F or higher (no method given) (NFPA 1984, p. 49-13)

Flammable Limits:

LEL: Not Found

UEL: Not Found

Extinguishing Methods: Not Flammable (Hayes 1982, p. 234). Extinguish by using water spray, dry chemical, foam, or carbon dioxide. Use water to keep fire-exposed containers cool. Use water spray to disperse the vapors (NFPA 1984, p. 49-13).

Special Fire Fighting Procedures: Wear full protective clothing (NFPA 1984, p. 49-13) including positive pressure breathing apparatus. Small fires: dry chemical, carbon dioxide, water spray, or foam. Large fires: water spray, fog, or foam. Move container from fire area if you can do so without risk. Fight fire from maximum distance. Dike fire control water for later disposal; do not scatter the material (DOT 1984, Guide 55).

Unusual Fire and Explosion Hazards: When heated to decomposition, it emits toxic fumes of chlorine containing compounds (Sax 1984, p. 153). Commercial solutions may contain flammable or combustible liquids. The dry powder will not burn (NFPA 1984, p. 49-13). Container may explode in heat of fire (DOT 1984, Guide 55).

SECTION IV -- REACTIVITY DATA

Stability: Unstable: Not Found.  
Stable: Not Found

Conditions to Avoid: Not Found

Incompatibility (Materials to Avoid): Avoid concentrated mineral acids, acid catalysts, acid oxidizing agents, phenols, or active metals (Hayes 1982, p. 234).

ALDRIN

SECTION IV -- REACTIVITY DATA (Continued)

**Hazardous Decomposition or Byproducts:** When heated to decomposition it emits toxic fumes of chlorine containing compounds (Sax 1984, p. 153).

**Hazardous Polymerization:** May Occur: Not Found  
May Not Occur: Not Found

**Conditions to Avoid:** Not Found

SECTION V -- HEALTH HAZARD DATA

**Routes of Entry:** Inhalation: Yes (NIOSH 1978, p. 42)  
Skin: Yes (NIOSH 1978, p. 42)  
Ingestion: Yes (NIOSH 1978, p. 42)

**Health Hazards (Acute, Delayed, and Chronic):** Poisoning by aldrin usually involves convulsions due to its effects on the central nervous system. Reproductive effects and liver effects have also been reported (Doull 1980, p. 383; Hayes 1982, p. 235). It is classified as an extremely toxic chemical. Probable oral lethal dose for humans is between 7 drops and one oz. for a 150 lb. adult human (Gosselin 1976, p. 186). Conflicting reports of carcinogenicity of this compound remain an area of controversy (Doull 1980, p. 383). Similar chemically and toxicologically to dieldrin (Gosselin 1984, p. II-285).

**Signs and Symptoms of Exposure:** Aldrin tends to produce convulsions before other, less serious signs of illness have appeared. Victims have reported headache, nausea, vomiting, dizziness, and mild clonic jerking. Some victims have convulsions without warning. Aldrin can burn the skin and eyes (Gilman 1985, p. 1640; Hayes 1982, p. 234).

**Medical Conditions Generally Aggravated by Exposure:** Not Found

**Emergency and First Aid Procedures:** Treatment is symptomatic (Hayes, 1982, p. 237). Move victim to fresh air; call emergency medical care. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In case of contact with material, immediately flush skin or eyes with running water for at least 15 minutes. Speed in removing material from skin is of extreme importance. Remove and isolate contaminated clothing and shoes at the site. Keep victim quiet and maintain normal body temperature. Effects may be delayed; keep victim under observation (DOT 1984, Guide 55).

## ALDRIN

### SECTION VI -- USE INFORMATION

Formerly used as an insecticide; manufacture and use have been discontinued in the USA (Merck 1983, p. 36). Registered as a termicide in the U.S. (USEPA/Pesticide Index 1985).

### SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE

(Steps to be Taken in Case Material is Released or Spilled)

Avoid inhalation (see Section V). Do not touch spilled material; stop leak if you can do so without risk. Wear positive pressure breathing apparatus and special protective clothing. Use water spray to reduce vapors. Small spills: absorb with sand or other noncombustible absorbent material and place into containers for later disposal. Small dry spills: with clean shovel place material into clean, dry container and cover; move containers from spill area. Large spills: dike far ahead of spill for later disposal (DOT 1984, Guide 55).



EPA CHEMICAL PROFILE

INTERIM

Date: October 31, 1985

Revision: \_\_\_\_\_

CHEMICAL IDENTITY -- MEXACARBATE

CAS Registry Number: 315-18-4

**Synonyms:** Carbamic Acid, Methyl-, 4-Dimethylamino-3,5-xylyl Ester; Zectran; 3,5-Dimethyl-4-(Dimethylamino)Phenyl Methylcarbamate; 3,5-Xylenol, 4-(Dimethylamino)-, Methylcarbamate; 4-(Dimethylamino)-3,5-Xylyl N-Methylcarbamate; 4-(Dimethylamino)-3,5-Dimethylphenol Methylcarbamate (Ester); 4-(Dimethylamino)-3,5-Dimethylphenyl N-Methylcarbamate; 4-(Dimethylamino)-3,5-Xylenol, Methylcarbamate (Ester); 4-(N,N-Dimethylamino)-3,5-Xylyl N-Methylcarbamate; 4-Dimethylamino-3,5-Dimethylphenyl Methylcarbamate; 4-Dimethylamino-3,5-Dimethylphenyl N-Methylcarbamate; 4-Dimethylamino-3,5-Xylenyl N-Methylcarbamate; 4-Dimethylamino-3,5-Xylyl Methylcarbamate; 4-Dimethylamino-3,5-Xylyl N-Methylcarbamate; Carbamate, 4-Dimethylamino-3,5-Xylyl, N-Methyl-; Carbamic Acid, Methyl-, 4-(Dimethylamino)-3,5-Dimethylphenyl Ester; Carbamic Acid, Methyl-, 4-(Dimethylamino)-3,5-Xylyl Ester; Dowco 139; Dowco-139; ENT 25,766; ENT 25766; ENT-25,766; MAZ; Methyl-4- Dimethylamino-3,5-Xylyl Carbamate; Methyl-4-Dimethylamino-3,5-Xylyl Ester of Carbamic Acid; Methylcarbamic Acid 4-(Dimethylamino)-3,5-Xylyl Ester; Methylcarbamic Acid, 4-(Dimethylamino)-3,5-Xylyl Ester; Mexicarbate; NCI-C00544; OMS-47; Phenol, 4-(Dimethylamino)-3,5-Dimethyl-, Methylcarbamate (Ester); Zactran; Zectane; Zextran; Phenol, 4-(Dimethylamino)- 3,5-Dimethyl-, Methylcarbamate (Ester)

**Chemical Formula:**  $C_{12}H_{18}N_2O_2$

**Molecular Weight:** 222.29

SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

OSHA PEL: Not Found

ACGIH TLV: Not Found

IDLH: Not Found

**Other Limits Recommended:** Toxicity information: LD<sub>50</sub> oral (rat) 14 mg/kg (\*NIOSH/RTECS 1985)

MEXACARBATE

SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

Boiling Point: Not Found

Specific Gravity ( $H_2O=1$ ): Not Found

Vapor Pressure (mmHg): Less than 0.1 at 139°C (\*Merck 1983)

Melting Point: 185°F, 85°C (\*Merck 1983)

Vapor Density (AIR=1): Not Found

Evaporation Rate (Butyl acetate=1): Not Found

Solubility in Water: 0.01% at 25°C (\*Merck 1983)

Appearance and Odor: White crystalline solid, odorless (\*Martin 1974)

SECTION III -- FIRE AND EXPLOSION HAZARD DATA

Flash Point (Method Used): Not Found

Flammable Limits:

LEL: Not Found

UEL: Not Found

Extinguishing Methods: (Non-Specific -- Carbamate Pesticide, Solid, n.o.s.) Small fires: dry chemical, carbon dioxide, water spray, or foam. Large fires: water spray, fog, or foam. Dike fire control water for later disposal; do not scatter the material (DOT 1984, Guide 55).

Special Fire Fighting Procedures: Not Found

Unusual Fire and Explosion Hazards: (Non-Specific -- Carbamate Pesticide, Solid, n.o.s.) Fire may produce irritating or poisonous gases. This material may burn but does not ignite readily. Container may explode in heat of fire (DOT 1984, Guide 55).

SECTION IV -- REACTIVITY DATA

Stability: Unstable:

Stable: Yes (\*Martin 1974)

Conditions to Avoid: Subject to photo-decomposition in the solid state (\*IARC 1972-1985).

MEXACARBATE

SECTION IV -- REACTIVITY DATA (Continued)

**Incompatibility (Materials to Avoid):** Decomposition in highly alkaline media (\*Martin 1974).

**Hazardous Decomposition or Byproducts:** When heated to decomposition it emits toxic fumes of nitrogen oxides (Sax 1984, p. 1108).

**Hazardous Polymerization:** May Occur: Not Found  
May Not Occur: Not Found

**Conditions to Avoid:** Not Found

SECTION V -- HEALTH HAZARD DATA

**Routes of Entry:** Inhalation: Yes (Non-Specific -- Carbamate Pesticide, Solid, n.o.s.) (DOT 1984, Guide 55)  
Skin: Yes (Non-Specific -- Carbamate Pesticide, Solid, n.o.s.) (DOT 1984, Guide 55)  
Ingestion: Yes (\*Gosselin 1976)

**Health Hazards (Acute, Delayed, and Chronic):** Extremely toxic: probable oral lethal dose for humans is 5-50 mg/kg; between 7 drops and 1 teaspoonful for 70 kg person (150 lb.) (\*Gosselin 1976). (Non-Specific -- Carbamate Pesticide, Solid, n.o.s.) Poisonous; may be fatal if inhaled, swallowed, or absorbed through skin. Contact may cause burns to skin and eyes (DOT 1984, Guide 55).

**Signs and Symptoms of Exposure:** Symptoms of carbamate poisoning resemble those of parathion. This material is similar to carbaryl; symptoms of carbaryl exposure include nausea, vomiting, abdominal cramps, diarrhea, excessive salivation, sweating, lassitude and weakness. Runny nose and sensation of tightness in chest may occur with inhalation exposures. Blurring or dimness of vision, tearing, eye muscle spasm, loss of muscle coordination, slurring of speech, and twitching of muscles may also occur (\*Gosselin 1976).

**Medical Conditions Generally Aggravated by Exposure:** Not Found

## MEXACARBATE

### SECTION V -- HEALTH HAZARD DATA (Continued)

**Emergency and First Aid Procedures:** (Non-Specific -- Carbamate Pesticide, Solid, n.o.s.) Move victim to fresh air; call emergency medical care. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In case of contact with material, immediately flush skin or eyes with running water for at least 15 minutes. Speed in removing material from skin is of extreme importance. Remove and isolate contaminated clothing and shoes at the site. Keep victim quiet and maintain normal body temperature. Effects may be delayed; keep victim under observation (DOT 1984, Guide 55).

### SECTION VI -- USE INFORMATION

It is an insecticide for non-agricultural uses, e.g., lawn and turf, flowers, gardens, vines, forest lands, woody shrubs and trees and also a molluscicide. It is not produced commercially in the United States (\*SRI).

### SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE

(Steps to be Taken in Case Material is Released or Spilled)

(Non-Specific -- Carbamate Pesticide) Keep sparks, flames, and other sources of ignition away. Keep material out of water sources and sewer. Avoid bodily contact with the material. If contact with material is anticipated, wear full protective clothing including boots, protective gloves, and goggles (Student 1981, p. 104).

EPA CHEMICAL PROFILE

INTERIM

Date: October 31, 1985

Revision: \_\_\_\_\_

CHEMICAL IDENTITY -- EMETINE, DIHYDROCHLORIDE

CAS Registry Number: 316-42-7

Synonyms: (NIOSH/RTECS 1983 Synonyms, Volume 2, p. 192) Amebicide; (-)-Emetine Dihydrochloride; 1-Emetine Dihydrochloride; Emetine, Hydrochloride; NSC-33669

Chemical Formula:  $C_{29}H_{40}N_2O_4 \cdot 2HCl$

Molecular Weight: 553.63

SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

OSHA PEL: Not Found

ACGIH TLV: Not Found

IDLH: Not Found

Other Limits Recommended: Toxicity information: LD<sub>low</sub> oral (cat, rabbit) 15 mg/kg (\*NIOSH/RTECS 1985)

SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

Boiling Point: Not Found

Specific Gravity (H<sub>2</sub>O=1): Not Found

Vapor Pressure (mmHg): Not Found

Melting Point: 455-491°F, 235-255°C decomposes (Merck 1983, p. 514)

Vapor Density (AIR=1): Not Found

Evaporation Rate (Butyl acetate=1): Not Found

Solubility in Water: Contains water of hydration varying from 3 to 8 molecules of water; 1 g of hydrated salt dissolves in 7 mL (Merck 1983, p. 514)

## EMETINE, DIHYDROCHLORIDE

### SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS (Continued)

**Appearance and Odor:** Clusters of needles after drying at 221°F, 105°C; turns yellow on exposure to light or heat ((Merck 1983, p. 514)

### SECTION III -- FIRE AND EXPLOSION HAZARD DATA

**Flash Point (Method Used):** Not Found

**Flammable Limits:**

LEL: Not Found

UEL: Not Found

**Extinguishing Methods:** Emetine is an alkaloid (Merck 1983, p. 513). Extinguishing methods for alkaloid salts are as follows. Small fires: dry chemical, carbon dioxide, water spray, or foam. Large fires: water spray, fog, or foam (DOT 1984, Guide 55).

**Special Fire Fighting Procedures:** Procedures for alkaloid salts include the following. Move container from fire area if you can do so without risk. Fight fire from maximum distance. Dike fire control water for later disposal; do not scatter the material. Keep unnecessary people away; isolate hazard area and deny entry. Stay upwind; keep out of low areas. Ventilate closed spaces before entering them. Wear positive pressure breathing apparatus and special protective clothing (DOT 1984, Guide 55).

**Unusual Fire and Explosion Hazards:** When heated to decomposition, it emits very toxic fumes of chlorides, hydrogen chloride and oxides of nitrogen (Sax 1984, p. 1275).

### SECTION IV -- REACTIVITY DATA

**Stability:** Unstable: Not Found

Stable: Not Found

**Conditions to Avoid:** Turns yellow on exposure to light or heat (Merck 1983, p. 514)

**Incompatibility (Materials to Avoid):** Not Found

**Hazardous Decomposition or Byproducts:** When heated to decomposition, it emits very toxic fumes of chlorides, hydrogen chloride, and oxides of nitrogen (Sax 1984, p. 1275).

## EMETINE, DIHYDROCHLORIDE

### SECTION IV -- REACTIVITY DATA (Continued)

Hazardous Polymerization: May Occur: Not Found  
May Not Occur: Not Found

Conditions to Avoid: Not Found

### SECTION V -- HEALTH HAZARD DATA

Routes of Entry: Inhalation: Not Found  
Skin: Not Found  
Ingestion: Yes (Sax 1984, p. 1275)

**Health Hazards** (Acute, Delayed, and Chronic): This material is highly toxic orally. It is an eye irritant (Sax 1984, p. 1275). (Non-Specific -- Emetine) Emetine is classified as extremely toxic. Probable oral lethal dose for humans is 5-50 mg/kg, or between 7 drops and one teaspoon for a 150-lb person (Gosselin 1984, p. II-244).

**Signs and Symptoms of Exposure:** (Non-Specific -- Emetine) Symptoms include nausea, vomiting, diarrhea, muscle weakness, pain, tenderness, hypotension, precordial pain and rapid heartbeat (Gosselin 1984, p. II-244).

**Medical Conditions Generally Aggravated by Exposure:** Not Found

**Emergency and First Aid Procedures:** Emetine is an alkaloid (Merck 1983, p. 513). Procedures for alkaloid salts are as follows. Move victim to fresh air; call emergency medical care. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In case of contact with material, immediately flush skin or eyes with running water for at least 15 minutes. Speed in removing material from skin is of extreme importance. Remove and isolate contaminated clothing and shoes at the site. Keep victim quiet and maintain normal body temperature. Effects may be delayed; keep victim under observation (DOT 1984, Guide 55).

### SECTION VI -- USE INFORMATION

Emetine, dihydrochloride is an injectable form of emetine (Gilman 1984, p. 1051). It is an antiamebic (Merck 1983, p. 514). Emetine is the active ingredient of ipecac (Gosselin 1984, p. II-244).

**EMETINE, DIHYDROCHLORIDE**

**SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE**

(Steps to be Taken in Case Material is Released or Spilled)

The following procedures should be used for alkaloid salts. Keep unnecessary people away; isolate hazard area and deny entry. Stay upwind; keep out of low areas. Ventilate closed spaces before entering them. Wear positive pressure breathing apparatus and special protective clothing. Remove and isolate contaminated clothing at the site. Do not touch spilled material; stop leak if you can do it without risk. Use water spray to reduce vapors. Small spills: take up with sand or other noncombustible absorbent material and place into containers for later disposal. Small dry spills: with clean shovel place material into clean, dry container and cover; move containers from spill area. Large spills: dike far ahead of spill for later disposal (DOT 1984, Guide 55).

**COMMENTS:**

Sources searched but no information found:

NFPA 1984  
Weiss 1980  
ACGIH 1983  
NIOSH/OSHA 1978  
Encyc Occupat Health and Safety 1983  
Weast 1979  
Physicians' Desk Reference 1985  
Farm Chemicals Handbook 1984



EPA CHEMICAL PROFILE

INTERIM

Date: October 31, 1985

Revision: \_\_\_\_\_

CHEMICAL IDENTITY -- TRICHLORONATE

CAS Registry Number: 327-98-0

**Synonyms:** 5082A; Agrisil; Agritox; Bay 37289; Bayer 37289; Bayer 5081; Bayer S 4400; Chemagro 37289; ENT 25,712; ENT-25712; Ethyl Trichlorophenylethylphosphonothioate; Fenophosphon; Fitosol; O-Ethyl 0-2,4,5-Trichlorophenyl Ethylphosphonothioate; Phenol, 2,4,5-Trichloro-, O-Ester with O-Ethyl Ethylphosphonothioate; Phosphonothioic Acid, Ethyl-, O-Ethyl 0-(2,4,5-Trichlorophenyl) Ester; Phytosol; Richloronate; S 4400; Trichloronat

**Chemical Formula:**  $C_{10}H_{12}Cl_3O_2PS$

**Molecular Weight:** 333.60

SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

OSHA PEL: Not Found

ACGIH TLV: Not Found

IDLH: Not Found

**Other Limits Recommended:** Toxicity information:  $LD_{50}$  oral (cat) 10 mg/kg (\*NIOSH/RTECS 1985)

SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

**Boiling Point:** 226°F, 108°C at 0.01 mmHg (\*Worthing 1979)

**Specific Gravity ( $H_2O=1$ ):** 1.365 at 20°C/4°C (\*Worthing 1979)

**Vapor Pressure (mmHg):** Not Found

**Melting Point:** Not Found

**Vapor Density (AIR=1):** Not Found

**Evaporation Rate (Butyl acetate=1):** Not Found

**Solubility in Water:** 50 mg/liter at 20°C (\*Worthing 1979)

**Appearance and Odor:** Amber colored liquid (\*Worthing 1979)

**TRICHLORONATE****SECTION III -- FIRE AND EXPLOSION HAZARD DATA**

**Flash Point** (Method Used): Not Found

**Flammable Limits:**

LEL: Not Found

UEL: Not Found

**Extinguishing Methods:** (Non-Specific -- Organophosphate Pesticide, Liquid, n.o.s.) Small fires: dry chemical, carbon dioxide, water spray, or foam. Large fires: water spray, fog, or foam (DOT 1984, Guide 55).

**Special Fire Fighting Procedures:** (Non-Specific -- Organophosphate Pesticide, Liquid, n.o.s.) Move container from fire area if you can do it without risk. Fight fire from maximum distance. Dike fire control water for later disposal; do not scatter the material. Wear positive pressure breathing apparatus and special protective clothing (DOT 1984, Guide 55).

**Unusual Fire and Explosion Hazards:** When heated to decomposition, it emits very toxic fumes of chlorine containing compounds, phosphorus oxides, and sulfur oxides (Sax 1984, p. 1397).

**SECTION IV -- REACTIVITY DATA**

**Stability:** Unstable: Not Found

Stable: Not Found

**Conditions to Avoid:** Not Found

**Incompatibility** (Materials to Avoid): Not Found

**Hazardous Decomposition or Byproducts:** When heated to decomposition it emits very toxic fumes of chlorine containing compounds, phosphorus oxides, and sulfur oxides (Sax 1984, p. 1397).

**Hazardous Polymerization:** May Occur: Not Found

May Not Occur: Not Found

**Conditions to Avoid:** Not Found

**SECTION V -- HEALTH HAZARD DATA**

**Routes of Entry:** Inhalation: Yes (Non-Specific -- Organic Phosphorus Pesticides) (Hayes 1982, p. 301)

Skin: Yes (Non-Specific -- Organic Phosphorus Pesticides) (Hayes 1982, p. 301)

Ingestion: Yes (Sax 1984, p. 1397)

## TRICHLORONATE

### SECTION V -- HEALTH HAZARD DATA (Continued)

**Health Hazards** (Acute, Delayed, and Chronic): Material is an organophosphate (\*Rumack 1975 to Present) and toxic effects are due to action on the nervous system (Hayes 1982, p. 301). It has high oral toxicity (Sax 1984, p. 1397) and death can occur in acute poisonings (\*DeReuch 1979). Delayed neurotoxicity has been reported (\*Rumack 1975 to Present).

**Signs and Symptoms of Exposure:** Headache, dizziness, nausea, salivation, vomiting, abdominal pain, diarrhea, chest pain, decreased heart rate, excessive discharge of mucous from the air passages, difficult breathing, contraction of the pupil, blurred vision, profuse perspiration, muscle twitching and spasms, profound weakness, psychotic behavior, uncoordination, unconsciousness, rarely convulsions. Low level absorption syndrome is similar to influenza. High dosage may cause toxic psychosis similar to alcoholism. Exposures may be misdiagnosed as asthma and heart failure (\*Rumack 1975 to Present).

**Medical Conditions Generally Aggravated by Exposure:** Not Found

**Emergency and First Aid Procedures:** (Non-Specific -- Organophosphate Pesticide, Liquid, n.o.s.) Move victim to fresh air; call emergency medical care. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In case of contact with material, immediately flush skin or eyes with running water for at least 15 minutes. Speed in removing material from skin is of extreme importance. Remove and isolate contaminated clothing and shoes at the site. Keep victim quiet and maintain normal body temperature. Effects may be delayed; keep victim under observation (DOT 1984, Guide 55).

### SECTION VI -- USE INFORMATION

Non-systemic insecticide (\*Worthing 1979). Not marketed in the U.S.A. or Canada (Farm Chemicals Handbook 1984, p. C-7). Not registered as a pesticide in the U.S. (USEPA/Pesticide Index 1985).

## TRICHLORONATE

### SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE (Steps to be Taken in Case Material is Released or Spilled)

Avoid inhalation (see Section V above). (Non-Specific -- Organophosphate Pesticide, Liquid, n.o.s.) Do not touch spilled material; stop leak if you can do so without risk. Use water spray to reduce vapors. Small spills: absorb with sand or other noncombustible absorbent material and place into containers for later disposal. Large spills: dike far ahead of spill for later disposal. Keep unnecessary people away; isolate hazard area and deny entry. Stay upwind; keep out of low areas. Ventilate closed spaces before entering them. Wear positive pressure breathing apparatus and special protective clothing. Remove and isolate contaminated clothing at the site (DOT 1984, Guide 55).

EPA CHEMICAL PROFILE

INTERIM

Date: October 31, 1985

Revision: \_\_\_\_\_

CHEMICAL IDENTITY -- BORON TRIFLUORIDE COMPOUND WITH  
METHYL ETHER (1:1)

CAS Registry Number: 353-42-4

Synonyms: (NIOSH/RTECS 1983 Synonym, Volume 1, p. 741) Boron, Trifluoro(Oxybis(methane))-,(T-4)-; Boron Trifluoride-Dimethyl Ether; (SANSS 1983 Synonyms): Methyl Ether, compound with Boron Fluoride (1:1); Boron Fluoride Complex with Dimethyl Ether; Boron Trifluoride Compound with Methyl Ether; Boron Trifluoride Dimethyl Ether Addition Compound; Boron Trifluoride Dimethyl Etherate; Boron Trifluoride Dimethyl Ether Complex

Chemical Formula:  $C_2H_6O \cdot BF_3$

Molecular Weight: 113.89

SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

OSHA PEL: Not Found

ACGIH TLV: Not Found

IDLH: Not Found

Other Limits Recommended: Toxicity information:  $LC_{low}$  inhalation (guinea pig) 0.233 mg/liter/4 hours (\*NIOSH/RTECS 1985)

SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

Boiling Point: Not Found

Specific Gravity ( $H_2O=1$ ): Not Found

Vapor Pressure (mmHg): Not Found

Melting Point: Not Found

Vapor Density (AIR=1): Not Found

**BORON TRIFLUORIDE COMPOUND WITH  
METHYL ETHER (1:1)**

**SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS (Continued)**

**Evaporation Rate** (Butyl acetate=1): Not Found

**Solubility in Water:** Not Found

**Appearance and Odor:** Not Found

**SECTION III -- FIRE AND EXPLOSION HAZARD DATA**

**Flash Point** (Method Used): Not Found

**Flammable Limits:**

LEL: Not Found

UEL: Not Found

**Extinguishing Methods:** This material may react violently with water. For small fires, use dry chemical, carbon dioxide, water spray, or foam. For large fires, use water spray, fog, or foam (DOT 1984, Guide 29).

**Special Fire Fighting Procedures:** Wear self-contained, positive-pressure breathing apparatus and full protective clothing. Move containers from fire area if possible. Do not get water inside containers. Spray cooling water on containers that are exposed to flame until well after fire is out. Withdraw immediately in case of rising sound from venting safety device or any discoloration of tank due to fire. Isolate for 1/2 mile in all directions if tank car or truck is involved in fire (DOT 1984, Guide 29).

**Unusual Fire and Explosion Hazards:** Fire may produce irritating or poisonous gases. Flammable/combustible material which may be ignited by heat spark or flame. Vapors may travel to a source of ignition and flash back. Container may explode in heat of fire. Vapor explosion hazard indoors, outdoors, or in sewer. Runoff to sewer may create fire or explosion hazard (DOT 1984, Guide 29).

**SECTION IV -- REACTIVITY DATA**

**Stability:** Unstable: Not Found

Stable: Not Found

**Conditions to Avoid:** Not Found

**Incompatibility** (Materials to Avoid): This material may react violently with water (DOT 1984, Guide 29).

**BORON TRIFLUORIDE COMPOUND WITH  
METHYL ETHER (1:1)**

**SECTION IV -- REACTIVITY DATA (Continued)**

**Hazardous Decomposition or Byproducts:** When heated to decomposition, it emits toxic fumes of fluorides (Sax 1984, p. 515).

**Hazardous Polymerization:** May Occur: Not Found  
May Not Occur: Not Found

**Conditions to Avoid:** Not Found

**SECTION V -- HEALTH HAZARD DATA**

**Routes of Entry:** Inhalation: Yes (Sax 1984, p. 515)  
Skin: Yes (DOT 1984, Guide 29)  
Ingestion: Yes (Non-Specific -- Boron Compounds)  
(Sax 1984, p. 513)

**Health Hazards.** (Acute, Delayed, and Chronic): This material is highly toxic by inhalation (Sax 1984, p. 515).

**Signs and Symptoms of Exposure:** Contact may cause burns to skin and eyes (DOT 1984, Guide 29).

**Medical Conditions Generally Aggravated by Exposure:** Not Found

**Emergency and First Aid Procedures:** Move victim to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Remove and isolate contaminated clothing at site. In case of contact with material, immediately flush skin or eyes with running water for at least 15 minutes. Keep victim quiet and maintain normal body temperature (DOT 1984, Guide 29).

**SECTION VI -- USE INFORMATION**

Not Found

**BORON TRIFLUORIDE COMPOUND WITH  
METHYL ETHER (1:1)**

**SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE**  
(Steps to be Taken in Case Material is Released or Spilled)

Keep unnecessary people away and isolate hazard area. Stay upwind and keep out of low areas. Wear self-contained, positive-pressure breathing apparatus and full protective clothing. Shut off ignition sources. Do not touch spilled material. Use water spray to reduce vapors, but do not get water inside containers. For small spills, absorb with sand or other noncombustible absorbent material and place into containers. For large spills, dike far ahead of spill for later disposal (DOT 1984, Guide 29).

**COMMENTS**

Sources searched but no information found:

ACGIH 1983  
NIOSH/OSHA 1978  
Hawley 1981  
Weast 1979  
Merck 1983  
NFPA 1984  
Student 1981  
Weiss 1980  
CHRIS 1978  
Doull 1980  
Clayton and Clayton 1981-82  
Arena 1979  
Gosselin 1984  
Encyc Occupat Health and Safety 1983  
Buchel 1983  
Farm Chemicals Handbook 1984  
Hayes 1982  
Physicians' Desk Reference 1985  
Gilman 1985



EPA CHEMICAL PROFILE

INTERIM

Date: October 31, 1985

Revision: \_\_\_\_\_

CHEMICAL IDENTITY -- FLUOROACETYL CHLORIDE

CAS Registry Number: 359-06-8

Synonyms (NIOSH/RTECS 1983 Synonyms, Volume 1, p. 252): Acetyl Chloride, Fluoro-; TL 670

Chemical Formula:  $C_2H_2ClFO$

Molecular Weight: 96.49

SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

OSHA PEL: Not Found

ACGIH TLV: Not Found

IDLH: Not Found

Other Limits Recommended: Toxicity information:  $LC_{low}$  inhalation  
(guinea pig) 0.1 mg/liter/10 minutes (\*NIOSH/RTECS 1985)

SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

Boiling Point: Not Found

Specific Gravity ( $H_2O=1$ ): Not Found

Vapor Pressure (mmHg): Not Found

Melting Point: Not Found

Vapor Density (AIR=1): Not Found

Evaporation Rate (Butyl acetate=1): Not Found

Solubility in Water: Not Found

Appearance and Odor: Not Found

## FLUOROACETYL CHLORIDE

### SECTION III -- FIRE AND EXPLOSION HAZARD DATA

**Flash Point** (Method Used): Not Found

**Flammable Limits:**

LEL: Not Found

UEL: Not Found

**Extinguishing Methods:** (Non-Specific -- Chloroacetyl Chloride and Fluoroacetic Acid) Extinguish with dry chemical, carbon dioxide, water spray, fog, or foam (DOT 1984, Guide 59).

**Special Fire Fighting Procedures:** (Non-Specific -- Chloroacetyl Chloride and Fluoroacetic Acid) Spray cooling water on containers that are exposed to flames until well after fire is out. Move container from fire area if you can do so without risk. Do not get water in container, as material may react violently with water (DOT 1984, Guide 59).

**Unusual Fire and Explosion Hazards:** When heated to decomposition, it emits very toxic fumes of chlorine and fluorine-containing compounds (Sax 1984, p. 1430). (Non-Specific -- Chloroacetyl Chloride and Fluoroacetic Acid) Some of these materials may ignite combustibles (i.e., wood, paper, oil, etc.) or react violently with water (DOT 1984, Guide 59).

### SECTION IV -- REACTIVITY DATA

**Stability:** Unstable: Not Found

Stable: Not Found

**Conditions to Avoid:** Not Found

**Incompatibility** (Materials to Avoid): Not Found

**Hazardous Decomposition or Byproducts:** When heated to decomposition, it emits very toxic fumes of chlorine and fluorine-containing compounds (Sax 1984, p. 1430).

**Hazardous Polymerization:** May Occur: Not Found  
May Not Occur: Not Found

**Conditions to Avoid:** Not Found

## FLUOROACETYL CHLORIDE

### SECTION V -- HEALTH HAZARD DATA

**Routes of Entry:** Inhalation: Yes (Sax 1984, p. 1430)  
Skin: Not Found  
Ingestion: Yes (Non-Specific -- Chloroacetyl Chloride) (NFPA 1984, p. 49-29)

**Health Hazards** (Acute, Delayed, and Chronic): Highly toxic by inhalation (Sax 1984, p. 1430). (Non-Specific -- Chloroacetyl Chloride) Corrosive to skin and irritating to eyes (NFPA 1984, p. 49-29).

**Signs and Symptoms of Exposure:** Not Found

**Medical Conditions Generally Aggravated by Exposure:** Not Found

**Emergency and First Aid Procedures:** (Non-Specific -- Chloroacetyl Chloride and Fluoroacetic Acid) Move victim to fresh air; call emergency medical care. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In case of contact with material, immediately flush skin or eyes with running water for at least 15 minutes. Remove and isolate contaminated clothing and shoes at site. Keep victim quiet and maintain normal body temperature. Effects may be delayed; keep victim under observation (DOT 1984, Guide 59).

### SECTION VI -- USE INFORMATION

Not Found

### SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE (Steps to be Taken in Case Material is Released or Spilled)

(Non-Specific -- Chloroacetyl Chloride and Fluoroacetic Acid) Keep unnecessary people away; isolate hazard area and deny entry. Stay upwind; keep out of low areas. Wear self-contained, breathing apparatus (positive pressure if available) and full protective clothing. Do not touch spilled material; stop leak if you can do so without risk. Use water spray to reduce vapors (may react violently with water). Small spills: absorb with sand or other non-combustible absorbent material and place into containers for later disposal. Large spills: dike far ahead of spill for later disposal (DOT 1984, Guide 59).

FLUOROACETYL CHLORIDE

COMMENTS:

Sources searched but no information found:

Weast 1979  
Hawley 1981  
Hayes 1982  
DASE 1980  
ACGIH 1983  
NIOSH/OSHA 1978  
Merck 1983  
Gilman 1985  
Gosselin 1984  
Weiss 1980  
Clayton and Clayton 1981-82  
Farm Chemicals Handbook 1984  
Doull 1980  
Buchel 1983

EPA CHEMICAL PROFILE

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Date: October 31, 1985

Revision: \_\_\_\_\_

CHEMICAL IDENTITY -- ETHYLENE FLUOROHYDRIN

CAS Registry Number: 371-62-0

Synonyms (NIOSH/RTECS 1983 Synonyms, Volume 2, p. 252): Ethanol, 2-Fluoro-; beta-Fluoroethanol; 2-Fluoroethanol; TL 741

Chemical Formula:  $C_2H_5FO$

Molecular Weight: 64.07

SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

OSHA PEL: Not Found

ACGIH TLV: Not Found

IDLH: Not Found

Other Limits Recommended: Toxicity information:  $LC_{low}$  inhalation (rat) 0.14 mg/liter/4 hours (\*NIOSH/RTECS 1985)

SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

Boiling Point: 218.3°F, 103.5°C (Weast 1979, p. C-297)

Specific Gravity ( $H_2O=1$ ): 1.1040 at 20°C/4°C (Weast 1979, p. C-297)

Vapor Pressure (mmHg): Not Found

Melting Point: -15.61°F, -26.45°C (Weast 1979, p. C-297)

Vapor Density (AIR=1): Not Found

Evaporation Rate (Butyl acetate=1): Not Found

Solubility in Water: Miscible (Weast 1979, p. C-297)

Appearance and Odor: Liquid (Hayes 1983, p. 500)

ETHYLENE FLUOROHYDRIN

SECTION III -- FIRE AND EXPLOSION HAZARD DATA

**Flash Point** (Method Used): 31°C (Hayes 1982, p. 500)

**Flammable Limits:**

LEL: Not Found

UEL: Not Found

**Extinguishing Methods:** Not Found

**Special Fire Fighting Procedures:** Not Found

**Unusual Fire and Explosion Hazards:** Toxic fluoride fumes may be emitted in a fire (Sax 1984, p. 1437).

SECTION IV -- REACTIVITY DATA

**Stability: Unstable:** Not Found

**Stable:** Not Found

**Conditions to Avoid:** Not Found

**Incompatibility** (Materials to Avoid): Not Found

**Hazardous Decomposition or Byproducts:** When heated to decomposition, it emits very toxic fumes of fluorides (Sax 1984, p. 1437).

**Hazardous Polymerization:** May Occur: Not Found

May Not Occur: Not Found

**Conditions to Avoid:** Not Found

SECTION V -- HEALTH HAZARD DATA

**Routes of Entry: Inhalation:** Yes (Sax 1984, p. 1437)

**Skin:** Yes (Sax 1984, p. 1437)

**Ingestion:** Yes (Hayes 1982, p. 500)

**Health Hazards** (Acute, Delayed, and Chronic): Toxicity rating is the same as for fluoroacetate, super toxic. The probable oral lethal dose in humans is a taste (less than 7 drops) for a 70 kg (150 lb.) person (Gosselin 1984, p. II-198). The chemical is highly toxic when inhaled or absorbed through the skin (Sax 1984, p. 1437). Toxicity depends on its oxidation to fluoroacetate by tissue alcohol dehydrogenase (Hayes 1982, p. 500).

## ETHYLENE FLUOROHYDRIN

## SECTION V -- HEALTH HAZARD DATA (Continued)

**Signs and Symptoms of Exposure:** Symptoms include tremors, severe muscular weakness, nausea, headache, and slight swelling of the liver (Hayes 1982, p. 500). Delayed convulsant (Gosselin 1984, p. II-198).

**Medical Conditions Generally Aggravated by Exposure:** Not Found

**Emergency and First Aid Procedures:** Acute poisoning should be treated like poisoning by fluoroacetate. Ethylene fluorohydrin (2-fluoroethanol) is listed among the organic fluorine derivatives of fluoroacetic acid (Hayes 1982, p. 501). The emergency procedures for fluoroacetic acid are: move victim to fresh air; call emergency medical care. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In case of contact with material, immediately flush skin or eyes with running water for at least 15 minutes. Remove and isolate contaminated clothing and shoes at the site. Keep victim quiet and maintain normal body temperature. Effects may be delayed; keep victim under observation (DOT 1984, Guide 59).

## SECTION VI -- USE INFORMATION

Ethylene Fluorohydrin is used as a rodenticide (Hayes 1982, p. 500) insecticide (Gosselin 1984, p. III-193), and acaricide (Buchel 1983, p. 177). Not registered as a pesticide in the U.S. (USEPA/Active Ingredients 1985).

## SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE

(Steps to be Taken in Case Material is Released or Spilled)

Avoid inhalation and skin contact; wear proper respiratory protection and protective clothing (see Section V above). (Non-Specific -- Fluoroacetic Acid) Do not touch spilled material; stop leak if you can do so without risk. Use water spray to reduce vapors. Small spills: absorb with sand or other noncombustible absorbent material and place into containers for later disposal. Large spills: dike far ahead of spill for later disposal (DOT 1984, Guide 59).

## COMMENTS:

Sources searched but no information found:

Student 1981  
DASE 1980  
Hawley 1981  
NFPA 1984  
Weiss 1980  
Merck 1983  
CHRIS 1978  
Farm Chemicals Handbook 1984

EPA CHEMICAL PROFILE

INTERIM

Date: October 31, 1985

Revision: \_\_\_\_\_

CHEMICAL IDENTITY -- ERGOTAMINE TARTRATE

CAS Registry Number: 379-79-3

**Synonyms: (SANSS 1983 Synonyms)** Ergotamine Bitartrate; Gotamine Tartrate; Gynergen; Neo-ergotin; Ergotaman-3',6',18-Trione, 12'-Hydroxy-2'-Methyl-5'-(Phenylmethyl)-, (5'.alpha.)-, [R-(R\*,R\*)]-2,3-Dihydroxybutanedioate (2:1) (Salt); Ergam; Ergate; Ergomar; Etin; Exmigra; Rigetamin; Secagyn; Secupan; Ergotamine, Tartrate (2:1)(Salt); Component of Cafergot

**Chemical Formula:**  $C_{66}H_{70}N_{10}O_{10} \cdot C_4H_6O_6$

**Molecular Weight:** 1313.56

SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

OSHA PEL: Not Found

ACGIH TLV: Not Found

IDLH: Not Found

**Other Limits Recommended:** Toxicity information: LD<sub>low</sub> oral (rat, rabbit) 1 mg/kg (\*NIOSH/RTECS 1985)

SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

Boiling Point: Not Found

Specific Gravity (H<sub>2</sub>O=1): Not Found

Vapor Pressure (mmHg): Not Found

Melting Point: 397°F, 203°C, decomposes (Merck 1983, p. 529)

Vapor Density (AIR=1): Not Found

Evaporation Rate (Butyl acetate=1): Not Found



**ERGOTAMINE TARTRATE**

**SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS (Continued)**

**Solubility in Water:** 1 g/500 mL (Merck 1983, p. 529)

**Appearance and Odor:** Powder or liquid forms available as drugs (Gilman 1985, p. 938).

**SECTION III -- FIRE AND EXPLOSION HAZARD DATA**

**Flash Point (Method Used):** Not Found

**Flammable Limits:**

LEL: Not Found

UEL: Not Found

**Extinguishing Methods:** Not Found

**Special Fire Fighting Procedures:** Not Found

**Unusual Fire and Explosion Hazards:** Not Found

**SECTION IV -- REACTIVITY DATA**

**Stability: Unstable:** Not Found

**Stable:** Not Found

**Conditions to Avoid:** Not Found

**Incompatibility (Materials to Avoid):** Protect from light and heat (Merck 1983, p. 529)

**Hazardous Decomposition or Byproducts:** When heated to decomposition, it emits toxic fumes of nitrogen oxides (Sax 1984, p. 1295).

**Hazardous Polymerization: May Occur:** Not Found

**May Not Occur:** Not Found

**Conditions to Avoid:** Not Found

**SECTION V -- HEALTH HAZARD DATA**

**Routes of Entry: Inhalation:** Yes (Gilman 1985, p. 938)

**Skin:** Not Found

**Ingestion:** Yes (NIOSH/RTECS 1983, p. 209)

## ERGOTAMINE TARTRATE

### SECTION V -- HEALTH HAZARD DATA (Continued)

**Health Hazards** (Acute, Delayed, and Chronic): High oral toxicity and a convulsant in humans (Sax 1984, p. 1295).

**Signs and Symptoms of Exposure:** Nausea and vomiting occur in some patients after oral administration. Weakness in the legs is common and muscle pains in the extremities may occur. Numbness and tingling of the fingers and toes may also occur (Gilman 1985, p. 938).

**Medical Conditions Generally Aggravated by Exposure:** People with liver damage are at a greater risk (Gilman 1985, p. 937).

**Emergency and First Aid Procedures:** (Non-Specific -- Alkaloid, n.o.s.) Move victim to fresh air; call emergency medical care. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In case of contact with material, immediately flush skin or eyes with running water for at least 15 minutes. Speed in removing material from skin is of extreme importance. Remove and isolate contaminated clothing and shoes at the site. Keep victim quiet and maintain normal body temperature. Effects may be delayed; keep victim under observation (DOT 1984, Guide 55).

### SECTION VI -- USE INFORMATION

The major uses of the ergot alkaloids fall into two categories: applications in obstetrics and treatment of migraine headaches (Gilman 1985, p. 937).

### SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE (Steps to be Taken in Case Material is Released or Spilled)

(Non-Specific -- Alkaloid, n.o.s.) Keep unnecessary people away; isolate hazard area and deny entry. Stay upwind; keep out of low areas. Wear positive pressure breathing apparatus and special protective clothing. Do not touch spilled material; stop leak if you can do so without risk. Use water vapor to reduce vapors. Absorb spills with sand or other noncombustible absorbent material. Small dry spills: with clean shovel place material into clean, dry container and cover; move containers from spill area. For large spills, dike far ahead of spill for later disposal (DOT 1984, Guide 55).

## EPA CHEMICAL PROFILE

## INTERIM

Date: October 31, 1985

Revision: \_\_\_\_\_

## CHEMICAL IDENTITY -- ISODRIN

CAS Registry Number: 465-73-6

**Synonyms:** 1,4:5,8-Dimethanonaphthalene, 1,2,3,4,10,10-Hexachloro-1,4,4a,5,8,8a-Hexahydro-, endo,endo-; Compound 711; ENT 19,244; Experimental Insecticide 711; 1,2,3,4,10,10-Hexachloro-1,4,4a,5,8,8a-Hexahydro-1,4; 5,8-endo,endo-Dimethanonaphthalene; 1,2,3,4,10,10-Hexachloro-1,4,4a,5,8,8a-Hexahydro-endo,endo-1,4:5,8-Dimethanonaphthalene; 1,4:5,8-Dimethanonaphthalene, 1,2,3,4,10,10-Hexachloro-1,4,4a,5,8,8a-Hexahydro-, (1 alpha, 4 alpha, 4a beta, 5 beta, 8 beta, 8a beta)-; SD 3418

**Chemical Formula:**  $C_{12}H_8Cl_6$ **Molecular Weight:** 364.90

## SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

**OSHA PEL:** Not Found**ACGIH TLV:** Not Found**IDLH:** Not Found

**Other Limits Recommended:** Toxicity information:  $LD_{50}$  oral (rat) 7 mg/kg (\*NIOSH/RTECS 1985)

## SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

**Boiling Point:** Not Found**Specific Gravity ( $H_2O=1$ ):** Not Found**Vapor Pressure (mmHg):** Not Found**Melting Point:** 464-468°F, 240-242°C (Sax 1984, p. 1641)**Vapor Density (AIR=1):** Not Found**Evaporation Rate (Butyl acetate=1):** Not Found

## ISODRIN

## SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS (Continued)

**Solubility in Water:** Not Found

**Appearance and Odor:** Solid (\*Hawley 1977)

## SECTION III -- FIRE AND EXPLOSION HAZARD DATA

**Flash Point (Method Used):** Not Found

**Flammable Limits:**

LEL: Not Found

UEL: Not Found

**Extinguishing Methods:** Material is related to aldrin (\*Gosselin 1976). (Non-Specific -- Aldrin) Extinguish by using water spray, dry chemical, foam, or carbon dioxide. Use water to keep fire exposed containers cool (NFPA 1984, p. 49-13).

**Special Fire Fighting Procedures:** (Non-Specific -- Aldrin) Wear full protective clothing (NFPA 1984, p. 49-13) including positive pressure breathing apparatus. Move container from fire area if you can do so without risk. Fight fire from maximum distance. Dike fire control water for later disposal; do not scatter the material (DOT 1984, Guide 55).

**Unusual Fire and Explosion Hazards:** (Non-Specific -- Aldrin) This material may burn but may not ignite readily. Container may explode in heat of fire. Fire and runoff from fire control water may produce irritating or poisonous gases (DOT 1984, Guide 55).

## SECTION IV -- REACTIVITY DATA

**Stability: Unstable:** Yes (\*White-Stevens 1971)

**Stable:**

**Conditions to Avoid:** Reactions induced by light or acid  
(\*White-Stevens 1971)

**Incompatibility (Materials to Avoid):** Not Found

**Hazardous Decomposition or Byproducts:** Material is related to aldrin (\*Gosselin 1976). (Non-Specific -- Aldrin) When heated to decomposition it emits toxic fumes of chlorine (Sax 1984, p. 153).

**Hazardous Polymerization:** **May Occur:** Not Found  
**May Not Occur:** Not Found

**Conditions to Avoid:** Not Found

## ISODRIN

### SECTION V -- HEALTH HAZARD DATA

**Routes of Entry:** Inhalation: Yes (Non-Specific -- Aldrin)  
(Sax 1984, p. 153)  
Skin: Yes (Sax 1984, p. 1641)  
Ingestion: Yes (Sax 1984, p. 1641)

**Health Hazards (Acute, Delayed, and Chronic):** It is classified as extremely toxic. Probable oral lethal dose for humans is 5-50 mg/kg or between 7 drops and 1 teaspoonful for a 70 kg (150 lb.) person. It causes renal damage and hyperactivity of sympathetic nervous system (\*Gosselin 1976).

**Signs and Symptoms of Exposure:** Symptoms experienced are similar to poisoning by dieldrin and aldrin, including overall discomfort, headache, nausea, vomiting, dizziness, tremors, convulsions, rise in blood pressure, fever, disturbances in sleep and behavior, and rapid heartbeat. Death from respiratory arrest may occur in coma (\*Gosselin 1976, \*Merck 1976).

**Medical Conditions Generally Aggravated by Exposure:** Not Found

**Emergency and First Aid Procedures:** Procedures are similar to those for dieldrin and aldrin poisoning (\*Gosselin 1976). Move victim to fresh air; call emergency medical care. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In case of contact with material, immediately flush skin or eyes with running water for at least 15 minutes. Speed in removing material from skin is of extreme importance. Remove and isolate contaminated clothing and shoes at the site. Keep victim quiet and maintain normal body temperature. Effects may be delayed; keep victim under observation (DOT 1984, Guide 55).

### SECTION VI -- USE INFORMATION

No longer used as a pesticide (\*NIOSH/RTECS 1985).

### SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE

(Steps to be Taken in Case Material is Released or Spilled)

Material is related to aldrin (\*Gosselin 1976). (Non-Specific -- Aldrin) Stay upwind; keep out of low areas. Ventilate closed spaces before entering them. Wear positive pressure breathing apparatus and special protective clothing. Remove and isolate contaminated clothing at the site. Do not touch spilled material; stop leak if you can do it without risk. Use water spray to reduce vapors. Small spills: take up with sand or other noncombustible absorbent material and place into containers for later disposal. Small dry spills: with clean shovel place material into clean, dry containers and cover; move containers from spill area. Large spills: dike far ahead of spill for later disposal (DOT 1984, Guide 55).

EPA CHEMICAL PROFILE

INTERIM

Date: October 31, 1985

Revision: \_\_\_\_\_

CHEMICAL IDENTITY -- CHLORFENVINFOS

CAS Registry Number: 470-90-6

**Synonyms:** Supona; 2,4-Dichloro-alpha-(Chloromethylene)Benzyl Diethyl Phosphate; 2-Chloro-1-(2,4-Dichlorophenyl)Ethenyl Diethyl Ester Phosphoric Acid; 2-Chloro-1-(2,4-Dichlorophenyl)Vinyl Diethyl Phosphate; 4072; Benzyl Alcohol, 2,4-Dichloro-alpha-(Chloromethylene)-, Diethyl Phosphate; beta-2-Chloro-1-(2',4'-Dichlorophenyl)Vinyl Diethyl Phosphate; Birlan; Birlane; C8949; Chlofenvinphos; Chlorofenvinphos; Chlorphenvinfos; Chlorphenvinphos; Compund 4072; CVP; CVP (Pesticide); Dermaton; Diethyl 1-(2,4-Dichlorophenyl)-2-Chlorovinyl Phosphate; Diethyl 2-Chloro-1-(2,4-Dichlorophenyl)Vinyl Phosphate; ENT 24969; GC 4072; GS 4072; OMS 1328; Phosphoric Acid, 2-Chloro-1-(2,4-Dichlorophenyl)Ethenyl Diethyl Ester; Phosphoric Acid, 2-Chloro-1-(2,4-Dichlorophenyl)Vinyl Diethyl Ester; Sapecron; SD 4072; Shell 4072; Supone; Vinyphate

**Chemical Formula:**  $C_{12}H_{14}Cl_3O_4P$

**Molecular Weight:** 359.56

SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

OSHA PEL: Not Found

ACGIH TLV: Not Found

IDLH: Not Found

**Other Limits Recommended:** Toxicity information: LD<sub>50</sub> oral (rat) 10 mg/kg (\*NIOSH/RTECS 1985)

SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

**Boiling Point:** 333-338°F, 167-170°C at 0.5 mmHg (\*Worthing 1979)

**Specific Gravity (H<sub>2</sub>O=1):** 1.36 at 15.5°C/16.5°C (\*Worthing 1979)

**Vapor Pressure (mmHg):**  $4.0 \times 10^{-6}$  at 20°C (\*Worthing 1979)

**Melting Point:** -2 to -9°F; -19 to -23°C (\*Worthing 1979)

**CHLORFENVINFOS****SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS (Continued)**

**Vapor Density (AIR=1):** Not Found

**Evaporation Rate (Butyl acetate=1):** Not Found

**Solubility in Water:** 145 mg/liter at 23°C (\*Worthing 1979).

**Appearance and Odor:** Amber-colored liquid with mild chemical odor (\*Worthing 1979; \*Spencer 1973).

**SECTION III -- FIRE AND EXPLOSION HAZARD DATA**

**Flash Point (Method Used):** Not Found

**Flammable Limits:**

LEL: Not Found

UEL: Not Found

**Extinguishing Methods:** (Non-Specific -- Organophosphorus Pesticide, Liquid, n.o.s.) Small fires: dry chemical, carbon dioxide, water spray, or foam. Large fires: water spray, fog, or foam (DOT 1984, Guide 55).

**Special Fire Fighting Procedures:** (Non-Specific -- Organophosphorus Pesticide, Liquid, n.o.s.) Move container from fire area if you can do it without risk. Fight fire from maximum distance. Dike fire control water for later disposal; do not scatter the material. Wear positive pressure breathing apparatus and special protective clothing (DOT 1984, Guide 55).

**Unusual Fire and Explosion Hazards:** (Non-Specific -- Organophosphorus Pesticide, Liquid, n.o.s.) This material may burn but does not ignite readily. Container may explode in heat of fire. Fire and runoff from fire control water may produce irritating or poisonous gases (DOT 1984, Guide 55).

**SECTION IV -- REACTIVITY DATA**

**Stability: Unstable:**

**Stable:** Yes, when stored in glass or polyethylene lined containers (\*Worthing 1979)

**Conditions to Avoid:** Alkaline aqueous solutions (\*Merck 1976)

**Incompatibility (Materials to Avoid):** Iron, steel, and brass (\*Worthing 1979).

## CHLORFENVINFOS

### SECTION IV -- REACTIVITY DATA (Continued)

Hazardous Decomposition or Byproducts: Not Found

Hazardous Polymerization: May Occur: Not Found  
May Not Occur: Not Found

Conditions to Avoid: Not Found

### SECTION V -- HEALTH HAZARD DATA

Routes of Entry: Inhalation: Yes (Non-Specific -- Organophosphorus  
Pesticide, Liquid, n.o.s.) (DOT 1984,  
Guide 55)  
Skin: Yes (Hayes 1982, p. 396)  
Ingestion: Yes (Hayes 1982, pp. 396-97)

Health Hazards (Acute, Delayed, and Chronic): Acute: cholinesterase inhibitor which affects central nervous system. Severe illness or death possible (Hayes 1982, pp. 396-397). Convulsions or coma and death (\*Gosselin 1976).

Signs and Symptoms of Exposure: Symptoms typical of cholinesterase poisoning. Nausea is often first symptom, with vomiting, abdominal cramps, diarrhea, and excessive salivation. Headache, giddiness, weakness, tightness in chest, blurring of vision, pinpoint pupils, loss of muscle coordination, and difficulty breathing. Convulsions and coma precede death (\*Gosselin 1976).

Medical Conditions Generally Aggravated by Exposure: Not Found

Emergency and First Aid Procedures: (Non-Specific -- Organophosphorus Pesticide, Liquid, n.o.s.) Move victim to fresh air; call emergency medical care. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In case of contact with material, immediately flush skin or eyes with running water for at least 15 minutes. Speed in removing material from skin is of extreme importance. Remove and isolate contaminated clothing and shoes at the site. Keep victim quiet and maintain normal body temperature. Effects may be delayed; keep victim under observation (DOT 1984, Guide 55).



## CHLORFENVINFOS

### SECTION VI -- USE INFORMATION

Used for control of ticks, flies, lice, and mites on cattle and for blowfly, lice, ked, and itchmite on sheep (\*Farm Chemicals Handbook 1980). Controls fleas and mites on dog; do not use on cats. Used on organic wastes and breeding places of fly larvae, including dairy barns (\*Rossoff 1974; Hayes 1982, p. 396). Also used as a foliage insecticide for potatoes, rice, maize, and sugar cane. Used to control soil insects, i.e., rootflies, rootworms, and cutworms (\*Spencer 1973).

### SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE

(Steps to be Taken in Case Material is Released or Spilled)

(Non-Specific -- Organophosphorus Pesticide, Liquid, n.o.s.) In case of spill or leak, do not touch spilled material; stop leak if you can do it without risk. Use water spray to reduce vapors. Small spills: take up with sand or other non-combustible absorbent material and place into containers for later disposal. Large spills: dike far ahead of spill for later disposal. Keep unnecessary people away; isolate hazard area and deny entry. Stay upwind; keep out of low areas. Ventilate closed spaces before entering them. Wear positive pressure breathing apparatus and special protective clothing. Remove and isolate contaminated clothing at the site (DOT 1984, Guide 55).

EPA CHEMICAL PROFILE

INTERIM

Date: October 31, 1985

Revision: \_\_\_\_\_

CHEMICAL IDENTITY -- METHYLMERCURIC DICYANAMIDE

CAS Registry Number: 502-39-6

**Synonyms:** (Cyanoguanidino)Methylmercury; Agrosol; Cyano(Methylmercuri) Guanidine; Guanidine, Cyano(Methylmercurio)-; Guanidine, Cyano-, Methylmercury Deriv; Mercury, (3-Cyanoguanidino)Methyl-; Mercury, (Cyanoguanidinato)Methyl-; Mercury, (Cyanoguanidinato-N')Methyl-; Methyl Mercuric Dicyandiamide; Methylmercuric Cyanoguanidine; Methylmercuric Dicyanamide; MMD; Morsodren; Morton EP-227; Morton Soil Drench; Morton Soil-Drench-C; N-Cyano-N'-(Methylmercury)Guanidine; Pano-Drench; Pano-Drench 4; Panodrin A-13; Panogen; Panogen 15; Panogen 43; Panogen 8; Panogen PX; Panogen Turf Spray; Panogen (Old); Panospray 30; R 8; R 8 (Fungicide); MEMA; Methylmercuric Dicyandiamide; Methylmercury dicyandiamide; Panogen Turf Fungicide

**Chemical Formula:**  $C_3H_6HgN_4$

**Molecular Weight:** 298.72

SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

**OSHA PEL:** Air: TWA 0.01 mg/m<sup>3</sup>; ceiling concentration 0.04 mg/m<sup>3</sup> (NIOSH/RTECS 1983, Volume 2, p. 662)

**ACGIH TLV:** TWA 0.01 mg (Hg)/m<sup>3</sup>; STEL (ceiling) 0.03 mg (Hg)/m<sup>3</sup> (skin) (NIOSH/RTECS 1983, Volume 2, p. 662)

**IDLH:** Not Found

**Other Limits Recommended:** IDLH for organo (alkyl) mercury compounds is 10 mg/m<sup>3</sup> (NIOSH/OSHA 1978, p. 144). Toxicity information: LD<sub>50</sub> oral (mouse) 20 mg/kg (\*NIOSH/RTECS 1985)

SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

**Boiling Point:** Not Found

**Specific Gravity (H<sub>2</sub>O=1):** Not Found

**Vapor Pressure (mmHg):**  $6.5 \times 10^{-5}$  at 35°C (\*Martin and Worthing 1974)

**Melting Point:** 313°F, 156°C (\*Hawley 1981)

**METHYLMERCURIC DICYNAMIDE**

**SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS (Continued)**

**Vapor Density (AIR=1):** Not Found

**Evaporation Rate (Butyl acetate=1):** Not Found

**Solubility in Water:** 2.17 g/100 ml at room temperature (\*Martin and Worthing 1974); soluble (Hawley 1981, p. 295)

**Appearance and Odor:** Crystals (\*Hawley 1981)

**SECTION III -- FIRE AND EXPLOSION HAZARD DATA**

**Flash Point (Method Used):** Not Found

**Flammable Limits:**

LEL: Not Found

UEL: Not Found

**Extinguishing Methods:** (Non-Specific -- Mercury-Based Pesticide, n.o.s.) This material may burn but will not ignite readily. For small fires, use dry chemical, carbon dioxide, water spray, or foam. For large fires, use water spray, fog, or foam (DOT 1984, Guide 55).

**Special Fire Fighting Procedures:** (Non-Specific -- Mercury-Based Pesticide, n.o.s.) Fight fire from maximum distance. Dike fire control water for later disposal. Wear positive pressure breathing apparatus and special protective clothing (DOT 1984, Guide 55).

**Unusual Fire and Explosion Hazards:** (Non-Specific -- Mercury-Based Pesticide, n.o.s.) This material may burn but does not ignite readily. Container may explode in heat of fire. Fire and runoff from fire control water may produce irritating or poisonous gases (DOT 1984, Guide 55).

**SECTION IV -- REACTIVITY DATA**

**Stability:** Unstable:

Stable: Yes (\*Martin and Worthing 1974)

**Conditions to Avoid:** Not Found

**Incompatibility (Materials to Avoid):** Not Found

**Hazardous Decomposition or Byproducts:** When heated to decomposition, it emits very toxic fumes of mercury and nitrogen oxides (Sax 1984, p. 1868).

METHYLMERCURIC DICYNAMIDE

SECTION IV -- REACTIVITY DATA (Continued)

Hazardous Polymerization: May Occur: Not Found  
May Not Occur: Not Found

Conditions to Avoid: Not Found

SECTION V -- HEALTH HAZARD DATA

Routes of Entry: Inhalation: Yes (Gosselin 1984, p. II-137)  
Skin: Yes (Gosselin 1984, p. II-137)  
Ingestion: Yes (Sax 1984, p. 1868)

**Health Hazards** (Acute, Delayed, and Chronic): Methylmercuric dicyanamide is extremely toxic to humans. The probable lethal dose for humans is 5-50 mg/kg of body weight (between 7 drops and one teaspoon for a 150 lb. person) (\*Gosselin 1984). Humans may be poisoned by feeding on the flesh of animals which have ingested this fungicide (\*Clark 1981). Eating treated seeds may also cause poisoning. The poisoning may show delayed manifestations on the nervous system. Patients frequently become gradually worse after their illness is recognized and exposure is stopped (Hayes, 1982, p. 21). This compound is a strong skin irritant and produces blisters and other dermatitis (\*Gosselin 1976).

**Signs and Symptoms of Exposure:** Prolonged exposure to skin may produce blisters (\*Gosselin 1984). In the case of ingestion there is nausea and abdominal pain. Vomiting and diarrhea may occur. Burning or prickling of the lips, tongue, and extremities. The patient may be confused, hallucinate, be irritable, have disturbed sleep, lose muscular coordination and lose memory. Visual fields may narrow concentrically; emotional instability may occur as well as inability to concentrate, with stupor and coma (\*Rumack 1975 to Present).

**Medical Conditions Generally Aggravated by Exposure:** Not Found

**Emergency and First Aid Procedures:** (Non-Specific -- Mercury-Based Pesticide, n.o.s.) Move victim to fresh air; call emergency medical care. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In case of contact with material, immediately flush skin or eyes with running water for at least 15 minutes. Speed in removing material from skin is of extreme importance. Remove and isolate contaminated clothing and shoes at the site. Keep victim quiet and maintain normal body temperature. Effects may be delayed; keep victim under observation (DOT 1984, Guide 55).

## METHYLMERCURIC DICYANAMIDE

### SECTION VI -- USE INFORMATION

Fungicide; a seed, soil, and turf treatment (Buchel 1983, p. 249) especially for cereals, sorghum, sugar beets, cotton, and flax (Hayes 1982, p. 20). Not registered as a pesticide in the U.S. (USEPA/Pesticide Index 1985).

### SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE

(Steps to be Taken in Case Material is Released or Spilled)

(Non-Specific -- Mercury-Based Pesticide n.o.s.) Keep unnecessary people away; isolate hazard area and deny entry. Stay upwind; keep out of low areas. Ventilate closed spaces before entering. Wear positive pressure breathing apparatus and special protective clothing. Remove and isolate contaminated clothing at the site. Do not touch spilled material. Use water to reduce vapors. In event of spill or leak: take up with absorbent material and place in containers with covers. Small dry spill: with clean shovel place material into clean, dry container and cover; move containers from spill area. Dike far ahead of spill if large (DOT 1984, Guide 55).

EPA CHEMICAL PROFILE

INTERIM

Date: October 31, 1985

Revision: \_\_\_\_\_

CHEMICAL IDENTITY -- PYRIDINE, 4-AMINO-

CAS Registry Number: 504-24-5

Synonyms: 4-Aminopyridine; 4-AP; 4-Pyridinamine; 4-Pyridylamine; Amino-4 Pyridine; Avitrol; gamma-Aminopyridine; MI-W-3; p-Aminopyridine; Phillips 1861; Pyridine, 4-Amino-; VMI 10-3

Chemical Formula:  $C_5H_6N_2$

Molecular Weight: 94.13

SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

OSHA PEL: Not Found

ACGIH TLV: Not Found

IDLH: Not Found

Other Limits Recommended: Toxicity information:  $LD_{100}$  oral (man)  
0.59 mg/kg (\*NIOSH/RTECS 1985)

SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

Boiling Point: 524.3°F, 273.5°C (\*Hawley 1977)

Specific Gravity ( $H_2O=1$ ): Not Found

Vapor Pressure (mmHg): Not Found

Melting Point: 318.0°F, 158.9°C (\*Hawley 1977)

Vapor Density (AIR=1): Not Found

Evaporation Rate (Butyl acetate=1): Not Found

Solubility in Water: Moderately soluble (\*Farm Chemicals Handbook 1981)

Appearance and Odor: White crystalline material with no odor (\*Farm Chemicals Handbook 1981).

PYRIDINE, 4-AMINO-

SECTION III -- FIRE AND EXPLOSION HAZARD DATA

**Flash Point** (Method Used): Not Found

**Flammable Limits:**

LEL: Not Found

UEL: Not Found

**Extinguishing Methods:** The material may burn but will not ignite easily. To extinguish use dry chemical, carbon dioxide, water spray, fog, or foam.(DOT 1984, Guide 55).

**Special Fire Fighting Procedures:** Wear positive pressure self-contained breathing apparatus and special protective clothing. Move container from fire area if you can do so without risk. Fight fire from maximum distance possible. Control runoff water with dikes and prevent material from scattering (DOT 1984, Guide 55).

**Unusual Fire and Explosion Hazards:** Material may produce irritating or poisonous gases in fire. Runoff from fire control water may give off poisonous gases (DOT 1984, Guide 55).

SECTION IV -- REACTIVITY DATA

**Stability:** Unstable:

Stable: Yes (\*Farm Chemicals Handbook 1981)

**Conditions to Avoid:** Not Found

**Incompatibility** (Materials to Avoid): Not Found

**Hazardous Decomposition or Byproducts:** It may emit irritating or poisonous gases in fire conditions (DOT 1984, Guide 55).

**Hazardous Polymerization:** May Occur: Not Found

May Not Occur: Not Found

SECTION V -- HEALTH HAZARD DATA

**Routes of Entry:** Inhalation: Yes (\*DOT 1984)

Skin: Yes (\*DOT 1984)

Ingestion: Yes (Rumack 1975 to Present)

**Health Hazards** (Acute, Delayed, and Chronic): Material may be fatal if inhaled, swallowed or absorbed through skin. Contact may cause burns to skin and eyes (\*DOT 1984). Material affects neural transmission. In sufficient concentrations, material may cause metabolic acidosis, respiratory arrest, and cardiac arrhythmias (\*Rumack 1975 to Present).

**PYRIDINE, 4-AMINO-**

**SECTION V -- HEALTH HAZARD DATA (Continued)**

**Signs and Symptoms of Exposure:** Rapid onset of disagreeable taste, immediate burning of throat, and abdominal discomfort, in addition to weakness, dizziness, disorientation, and seizures may occur. Delayed symptoms of oral ingestion include elevated liver enzymes, and respiratory arrest (\*Rumack 1975 to Present).

**Medical Conditions Generally Aggravated by Exposure:** Not Found

**Emergency and First Aid Procedures:** Move victim to fresh air; call emergency medical care. If breathing is difficult, give oxygen. In case of contact with material, immediately flush skin or eyes with running water for at least fifteen minutes (\*DOT 1984).

**SECTION VI -- USE INFORMATION**

Material is used as an avicide (bird repellent), an intermediate and as a fixer in some textile dyes (\*Rumack 1975 to Present, \*Hawley 1977).

**SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE**

(Steps to be Taken in Case Material is Released or Spilled)

Keep unnecessary people away; isolate the hazardous area and deny entry. Stay upwind. Wear positive pressure breathing apparatus and special protective clothing. Do not touch spilled material; stop leak if possible without risk. Use water spray to reduce vapors. Small spills: absorb with sand or other noncombustible absorbent material and place into containers for later disposal. Small dry spills: with clean shovel place material into clean, dry container and cover; move containers from spill area. Large spills: dike far ahead of spill for later disposal (\*DOT 1984).



## EPA CHEMICAL PROFILE

### INTERIM

Date: October 31, 1985

Revision: \_\_\_\_\_

## CHEMICAL IDENTITY -- MUSTARD GAS

CAS Registry Number: 505-60-2

**Synonyms:** Sulfide, bis(2-Chloroethyl); 1,1'-Thiobis(2-Chloroethane); 1-Chloro-2-(beta-Chloroethylthio)Ethane; 2,2'-Dichlorodiethyl Sulfide; 2,2'-Dichlorodiethyl Sulphide; 2,2'-Dichloroethyl Sulfide; 2,2'-Dichloroethyl Sulphide; beta, beta'-Dichloroethyl Sulfide; beta, beta'-Dichloroethyl Sulphide; beta,beta-Dichlor-Ethyl-Sulphide; Bis(2-Chloroethyl) Sulfide; Bis(2-Chloroethyl) Sulphide; Bis(beta-Chloroethyl) Sulfide; Bis(beta-Chloroethyl) Sulphide; Di-2-Chloroethyl Sulfide; Di-2-Chloroethyl Sulphide; Distilled Mustard; Ethane, 1,1'-Thiobis(2-Chloro-; H; HD; Kampfstoff "Lost"; Mustard HD; Mustard Vapor; Mustard, Sulfur; S Mustard; S-Lost; S-Yperite; Schwefel-Lost; Sulfur Mustard; Sulfur Mustard Gas; Sulphur Mustard; Sulphur Mustard Gas; Yellow Cross Liquid; Yperite

**Chemical Formula:**  $C_4H_8Cl_2S$

**Molecular Weight:** 159.08

## SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

**OSHA PEL:** Not Found

**ACGIH TLV:** Not Found

**IDLH:** Not Found

**Other Limits Recommended:** Toxicity information:  $LC_{low}$  inhalation (human) 0.149 mg/liter for 10 minutes (\*NIOSH/RTECS 1985)

## SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

**Boiling Point:** 419-423°F, 215-217°C (\*Merck 1976)

**Specific Gravity ( $H_2O=1$ ):** 1.274 at 20°C/4°C (liquid) (\*Merck 1976)

**Vapor Pressure (mmHg):** 0.090 at 30°C (\*Merck 1976)

**Melting Point:** 55-57°F, 13-14°C (\*Merck 1976)

**Vapor Density (AIR=1):** 5.4 (\*Sax 1975)

## MUSTARD GAS

### SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

**Evaporation Rate** (Butyl acetate=1): Not Found

**Solubility in Water:** 0.68 g/liter at 25°C (\*IARC 1972-1985); very sparingly soluble in water (Merck 1983, p. 904).

**Appearance and Odor:** Colorless oily liquid (\*IARC 1972-1985) with a weak, sweet odor (\*Merck 1976) or garlic-like odor (U.S. Army 1975, p. 3-8).

### SECTION III -- FIRE AND EXPLOSION HAZARD DATA

**Flash Point** (Method Used): 221°F, 105°C (\*Sax 1975)

**Flammable Limits:**

LEL: Not Found

UEL: Not Found

**Extinguishing Methods:** Extinguish with water, foam, dry chemical, or carbon dioxide (\*Sax 1975).

**Special Fire Fighting Procedures:** Protective clothing and self-contained breathing apparatus required in presence of mustard gas (\*Sax 1975). Cool all affected containers with flooding quantities of water. Apply water from as far a distance as possible (Student 1981, p. 358).

**Unusual Fire and Explosion Hazards:** Can be ignited by large explosive charge. When heated to decomposition, emits highly toxic fumes of oxides of sulfur and chlorine containing compounds. Reacts with water or steam to produce toxic and corrosive fumes (\*Sax 1975). Containers may rupture violently in a fire (Student 1981, p. 358).

### SECTION IV -- REACTIVITY DATA

**Stability:** Unstable: Yes; hydrolyzed in aqueous solution (\*IARC 1972-1985)

Stable:

**Conditions to Avoid:** High heat; contact with acid or acid fumes (\*Sax 1984, p. 482).

**Incompatibility** (Materials to Avoid): Incompatible with bleaching powder (Sax 1984, p. 482). Reacts violently with oxidizing materials. Reacts with water or steam to produce toxic and corrosive fumes (\*Sax 1975).

## MUSTARD GAS

### SECTION IV -- REACTIVITY DATA (Continued)

**Hazardous Decomposition or Byproducts:** Emits highly toxic fumes of oxides of sulfur and chlorine containing compounds when heated to decomposition or on contact with acid or acid fumes (\*Sax 1974)

**Hazardous Polymerization:** May Occur: Not Found  
May Not Occur: Not Found

**Conditions to Avoid:** Not Found

### SECTION V -- HEALTH HAZARD DATA

**Routes of Entry:** Inhalation: Yes (\*Sax 1975)  
Skin: Yes (\*Sax 1975)  
Ingestion: Yes (\*Sax 1975)

**Health Hazards** (Acute, Delayed, and Chronic): The median lethal dosage is 1500 mg-minute/m<sup>3</sup> for inhalation and 10,000 mg-minute/m<sup>3</sup> for skin absorption (masked personnel). The median incapacitating dosage is 200 mg-minute/m<sup>3</sup> for eye injury and 2000 mg-minute/m<sup>3</sup> for skin absorption (masked personnel). Wet skin absorbs more material than dry skin (U.S. Army 1975, p. 3-8). May cause death or permanent injury after very short exposure to small quantities (\*Sax 1975). It is a blistering gas and is highly irritating to eyes, skin, and lungs. Pulmonary lesions are often fatal (Sax 1984, pp. 461-462). Permanent eye damage and severe respiratory impairment. It is a carcinogen (Merck 1983, p. 904).

**Signs and Symptoms of Exposure:** May cause conjunctivitis and blindness. In 1-12 hours there may be coughing, swollen eyelids, reddened skin, and severe itching. There may be swelling and destruction of tissue in the respiratory tract and exposed skin. Ingestion may cause nausea and vomiting (\*Merck 1976).

**Medical Conditions Generally Aggravated by Exposure:** Not Found

**Emergency and First Aid Procedures:** Remove patient from contaminated atmosphere as rapidly as possible. Irrigate exposed eyes with water for at least 15 minutes. Wash exposed areas of the skin twice with soap and water. Local lesions should be cleaned and treated similarly to burns with emollients (\*Rumack 1975 to Present).

## MUSTARD GAS

### SECTION VI -- USE INFORMATION

It has been used as a chemical warfare agent (\*IARC 1972-1985) and as a chemical intermediate. It is not produced commercially in the U.S. (\*SRI).

### SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE

(Steps to be Taken in Case Material is Released or Spilled)

To clean up a spill, cover with up to 15 percent calcium hypochloride. Place in container; neutralize after 12 hours if necessary (\*Rumack 1975 to Present). Keep sparks, flames, and other sources of ignition away. Keep material out of water sources and sewers. Attempt to stop leak if without hazard. Use water spray to knock down vapors. Avoid breathing vapors and bodily contact with the material. Keep upwind. Wear self-contained breathing apparatus and full protective clothing. Wash away any material which may have contacted the body with copious amounts of soap and water. Downwind evacuation must be considered (Student 1981, p. 358).

EPA CHEMICAL PROFILE

INTERIM

Date: October 31, 1985

Revision: \_\_\_\_\_

CHEMICAL IDENTITY -- POTASSIUM SILVER CYANIDE

CAS Registry Number: 506-61-6

**Synonyms:** Argentate(1-), bis(Cyano-C)-, Potassium; Argentate(1-), Dicyano-, Potassium; Argentates(I) (Sol), Dicyano-; Potassium Argentocyanide; Potassium bis(Cyano-C)Argentate(1-); Potassium Dicyanoargentate; Potassium Dicyanoargentate ( $\text{KAg}(\text{CN})_2$ ); Potassium Dicyanoargentate(1-); Potassium Dicyanoargentate(I); Potassium Silver Cyanide ( $\text{KAg}(\text{CN})_2$ ); Silver Potassium Cyanide [ $\text{AgK}(\text{CN})_2$ ]

**Chemical Formula:**  $\text{C}_2\text{AgN}_2 \cdot \text{K}$

**Molecular Weight:** 199.01

SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

OSHA PEL: Not Found

ACGIH TLV: Not Found

IDLH: Not Found

**Other Limits Recommended:** TWA 0.01 mg/m<sup>3</sup> as Ag (soluble silver salts) (\*ACGIH 1980); TWA 5.0 mg/m<sup>3</sup> as CN (skin; cyanides) (ACGIH 1985, p. 14). Toxicity information: LD<sub>50</sub> oral (rat) 21 mg/kg (\*NIOSH/RTECS 1985)

SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

Boiling Point: Not Found

Specific Gravity ( $\text{H}_2\text{O}=1$ ): 2.36 at 25°C (\*Hawley 1977)

Vapor Pressure (mmHg): Not Found

Melting Point: Not Found

Vapor Density (AIR=1): Not Found

Evaporation Rate (Butyl acetate=1): Not Found

**POTASSIUM SILVER CYANIDE**

**SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS (Continued)**

**Solubility in Water:** Soluble (\*Merck 1976)

**Appearance and Odor:** White crystals (\*Merck 1976)

**SECTION III -- FIRE AND EXPLOSION HAZARD DATA**

**Flash Point (Method Used):** Not Found

**Flammable Limits:**

LEL: Not Found

UEL: Not Found

**Extinguishing Methods:** (Non-Specific -- Cyanide, Inorganic, n.o.s.)

Use dry chemical, carbon dioxide, water spray, or foam for small fire, and water spray, fog, or foam for large fires. Move containers of this material away from fire area if this can be done without risk (DOT 1984, Guide 55).

**Special Fire Fighting Procedures:** (Non-Specific -- Cyanide, Inorganic, n.o.s.) Isolate hazard area and deny entry. Stay upwind; keep out of low areas. Ventilate closed spaces before entering them. Wear positive pressure breathing apparatus and special protective clothing. Fight fire from maximum distance. Dike fire control water for later disposal. Do not scatter the material (DOT 1984, Guide 55).

**Unusual Fire and Explosion Hazards:** When heated to decomposition, potassium silver cyanide emits very toxic fumes of cyanide and nitrogen oxides (Sax 1984, p. 2282).

**SECTION IV -- REACTIVITY DATA**

**Stability: Unstable:** Not Found

**Stable:** Not Found

**Conditions to Avoid:** Light (\*Merck 1976)

**Incompatibility (Materials to Avoid):** Not Found

**Hazardous Decomposition or Byproducts:** When heated to decomposition, potassium silver cyanide emits very toxic fumes of cyanide and nitrogen oxides (Sax 1984, p. 2282).

**Hazardous Polymerization: May Occur:** Not Found

**May Not Occur:** Not Found

**Conditions to Avoid:** Not Found

## POTASSIUM SILVER CYANIDE

### SECTION V -- HEALTH HAZARD DATA

**Routes of Entry:** Inhalation: Yes (\*Rumack 1975 to Present)  
Skin: Yes (\*Rumack 1975 to Present)  
Ingestion: Yes (\*Rumack 1975 to Present)

**Health Hazards (Acute, Delayed, and Chronic):** The primary health hazard is as a cyanide (\*Gosselin 1976). (Non-specific -- Cyanide, Inorganic, n.o.s.). It is poisonous and may be fatal if inhaled, swallowed or absorbed through the skin. Fire may produce irritating or poisonous gases (DOT 1984, Guide 55).

**Signs and Symptoms of Exposure:** As a cyanide, massive doses may produce, without warning, sudden loss of consciousness and prompt death from respiratory arrest. Smaller but still lethal doses result in illness that may be prolonged for 1 or more hours. Other symptoms may include numbness in throat, salivation, nausea, anxiety, dizziness, irregular breathing, odor of bitter almonds may be noted on breath, blood pressure may rise, slowing of the heart beat, sensation of constriction in the chest, unconsciousness followed by violent convulsions and paralysis (\*Gosselin 1976).

**Medical Conditions Generally Aggravated by Exposure:** Not Found

**Emergency and First Aid Procedures:** (Non-Specific -- Cyanide, Inorganic, n.o.s.) Move victim to fresh air; call emergency medical care. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In case of contact with material, immediately flush skin or eyes with running water for at least 15 minutes. Speed in removing material from skin is of extreme importance. Remove and isolate contaminated clothing and shoes at the site. Keep victim quiet and maintain normal body temperature. Effects may be delayed; keep victim under observation (DOT 1984, Guide 55).

### SECTION VI -- USE INFORMATION

Potassium silver cyanide is used in silver plating, as a bactericide (\*Merck 1976), and in the manufacture of antiseptics (\*Hawley 1977). Not registered as a pesticide in the U.S. (USEPA/Active Ingredients 1985).

## POTASSIUM SILVER CYANIDE

### SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE

(Steps to be Taken in Case Material is Released or Spilled)

Avoid inhalation or skin contact (see Section V above). (Non-Specific -- Cyanide, Inorganic, n.o.s.) Wear positive pressure breathing apparatus and protective clothing. Do not touch spilled materials; stop leak if you can do so without risk. Use water spray to reduce vapors. Small spills: absorb with sand or other noncombustible absorbent material and place into containers for later disposal. Small dry spills: with clean shovel place material into clean, dry container and cover; move containers from spill area. Large spills: dike far ahead of spill for later disposal (DOT 1984, Guide 55).



EPA CHEMICAL PROFILE

INTERIM

Date: October 31, 1985

Revision: \_\_\_\_\_

CHEMICAL IDENTITY -- CYANOGEN BROMIDE

CAS Registry Number: 506-68-3

Synonyms: Bromine Cyanide; Bromocyan; Bromocyanide; Bromocyanogen; Campilit; Cyanobromide; Cyanogen Monobromide; TL 822

Chemical Formula: CBrN

Molecular Weight: 105.93

SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

OSHA PEL: Not Found

ACGIH TLV: Not Found

IDLH: Not Found

Other Limits Recommended: Suggested TLV less than 0.5 ppm (\*Patty 1963). Toxicity information: LC<sub>low</sub> inhalation (human)  
0.398 mg/liter/10 minutes (\*NIOSH/RTECS 1985)

SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

Boiling Point: 142°F, 61.4°C (\*Weast 1979)

Specific Gravity (H<sub>2</sub>O=1): 2.015 at 20°C/4°C (\*Merck 1976)

Vapor Pressure (mmHg): 92 at 20°C (\*Patty 1963)

Melting Point: 126°F, 52°C (\*Merck 1976)

Vapor Density (AIR=1): 3.62 (\*Patty 1963)

Evaporation Rate (Butyl acetate=1): Not Found

Solubility in Water: Soluble (\*Weast 1979)

Appearance and Odor: Colorless to white cubes or needle-like crystals with a penetrating odor (\*Merck 1976; \*Sax 1979; \*NFPA 1978; \*Patty 1963)

## CYANOGEN BROMIDE

### SECTION III -- FIRE AND EXPLOSION HAZARD DATA

**Flash Point** (Method Used): Not Found

**Flammable Limits:** Noncombustible (NFPA 1978, p. 49-34)

**LEL:** Not Found

**UEL:** Not Found

**Extinguishing Methods:** Extinguish fire using agent suitable for type of surrounding fire. Material itself does not burn or burns with difficulty. Use foam, carbon dioxide, or dry chemical. Cool all affected containers with flooding quantities of water. Do not use water on material itself. If large quantities of combustibles are involved, use water in flooding quantities as spray and fog. Use water spray to absorb vapors. Keep material out of water sources and sewers. Use water spray to knock down vapors (Student 1981, p. 158).

**Special Fire Fighting Procedures:** Wear full protective clothing. Avoid direct water contact as it will cause cyanogen bromide to decompose, releasing toxic gases (\*NFPA 1978). Avoid breathing vapors or dusts; keep upwind; wear self-contained breathing apparatus (Student 1981, p. 158).

**Unusual Fire and Explosion Hazards:** Cyanogen bromide is not combustible itself, but impure cyanogen bromide decomposes rapidly and tends to explode (\*Merck 1976). A violent reaction may take place on contact with large quantities of acid (\*NFPA 1978). Vapors are highly irritating (\*Merck 1976).

### SECTION IV -- REACTIVITY DATA

**Stability:** **Unstable:** Yes, impure material decomposes rapidly and tends to explode (\*Merck 1976)

**Stable:**

**Conditions to Avoid:** Avoid physical damage, contact with acids or water, and store away from a location where water may be needed for fire control (\*NFPA 1978).

**Incompatibility** (Materials to Avoid): Water, acids (\*NFPA 1978)

**Hazardous Decomposition or Byproducts:** When material is heated to decomposition, it emits very toxic fumes of cyanide and bromide (Sax 1984, p. 825).

## CYANOGEN BROMIDE

### SECTION IV -- REACTIVITY DATA (Continued)

Hazardous Polymerization: May Occur: Not Found  
May Not Occur: Not Found

Conditions to Avoid: Not Found

### SECTION V -- HEALTH HAZARD DATA

Routes of Entry: Inhalation: Yes (\*NIOSH 1979)  
Skin: Yes (\*Rumack 1975 to Present)  
Ingestion: Yes (\*Rumack 1975 to Present)

**Health Hazards** (Acute, Delayed, and Chronic): Super toxic; probable oral lethal dose in humans is less than 5 mg/kg or a taste (less than 7 drops) for a 70 kg (150 lb.) person (\*Gosselin 1976). Vapors are highly irritant and very poisonous (\*Merck 1976).

**Signs and Symptoms of Exposure:** Cyanogen bromide's toxic action resembles that of hydrocyanic acid; it has a pronounced irritant effect and high concentrations may cause pulmonary edema (\*Encyc Occupat Health and Safety 1971). High concentrations produce excessive respiration (causing increased uptake of cyanide), then labored breathing, paralysis, unconsciousness, convulsions and respiratory arrest. Headache, dizziness, nausea, and vomiting may occur with lesser concentrations. Chronic exposure may cause fatigue and weakness (\*Merck 1976). Patients may experience confusion, anxiety, an initial rise in blood pressure with a decreased heart beat followed by an increased heart beat; cyanosis is not a consistent finding, in fact, the patient may be reddish. An odor of bitter almonds on the patient's breath may be present (\*Rumack 1975 to Present).

**Medical Conditions Generally Aggravated by Exposure:** Individuals with chronic diseases of the kidneys, respiratory tract, skin, or thyroid are at greater risk of developing toxic cyanide effects (\*Encyc Occupat Health and Safety 1983).

**Emergency and First Aid Procedures:** Move victim to fresh air; call emergency medical care. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In case of contact with material, immediately flush skin or eyes with running water for at least 15 minutes. Speed in removing material from skin is of extreme importance. Remove and isolate contaminated clothing and shoes at the site. Keep victim quiet and maintain normal body temperature. Effects may be delayed; keep victim under observation (DOT 1984, Guide 55).

## CYANOGEN BROMIDE

### SECTION VI -- USE INFORMATION

Cyanogen bromide is used in organic synthesis, as a fumigant, a pesticide, in cellulose technology, and in gold-extraction (\*Patty 1963). Not registered as a pesticide in the U.S. (USEPA/Active Ingredients 1985).

### SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE

(Steps to be Taken in Case Material is Released or Spilled)

Protective clothing including impervious hand protection should be worn (\*Encyc Occupat Health and Safety 1971). Wear positive pressure breathing apparatus. Do not touch spilled material; stop leak if you can do it without risk. Use water spray to reduce vapors. Small spills: take up with sand or other noncombustible absorbent material and place into containers for later disposal. Large spills: dike far ahead of spill for later disposal (DOT 1984, Guide 55).

## EPA CHEMICAL PROFILE

### INTERIM

Date: October 31, 1985

Revision: \_\_\_\_\_

### CHEMICAL IDENTITY -- CYANOGEN IODIDE

CAS Registry Number: 506-78-5

Synonyms: (NIOSH/RTECS 1983 Synonyms, Volume 2, p. 545): Iodine  
Cyanide; Jodcyan

Chemical Formula: CIN

Molecular Weight: 152.92

### SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

OSHA PEL: Not Found

ACGIH TLV: TWA 5.0 mg (cyanide)/m<sup>3</sup> (skin) (ACGIH 1983, p. 16)

IDLH: Not Found

Other Limits Recommended: Toxicity information: LD<sub>low</sub> oral (cat) 18  
mg/kg (\*NIOSH/RTECS 1985)

### SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

Boiling Point: Not Found

Specific Gravity (H<sub>2</sub>O=1): 2.84 (Hawley 1981, p. 295)

Vapor Pressure (mmHg): 1 at 25.2°C (Sax 1984, p. 826)

Melting Point: 295.7°F, 146.5°C (Hawley 1981, p. 295)

Vapor Density (AIR=1): Not Found

Evaporation Rate (Butyl acetate=1): Not Found

Solubility in Water: Slightly (Weast 1980, p. C-259)

Appearance and Odor: White needles with a very pungent odor (Merck  
1983, p. 385).

## CYANOGEN IODIDE

### SECTION III -- FIRE AND EXPLOSION HAZARD DATA

**Flash Point** (Method Used): Not Found

**Flammable Limits:**

LEL: Not Found

UEL: Not Found

**Extinguishing Methods:** (Non-Specific -- Cyanide or Cyanide Mixture, Dry) Small fires: dry chemical, carbon dioxide, water spray, or foam. Large fires: water spray, fog, or foam. Move container from fire area if you can do so without risk. Fight fire from maximum distance. Dike fire control water for later disposal; do not scatter the material (DOT 1984, Guide 55).

**Special Fire Fighting Procedures:** (Non-Specific -- Cyanide or Cyanide Mixture, Dry) Keep unnecessary people away; isolate hazard area and deny entry. Stay upwind; keep out of low areas. Ventilate closed spaces before entering them. Wear positive pressure breathing apparatus and special protective clothing. Remove and isolate contaminated clothing at the site (DOT 1984, Guide 55).

**Unusual Fire and Explosion Hazards:** When heated to decomposition, it emits very toxic fumes of nitrogen oxides, cyanide, and iodide (Sax 1984, p. 826).

### SECTION IV -- REACTIVITY DATA

**Stability:** Unstable: Not Found

Stable: Not Found

**Conditions to Avoid:** Not Found

**Incompatibility** (Materials to Avoid): Phosphorus (Sax 1984, p. 826)

**Hazardous Decomposition or Byproducts:** When heated to decomposition, it emits very toxic fumes of nitrogen oxides, cyanide, and iodide (Sax 1984, p. 826).

**Hazardous Polymerization:** May Occur: Not Found

May Not Occur: Not Found

**Conditions to Avoid:** Not Found

## CYANOGEN IODIDE

## SECTION V -- HEALTH HAZARD DATA

**Routes of Entry:** **Inhalation:** No (Merck 1983, p. 385)  
**Skin:** Yes (Sax 1984, p. 826, p. 822)  
**Ingestion:** Yes (Sax 1984, p. 826, p. 822)

**Health Hazards** (Acute, Delayed, and Chronic): Causes convulsions, paralysis and death from respiratory failure (Merck 1983, p. 385). Highly toxic; strong irritant to eyes and skin (Hawley 1981, p. 295). (Non-Specific -- Cyanide or Cyanide Mixture, Dry): Poisonous, may be fatal if swallowed or absorbed through skin. Contact may cause burns to the skin and eyes. Fire may produce irritating or poisonous gases (DOT 1984, Guide 55).

**Signs and Symptoms of Exposure:** Can cause death due to respiratory failure (Merck 1983, p. 385). Health effects are similar to cyanides and iodides (Sax 1984, p. 826). Upon ingestion, a bitter, acrid, burning taste is sometimes noted. Other symptoms are anxiety, confusion, dizziness, giddiness, rapid and difficult breathing, palpitations, tightness in chest, unconsciousness, violent convulsions and death (Gosselin 1984, p. III-127).

**Medical Conditions Generally Aggravated by Exposure:** Not Found

**Emergency and First Aid Procedures:** (Non-Specific -- Cyanide or Cyanide Mixture, Dry) Move victim to fresh air; call emergency medical care. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In case of contact with material, immediately flush skin or eyes with running water for at least 15 minutes. Speed in removing material from skin is of extreme importance. Remove and isolate contaminated clothing and shoes at the site. Keep victim quiet and maintain normal body temperature. Effects may be delayed; keep victim under observation (DOT 1984, Guide 55).

## SECTION VI -- USE INFORMATION

Taxidermists' preservatives (Hawley 1981, p. 295). Generally for destroying all lower forms of life (Merck 1983, p. 385).

## CYANOGEN IODIDE

### SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE

(Steps to be Taken in Case Material is Released or Spilled)

(Non-Specific -- Cyanide or Cyanide Mixture, Dry) Wear positive pressure breathing apparatus and special protective clothing. Do not touch spilled material; stop leak if you can do so without risk. Use water spray to reduce vapors. Small spills: absorb with sand or other noncombustible absorbent material and place into containers for later disposal. Small dry spills: with clean shovel, place material into clean, dry container and cover; move containers from spill area. Large spills: dike far ahead of spill for later disposal (DOT 1984, Guide 55).

### COMMENTS

Sources searched but no information found:

NIOSH/OSHA 1978

NFPA 1984

Student 1981

Weiss 1980

CHRIS 1978

Doull 1980

Clayton and Clayton 1981-82

Arena 1979

Encyc Occupat Health and Safety 1983

Buchel 1983

Farm Chemicals Handbook 1984

Hayes 1982



EPA CHEMICAL PROFILE

INTERIM

Date: October 31, 1985

Revision: \_\_\_\_\_

CHEMICAL IDENTITY -- TETRANITROMETHANE

CAS Registry Number: 509-14-8

Synonyms: Methane, Tetranitro; NCI-C55947; Tetan; TNM

Chemical Formula:  $\text{CN}_4\text{O}_8$

Molecular Weight: 196.04

SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

OSHA PEL: TWA 1 ppm (\*NIOSH/RTECS 1985)

ACGIH TLV: 1 ppm, 8 mg/m<sup>3</sup> (\*ACGIH 1980)

IDLH: 5 ppm (NIOSH/OSHA 1978, p. 178)

Other Limits Recommended: Not Found

SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

Boiling Point: 259°F, 126°C (\*Merck 1976)

Specific Gravity ( $\text{H}_2\text{O}=1$ ): 1.6380 at 20°C/4°C (\*Weast 1979)

Vapor Pressure (mmHg): 13 at 25°C (\*Patty 1963)

Melting Point: 57.6°F, 14.2°C (\*Weast 1979)

Vapor Density (AIR=1): 6.8 (\*Patty 1963)

Evaporation Rate (Butyl acetate=1): Not Found

Solubility in Water: Insoluble (\*Weast 1979)

Appearance and Odor: Pale yellow liquid (\*Merck 1976) or colorless oily fluid with acrid biting odor (\*Patty 1963), causes tears (NIOSH/OSHA 1978, p. 178).

## TETRANITROMETHANE

## SECTION III -- FIRE AND EXPLOSION HAZARD DATA

**Flash Point (Method Used):** Not Found

**Flammable Limits:** Non-combustible (NIOSH/OSHA 1978, p. 178)

**LEL:** Not Found

**UEL:** Not Found

**Extinguishing Methods:** Extinguish small fires with water only, no dry chemicals or carbon dioxide. For large fires, flood the fire area with water (DOT 1984, Guide 47).

**Special Fire Fighting Procedures:** Do not move cargo or vehicle if cargo has been exposed to heat. Cool containers that are exposed to flames with water from the side until well after fire is out. For massive fire, use unmanned hose holder or monitor nozzles; if this is impossible, withdraw from area and let fire burn (DOT 1984, Guide 47).

**Unusual Fire and Explosion Hazards:** Spontaneous chemical reaction may produce fire. Material is a strong oxidizer. The potential for explosion is severe, especially when exposed to heat or to powerful oxidizing or reducing agents; or when shocked or heated (\*Sax 1975). It is more easily detonated than TNT (\*Patty 1963). Impurities can also cause explosion (\*Merck 1976). The material is highly sensitive; hydrocarbons exposed to it form exceedingly sensitive explosives (\*NFPA 1978).

## SECTION IV -- REACTIVITY DATA

**Stability:** Unstable: Yes (\*Sax 1975)

**Stable:**

**Conditions to Avoid:** Impurities, shock, heat, and reducing agents (\*Sax 1975)

**Incompatibility (Materials to Avoid):** Hydrocarbons, aluminum, toluene, cotton, aromatic nitro compounds (Sax 1984, p. 2550); alkalis, metals (NIOSH/OSHA 1978, p. 178); and rubber (Merck 1983, p. 1321).

**Hazardous Decomposition or Byproducts:** When heated to decomposition, it emits highly toxic fumes of oxides of nitrogen. Shock will explode it (\*Sax 1975).

**Hazardous Polymerization:** May Occur: Not Found

**May Not Occur:** Not Found

**Conditions to Avoid:** Not Found

## TETRANITROMETHANE

### SECTION V -- HEALTH HAZARD DATA

**Routes of Entry:** Inhalation: Yes (\*Patty 1963)  
Skin: Yes (\*Rumack 1975 to Present)  
Ingestion: Yes (\*Patty 1963)

**Health Hazards** (Acute, Delayed, and Chronic): Acute effects include irritation of the eyes and respiratory passages and mild burns to the skin (\*Sax 1975). After more prolonged inhalation, headache and respiratory distress may occur (\*Patty 1963). After prolonged exposure, central nervous system, heart, liver, and kidney damage can occur as well as pulmonary edema (\*ACGIH 1980; \*Sax 1975).

**Signs and Symptoms of Exposure:** Symptoms include burning eyes, skin, and mucous membranes (\*Sax 1975); headache, difficulty in breathing, and dizziness. Skin contact results in bluish discoloration of skin and mucous membranes (cyanosis), and skin burns (NIOSH/OSHA 1978, p. 179). Chronic signs and symptoms included weariness, and pneumonia (\*ACGIH 1980).

**Medical Conditions Generally Aggravated by Exposure:** Not Found

**Emergency and First Aid Procedures:** Exposed skin should be washed twice with soap and water. Flush eyes with water at least 15 minutes (\*Rumack 1975 to Present).

### SECTION VI -- USE INFORMATION

It is proposed as an irritant war gas (\*Merck 1976). It is used as an oxidizing agent in rocket propellants; explosives; diesel fuel additives; and a reagent for detecting double bonds (\*SRI).

### SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE (Steps to be Taken in Case Material is Released or Spilled)

Remove all ignition sources. Ventilate area of spill or leak. Collect for reclamation or absorb in vermiculite, dry sand, earth or a similar material. Avoid shock and friction if liquid spills on combustible material such as wood, or paper (\*NIOSH/OSHA 1981). Use water spray to reduce vapors. Flush area with flooding amounts of water and dike spill for later disposal. Keep unnecessary people away; isolate hazard area and deny entry. Stay upwind; keep out of low areas. Wear positive pressure, self-contained breathing apparatus and full protective clothing (DOT 1984, Guide 47).

EPA CHEMICAL PROFILE

INTERIM

Date: October 31, 1985

Revision: \_\_\_\_\_

CHEMICAL IDENTITY -- DITHIAZANINE IODIDE

CAS Registry Number: 514-73-8

Synonyms (NIOSH/RTECS 1983 Synonyms, Volume 1, p. 664): Benzothiazolium, 3-Ethyl-2-(5-(3-Ethyl-2-Benzothiazolinylidene)-1,3-Pentadienyl)-, Iodide; Abminthic; Anelmid; Delvex; 3,3'-Diethylpentamethinethiacyanine Iodide; Dilombrin; 3,3'-Diethylthiadicarbocyanine Iodide; L-01748; Omni-Passin; Partel; Telmid; Vercidon; 3-Ethyl-2-(5-(3-Ethyl-2-Benzothiazolylydene)-1,3-Pentadienyl)benzothiazolium Iodide; Anguifugan; Dejo; Deselmine; Dizan; Nectocyd; Telmicid (Merck 1983, p. 492)

Chemical Formula:  $C_{23}H_{24}N_2S_2I$

Molecular Weight: 519.51

SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

OSHA PEL: Not Found

ACGIH TLV: Not Found

IDLH: Not Found

Other Limits Recommended: Toxicity information:  $LD_{50}$  oral (mouse)  
20 mg/kg (\*NIOSH/RTECS 1985)

SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

Boiling Point: Not Found

Specific Gravity ( $H_2O=1$ ): Not Found

Vapor Pressure (mmHg): Not Found

Melting Point: Decomposes at 248°C (Merck 1983, p. 492)

Vapor Density (AIR=1): Not Found

Evaporation Rate (Butyl acetate=1): Not Found

## DITHIAZANINE IODIDE

### SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS (Continued)

**Solubility in Water:** Insoluble (Merck 1983, p. 492)

**Appearance and Odor:** Green, needle-like crystals (Merck 1983, p. 492).

### SECTION III -- FIRE AND EXPLOSION HAZARD DATA

**Flash Point (Method Used):** Not Found

**Flammable Limits:**

LEL: Not Found

UEL: Not Found

**Extinguishing Methods:** (Non-Specific -- Pesticide, Solid, n.o.s.)

Small fires: dry chemical, carbon dioxide, water spray or foam. Large fires: water spray, fog, or foam. Move container from fire area if you can do it without risk (DOT 1984, Guide 53).

**Special Fire Fighting Procedures:** (Non-Specific -- Pesticide, Solid, n.o.s.) This material may burn but does not ignite readily. Keep unnecessary people away; isolate hazard area and deny entry. Stay upwind; keep out of low areas. Wear self-contained, positive pressure if available, breathing apparatus and full protective clothing (DOT 1984, Guide 53).

**Unusual Fire and Explosion Hazards:** When heated to decomposition, it emits toxic fumes of iodine, sulfur oxides, and nitrogen oxides (Sax 1984, p. 1024).

### SECTION IV -- REACTIVITY DATA

**Stability: Unstable:** Not Found

**Stable:** Not Found

**Conditions to Avoid:** Not Found

**Incompatibility (Materials to Avoid):** Not Found

**Hazardous Decomposition or Byproducts:** When heated to decomposition, it emits toxic fumes of iodine, sulfur oxides, and nitrogen oxides (Sax 1984, p. 1024).

**Hazardous Polymerization: May Occur:** Not Found

**May Not Occur:** Not Found

**Conditions to Avoid:** Not Found

## DITHIAZANINE IODIDE

### SECTION V -- HEALTH HAZARD DATA

Routes of Entry: Inhalation: Not Found  
Skin: Not Found  
Ingestion: Yes (Sax 1984, p. 1024)

Health Hazards (Acute, Delayed, and Chronic): Highly toxic by mouth (Sax 1984, p. 1024). (Non-Specific -- Pesticide, Solid, n.o.s.)  
Poisonous if swallowed, or if dust is inhaled (DOT 1984, Guide 53).

Signs and Symptoms of Exposure: Not Found

Medical Conditions Generally Aggravated by Exposure: Not Found

Emergency and First Aid Procedures: (Non-Specific -- Pesticide, Solid, n.o.s.) Move victim to fresh air; call emergency medical care. Remove and isolate contaminated clothing and shoes at the site. In case of contact with material, immediately flush skin or eyes with running water for at least 15 minutes (DOT 1984, Guide 53).

### SECTION VI -- USE INFORMATION

Veterinary anthelmintic, sensitizer for photographic emulsions (Merck 1983, p. 492) and for insecticides (Farm Chemicals Handbook 1984, p. C-85).  
Not registered as a pesticide in the U.S. (USEPA/Active Ingredients 1985).

### SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE

(Steps to be Taken in Case Material is Released or Spilled)

(Non-Specific -- Pesticide, Solid, n.o.s.) Do not touch spilled material; stop leak if you can do so without risk. Small spills: absorb with sand or other non-combustible absorbent material and place into containers for later disposal. Small dry spills: with clean shovel place material into clean, dry container and cover; move containers from spill area. Large spills: dike far ahead of spill for later disposal (DOT 1984, Guide 53).

### COMMENTS:

Sources searched but no information found:

Weast 1979  
Hawley 1981  
ACGIH 1984  
NIOSH/OSHA 1978  
Weiss 1980  
Gosselin 1984  
Hayes 1982  
Buchel 1983  
Encyc Occupat Health and Safety 1983

EPA CHEMICAL PROFILE

INTERIM

Date: October 31, 1985

Revision: \_\_\_\_\_

CHEMICAL IDENTITY -- BIS(CHLOROMETHYL) KETONE

CAS Registry Number: 534-07-6

Synonyms: (NIOSH/RTECS 1983 Synonyms, Volume 3, p. 325) 2-Propanone, 1,3-Dichloro-; sym-Dichloroacetone; alpha,alpha'-Dichloroacetone; alpha,gamma-Dichloroacetone; 1,3-Dichloroacetone; 1,3-Dichloro-2-Propanone

Chemical Formula:  $C_3H_4Cl_2O$

Molecular Weight: 126.97

SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

OSHA PEL: Not Found

ACGIH TLV: Not Found

IDLH: Not Found

Other Limits Recommended: Toxicity information:  $LC_{50}$  inhalation (mouse) 0.027 mg/liter/2 hours (\*NIOSH/RTECS 1985)

SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

Boiling Point: 343°F, 173°C (Merck 1983, p. 443)

Specific Gravity ( $H_2O=1$ ): 1.3826 at 46°C/4°C (Merck 1983, p. 443)

Vapor Pressure (mmHg): Not Found

Melting Point: 113°F, 45°C (Merck 1983, p. 443)

Vapor Density (AIR=1): 4.38 (Sax 1984, p. 464)

Evaporation Rate (Butyl acetate=1): Not Found

Solubility in Water: Soluble (Merck 1983, p. 443)

Appearance and Odor: Crystalline solid (Merck 1983, p. 443)

**BIS(CHLOROMETHYL) KETONE**

**SECTION III -- FIRE AND EXPLOSION HAZARD DATA**

**Flash Point (Method Used):** Not Found

**Flammable Limits:**

LEL: Not Found

UEL: Not Found

**Extinguishing Methods:** For small fires, use dry chemical, carbon dioxide, water spray, or foam. For large fires, use water spray, fog, or foam. Move container from fire area if you can do so without risk. Fight fire from maximum distance. Dike fire control water for later disposal; do not scatter the material (DOT 1984, Guide 55).

**Special Fire Fighting Procedures:** Keep unnecessary people away; isolate hazard area and deny entry. Stay upwind; keep out of low areas. Ventilate closed spaces before entering them. Wear positive pressure breathing apparatus and special protective clothing. Remove and isolate contaminated clothing at the site. If water pollution occurs, notify appropriate authorities (DOT 1984, Guide 55).

**Unusual Fire and Explosion Hazards:** When heated to decomposition, it emits highly toxic fumes of chlorides (Sax 1984, p. 464). This material may burn but does not ignite readily. Container may explode in heat of fire (DOT 1984, Guide 55).

**SECTION IV -- REACTIVITY DATA**

**Stability: Unstable:** Not Found

**Stable:** Not Found

**Conditions to Avoid:** Not Found

**Incompatibility (Materials to Avoid):** Not Found

**Hazardous Decomposition or Byproducts:** When heated to decomposition, it emits highly toxic fumes of chlorides (Sax 1984, p. 464).

**Hazardous Polymerization: May Occur:** Not Found

**May Not Occur:** Not Found

**Conditions to Avoid:** Not Found

**SECTION V -- HEALTH HAZARD DATA**

**Routes of Entry: Inhalation:** Yes (Sax 1984, p. 464)

**Skin:** Yes (DOT 1984, Guide 55)

**Ingestion:** Yes (Sax 1984, p. 464)



## BIS(CHLOROMETHYL) KETONE

### SECTION V -- HEALTH HAZARD DATA (Continued)

**Health Hazards** (Acute, Delayed, and Chronic): It may be fatal if inhaled, swallowed or absorbed through skin. Contact may cause burns to skin and eyes. Fire may produce irritating or poisonous gases. Runoff from fire control water may give off poisonous gases. Runoff from fire control or dilution water may cause pollution (DOT 1984, Guide 55).

**Signs and Symptoms of Exposure:** It causes tearing and blistering (Merck 1983, p. 443).

**Medical Conditions Generally Aggravated by Exposure:** Not Found

**Emergency and First Aid Procedures:** Move victim to fresh air; call emergency medical care. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In case of contact with material, immediately flush skin or eyes with running water for at least 15 minutes. Speed in removing material from skin is of extreme importance. Remove and isolate contaminated clothing and shoes at the site. Keep victim quiet and maintain normal body temperature. Effects may be delayed; keep victim under observation (DOT 1984, Guide 55).

### SECTION VI -- USE INFORMATION

Formerly extensively used in textiles (especially polyester fabrics) and still employed in polyurethane foams, textile backcoating and adhesives (Gosselin 1984, p. II-303).

### SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE

(Steps to be Taken in Case Material is Released or Spilled)

Avoid inhalation. Wear respiratory protection, eye protection and protective clothing. In case of contact, immediately flush skin or eyes with water (see Section V above). Do not touch spilled material; stop leak if you can do so without risk. Use water spray to reduce vapors. For small spills, absorb with sand or other noncombustible absorbent material and place into containers for later disposal. Small dry spills: with clean shovel place material into clean, dry container and cover; move containers from spill area. For large spills, dike far ahead of spill for later disposal (DOT 1984, Guide 55).

**BIS(CHLOROMETHYL) KETONE**

**COMMENTS**

Sources searched but no information found:

ACGIH 1983  
NIOSH/OSHA 1978  
Hawley 1981  
Weast 1979  
NFPA 1984  
Student 1981  
Weiss 1980  
CHRIS 1978  
Doull 1980  
Clayton and Clayton 1981-82  
Arena 1979  
Encyc Occupat Health and Safety 1983  
Buchel 1983  
Farm Chemicals Handbook 1984  
Hayes 1982  
Physicians' Desk Reference 1985

EPA CHEMICAL PROFILE

INTERIM

Date: October 31, 1985

Revision: \_\_\_\_\_

CHEMICAL IDENTITY -- DINITROCRESOL

CAS Registry Number: 534-52-1

Synonyms: 4,6-Dinitro-o-Cresol; 2,4-Dinitro-6-Methylphenol;  
2-Methyl-4,6-Dinitrophenol; 3,5-Dinitro-2-Hydroxytoluene;  
6-Methyl-2,4-Dinitrocresol; Antinonin; Antinonnin; Arborol; Capsine; Chemsect  
DNOC; Degrassan; Dekrysil; Detal; Dillex; Dinitro; Dinitro-o-Cresol;  
Dinitrodendtroxal; Dinitrol; Dinitromethyl Cyclohexyltriolenol; Dinitrosol;  
Dinoc; Dinurania; Ditrosol; DN; DN-Dry Mix No. 2; DNC; DNOC; Effusan 3436;  
Elgetol; Elgetol 30; Elipol; ENT 154; Extrar; Hedolit; K III; K IV; Krenite;  
Kreozan; Kresamone; Krezotol 50; Sandolin A; Selinon; Toluene,  
3,5-Dinitro-2-Hydroxy-; Phenol, 2-methyl-4,6-dinitro

Chemical Formula:  $C_7H_6N_2O_5$

Molecular Weight: 198.13

SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

OSHA PEL: TWA 200  $\mu\text{g}/\text{m}^3$  (skin) (\*NIOSH 1977 to Present)

ACGIH TLV: TWA 0.2  $\text{mg}/\text{m}^3$ ; STEL 0.6  $\text{mg}/\text{m}^3$  (skin) (\*ACGIH 1982)

IDLH: 5  $\text{mg}/\text{m}^3$  (NIOSH/OSH 1980, p. 90)

Other Limits Recommended: Not Found

SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

Boiling Point: 594°F, 312°C (ACGIH 1980, p. 152)

Specific Gravity ( $H_2O=1$ ): Not Found

Vapor Pressure (mmHg):  $5 \times 10^{-5}$  (NIOSH/OSHA 1978, p. 90)

Melting Point: 190°F, 87.5°C (\*Merck 1976)

Vapor Density (AIR=1): 6.82 (Sax 1984, p. 1212)

## DINITROCRESOL

### SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS (Continued)

**Evaporation Rate** (Butyl acetate=1): Not Found

**Solubility in Water:** 0.01 g in 100 ml (NIOSH/OSHA 1978, p. 90)

**Appearance and Odor:** Yellow odorless solid (NIOSH/OSHA 1978, p. 90;  
\*Spencer 1982)

### SECTION III -- FIRE AND EXPLOSION HAZARD DATA

**Flash Point** (Method Used): None (NIOSH/OSHA 1978, p. 90)

**Flammable Limits:**

LEL: Not Found

UEL: Not Found

**Extinguishing Methods:** Water, foam, dry chemical, carbon dioxide  
(\*CHRIS 1980)

**Special Fire Fighting Procedures:** Keep unnecessary people away;  
isolate hazard area. Stay upwind and keep out of low areas. Wear  
self-contained breathing apparatus and full protective clothing. Move  
container from fire area if you can do so without risk (DOT 1984, Guide  
53).

**Unusual Fire and Explosion Hazards:** It is explosive and is usually  
moistened with up to 10 percent water to reduce the hazard (\*Spencer 1982).

### SECTION IV -- REACTIVITY DATA

**Stability:** Unstable: Not Found

Stable: Not Found

**Conditions to Avoid:** Not Found

**Incompatibility** (Materials to Avoid): Not Found

**Hazardous Decomposition or Byproducts:** Not Found

**Hazardous Polymerization:** May Occur: Not Found

May Not Occur: Not Found

**Conditions to Avoid:** Not Found

## DINITROCRESOL

### SECTION V -- HEALTH HAZARD DATA

**Routes of Entry:** Inhalation: Yes (ACGIH 1980, p. 152)  
Skin: Yes (\*Gosselin 1976)  
Ingestion: Yes (\*Gosselin 1976)

**Health Hazards (Acute, Delayed, and Chronic):** Extremely toxic material; probable oral lethal dose is 5-50 mg/kg in humans or between 7 drops and 1 teaspoonful for a 70 kg (150 lb.) person (\*Gosselin 1976).

**Signs and Symptoms of Exposure:** Symptoms of acute poisoning include nausea, gastric upset, restlessness, sensation of heat, flushed skin, sweating, rapid respiration and heart beat, fever, blue coloration of skin, collapse, and coma (\*Doull 1980). Chief symptoms after inhalation were reported to include fever, rapid pulse and respiration, shortness of breath, and cough (ACGIH 1980, p. 152). Chronic exposure may produce fatigue, restlessness, anxiety, sweating, and thirst (\*Doull 1980).

**Medical Conditions Generally Aggravated by Exposure:** Not Found

**Emergency and First Aid Procedures:** Move victim to fresh air and call emergency medical care. Remove and isolate contaminated clothing and shoes at the site. Immediately flush skin or eyes with running water for at least 15 minutes if contact with material occurs (DOT 1984, Guide 53). Wash contaminated skin and hair promptly with soap and water, or with water alone if soap is not available; flush chemical from eyes with copious amounts of clean water; in systemic poisoning reduce elevated body temperature by physical means; administer sponge baths and cover victim with light blankets. Administer oxygen to minimize tissue anoxia (\*Morgan 1982).

### SECTION VI -- USE INFORMATION

4,6-Dinitro-o-cresol is used as a spray to kill insect eggs on fruit trees, as an herbicide, and as an insecticide (Hawley 1981, p. 374).

### SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE (Steps to be Taken in Case Material is Released or Spilled)

Do not touch spilled material; stop leak if it can be done without risk. Take up small spills with sand or other noncombustible absorbent material; place into containers for later disposal. Small dry spills may be shoveled into clean, dry containers and covered. Larger spills should be diked for later disposal (DOT 1984, Guide 53). Respiratory protective equipment, hand protection, and eye protection should be used when handling this material. Clothing and equipment should be cleaned after use (\*Encyc Occupat Health and Safety 1971).

## EPA CHEMICAL PROFILE

### INTERIM

Date: October 31, 1985

Revision: \_\_\_\_\_

## CHEMICAL IDENTITY -- CRIMIDINE

CAS Registry Number: 535-89-7

**Synonyms:** Pyrimidine, 2-Chloro-4-(Dimethylamino)-6-Methyl-; 2-Chloro-4-Dimethylamino-6-Methyl-Pyrimidine; 2-Chloro-4-Methyl-6-Dimethylaminopyrimidine; 2-Chloro-N,N-6-Trimethyl-4-Pyrimidinamine; 4-Pyrimidinamine, 2-Chloro-N,N,6-trimethyl-; Castrix; W 491

**Chemical Formula:**  $C_7H_{10}N_3Cl$

**Molecular Weight:** 171.65

## SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

OSHA PEL: Not Found

ACGIH TLV: Not Found

IDLH: Not Found

**Other Limits Recommended:** Toxicity information: LD<sub>50</sub> oral (mouse)  
1.2 mg/kg (\*NIOSH/RTECS 1985)

## SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

**Boiling Point:** 284-297°F, 140-147°C at 4 mmHg (\*Weast 1974)

**Specific Gravity** (H<sub>2</sub>O=1): Not Found

**Vapor Pressure** (mmHg): Less than 10<sup>-5</sup> at 20°C (\*Hartley 1983)

**Melting Point:** 189°F, 87°C (\*Weast 1974)

**Vapor Density** (AIR=1): Not Found

**Evaporation Rate** (Butyl acetate=1): Not Found

**Solubility in Water:** 0.936 g/100 mL at 20°C (\*Hartley 1983)

**Appearance and Odor:** Brown waxy solid (\*Weast 1974); colorless crystals (\*Hartley 1983)

## CRIMIDINE

## SECTION III -- FIRE AND EXPLOSION HAZARD DATA

**Flash Point** (Method Used): Not Found

**Flammable Limits:**

LEL: Not Found

UEL: Not Found

**Extinguishing Methods:** (Non-Specific -- Pesticide, Solid, n.o.s.)

Small fires: dry chemical, carbon dioxide, water spray, or foam. Large fires: water spray, fog, or foam (DOT 1984, Guide 53).

**Special Fire Fighting Procedures:** Wear self-contained breathing apparatus for fumes (\*Hartley 1983).

**Unusual Fire and Explosion Hazards:** It emits highly toxic fumes when heated to decomposition (\*Sax 1975).

## SECTION IV -- REACTIVITY DATA

**Stability:** Unstable:

Stable: Yes, very stable in neutral medium (\*Hartley 1983)

**Conditions to Avoid:** Decomposing heat (\*Sax 1975)

**Incompatibility** (Materials to Avoid): Acids and acid fumes (\*Sax 1975)

**Hazardous Decomposition or Byproducts:** It emits highly toxic chloride fumes when heated to decomposition (\*Sax 1975)

**Hazardous Polymerization:** May Occur: Not Found

May Not Occur: Not Found

**Conditions to Avoid:** Not Found

## SECTION V -- HEALTH HAZARD DATA

**Routes of Entry:** Inhalation: Not Found

Skin: Not Found

Ingestion: Yes (\*Gosselin 1984)

**Health Hazards** (Acute, Delayed, and Chronic): Super toxic; probable oral lethal dose in humans is less than 5 mg/kg or less than 7 drops for a 70 kg (150 lb.) person (\*Gosselin 1984). May cause serious central nervous system damage leading to convulsions (\*Merck 1983).

## CRIMIDINE

### SECTION V -- HEALTH HAZARD DATA (Continued)

**Signs and Symptoms of Exposure:** Exposure may result in serious central nervous system damage leading to convulsions that may be fatal (\*Merck 1976). Symptoms include restlessness; apprehension; muscular stiffness; sensitivity to light, noises, and contact; and cold sweat. If patient survives 5 to 6 hours there may not be serious problems (\*Gosselin 1984).

**Medical Conditions Generally Aggravated by Exposure:** Not Found

**Emergency and First Aid Procedures:** (Non-Specific -- Pesticide, Solid, n.o.s.) Move victim to fresh air; call emergency medical care. Remove and isolate contaminated clothing and shoes at the site. In case of contact with material, immediately flush skin or eyes with running water for at least 15 minutes (DOT 1984, Guide 53).

### SECTION VI -- USE INFORMATION

It is used as a rodenticide (\*Merck 1983). Not registered as a pesticide in the U.S. (USEPA/Pesticide Index 1985).

### SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE (Steps to be Taken in Case Material is Released or Spilled)

Use organic vapor respiratory protection (\*Hartley 1983). (Non-Specific -- Pesticide, Solid, n.o.s.) Keep unnecessary people away; isolate hazard area and deny entry. Stay upwind; keep out of low areas. Wear self-contained (positive pressure if available) breathing apparatus and full protective clothing. Do not touch spilled material; stop leak if you can do so without risk. Small spills: absorb with sand or other noncombustible absorbent material and place into containers for later disposal. Small dry spills: with clean shovel place material into clean, dry container and cover; move containers from spill area. Large spills: dike far ahead of spill for later disposal. If water pollution occurs, notify appropriate authorities (DOT 1984, Guide 53).



EPA CHEMICAL PROFILE

INTERIM

Date: October 31, 1985

Revision: \_\_\_\_\_

CHEMICAL IDENTITY -- ETHYLBIS(2-CHLOROETHYL)AMINE

CAS Registry Number: 538-07-8

Synonyms (NIOSH/RTECS 1983 Synonyms, Volume 3, p. 818): Triethylamine, 2,2'-Dichloro-; bis(2-Chloroethyl)Ethylamine; Ethylbis(beta-Chloroethyl)Amine; Ethyl-S; HN1; TL 329  
(U.S. Army 1975 Synonyms, p. 3-9): Nitrogen Mustard; HN-1

Chemical Formula:  $C_6H_{13}Cl_2N$

Molecular Weight: 170.10

SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

OSHA PEL: Not Found

ACGIH TLV: Not Found

IDLH: Not Found

Other Limits Recommended: Toxicity information:  $LD_{low}$  dermal (dog)  
40 mg/kg (\*NIOSH/RTECS 1985)

SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

Boiling Point: 185°F, 85°C at 12 mmHg (Merck 1983, p. 683)

Specific Gravity ( $H_2O=1$ ): 1.0861 at 23°C/4°C (Merck 1983, p. 683)

Vapor Pressure (mmHg): 0.24 at 25°C (U.S. Army 1975, p. 3-9)

Melting Point: -29°F, -34°C (Merck 1983, p. 683)

Vapor Density (AIR=1): 5.9 (U.S. Army 1975, p. 3-9)

Evaporation Rate (Butyl acetate=1): Not Found

Solubility in Water: Practically insoluble (Merck 1983, p. 683)

Appearance and Odor: Liquid with a faint, fishy amine odor (Merck 1983, p. 683).

**ETHYLBIS(2-CHLOROETHYL)AMINE**

**SECTION III -- FIRE AND EXPLOSION HAZARD DATA**

**Flash Point** (Method Used): High enough not to interfere with military use of the agent (U.S. Army 1975, p. 3-9).

**Flammable Limits:**

LEL: Not Found

UEL: Not Found

**Extinguishing Methods:** Not Found

**Special Fire Fighting Procedures:** Not Found

**Unusual Fire and Explosion Hazards:** When heated to decomposition, it emits very toxic fumes of nitrogen oxides and chlorides (Sax 1984, p. 458).

**SECTION IV -- REACTIVITY DATA**

**Stability:** Unstable:

Stable: Yes (U.S. Army 1975, p. 3-9)

**Conditions to Avoid:** Not Found

**Incompatibility** (Materials to Avoid): Not Found

**Hazardous Decomposition or Byproducts:** When heated to decomposition, it emits very toxic fumes of nitrogen oxides and chlorine (Sax 1984, p. 458).

**Hazardous Polymerization:** May Occur: Not Found  
May Not Occur: Not Found

**Conditions to Avoid:** Polymerizes slowly (U.S. Army 1975, p. 3-10). (Hazard not specified.)

**SECTION V -- HEALTH HAZARD DATA**

**Routes of Entry:** Inhalation: Yes (Sax 1984, p. 458)  
Skin: Yes (Sax 1984, p. 458)  
Ingestion: Yes (Sax 1984, p. 458)

ETHYLBIS(2-CHLOROETHYL)AMINE

SECTION V -- HEALTH HAZARD DATA (Continued)

**Health Hazards** (Acute, Delayed, and Chronic): This compound is a nitrogen mustard. It is highly irritating to skin, eyes, and mucous membranes (Merck 1983, p. 683). Nitrogen mustards have preferential toxicity for rapidly dividing cells. Workers exposed briefly to estimated concentrations of 10-100 ppm by inhalation became severely ill (Encyc Occupat Health and Safety 1983, p. 462). The median lethal dosage is 1,500 mg/minute/m<sup>3</sup> (U.S. Army 1975, p. 3-9).

**Signs and Symptoms of Exposure:** Irritates the eyes in quantities which do not significantly damage the skin or respiratory tract, insofar as single exposures are concerned. After mild vapor exposure, there may be no skin lesions. After severe vapor exposures, or after exposure to the liquid, erythema may appear. Irritation and itching may occur. Later, blisters may appear in the erythematous areas. Effects on the respiratory tract include irritation of the nose and throat, hoarseness progressing to loss of voice, and a persistent cough. Fever, labored respiration, and moist rales develop. Bronchial pneumonia may appear after the first 24 hours. Following ingestion or systemic absorption, material causes inhibition of cell mitosis, resulting in depression of the blood-forming mechanism and injury to other tissues. Severe diarrhea, which may be hemorrhagic, occurs. Lesions are most marked in the small intestine and consist of degenerative changes and necrosis in the mucous membranes. Ingestion of 2 to 6 milligrams causes nausea and vomiting (U.S. Army 1975, p. 3-9).

**Medical Conditions Generally Aggravated by Exposure:** Not Found

**Emergency and First Aid Procedures:** (Non-Specific -- Nitrogen Mustards) Stop exposure and treat symptomatically (Gilman 1985, p. 1257). (Non-Specific -- Poisonous Liquid, n.o.s.) Move victim to fresh air; call emergency medical care. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In case of contact with material, immediately flush skin or eyes with running water for at least 15 minutes. Speed in removing material from skin is of extreme importance. Remove and isolate contaminated clothing and shoes at the site. Keep victim quiet and maintain normal body temperature. Effects may be delayed; keep victim under observation (DOT 1984, Guide 55).

SECTION VI -- USE INFORMATION

Delayed-action, military casualty agent (U.S. Army 1975, p. 3-10)

ETHYLBIS(2-CHLOROETHYL)AMINE

SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE

(Steps to be Taken in Case Material is Released or Spilled)

Avoid inhalation and skin contact; wear proper respiratory protection and protective clothing (see Section V above). (Non-Specific -- Poisonous Liquid, n.o.s.) Do not touch spilled material; stop leak if you can do so without risk. Use water spray to reduce vapors. Small spills: absorb with sand or other noncombustible absorbent material and place into containers for later disposal. Large spills: dike far ahead of spill for later disposal (DOT 1984, Guide 55).

COMMENTS:

Sources searched but no information found:

Weast 1979

Hawley 1981

EPA CHEMICAL PROFILE

INTERIM

Date: October 31, 1985

Revision: \_\_\_\_\_

CHEMICAL IDENTITY -- LEWISITE

CAS Registry Number: 541-25-3

**Synonyms:** Arsine, Dichloro(2-Chlorovinyl)-; Arsine, (2-Chlorovinyl) Dichloro-; Arsonous Dichloride, (2-Chloroethenyl)- (90); Chlorovinylarsine Dichloride; beta-Chlorovinylbichloroarsine; 2-Chlorovinylldichloroarsine; Dichloro(2-Chlorovinyl)Arsine

**Chemical Formula:**  $C_2H_2AsCl_3$

**Molecular Weight:** 207.31

SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

**OSHA PEL:** TWA 500  $\mu g/m^3$  as arsenic (NIOSH/RTECS 1982, p. 442)

**ACGIH TLV:** Not Found

**IDLH:** Not Found

**Other Limits Recommended:** Toxicity information:  $LC_{low}$  inhalation (human) 0.051 mg/liter/30 minutes (\*NIOSH/RTECS 1985)

SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

**Boiling Point:** 374°F, 190°C (decomposes) (Merck 1983, p. 445)

**Specific Gravity ( $H_2O=1$ ):** 1.888 at 20°C/4°C (Merck 1983, p. 445)

**Vapor Pressure (mmHg):** 0.395 at 20°C (Merck 1983, p. 445)

**Melting Point:** 32°F, 0.1°C (Merck 1983, p. 445)

**Vapor Density (AIR=1):** 7.1 (U.S. Army 1975, pp. 3-11, 3-12)

**Evaporation Rate (Butyl acetate=1):** Not Found

**Solubility in Water:** Insoluble (Merck 1983, p. 445)

**Appearance and Odor:** Liquid with odor of geraniums (Merck 1983, p. 445).

LEWISITE

SECTION III -- FIRE AND EXPLOSION HAZARD DATA

**Flash Point** (Method Used): None (U.S. Army 1975, pp. 3-11, 3-12)

**Flammable Limits:**

LEL: Not Found

UEL: Not Found

**Extinguishing Methods:** (Non-Specific -- Arsenic Compound, Liquid, n.o.s.) Extinguish with dry chemical, carbon dioxide, water spray, or foam. Use water spray, fog, or foam for large fires (DOT 1984, Guide 55).

**Special Fire Fighting Procedures:** (Non-Specific -- Arsenic Compound, Liquid, n.o.s.) Wear special protective clothing and positive pressure breathing apparatus (DOT 1984, Guide 55).

**Unusual Fire and Explosion Hazards:** (Non-Specific -- Arsenic Compound, Liquid, n.o.s.) Container may explode in heat of fire. Fire may produce irritating and poisonous gases (DOT 1984, Guide 55).

SECTION IV -- REACTIVITY DATA

**Stability:** Unstable: Not Found

Stable: Not Found

**Conditions to Avoid:** Not Found

**Incompatibility** (Materials to Avoid): Hydrolyzed by alkalies; neutralized by sodium hypochlorite (Merck 1983, p. 445).

**Hazardous Decomposition or Byproducts:** Not Found

**Hazardous Polymerization:** May Occur: Not Found

May Not Occur: Not Found

**Conditions to Avoid:** Not Found

SECTION V -- HEALTH HAZARD DATA

**Routes of Entry:** Inhalation: Yes (Sax 1984, p. 783)

Skin: Yes (Sax 1984, p. 783)

Ingestion: Yes (Sax 1984, p. 783)

## LEWISITE

## SECTION V -- HEALTH HAZARD DATA (Continued)

**Health Hazards** (Acute, Delayed, and Chronic): Highly toxic by all routes of exposure. Lethal dose in humans is 6 ppm (inhalation), 20 mg/kg (skin) (Sax 1984, p. 783). Eye injury below 300 mg-min./m<sup>3</sup>. It is a blister agent, cell irritant, and systemic poison (U.S. Army 1975, pp. 3-11, 3-12).

**Signs and Symptoms of Exposure:** This material causes pulmonary edema, diarrhea, restlessness, weakness, subnormal temperature and low blood pressure. It produces an immediate searing sensation in the eye, and permanent loss of sight if not decontaminated within 1 minute. It produces an immediate and strong stinging sensation to the skin, followed by reddening within 30 minutes and blistering after about 13 hours. Inhalation of high concentrations may be fatal in as short a time as 10 minutes (U.S. Army 1975, pp. 3-11, 3-12).

**Medical Conditions Generally Aggravated by Exposure:** Not Found

**Emergency and First Aid Procedures:** (Non-Specific -- Arsenic Compound, Liquid, n.o.s.) Move victim to fresh air; call emergency medical care. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Remove and isolate contaminated clothing and shoes at the site. In case of contact with material, immediately flush skin or eyes with running water for at least 15 minutes. Keep victim quiet and maintain normal body temperature. Effects may be delayed; keep victim under observation. Speed in removing material from skin is of extreme importance (DOT 1984, Guide 55).

## SECTION VI -- USE INFORMATION

Vesicant war gas; chemical warfare agent (Doull 1980, p. 279).

## LEWISITE

### SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE

(Steps to be Taken in Case Material is Released or Spilled)

Avoid contact with eyes and skin; avoid breathing vapors (see Section V above). (Non-Specific -- Arsenic Compound, Liquid, n.o.s.) Keep unnecessary people away; isolate hazard area and deny entry. Stay upwind; keep out of low areas. Ventilate closed spaces before entering them. Wear positive pressure breathing apparatus and special protective clothing. Remove and isolate contaminated clothing at the site. Do not touch spilled material; stop leak if you can do so without risk. Use water spray to reduce vapors. Small spills: absorb with sand or other noncombustible absorbent material and place into containers for later disposal. Large spills: dike far ahead of spill for later disposal (DOT 1984, Guide 55). Can be decontaminated by supertropical bleach, DS2, or caustic soda (U.S. Army 1975, pp. 3-11, 3-12).



EPA CHEMICAL PROFILE

INTERIM

Date: October 31, 1985  
Revision: \_\_\_\_\_

CHEMICAL IDENTITY -- DITHIOBIURET

CAS Registry Number: 541-53-7

Synonyms: Biuret, 2,4-Dithio-; Imidodicarbonimidothioic Diamide; Imidodicarbonodithioic Diamide; Thioimidodicarbonic Diamide; DTB; Urea, 2-thio-1-(thiocarbamoyl)-

Chemical Formula:  $C_2H_5N_3S_2$

Molecular Weight: 135.22

SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

OSHA PEL: Not Found

ACGIH TLV: Not Found

IDLH: Not Found

Other Limits Recommended: Toxicity information:  $LD_{50}$  oral (rat) 5 mg/kg (\*NIOSH/RTECS 1985)

SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

Boiling Point: Not Found

Specific Gravity ( $H_2O=1$ ): 1.522 at 30°C (Merck 1983, p. 493)

Vapor Pressure (mmHg): Not Found

Melting Point: 358°F, 181°C (decomposes) (Merck 1983, p. 493)

Vapor Density (AIR=1): Not Found

Evaporation Rate (Butyl acetate=1): Not Found

Solubility in Water: 0.27 g/100 mL at 27°C (Merck 1983, p. 493)

Appearance and Odor: Crystalline solid (Merck 1983, p. 493); odor not found

**DITHIOBIURET****SECTION III -- FIRE AND EXPLOSION HAZARD DATA**

**Flash Point (Method Used):** Not Found

**Flammable Limits:**

**LEL:** Not Found

**UEL:** Not Found

**Extinguishing Methods:** (Non-Specific -- Dithiocarbamate Pesticide, Solid, n.o.s.) Extinguish fire using agent suitable for type of surrounding fire. (Material itself does not burn or burns with difficulty.) Use water in flooding quantities as fog. Use alcohol foam, carbon dioxide or dry chemical (Student 1981, p. 213).

**Special Fire Fighting Procedures:** (Non-Specific -- Dithiocarbamate Pesticide, Solid, n.o.s.) Wear boots, protective gloves, goggles and self-contained breathing apparatus (Student 1981, p. 213).

**Unusual Fire and Explosion Hazards:** When heated to decomposition, it emits highly toxic fumes of oxides of sulfur and nitrogen (Sax 1984, p. 1257).

**SECTION IV -- REACTIVITY DATA**

**Stability:** **Unstable:** Not Found

**Stable:** Not Found

**Conditions to Avoid:** Not Found

**Incompatibility (Materials to Avoid):** Not Found

**Hazardous Decomposition or Byproducts:** Sulfur oxides and nitrogen oxides are formed when the material is heated to decomposition (Sax 1984, p. 1257).

**Hazardous Polymerization:** **May Occur:** Not Found

**May Not Occur:** Not Found

**Conditions to Avoid:** Not Found

**SECTION V -- HEALTH HAZARD DATA**

**Routes of Entry:** **Inhalation:** Yes (Sax 1984, p. 1257)

**Skin:** Not Found

**Ingestion:** Yes (Sax 1984, p. 1257)

## DITHIOBIURET

### SECTION V -- HEALTH HAZARD DATA (Continued)

**Health Hazards (Acute, Delayed, and Chronic):** The material is highly toxic. It may cause respiratory failure (Merck 1983, p. 493).

**Signs and Symptoms of Exposure:** Symptoms include respiratory paralysis (Merck 1983, p. 493).

**Medical Conditions Generally Aggravated by Exposure:** Not Found

**Emergency and First Aid Procedures:** (Non-Specific -- Dithiocarbamate Pesticide, n.o.s.) Move victim to fresh air; call emergency medical care. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In case of contact with material, immediately flush skin or eyes with running water for at least 15 minutes. Speed in removing material from skin is of extreme importance. Remove and isolate contaminated clothing and shoes at the site. Keep victim quiet and maintain normal body temperature. Effects may be delayed; keep victim under observation (DOT 1984, Guide 55).

### SECTION VI -- USE INFORMATION

This material is used as a plasticizer, as a rubber accelerator, and as an intermediate in manufacturing of pesticides (Merck 1983, p. 493).

### SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE

(Steps to be Taken in Case Material is Released or Spilled)

(Non-Specific -- Dithiocarbamate Pesticide, Solid, n.o.s.) Keep sparks, flames and other sources of ignition away. Keep material out of water sources and sewers. Avoid breathing dusts and fumes from burning material. Keep upwind; avoid bodily contact with the material. Wear boots, protective gloves, and goggles. Do not handle broken packages without protective equipment. Wash away any material which may have contacted the body with copious amounts of water or soap and water. Wear self-contained breathing apparatus. If contact with material is anticipated wear full protective clothing (Student 1981, p. 213).

## EPA CHEMICAL PROFILE

### INTERIM

Date: October 31, 1985

Revision: \_\_\_\_\_

### CHEMICAL IDENTITY -- PROPIONITRILE, 3-CHLORO-

CAS Registry Number: 542-76-7

**Synonyms:** 3-Chloropropanonitrile; 1-Chloro-2-Cyanoethane;  
3-Chloropropanenitrile; 3-Chloropropionitrile; beta-Chloropropionitrile;  
Propanenitrile, 3-Chloro-; USAF A-8798

**Chemical Formula:**  $C_3H_4ClN$

**Molecular Weight:** 89.53

### SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

OSHA PEL: Not Found

ACGIH TLV: Not Found

IDLH: Not Found

**Other Limits Recommended:** Toxicity information: LD<sub>50</sub> oral (mouse) 9  
mg/kg (\*NIOSH/RTECS 1985)

### SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

**Boiling Point:** 347-349°F, 175-176°C (Weast 1983, p. C-477)

**Specific Gravity (H<sub>2</sub>O=1):** 1.1573 at 20°C (Weast 1983, p. C-477)

**Vapor Pressure (mmHg):** 5 at 46°C (\*Patty 1963)

**Melting Point:** -60°F, -51°C (\*Merck 1976)

**Vapor Density (AIR=1):** 3.0 (NFPA 1984, p. 325M-26)

**Evaporation Rate (Butyl acetate=1):** Not Found

**Solubility in Water:** 4.5 g/100 mL at 25°C (Merck 1983, p. 304)

**Appearance and Odor:** Colorless liquid with a characteristic acrid odor  
(\*Hawley 1977)

PROPIONITRILE, 3-CHLORO-

SECTION III -- FIRE AND EXPLOSION HAZARD DATA

**Flash Point (Method Used):** 168°F (CC) (\*Hawley 1977; Sax 1984, p. 769)

**Flammable Limits:**

LEL: Not Found

UEL: Not Found

**Extinguishing Methods:** Alcohol foam is recommended, but water spray can be used because the material can be cooled below its flash point (NFPA 1984, p. 325M-26).

**Special Fire Fighting Procedures:** (Non-Specific -- Propionitrile)  
Wear positive pressure breathing apparatus and special protective clothing. Isolate for 1/2 mile in all directions if tank car or truck is involved in fire (DOT 1984, Guide 28).

**Unusual Fire and Explosion Hazards:** Toxic gas (hydrogen chloride) is released when the compound is heated above 130°C (266°F) (\*Merck 1976). When heated to decomposition, it emits very toxic fumes of chlorine-containing compounds and nitrogen oxides (Sax 1984, p. 769).

SECTION IV -- REACTIVITY DATA

**Stability:** Unstable: Not Found

Stable: Not Found

**Conditions to Avoid:** Not Found

**Incompatibility (Materials to Avoid):** Heat (\*Merck 1976).

**Hazardous Decomposition or Byproducts:** Hydrogen chloride is a by-product (\*Merck 1976). Also, when heated to decomposition, it emits very toxic fumes of chlorine-containing compounds and nitrogen oxides (Sax 1984, p. 769).

**Hazardous Polymerization:** May Occur: Not Found

May Not Occur: Not Found

**Conditions to Avoid:** Not Found

SECTION V -- HEALTH HAZARD DATA

**Routes of Entry:** Inhalation: Yes (\*Hawley 1977)

Skin: Yes (\*Hawley 1977)

Ingestion: Yes (\*Hawley 1977)

## PROPIONITRILE, 3-CHLORO-

### SECTION V -- HEALTH HAZARD DATA (Continued)

**Health Hazards** (Acute, Delayed, and Chronic): Toxic effects are a result of systemic cyanide poisoning (\*Merck 1976). (Non-Specific -- Cyanide) Few poisons are more rapidly lethal. Average oral lethal dose for hydrogen cyanide is approximately 60-90 mg (corresponds to 200 mg of potassium cyanide). Cause of death is lack of oxygen to the body's cells (especially the brain and heart) as a result of the chemical inhibiting cell enzymes (Gosselin 1984, pp. III-124-125).

**Signs and Symptoms of Exposure:** (Non-Specific -- Cyanide) Symptoms include rapid and irregular breathing, anxiety, confusion, odor of bitter almonds (on breath or vomitus), nausea, vomiting (if oral exposure), irregular heart beat, a feeling of tightness in the chest, bright pink coloration of the skin, sweating, protruding eyeballs, dilated pupils, unconsciousness followed by convulsions, involuntary urination and defecation, paralysis and respiratory arrest (heart will beat after breathing stops) (Gosselin 1984, p. III-126-127).

**Medical Conditions Generally Aggravated by Exposure:** Not Found

**Emergency and First Aid Procedures:** (Non-Specific -- Cyanide) Get emergency medical treatment immediately. If victim has taken the substance by ingestion (orally) and is not showing symptoms, give syrup of ipecac. If there is exposure through skin contact, wash immediately with soap and water. If severe skin contact, treat patient for oral or inhalation exposure. Exposed eyes should be flushed copiously with water for at least 15 minutes. If the victim stops breathing before emergency medical treatment is available, give artificial respiration or oxygen, but avoid mouth to mouth respiration; also avoid contact with contaminated skin (Gosselin 1984, p. III-127; \*Rumack 1975 to Present).

### SECTION VI -- USE INFORMATION

Used in pharmaceutical and polymer synthesis (\*Merck 1976).

### SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE (Steps to be Taken in Case Material is Released or Spilled)

(Non-Specific -- Propionitrile) Do not touch spilled material; stop leak if you can do so without risk. Use water spray to reduce vapors. Absorb small spills with sand or other noncombustible absorbent material. Dike far ahead of spill for later disposal. Isolate hazard area and deny entry. Stay upwind. Wear positive pressure breathing apparatus and special protective clothing (DOT 1984, Guide 28).

EPA CHEMICAL PROFILE

INTERIM

Date: October 31, 1985

Revision: \_\_\_\_\_

CHEMICAL IDENTITY -- CHLOROMETHYL ETHER

CAS Registry Number: 542-88-1

**Synonyms:** Bis(Chloromethyl) Ether; 1,1'-Dichlorodimethyl Ether; alpha,alpha'-Dichlorodimethyl Ether; BCME; bis-CME; Chloro(chloromethoxy) Methane; Dichlorinated Methyl Oxide; Dichlorodimethyl Ether; Dichloromethyl Ether; Dimethyl-1,1'-Dichloroether; Ether, bis(Chloromethyl); Monochloromethyl Ether; Oxybis(Chloromethane); Sym-Dichloro-Dimethyl Ether; Sym-Dichloromethyl Ether; Methane, Oxybis(chloro-

**Chemical Formula:**  $C_2H_4Cl_2O$

**Molecular Weight:** 114.97

SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

**OSHA PEL:** Not Found

**ACGIH TLV:** TWA 0.001 ppm (0.005 mg/m<sup>3</sup>) (\*ACGIH 1980)

**IDLH:** Not Found

**Other Limits Recommended:** Human carcinogen -- recommended TLV 0.001 ppm (ACGIH 1984, p. 40). Toxicity information: LC<sub>low</sub> inhalation (man) 0.469 mg/liter/3 hours (\*NIOSH/RTECS 1985).

SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

**Boiling Point:** 223°F, 106°C (\*Merck 1976)

**Specific Gravity (H<sub>2</sub>O=1):** 1.315 at 20°C (\*Merck 1976)

**Vapor Pressure (mmHg):** 30 at 22°C (\*Callahan 1979)

**Melting Point:** -42.7°F, -41.5°C (\*Weast 1979)

**Vapor Density (AIR=1):** 4.0 (\*Sax 1968)

**Evaporation Rate (Butyl acetate=1):** Not Found

## CHLOROMETHYL ETHER

### SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS (Continued)

**Solubility in Water:** Not soluble; decomposes (Weast 1979, p. C-300)

**Appearance and Odor:** Colorless liquid (\*Merck 1976) with extremely suffocating odor (\*Sittig, 1981).

### SECTION III -- FIRE AND EXPLOSION HAZARD DATA

**Flash Point (Method Used):** Less than 19°C (\*Bretherick 1979)

**Flammable Limits:**

LEL: Dangerously explosive (\*Sax 1985)

UEL: Not Found

**Extinguishing Methods:** Small fires: dry chemical, carbon dioxide, water spray, or foam. Large fires: water spray, fog, or foam (\*DOT 1984).

**Special Fire Fighting Procedures:** Move container from fire area if you can do so without risk. Fight fire from maximum distance. Dike fire control water for later disposal; do not scatter the material (\*DOT 1984).

**Unusual Fire and Explosion Hazards:** This material may burn but will not ignite easily. Container may explode in heat of fire (\*DOT 1984).

### SECTION IV -- REACTIVITY DATA

**Stability:** Unstable: Yes (\*Merck 1976)

Stable:

**Conditions to Avoid:** Avoid decomposing heat (Sax 1985, p. 63); powerful oxidizers areas, of high fire hazard (\*Sax 1975) and moist air (\*Merck 1976).

**Incompatibility (Materials to Avoid):** Water: hydrolyzes very rapidly (half life 10-40 seconds) on contact with water (\*Callahan 1979).

**Hazardous Decomposition or Byproducts:** When heated to decomposition, it emits very toxic fumes of chlorides (Sax 1985, p. 463). Decomposed by water to hydrochloric acid and formaldehyde (\*Merck 1976).

**Hazardous Polymerization:** May Occur: Not Found

May Not Occur: Not Found

**Conditions to Avoid:** Not Found



## CHLOROMETHYL ETHER

### SECTION V -- HEALTH HAZARD DATA

**Routes of Entry:** Inhalation: Yes (Sax 1985, p. 463)  
Skin: Yes (Sax 1985, p. 463)  
Ingestion: Yes (Sax 1985, p. 463)

**Health Hazards** (Acute, Delayed, and Chronic): Acute toxicity is high by ingestion, inhalation, and skin irritation. Small quantities may cause death or permanent injury after very short exposure (\*Sax 1968). Chloromethyl ether is an alkylating agent which is a recognized human carcinogen. There is a strong association between industrial exposure and excess lung cancer (\*Sittig 1981; \*NIOSH 1984; \*IARC 1972-85).

**Signs and Symptoms of Exposure:** Vapor is severely irritating to the skin and mucous membranes and may cause cornea damage which may heal slowly (\*Sittig 1981).

**Medical Conditions Generally Aggravated by Exposure:** Not Found

**Emergency and First Aid Procedures:** Move victim to fresh air; call emergency medical care. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In case of contact with material, immediately flush skin or eyes with running water for at least 15 minutes. Speed in removing material from skin is of extreme importance. Remove and isolate contaminated clothing and shoes at the site. Keep victim quiet and maintain normal body temperature. Effects may be delayed. Keep victim under observation (\*DOT 1984).

### SECTION VI -- USE INFORMATION

Used as a research chemical and lab reagent (\*Hawley 1977; \*SRI). Not used commercially in the U.S. (\*SRI), but was formerly used for chloromethylation in industry (\*ACGIH 1980). Has been used as an alkylating agent in the manufacture of polymers (\*Sittig 1981).

## CHLOROMETHYL ETHER

### SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE

(Steps to be Taken in Case Material is Released or Spilled)

Full body protective clothing and gloves should be used on entering areas of potential exposure. Those employed in handling operations should be provided with full-face, supplied air respirators of continuous flow or pressure demand type (\*Sittig 1981). Keep unnecessary people away; isolate hazard area and deny entry. Stay upwind; keep out of low areas. Ventilate closed spaces before entering them. Wear positive pressure breathing apparatus and special protective clothing. Remove and isolate contaminated clothing at the site. Spill or leak: do not touch spilled material; stop leak if you can do so without risk. Use water spray to reduce vapors. Small spills: absorb with sand or other noncombustible absorbent material and place into containers for later disposal. Large spills: dike far ahead of spills for later disposal (\*DOT 1984).

EPA CHEMICAL PROFILE

INTERIM

Date: October 31, 1985

Revision: \_\_\_\_\_

CHEMICAL IDENTITY -- ETHYL THIOCYANATE

CAS Registry Number: 542-90-5

Synonyms: (NIOSH/RTECS 1983 Synonyms, Volume 2, p. 743) Thiocyanic Acid, Ethyl Ester; Ethane, Thiocyanato-; Ethyl Rhodanate; Ethyl Sulfocyanate

Chemical Formula:  $C_2H_5NS$

Molecular Weight: 87.15

SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

OSHA PEL: Not Found

ACGIH TLV: Not Found

IDLH: Not Found

Other Limits Recommended: Toxicity information:  $LD_{low}$  oral (cat) 10 mg/kg (\*NIOSH/RTECS 1985)

SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

Boiling Point: 295°F, 146°C (Merck 1983, p. 1336)

Specific Gravity ( $H_2O=1$ ): 1.007 at 23°C/4°C (Merck 1983, p. 1336)

Vapor Pressure (mmHg): Not Found

Melting Point: -122°F, -85.5°C (Weast 1983, p. C-515)

Vapor Density (AIR=1): Not Found

Evaporation Rate (Butyl acetate=1): Not Found

Solubility in Water: Insoluble (Merck 1983, p. 1336)

Appearance and Odor: Liquid (Merck 1983, p. 1336).

ETHYL THIOCYANATE

SECTION III -- FIRE AND EXPLOSION HAZARD DATA

**Flash Point** (Method Used): Not Found

**Flammable Limits:**

LEL: Not Found

UEL: Not Found

**Extinguishing Methods:** (Non-Specific -- Pesticide, Liquid, n.o.s.)

Small fires: dry chemical, carbon dioxide, water spray, or foam. Large fires: water spray, fog, or foam (DOT 1984, Guide 55).

**Special Fire Fighting Procedures:** (Non-Specific -- Pesticide, Liquid, n.o.s.) Keep unnecessary people away; isolate hazard area and deny entry. Stay upwind; keep out of low areas. Ventilate closed spaces before entering them. Wear positive pressure breathing apparatus and special protective clothing. Move container from fire area if you can do it without risk. Fight fire from maximum distance. Dike fire control water for later disposal; do not scatter the material (DOT 1984, Guide 55).

**Unusual Fire and Explosion Hazards:** When heated to decomposition, it emits very toxic fumes of oxides of nitrogen and sulfur (Sax 1984, p. 1394).

SECTION IV -- REACTIVITY DATA

**Stability:** Unstable: Not Found

Stable: Not Found

**Conditions to Avoid:** Not Found

**Incompatibility** (Materials to Avoid): Not Found

**Hazardous Decomposition or Byproducts:** When heated to decomposition, it emits very toxic fumes of oxides of nitrogen and sulfur (Sax 1984, p. 1394).

**Hazardous Polymerization:** May Occur: Not Found

May Not Occur: Not Found

**Conditions to Avoid:** Not Found

SECTION V -- HEALTH HAZARD DATA

**Routes of Entry:** Inhalation: Not Found

Skin: Not Found

Ingestion: Yes (Sax 1984, p. 1394)

## ETHYL THIOCYANATE

### SECTION V -- HEALTH HAZARD DATA (Continued)

**Health Hazards** (Acute, Delayed, and Chronic): This material is highly toxic if ingested (Sax 1984, p. 1394).

**Signs and Symptoms of Exposure:** Toxicity hazard similar to thiocyanate (Sax 1984, p. 1394). Prolonged absorption may produce various skin eruptions, runny nose, and occasionally dizziness, cramps, nausea, vomiting and mild or severe disturbances of the nervous system (Sax 1984, p. 2568). Ethyl thiocyanate is an aliphatic thiocyanate (Gosselin 1981, p. II-288). Aliphatic thiocyanates have the following signs and symptoms. The ingestion of a concentrated solution may lead to vomiting. The principal systemic reaction is probably one of central nervous depression, interrupted by periods of restlessness, abnormally fast and deep respiratory movements and convulsions. Death is usually due to respiratory arrest from paralysis of the medullary centers. In nonfatal cases injuries to the liver and kidneys may appear (Gosselin 1981, p. III-16).

**Medical Conditions Generally Aggravated by Exposure:** Not Found

**Emergency and First Aid Procedures:** Treatment is as for aliphatic thiocyanates (Gosselin 1981, p. II-288). Because cyanide is probably largely responsible for poisonings, antidotal measures against cyanide should be instituted promptly (Gosselin 1981, p. III-16). First aid for cyanide includes moving the victim to fresh air. Call emergency medical care. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In case of contact with material, immediately flush skin or eyes with running water for at least 15 minutes. Speed in removing material from skin is of extreme importance. Remove and isolate contaminated clothing and shoes at the site. Keep victim quiet and maintain normal body temperature. Effects may be delayed, keep victim under observation (DOT 1984, Guide 55).

### SECTION VI -- USE INFORMATION

It is an agricultural insecticide (Gosselin 1981, p. II-288).

## ETHYL THIOCYANATE

### SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE

(Steps to be Taken in Case Material is Released or Spilled)

(Non-Specific -- Pesticide, Liquid, n.o.s.) Do not touch spilled material; stop leak if you can do so without risk. Use water spray to reduce vapors. For small spills, absorb with sand or other noncombustible absorbent material and place into containers for later disposal. For large spills, dike far ahead of spill for later disposal. Wear self-contained breathing apparatus and full protective clothing (DOT 1984, Guide 55).

### COMMENTS

Sources searched but no information found:

Hayes 1982  
NFPA 1984  
Farm Chemicals Handbook 1984  
Buchel 1983  
Hawley 1981  
DASE 1980  
Verschuieren 1983

EPA CHEMICAL PROFILE

INTERIM

Date: October 31, 1985

Revision: \_\_\_\_\_

CHEMICAL IDENTITY -- TRIS(2-CHLOROETHYL)AMINE

CAS Registry Number: 555-77-1

Synonyms: (SANSS 1983 SYNONYMS) Triethylamine, 2,2',2''-Trichloro-; Trichlormethine; Tri-(2-Chloroethyl)Amine; 2,2',2''-Trichlorotriethylamine; Tris(beta-chloroethyl)amine; TS 160; Ethanamine, 2-Chloro-N,N-bis(2-Chloroethyl)-; HN 3; TL 145; 2-Chloro-N,N-bis(2-Chloroethyl) Ethanamine

Chemical Formula:  $C_6H_{12}Cl_3N$

Molecular Weight: 204.54

SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

OSHA PEL: Not Found

ACGIH TLV: Not Found

IDLH: Not Found

Other Limits Recommended: Toxicity information:  $LC_{10\%}$  inhalation (mouse) 0.35 mg/liter/10 minutes (\*NIOSH/RTECS 1985)

SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

Boiling Point: 493°F, 256°C calculated, decomposes (U.S. Army 1975, p. 3-10)

Specific Gravity ( $H_2O=1$ ): 1.2347 (Merck 1979, p. 1379)

Vapor Pressure (mmHg): 0.0109 at 25°C (U.S. Army 1975, p. 3-10)

Melting Point: 25°F, -4°C (Weast 1979, p. C-110)

Vapor Density (AIR=1): 7.1 (U.S. Army 1975, p. 3-10)

Evaporation Rate (Butyl acetate=1): Not Found

Solubility in Water: Slightly soluble (Weast 1979, p. C-110)

TRIS(2-CHLOROETHYL)AMINE

SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS (Continued)

**Appearance and Odor:** Liquid with faint odor of fish and soap (Merck 1983, p. 1379); none when pure (U.S. Army 1975, p. 3-10)

SECTION III -- FIRE AND EXPLOSION HAZARD DATA

**Flash Point (Method Used):** High enough not to interfere with military use of the agent (U.S. Army 1975, p. 3-10).

**Flammable Limits:**

LEL: Not Found

UEL: Not Found

**Extinguishing Methods:** Not Found

**Special Fire Fighting Procedures:** Not Found

**Unusual Fire and Explosion Hazards:** Not Found

SECTION IV -- REACTIVITY DATA

**Stability:** Unstable:

Stable: Yes (U.S. Army 1975, p. 3-10)

**Conditions to Avoid:** Decomposing heat (Sax 1984, p. 2691)

**Incompatibility (Materials to Avoid):** No action on metals or other materials if material is kept dry (U.S. Army 1975, p. 3-10); otherwise, no information found.

**Hazardous Decomposition or Byproducts:** When heated to decomposition, it emits chloride and nitrogen oxides (Sax 1984, p. 2691).

**Hazardous Polymerization:** May Occur: Not Found  
May Not Occur: Not Found

**Conditions to Avoid:** Not Found

SECTION V -- HEALTH HAZARD DATA

**Routes of Entry:** Inhalation: Yes (Sax 1984, p. 2691)  
Skin: Yes (Sax 1984, p. 2691)  
Ingestion: Yes (Sax 1984, p. 2691)



## TRIS(2-CHLOROETHYL)AMINE

### SECTION V -- HEALTH HAZARD DATA (Continued)

**Health Hazards** (Acute, Delayed, and Chronic): Most toxic of the nitrogen mustards. The median lethal dose for inhalation is 1,500 mg-min/m<sup>3</sup>; for skin absorption (masked personnel) is 10,000 mg-min/m<sup>3</sup>. The medium incapacitating dose for eye injury is 200 mg-min/m<sup>3</sup>; for skin absorption is 2,500 mg-min/m<sup>3</sup> (U.S. Army 1975, p. 3-10).

**Signs and Symptoms of Exposure:** Irritates the eyes in quantities which do not significantly damage the skin or respiratory tract, insofar as single exposures are concerned. After mild vapor exposure, there may be no skin lesions. After severe vapor exposures, or after exposure to the liquid, erythema may appear. Irritation and itching may occur. Later, blisters may appear in the erythematous areas. Effects on the respiratory tract include irritation of the nose and throat, hoarseness progressing to loss of voice, and a persistent cough. Fever, labored respiration, and moist rales develop. Bronchial pneumonia may appear after the first 24 hours. Following ingestion or systemic absorption, material causes inhibition of cell mitosis, resulting in depression of the blood-forming mechanism and injury to other tissues. Severe diarrhea, which may be hemorrhagic, occurs. Lesions are most marked in the small intestine and consist of degenerative changes and necrosis in the mucous membranes. Ingestion of 2 to 6 milligrams causes nausea and vomiting (U.S. Army 1975, p. 3-11).

**Medical Conditions Generally Aggravated by Exposure:** Not Found

**Emergency and First Aid Procedures:** (Non-Specific -- Nitrogen Mustards) Stop exposure and treat symptomatically (Gilman 1985, p. 1257). (Non-Specific -- Poisonous Liquid, n.o.s.) Move victim to fresh air; call emergency medical care. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In case of contact with material, immediately flush skin or eyes with running water for at least 15 minutes. Speed in removing material from skin is of extreme importance. Remove and isolate contaminated clothing and shoes at the site. Keep victim quiet and maintain normal body temperature. Effects may be delayed; keep victim under observation (DOT 1984, Guide 55).

### SECTION VI -- USE INFORMATION

Delayed-action casualty military agent (U.S. Army 1975, p. 3-10).

## TRIS(2-CHLOROETHYL)AMINE

### SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE (Steps to be Taken in Case Material is Released or Spilled)

Avoid inhalation and skin contact (see Section V above). (Non-Specific -- Poisonous Liquid, n.o.s.) Do not touch spilled material; stop leak if you can do so without risk. Use water spray to reduce vapors. Small spills: absorb with sand or other noncombustible absorbent material and place into containers for later disposal. Large spills: dike far ahead of spill for later disposal (DOT 1984, Guide 55).

### COMMENTS

Sources searched but no information found:

NFPA 1984  
Hawley 1981  
Student 1981

EPA CHEMICAL PROFILE

INTERIM

Date: October 31, 1985

Revision: \_\_\_\_\_

CHEMICAL IDENTITY -- METHYL ISOTHIOCYANATE

CAS Registry Number: 556-61-6

Synonyms: (NIOSH/RTECS 1983 Synonyms, Volume 2, p. 676) Methane, Isothiocyanato-; Isothiocyanatomethane; Isothiocyanic Acid, Methyl Ester; Methyl Mustard Oil; MIC; MIT; MITC; Morton EP-161E; Trapex; Trapexide; Vorlex; Vortex; WN 12

Chemical Formula:  $C_2H_3NS$

Molecular Weight: 73.12

SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

OSHA PEL: Not Found

ACGIH TLV: Not Found

IDLH: Not Found

Other Limits Recommended: Toxicity information:  $LD_{low}$  oral (woman)  
1000 mg/kg;  $LD_{50}$  dermal (rabbit) 33 mg/kg (\*NIOSH/RTECS 1985)

SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

Boiling Point: 246°F, 119°C (Sax 1984, p. 1866)

Specific Gravity ( $H_2O=1$ ): 1.069 at 37°C/4°C (Weast 1983, p. C-376)

Vapor Pressure (mmHg): Not Found

Melting Point: 95-97°F, 35-36°C (Sax 1984, p. 1866)

Vapor Density (AIR=1): Not Found

Evaporation Rate (Butyl acetate=1): Not Found

## METHYL ISOTHIOCYANATE

### SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS (Continued)

**Solubility in Water:** Slightly soluble (Sax 1984, p. 1866)

**Appearance and Odor:** Crystalline (Sax 1984, p. 1866)

### SECTION III -- FIRE AND EXPLOSION HAZARD DATA

**Flash Point (Method Used):** Not Found

**Flammable Limits:**

LEL: Not Found

UEL: Not Found

**Extinguishing Methods:** (Non-Specific -- Pesticide, Solid, n.o.s.)

Small fires: dry chemical, carbon dioxide, water spray, or foam. Large

fires: water spray, fog, or foam (DOT 1984, Guide 53).

**Special Fire Fighting Procedures:** (Non-Specific -- Pesticide, Solid, n.o.s.) Move container from area if you can do so without risk. Wear self-contained (positive pressure if available) breathing apparatus and full protective clothing (DOT 1984, Guide 53).

**Unusual Fire and Explosion Hazards:** (Non-Specific -- Pesticide, Solid, n.o.s.) This material may burn, but does not ignite readily. Fire may produce irritating or poisonous gases (DOT 1984, Guide 53).

### SECTION IV -- REACTIVITY DATA

**Stability: Unstable:** Not Found

**Stable:** Not Found

**Conditions to Avoid:** Do not store below -20°C or at elevated temperatures. Keep away from sparks (Farm Chemicals Handbook 1984, p. C-242).

**Incompatibility (Materials to Avoid):** Not Found

**Hazardous Decomposition or Byproducts:** When heated it emits very dangerous cyanides and sulfur compounds (Sax 1984, p. 1866).

**Hazardous Polymerization: May Occur:** Not Found

**May Not Occur:** Not Found

**Conditions to Avoid:** Not Found

## METHYL ISOTHIOCYANATE

### SECTION V -- HEALTH HAZARD DATA

**Routes of Entry:** Inhalation: Yes (Farm Chemicals Handbook 1984, p. C-242)  
Skin: Yes (Farm Chemicals Handbook 1984, p. C-242)  
Ingestion: Yes (NIOSH/RTECS 1983, p. 676)

**Health Hazards** (Acute, Delayed, and Chronic): Very toxic; probable human oral lethal dose is 50-500 mg/kg, or between 1 teaspoonful and 1 oz. for a 70 kg (150 lb.) person (Gosselin 1984, p. II-352). Highly irritating to skin, mucous membranes, and eyes (Sax 1984, p. 1866). Human oral minimum lethal dose: approximately 1 g/kg (NIOSH/RTECS 1983, Volume 2, p. 676).

**Signs and Symptoms of Exposure:** Extreme irritation of eyes, mucous membranes, and skin. Coughing and other symptoms of extreme pulmonary irritation would be expected if vapors are inhaled (Sax 1984, p. 1866).

**Medical Conditions Generally Aggravated by Exposure:** Not Found

**Emergency and First Aid Procedures:** (Non-Specific -- Pesticide, Solid, n.o.s.) Move victim to fresh air; call emergency medical care. In case of contact with material, immediately flush skin or eyes with running water for at least 15 minutes. Remove and isolate contaminated clothing and shoes at the site (DOT 1984, Guide 53).

### SECTION VI -- USE INFORMATION

It is used as a soil fumigant. A mixture of methyl isothiocyanate and chlorinated C<sub>3</sub> hydrocarbons is used as a soil fumigant for control of weeds, fungi, insects, and nematodes (Farm Chemicals Handbook 1984, pp. C230, C242).

### SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE

(Steps to be Taken in Case Material is Released or Spilled)

**Protective clothing:** common protective clothing such as rubber gloves and boots may be penetrated by methyl isothiocyanate mixtures (Vorlex). Polyethylene gloves and footwear are recommended. For short-term exposure when small spills occur, during repair of equipment, transfer of liquid, etc. use half-face respirator with chemical worker's goggles or full-face respirators. Cartridges such as Willson R-21 are adequate for short-term exposure. For large spills in poorly ventilated areas, use a self-contained or air-supplied respirator (Farm Chemicals Handbook 1984, p. C-242).

METHYL ISOTHIOCYANATE

SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE (Continued)  
(Steps to be Taken in Case Material is Released or Spilled)

(Non-Specific -- Pesticide, Solid, n.o.s.) Do not touch spilled material; stop leak if you can do so without risk. Small spills: absorb with sand or other noncombustible absorbent material and place into containers for later disposal. Small dry spills: with clean shovel place material into clean, dry container and cover; move containers from spill area. Large spills: dike far ahead of spill for later disposal. Keep unnecessary people away; isolate hazard area and deny entry. Stay upwind; keep out of low areas. Wear self-contained (positive pressure if available) breathing apparatus and full protective clothing (DOT 1984, Guide 53).

EPA CHEMICAL PROFILE

INTERIM

Date: October 31, 1985

Revision: \_\_\_\_\_

CHEMICAL IDENTITY -- METHYL THIOCYANATE

CAS Registry Number: 556-64-9

Synonyms: Thiocyanic Acid, Methyl Ester; Thiocyanatomethane; Methyl Rhodanate; Methyl Sulfocyanate

Chemical Formula:  $C_2H_3NS$

Molecular Weight: 73.12

SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

OSHA PEL: Not Found

ACGIH TLV: Not Found

IDLH: Not Found

Other Limits Recommended: Toxicity information:  $LD_{low}$  oral (cat)  
8.5 mg/kg (\*NIOSH/RTECS 1985)

SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

Boiling Point: 266-271°F, 130-133°C (Sax 1984, p. 1934)

Specific Gravity ( $H_2O=1$ ): 1.068 at 25°C/4°C (\*Weast 1979)

Vapor Pressure (mmHg): Not Found

Melting Point: -60°F, -51°C (\*Merck 1976)

Vapor Density (AIR=1): Not Found

Evaporation Rate (Butyl acetate=1): Not Found

Solubility in Water: Very slight (\*Merck 1976)

Appearance and Odor: Colorless liquid, onion odor (\*Merck 1976)

METHYL THIOCYANATE

SECTION III -- FIRE AND EXPLOSION HAZARD DATA

**Flash Point** (Method Used): Not Found

**Flammable Limits:**

LEL: Not Found

UEL: Not Found

**Extinguishing Methods:** (Non-Specific -- Pesticide, Liquid, n.o.s.)

Small fires: dry chemical, carbon dioxide, water spray, or foam. Large fires: water spray, fog, or foam. Move container from fire area if you can do so without risk. Fight fire from maximum distance. Dike fire control water for later disposal; do not scatter the material (DOT 1984, Guide 55).

**Special Fire Fighting Procedures:** (Non-Specific -- Pesticide, Liquid, n.o.s.) Keep unnecessary people away; isolate hazard area and deny entry. Stay upwind; keep out of low areas. Ventilate closed spaces before entering them. Wear positive pressure breathing apparatus and special protective clothing. Remove and isolate contaminated clothing at the site. If water pollution occurs, notify appropriate authorities (DOT 1984, Guide 55).

**Unusual Fire and Explosion Hazards:** When heated to decomposition, it emits very toxic fumes of oxides of nitrogen and sulfur (Sax 1984, p. 1934).

SECTION IV -- REACTIVITY DATA

**Stability:** Unstable: Not Found

Stable: Not Found

**Conditions to Avoid:** This material is volatile (\*Gosselin 1976)

**Incompatibility** (Materials to Avoid): (Non-Specific -- Thiocyanates)

Incompatible with nitric acid. Violent reactions have occurred when mixed with chlorates, nitrates, nitric acid, organic peroxides, peroxides, potassium chlorate, and sodium chlorate (Sax 1984, p. 2568).

**Hazardous Decomposition or Byproducts:** When heated to decomposition it emits very toxic fumes of oxides of nitrogen and sulfur (Sax 1984, p. 1934).

**Hazardous Polymerization:** May Occur: Not Found

May Not Occur: Not Found

**Conditions to Avoid:** Not Found



## METHYL THIOCYANATE

### SECTION V -- HEALTH HAZARD DATA

**Routes of Entry:** Inhalation: Yes (\*Rumack 1975 to Present)  
Skin: Yes (\*Gosselin 1976)  
Ingestion: Yes (\*Rumack 1975 to Present)

**Health Hazards** (Acute, Delayed, and Chronic): This material is highly toxic if ingested (Sax 1984, p. 1934). It is a rapidly acting poison (\*Gosselin 1976).

**Signs and Symptoms of Exposure:** (Non-Specific -- Thiocyanates)  
Prolonged absorption may produce various skin eruptions, runny nose, and occasionally, dizziness, cramps, nausea, vomiting and mild or severe disturbances of the nervous system (Sax 1984, p. 2568). (Non-Specific -- Aliphatic Thiocyanates) The ingestion of a concentrated solution may lead to vomiting. The principal systemic reaction is probably one of central nervous system depression, interrupted by periods of restlessness, abnormally fast and deep respiratory movements and convulsions. Death is usually due to respiratory arrest from paralysis of the medullary centers. In nonfatal cases injuries to the liver and kidneys may appear (Gosselin 1981, p. III-16).

**Medical Conditions Generally Aggravated by Exposure:** Not Found

**Emergency and First Aid Procedures:** (Non-Specific -- Aliphatic Thiocyanates) Because cyanide is probably largely responsible for poisonings, antidotal measures against cyanide should be instituted promptly (Gosselin 1981, p. III-16). (Non-Specific -- Cyanide Solution) Move victim to fresh air; call emergency medical care. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In case of contact with material, immediately flush skin or eyes with running water for at least 15 minutes. Speed in removing material from skin is of extreme importance. Remove and isolate contaminated clothing and shoes at the site. Keep victim quiet and maintain normal body temperature. Effects may be delayed, keep victim under observation (DOT 1984, Guide 55).

### SECTION VI -- USE INFORMATION

It is used as an agricultural insecticide, a fumigant (\*Gosselin 1976), and as a research chemical. No evidence of commercial production in the U.S. (\*SRI).

## METHYL THIOCYANATE

### SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE

(Steps to be Taken in Case Material is Released or Spilled)

Avoid inhalation and skin contact. Wear proper protective clothing and respiratory protection (see Section V above). (Non-Specific -- Pesticide, Liquid, n.o.s.) Do not touch spilled material; stop leak if you can do so without risk. Use water spray to reduce vapors. For small spills, absorb with sand or other noncombustible absorbent material and place into containers for later disposal. For large spills, dike far ahead of spill for later disposal (DOT 1984, Guide 55).

EPA CHEMICAL PROFILE

INTERIM

Date: October 31, 1985

Revision: \_\_\_\_\_

CHEMICAL IDENTITY -- METHANESULFONYL FLUORIDE

CAS Registry Number: 558-25-8

Synonyms: (NIOSH/RTECS 1983 Synonyms, Volume 2, p. 684) Fumette;  
Methanesulphonyl Fluoride; MSF

Chemical Formula:  $\text{CH}_3\text{FO}_2\text{S}$

Molecular Weight: 98.10

SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

OSHA PEL: Not Found

ACGIH TLV: Not Found

IDLH: Not Found

Other Limits Recommended: Toxicity information:  $\text{LC}_{\text{low}}$  inhalation  
(rat) 0.14 mg/liter (\*NIOSH/RTECS 1985)

SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

Boiling Point: Not Found

Specific Gravity ( $\text{H}_2\text{O}=1$ ): Not Found

Vapor Pressure (mmHg): Not Found

Melting Point: Not Found

Vapor Density (AIR=1): Not Found

Evaporation Rate (Butyl acetate=1): Not Found

Solubility in Water: Not Found

Appearance and Odor: Not Found

**METHANESULFONYL FLUORIDE**

**SECTION III -- FIRE AND EXPLOSION HAZARD DATA**

**Flash Point** (Method Used): Not Found

**Flammable Limits:**

LEL: Not Found

UEL: Not Found

**Extinguishing Methods:** Not Found

**Special Fire Fighting Procedures:** Not Found

**Unusual Fire and Explosion Hazards:** When heated to decomposition, it emits very toxic fumes of fluorides and sulfur oxides (Sax 1984, p. 1764).

**SECTION IV -- REACTIVITY DATA**

**Stability: Unstable:** Not Found

**Stable:** Not Found

**Conditions to Avoid:** Not Found

**Incompatibility** (Materials to Avoid): Not Found

**Hazardous Decomposition or Byproducts:** When heated to decomposition, it emits very toxic fumes of fluorides and sulfur oxides (Sax 1984, p. 1764).

**Hazardous Polymerization: May Occur:** Not Found

**May Not Occur:** Not Found

**Conditions to Avoid:** Not Found

**SECTION V -- HEALTH HAZARD DATA**

**Routes of Entry: Inhalation:** Yes (Sax 1984, p. 1764)

**Skin:** Not Found

**Ingestion:** Not Found

**Health Hazards** (Acute, Delayed, and Chronic): Highly toxic when inhaled (Sax 1984, p. 1764).

**Signs and Symptoms of Exposure:** Not Found

**Medical Conditions Generally Aggravated by Exposure:** Not Found

**Emergency and First Aid Procedures:** Not Found

## METHANESULFONYL FLUORIDE

### SECTION VI -- USE INFORMATION

Not Found

### SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE

(Steps to be Taken in Case Material is Released or Spilled)

Avoid inhalation. Wear proper respiratory protection (see Section V above).

### COMMENTS

Sources searched but no information found:

Weast 1979  
DOT 1984  
ACGIH 1984  
NIOSH/OSHA 1978  
Weiss 1980  
Merck 1983  
Buchel 1983  
Encyc Occupat Health and Safety 1983  
Farm Chemicals Handbook 1984  
Hawley 1981  
Clayton and Clayton 1981-82  
Verschueren 1983  
Student 1981  
NFPA 1984  
Gosselin 1984

EPA CHEMICAL PROFILE

INTERIM

Date: October 31, 1985

Revision: \_\_\_\_\_

CHEMICAL IDENTITY -- ETHION

CAS Registry Number: 563-12-2

**Synonyms:** Phosphorodithioic Acid, S,S'-Methylene O,O,O',O'-Tetraethyl Ester; AC 3422; Bis(S-(Diethoxyphosphinothioyl)Mercapto)Methane; Bladan; Diethion; Embathion; ENT 24,105; Ethanox; Ethiol; Ethiol 100; Ethodan; Ethopaz; Ethyl Methylene Phosphorodithioate; FMC-1240; Fosfatox E; Fosfono 50; Hylemax; Hylemox; Itopaz; KWIT; NIA 1240; Niagara 1240; Nialate; O,O,O',O'-Tetraethyl S,S'-Methylene Di(Phosphorodithioate); O,O,O',O'-Tetraethyl S,S'-Methylenebisphosphordithioate; O,O,O',O'-Tetraethyl S,S'-Methylenebisphosphorodithioate; O,O,O,O-Tetraethyl S,S'-Methylenebis (Dithiophosphate); Phosphorodithioic Acid, O,O-Diethyl Ester, S,S-Diester with Methanedithiol; Phosphorodithioic Acid, S,S'-Methylene O,O,O',O'-Tetraethyl Ester; Phosphotox E; Rhodiocide; Rhodocide; Rodocid; Rodocide; RP 8167; S,S'-Methylene O,O,O',O'-Tetraethyl Phosphorodithioate; Soprathion; Tetraethyl S,S'-Methylene Bis(Phosphorothiolothionate); Vegfru Fosmite

**Chemical Formula:**  $C_9H_{22}O_4P_2S_4$

**Molecular Weight:** 384.48

SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

**OSHA PEL:** Not Found

**ACGIH TLV:** TWA 0.4 mg/m<sup>3</sup> (skin) (\*ACGIH 1984)

**IDLH:** Not Found

**Other Limits Recommended:** Toxicity information: LD<sub>50</sub> oral (rat) 13 mg/kg (\*NIOSH/RTECS 1985)

SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

**Boiling Point:** Not Found

**Specific Gravity (H<sub>2</sub>O=1):** 1.215-1.230 at 20°C/4°C (\*Worthing 1979)

**Vapor Pressure (mmHg):**  $1.5 \times 10^{-6}$  at 77°F, 25°C (\*Worthing 1979)

**Melting Point:** 9-10°F, -12 - -13°C (\*Merck 1983)

## ETHION

## SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS (Continued)

Vapor Density (AIR=1): Not Found

Evaporation Rate (Butyl acetate=1): Not Found

Solubility in Water: Slightly soluble (\*Merck 1983)

Appearance and Odor: Colorless to amber-colored liquid (\*Worthing 1979); odorless (\*Farm Chemicals Handbook 1984) or very disagreeable odor (\*ACGIH 1980)

## SECTION III -- FIRE AND EXPLOSION HAZARD DATA

Flash Point (Method Used): Not Found

Flammable Limits: Does not ignite easily (\*DOT 1984)

LEL: Not Found

UEL: Not Found

Extinguishing Methods: For small fires, use dry chemical, carbon dioxide, water spray, or foam. For large fires, use water spray, fog, or foam (\*DOT 1984).

Special Fire Fighting Procedures: Move containers from fire area if it can be done without risk. Dike fire control water for later disposal, do not scatter the material. Fight fire from maximum distance. Wear positive pressure breathing apparatus and protective clothing (\*DOT 1984).

Unusual Fire and Explosion Hazards: Shock can shatter the container, releasing the contents (\*Sax 1979). Fire may produce irritating or poisonous gases (\*DOT 1984).

## SECTION IV -- REACTIVITY DATA

Stability: Unstable: Yes (\*Worthing 1979)

Stable:

Conditions to Avoid: Slowly oxidized in air (\*Worthing 1979)

Incompatibility (Materials to Avoid): Hydrolyzed by acids and alkalies (\*Worthing 1979)

Hazardous Decomposition or Byproducts: Decomposes above 302°F, 150°C (\*Sunshine 1969). When heated to decomposition it emits highly toxic fumes of oxides of sulfur and phosphorus (Sax 1984, p. 1372).

ETHION

SECTION IV -- REACTIVITY DATA (Continued)

Hazardous Polymerization: May Occur: Not Found  
May Not Occur: Not Found

Conditions to Avoid: Not Found

SECTION V -- HEALTH HAZARD DATA

Routes of Entry: Inhalation: Yes (\*DOT 1984)  
Skin: Yes (\*DOT 1984)  
Ingestion: Yes (\*DOT 1984)

**Health Hazards** (Acute, Delayed, and Chronic): This material is very toxic; the probable oral lethal dose for humans is 50-500 mg/kg, which is between one teaspoonful and one ounce for a 150-lb person (\*Gosselin 1976).

**Signs and Symptoms of Exposure:** Symptoms may include nausea, vomiting, abdominal cramps, diarrhea, excessive salivation, headache, giddiness, weakness, muscle twitching, difficult breathing, blurring or dimness of vision, and loss of muscle coordination. Death may occur from failure of the respiratory center, paralysis of the respiratory muscles, intense bronchoconstriction, or all three (\*Gosselin 1976).

**Medical Conditions Generally Aggravated by Exposure:** Not Found

**Emergency and First Aid Procedures:** Move victim to fresh air; call emergency medical care. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In case of contact with material, immediately flush skin and eyes with running water for at least 15 minutes. Speed in removing material from skin is of extreme importance. Remove and isolate contaminated clothing and shoes at the site. Keep victim quiet and maintain normal body temperature. Effects may be delayed; keep victim under observation (\*DOT 1984).

SECTION VI -- USE INFORMATION

Insecticide and acaricide for citrus fruit, apples, nuts, other fruit, and cotton (\*SRI).



ETHION

**SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE**

(Steps to be Taken in Case Material is Released or Spilled)

Avoid breathing vapors. Wear proper respiratory protection and protective clothing (see Section V above). Do not touch spilled material. Use water spray to reduce vapors. Take up small spills with sand or other noncombustible absorbent material. Large spills should be diked far ahead of the spill for later disposal (\*DOT 1984).

EPA CHEMICAL PROFILE

INTERIM

Date: October 31, 1985

Revision: \_\_\_\_\_

CHEMICAL IDENTITY -- SEMICARBAZIDE HYDROCHLORIDE

CAS Registry Number: 563-41-7

**Synonyms:** Amidourea Hydrochloride; Aminourea Hydrochloride;  
Carbamylhydrazine Hydrochloride; Hydrazinecarboxamide Monohydrochloride;  
Hydrazinecarboxamide, Hydrochloride; Hydrazinecarboxamide, Monohydrochloride;  
Semicarbazide Chloride; Semicarbazide, Monohydrochloride

**Chemical Formula:**  $\text{CH}_5\text{N}_3\text{O}\cdot\text{HCl}$

**Molecular Weight:** 111.54

SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

OSHA PEL: Not Found

ACGIH TLV: Not Found

IDLH: Not Found

**Other Limits Recommended:** Toxicity information:  $\text{LD}_{\text{low}}$  oral (rat)  
10 mg/kg (\*NIOSH/RTECS 1985)

SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

**Boiling Point:** Not Found

**Specific Gravity ( $\text{H}_2\text{O}=1$ ):** Not Found

**Vapor Pressure (mmHg):** Not Found

**Melting Point:** 342-347°F, 172-175°C (Hawley 1981, p. 914); decomposes  
at 347-365°F, 175-185°C (Merck 1983, p. 1214)

**Vapor Density (AIR=1):** Not Found

**Evaporation Rate (Butyl acetate=1):** Not Found

**Solubility in Water:** Freely soluble in water with acid reaction  
(\*Merck 1976)

**Appearance and Odor:** Snow white crystals (\*Hawley 1977)

## SEMICARBAZIDE HYDROCHLORIDE

### SECTION III -- FIRE AND EXPLOSION HAZARD DATA

**Flash Point** (Method Used): Not Found

**Flammable Limits:**

LEL: Not Found

UEL: Not Found

**Extinguishing Methods:** (Non-Specific -- Poisonous Solid, n.o.s.) This material may burn, but does not ignite readily. For small fires use dry chemical, carbon dioxide, water spray, or foam. For large fires, use water spray, fog, or foam (DOT 1984, Guide 53).

**Special Fire Fighting Procedures:** (Non-Specific -- Poisonous Solid, n.o.s.) Wear self-contained (positive pressure if available) breathing apparatus and full protective clothing (DOT 1984, Guide 53).

**Unusual Fire and Explosion Hazards:** When heated to decomposition, it emits very toxic fumes of nitrogen oxides and hydrogen chloride (Sax 1984, p. 2392).

### SECTION IV -- REACTIVITY DATA

**Stability:** Unstable: Not Found

Stable: Not Found

**Conditions to Avoid:** Not Found

**Incompatibility** (Materials to Avoid): Not Found

**Hazardous Decomposition or Byproducts:** When heated to decomposition it emits very toxic fumes of nitrogen oxides and hydrogen chloride (Sax 1984, p. 2392).

**Hazardous Polymerization:** May Occur: Not Found

May Not Occur: Not Found

**Conditions to Avoid:** Not Found

### SECTION V -- HEALTH HAZARD DATA

**Routes of Entry:** Inhalation: Not Found

Skin: Not Found

Ingestion: Yes (Hawley 1981, p. 914)

## SEMICARBAZIDE HYDROCHLORIDE

### SECTION V -- HEALTH HAZARD DATA (Continued)

**Health Hazards** (Acute, Delayed, and Chronic): Toxic by ingestion (Hawley 1981, p. 914).

**Signs and Symptoms of Exposure:** Not Found

**Medical Conditions Generally Aggravated by Exposure:** Not Found

**Emergency and First Aid Procedures:** (Non-Specific -- Poisonous Solid, n.o.s.) Move victim to fresh air; call emergency medical care. Remove and isolate contaminated clothing and shoes at site. In case of contact with material, immediately flush skin or eyes with running water for at least 15 minutes (DOT 1984, Guide 53).

### SECTION VI -- USE INFORMATION

As a reagent for ketones and aldehydes with which it affords crystalline compounds having characteristic melting points (Merck 1983, p. 1214).

### SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE

(Steps to be Taken in Case Material is Released or Spilled)

(Non-Specific -- Poisonous Solid, n.o.s.) Isolate hazard area. Stay upwind; keep out of low areas. Wear self-contained (positive pressure if available) breathing apparatus and full protective clothing. Do not touch spilled material. Absorb small spills with sand or other noncombustible absorbent material and place into containers for later disposal. Take up small, dry spills with clean shovel; place material into clean, dry container and cover; move containers from spill area. Dike far ahead of large spills for later disposal (DOT 1984, Guide 53).

EPA CHEMICAL PROFILE

INTERIM

Date: October 31, 1985

Revision: \_\_\_\_\_

CHEMICAL IDENTITY -- TOLUENE 2,4-DIISOCYANATE

CAS Registry Number: 584-84-9

**Synonyms:** 2,4-Dicyanato-1-Methylphenylene; 2,4-Diisocyanato-1-Methylbenzene; 2,4-Diisocyanatotoluene; 2,4-TDI; 2,4-Toluene Diisocyanate; 2,4-Toluenediisocyanate; 2,4-Toluylene Diisocyanate; 2,4-Tolylene Diisocyanate; 2,4-Tolylenediisocyanate; 4-Methyl-m-Phenylene Diisocyanate; 4-Methyl-m-Phenylene Isocyanate; 4-Methyl-Phenylene Diisocyanate; 4-Methyl-Phenylene Isocyanate; Benzene, 2,4-Diisocyanato-1-Methyl; Desmodur T80; Di-Iso-Cyanatoluene; Hylene T; Hylene T CPA; Hylene TLC; Hylene TM; Hylene TM-65; Hylene TRF; Isocyanic Acid, 4-Methyl-m-Phenylene Ester; Isocyanic Acid, Methylphenylene Ester; Meta-Toluene Diisocyanate; Mondur TD; Mondur TD-80; Mondur TDS; Nacconate 100; NCI-C50533; Niax TDI; Niax TDI-P; Rubinate TDI 80/20; TDI; TDI-80; Toluene Diisocyanate; Toluene, 2,4-Diisocyanato-; Toluene-2,4-Diisocyanate; Toluylene-2,4-Diisocyanate; Tolyene 2,4-Diisocyanate; Tolyene-2,4-Diisocyanate; Tolylene Diisocyanate; Tolylene-2,4-Diisocyanate

**Chemical Formula:**  $C_9H_6N_2O_2$

**Molecular Weight:** 174.15

SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

**OSHA PEL:** Ceiling 0.02 ppm (0.14 mg/m<sup>3</sup>) (NIOSH/OSHA 1978, p. 180)

**ACGIH TLV:** TWA 0.005 ppm (0.04 mg/m<sup>3</sup>); STEL 0.02 ppm (0.15 mg/m<sup>3</sup>) (\*ACGIH 1984)

**IDLH:** 10 ppm (\*Encyc Occupat Health and Safety 1983)

**Other Limits Recommended:** Occupational exposure to diisocyanates recommended standard: TWA 0.005 ppm; Ceiling 0.02 ppm/10 minutes (NIOSH/OSHA 1978, p. 180)

SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

**Boiling Point:** 484°F, 251°C (\*Merck 1983)

**Specific Gravity (H<sub>2</sub>O=1):** 1.2244 at 20°C/4°C (\*Merck 1983)

**Vapor Pressure (mmHg):** 1 at 80°C (\*Clayton and Clayton 1981-82)

## TOLUENE 2,4-DIISOCYANATE

### SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

**Melting Point:** 67.1-70.7°F, 19.5-21.5°C (\*Merck 1983)

**Vapor Density (AIR=1):** 6.0 (\*Clayton and Clayton 1981-82)

**Evaporation Rate (Butyl acetate=1):** Not Found

**Solubility in Water:** Reacts with water evolving carbon dioxide (Merck 1983, p. 1364).

**Appearance and Odor:** Colorless, yellow or dark liquid or solid with a sweet, fruity, pungent odor (NIOSH/OSHA 1978, p. 180).

### SECTION III -- FIRE AND EXPLOSION HAZARD DATA

**Flash Point (Method Used):** 270°F, 132°C (\*Merck 1983)

**Flammable Limits:**

LEL: 0.9% (\*NFPA 1978)

UEL: 9.5% (\*NFPA 1978)

**Extinguishing Methods:** Water gently applied to surface or foam may cause frothing which will extinguish the fire (\*NFPA 1978). If material is on fire or involved in fire do not extinguish fire unless flow can be stopped. Use water in flooding quantities as fog. Solid streams of water may be ineffective. Cool all affected containers with flooding quantities of water. Apply water from as far a distance as possible. Use "alcohol" foam, carbon dioxide or dry chemical. Use water spray to absorb vapor (Student 1981, p. 503).

**Special Fire Fighting Procedures:** If water gets below the surface of the liquid, it will turn to steam and cause frothing. Full protective clothing, including self-contained breathing apparatus, rubber gloves, boots and bands around legs, arms, and waist should be provided. No skin surface should be exposed (\*NFPA 1978). Move container from fire area if you can do it without risk. Cool containers that are exposed to flames with water from the side until well after fire is out. Dike fire control water for later disposal; do not scatter the material (DOT 1984, Guide 57).

**Unusual Fire and Explosion Hazards:** When heated to decomposition it emits very toxic fumes of cyanide and nitrogen oxides (Sax 1984, p. 2590). Reacts violently with amines, alcohol, bases and warm water causing fire and explosion hazards (DASE 1980, p. 907).

## TOLUENE 2,4-DIISOCYANATE

### SECTION IV -- REACTIVITY DATA

**Stability:** Unstable:

**Stable:** Yes (Weiss 1980, p. 871)

**Conditions to Avoid:** Avoid heating (\*NFPA 1978).

**Incompatibility (Materials to Avoid):** Strong oxidizers, water, acids, bases, amines, etc., cause foam and splatter (NIOSH/OSHA 1978, p. 180)

**Hazardous Decomposition or Byproducts:** When heated to decomposition, it emits very toxic fumes of cyanide and nitrogen oxide (Sax 1984, p. 2590).

**Hazardous Polymerization:** May Occur: Yes (\*Merck 1983)

May Not Occur:

**Conditions to Avoid:** Concentrated alkaline compound such as sodium hydroxide or tertiary amines may cause run-away polymerization (\*Merck 1983). Slow, not hazardous polymerization may occur above 113°C (\*CHRIS 1978).

### SECTION V -- HEALTH HAZARD DATA

**Routes of Entry:** Inhalation: Yes (NIOSH/OSHA 1978, p. 180)

Skin: Yes (NIOSH/OSHA 1978, p. 180)

Ingestion: Yes (NIOSH/OSHA 1978, p. 180)

**Health Hazards (Acute, Delayed, and Chronic):** Can cause death. Contact with skin may cause allergic eczema. Substance is very corrosive to eyes. Chronic exposure may cause chronic lung disease (\*Gosselin 1976, Weiss 1980, p. 871, DASE 1980, p. 907). As a vapor TDI is a powerful irritant to the respiratory tract. Chronic loss of respiratory function may occur (\*Gosselin 1976). Acute asthmatic bronchitis or frank asthma may occur (\*IARC 1972-85). A splash in the eyes of workmen has caused keratitis and conjunctivitis (\*Grant 1974). This compound causes inflammation of the skin, also chemical pneumonitis and pulmonary edema (\*ACGIH 1980).

**Signs and Symptoms of Exposure:** Contact with skin causes redness and pain. Contact with eyes causes redness, pain and blurred vision. Inhalation causes shortness of breath, coughing, bronchospasm, and labored breathing. Ingestion causes sore throat, abdominal pain, nausea, vomiting, and diarrhea (\*Merck 1983; \*Gosselin 1976; \*Grant 1974; \*ACGIH 1980; Weiss 1980, p. 871, DASE 1980, p. 907). Neurological symptoms include euphoria, loss of consciousness, headache, difficulty in concentration, poor memory, confusion, irritability, and depression (\*BR J IND MED 33(2):65-71 1976).

## TOLUENE 2,4-DIISOCYANATE

**Medical Conditions Generally Aggravated by Exposure:** Not Found

**Emergency and First Aid Procedures:** Move victim to fresh air; call emergency medical care. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In case of contact with material, immediately flush skin or eyes with running water for at least 15 minutes. Speed in removing material from skin is of extreme importance. Remove and isolate contaminated clothing and shoes at the site. Keep victim quiet and maintain normal body temperature. Effects may be delayed; keep victim under observation (DOT 1984, Guide 57).

### SECTION VI -- USE INFORMATION

Polyurethane foams; coatings in floor and wood finishes; sealers; paints; concrete sealers for aircraft and tank trucks; elastomers in clay pipe seals (\*IARC 1972-1985); elastomers and coatings; and cross-linking agent for nylon (Hawley 1981, p. 1030).

### SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE

(Steps to be Taken in Case Material is Released or Spilled)

Shut off ignition sources; no smoking or flames in hazard area. Do not touch spilled material; stop leak if you can do so without risk. Use water spray to reduce vapors. Small spills: absorb with sand or other non-combustible absorbent material and place into containers for later disposal. Small dry spills: with clean shovel place material into clean, dry container and cover; move containers from spill area. Large spills: dike far ahead of spill for later disposal. Keep unnecessary people away; isolate hazard area and deny entry. Stay upwind; keep out of low areas. Ventilate closed spaces before entering them. Wear positive pressure breathing apparatus and special protective clothing (DOT 1984, Guide 57). If material is not on fire and not involved in fire; keep sparks, flames, and other sources of ignition away. Keep material out of water sources and sewers. Build dikes to contain flow as necessary; attempt to stop leak if without hazard. Use water spray to knock down vapors. If material is leaking (not on fire), downwind evacuation must be considered (Student 1981, p. 503).



## EPA CHEMICAL PROFILE

### INTERIM

Date: October 31, 1985

Revision: \_\_\_\_\_

## CHEMICAL IDENTITY -- PERCHLOROMETHYLMERCAPTAN

CAS Registry Number: 594-42-3

**Synonyms:** Trichloromethanesulphenyl Chloride; (Trichloromethyl)Sulphenyl Chloride; Clairsit; Methanesulfenic Acid, Trichloro-, Chloride; Methanesulphenyl Chloride, Trichloro-; PCM; Perchloro-Methyl-Mercaptan; Perchloromethanethiol; Perchloromethyl Mercaptan; PMM; Thiocarbonyl Tetrachloride; Trichloromethanesulphenyl Chloride; Trichloromethylsulphenyl Chloride; Trichloromethylsulphenyl Chloride

**Chemical Formula:**  $\text{CCl}_4\text{S}$

**Molecular Weight:** 185.87

## SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

**OSHA PEL:** TWA 0.8 mg/m<sup>3</sup> (\*NIOSH/RTECS 1985)

**ACGIH TLV:** TWA 0.1 ppm, 0.8 mg/m<sup>3</sup> (\*ACGIH 1980)

**IDLH:** 10 ppm (NIOSH/OSHA 1978, p. 150)

**Other Limits Recommended:** Not Found

## SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

**Boiling Point:** 297-298°F, 147-148°C (\*Weast 1979)

**Specific Gravity ( $\text{H}_2\text{O}=1$ ):** 1.6947 at 20°C (\*ACGIH 1980)

**Vapor Pressure (mmHg):** 25 at 51°C (Weast 1984, p. C-374)

**Melting Point:** Not Found

**Vapor Density (AIR=1):** 6.414 (\*Sax 1979)

**Evaporation Rate (Butyl acetate=1):** Not Found

**Solubility in Water:** Insoluble (\*ACGIH 1980)

**PERCHLOROMETHYLMERCAPTAN****SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS (Continued)**

**Appearance and Odor:** Oily, yellow (\*ACGIH 1980) to orange-red liquid (\*CHRIS 1978). Odor is intensely unpleasant; strong, unbearable, acrid (\*CHRIS 1978).

**SECTION III -- FIRE AND EXPLOSION HAZARD DATA**

**Flash Point (Method Used):** Not Found

**Flammable Limits:**

LEL: Not Found

UEL: Not Found

**Extinguishing Methods:** This compound is neither flammable nor a serious fire hazard, although it will support combustion (\*ACGIH 1980). Fight small fires with dry chemical, carbon dioxide, water spray, or foam, and large fires with water spray, fog, or foam. Move containers containing this compound away from fire area if possible (DOT 1984, Guide 55).

**Special Fire Fighting Procedures:** Fight fire from maximum distance. Dike fire control water for later disposal; do not scatter the material. Positive pressure breathing apparatus and special protective clothing should be worn (DOT 1984, Guide 55).

**Unusual Fire and Explosion Hazards:** Very irritating vapors formed from hot material; may form phosgene gas, hydrogen chloride, and sulfur dioxide (Weiss 1980, p. 739).

**SECTION IV -- REACTIVITY DATA**

**Stability: Unstable:**

**Stable:** Yes (Weiss 1980, p. 739)

**Conditions to Avoid:** Reacts with water only when hot to give carbon dioxide, hydrochloric acid, and sulfur (Weiss 1980, p. 739).

**Incompatibility (Materials to Avoid):** Reacts with iron or steel, evolving carbon tetrachloride. Corrosive to most metals (Weiss 1980, p. 739).

**Hazardous Decomposition or Byproducts:** At high temperatures this compound will decompose to carbon tetrachloride, sulfur chloride, heavy oil polymers, phosgene gas, hydrogen chloride, and sulfur dioxide (Weiss 1980, p. 739).

PERCHLOROMETHYLMERCAPTAN

SECTION IV -- REACTIVITY DATA (Continued)

Hazardous Polymerization: May Occur:  
May Not Occur: Yes (Weiss 1980, p. 739)

Conditions to Avoid: Not Found

SECTION V -- HEALTH HAZARD DATA

Routes of Entry: Inhalation: Yes (\*Sax 1975)  
Skin: Yes (\*CHRIS 1978)  
Ingestion: Yes (\*Sax 1975)

**Health Hazards** (Acute, Delayed, and Chronic): May cause death or permanent injury after short exposure to small quantities (\*Sax 1975); strong irritant to eyes and skin (\*Hawley 1977). Inhalation may cause severe irritation of the upper respiratory tract. It also is a strong irritant to the eyes and skin. Brief exposure to lower concentrations may produce central nervous system depression and lung, liver, and heart congestion. Severe exposures may be fatal. Exposure of eyes may lead to severe conjunctivitis or corneal damage. The liquid is irritating to the skin, and may be absorbed through the skin in quantities sufficient to cause general toxic effects. Ingestion may cause damage to mucous membranes and result in pain and burning of the mouth and throat, nausea, vomiting, cramps, and diarrhea. In severe cases, tissue ulceration and CNS depression may occur (\*CHRIS 1980).

**Signs and Symptoms of Exposure:** Symptoms of exposure include eye irritation, conjunctivitis, and skin irritation. Ingestion causes burning of mouth and throat, nausea, vomiting, cramps, and diarrhea (\*CHRIS 1978, 1980). Persons exposed at less than 45 ppm noted strong eye, throat, and chest irritation, as well as nausea (\*ACGIH 1980).

**Medical Conditions Generally Aggravated by Exposure:** Not Found

**Emergency and First Aid Procedures:** Move victim to fresh air and call for emergency medical care. Give artificial respiration if necessary. If breathing is difficult, give oxygen. If skin or eyes are exposed, flush with running water for at least 15 minutes. It is extremely important to remove this material from skin as quickly as possible. Remove and isolate contaminated clothing and shoes. Keep victim quiet and maintain normal body temperature. Effects may be delayed; keep victim under observation (DOT 1984, Guide 55).

PERCHLOROMETHYLMERCAPTAN

SECTION VI -- USE INFORMATION

This compound is used as a fumigant, dye intermediate, and in other organic syntheses (\*ACGIH 1980).

SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE  
(Steps to be Taken in Case Material is Released or Spilled)

Do not touch spilled material; stop leak if this can be done without risk. Use water spray to reduce vapors. For a relatively small spill or leak, isolate the area in all directions for 220 feet. For a larger spill (e.g., from a tank) first isolate the area for 450 feet in all directions, and then evacuate in a downwind direction an area 1.1 miles in width and 1.6 miles in length (DOT 1984, Guide 55 and Table of Isolation and Evacuation Distances).

Wear positive pressure breathing apparatus and special protective clothing. Take up small spills with sand or other noncombustible absorbent material and place into containers for later disposal. For large spills dike far ahead of spill for later disposal. It may be necessary to seek emergency assistance (DOT 1984, Guide 55).