

**Chemistry Laboratory Information Profiles**  
<http://membership.acs.org/c/ccs/pubs/CLIPS/>

We all know that, in general, chemicals are hazardous—that if they are mishandled or misused harm can result. Everyone also knows that statements of the hazards associated with a given chemical are scattered throughout the pages of the Material Safety Data Sheet (MSDS) and also appear on the label of the container for that chemical. We acknowledge that our professional responsibility as teachers of chemistry requires that all concerned be cognizant of the hazards of the chemicals we and our students use and handle.

But there are problems in acquiring this hazard information from MSDSs and labels. Many MSDSs and labels do not directly apply to the use of chemicals in the instructional laboratory. They are written for industrial use where the procedures involve large quantities of chemicals in multi-gallon sized vessels connected one to another by piping equipped with valves requiring electric-powered motors to open and close. Although it is certainly possible to “translate” such MSDSs into information suited to laboratory quantities and use, the effort to do so is singularly un-rewarding to many teachers who typically face more immediate demands on their time.

Further, different MSDSs disclose hazard information in different ways. The information about, say, flammability that is displayed in Section 3, page 2, of the MSDS for one chemical is found in Section V, page 4, in the MSDS for another chemical in its discussion of combustibility. Although it is less common today than it was a few years ago, some MSDSs do not disclose all of the information required by the pertinent OSHA regulation, 29 CFR 1910.1200, and therefore cannot be relied upon. Even experienced chemists are sometimes unable to determine whether an MSDS is defective without spending several hours searching the literature for the accurate information.

Labels on chemical containers are usually better in that most list the hazards, precautions, and first aid procedures in the same places, although not always in the same order. Even so, suppliers seem to have their own idiosyncrasies in the way they present information on their labels. The labels on smaller containers are problematic in yet another way: either the printed font is too small to read and comprehend easily or the information is abbreviated or condensed.

Accordingly, there seems to be a need for a document that describes the hazards of a chemical in a manner more useful for teachers and their students. To this end, I have devised CLIPs, Chemical Laboratory Information Profiles.

CLIPS can be used to assist your determinations of the precautions your students should take in their laboratory work, or they can be used to guide students in discussions wherein they participate in selecting the precautionary measures for their own laboratory work. Also, using a few published CLIPs as examples, students could be assigned the task of preparing their own CLIPs for one or more of the reagents to be used in next week’s laboratory work. Other pedagogic applications are possible.

The CLIP itself and its format are intended to be self-explanatory. Suggestions for clarification and improvement are always welcome.

Jay A. Young  
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## Chemicals

Acetic Acid  
Acetic Anhydride  
Acetone  
Acrylonitrile  
Acetaldehyde  
Aluminum Oxide  
Anthracene  
Antimony (III) Chloride  
Aqueous Ammonia  
Arsenic (III) Oxide  
Asbestos  
Barium Chloride Dihydrate  
Borax  
Calcium Carbide  
Canola Oil  
Carbon Disulfide  
Chromium (VI) Oxide  
Citric Acid  
Cobalt (II) Chloride Hexahydrate  
Cobalt (II) Oxide  
Copper(I) Oxide  
Copper(II) Sulfate Pentahydrate  
Diethyl Phthalate  
EDTA  
Formic Acid  
Glass Wool  
Glycerol  
Graphite  
Hydrochloric Acid  
Hydrogen Peroxide  
Iron (II) Sulfate Heptahydrate  
Iron (III) Oxide  
Isopropyl Ether  
Liquid Nitrogen  
Manganese (IV) Oxide  
Mercury (I) Chloride  
n-Hexane  
Nitric Acid  
Oleic Acid  
Osmium Tetroxide  
Petroleum Ether  
Phenolphthalein Solution  
Potassium Chlorate  
Potassium Chromate  
Potassium Cyanide  
Potassium Dichromate  
Potassium Permanganate  
Sodium  
Sodium Acetate  
Sodium Carbonate  
Sodium Fluoride  
Sodium Hydroxide  
Sodium Hypochlorite Solution  
Sodium Nitrate  
Sodium Thiosulfate Pentahydrate  
Sucrose  
Sulfur  
Sulfuric Acid  
Turpentine  
Water  
Zirconium (IV) Oxide

## CLIP, Chemical Laboratory Information Profile

"Only when you know the hazards, can you take the necessary precautionary measures."

**Acetaldehyde****CAS No.: 75-07-0**

Synonyms: Ethanal, ethyl aldehyde

**Physical Properties**

Colorless liquid with a pungent, fruity odor.  
 Vapor pressure at 20 °C: 768 Torr  
 Melting point: -124 °C  
 Boiling point: 21 °C

**Exposure Limits**

OSHA PEL: 200 ppm  
 ACGIH TLV: 25 ppm

**Hazardous Characteristics**

Overall toxicity 2	Flammability 4	Destructive to skin/eye 3	Absorbed through skin 0	Sensitizer? No	Self-reactive? Yes	Incompatible with:  Bases, oxidizing agents, acid anhydrides, alcohols, halogens, amines, ammonia, ketones, phenols, hydrogen cyanide, hydrogen sulfide.*
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0: None (or very low); 1: Slight; 2: Moderate; 3: High; 4: Severe.

**\*Reactivity Hazards**

Polymerizes violently in the presence of many bases, of trace metals, and of acetic acid as well. Often spontaneously explodes when in contact with strong oxidizing agents. The vapor can ignite spontaneously when in contact with corroded metal. See Bretherick's *Handbook of Reactive Chemical Hazards* for details and for other incompatibilities.

Cited as known to be or reasonably anticipated to be carcinogenic in NTP-9?

Yes

Identified as a reproductive toxin in Frazier and Hage, *Reproductive Hazards of the Workplace*?

No

**Typical symptoms of acute exposures:**

Sore throat, coughing, labored breathing, lung edema, unconsciousness if inhaled; serious cases can be fatal. Corrosive if in eyes; also causes inflammation and/or pain. On the skin causes inflammation and/or pain. Severely irritating if swallowed or in the mouth, and corrodes tissues, causes vomiting, diarrhea, abdominal pain. Repeated inhalation of the vapor produces effects similar to those associated with chronic alcoholic intoxication.

**Principal target organ(s) or system(s):**

Respiratory system, eyes, skin, gastro-intestinal tract, central nervous system.

**Storage Requirements**

With other flammables in a cool, dry, well-ventilated location, away from ignition sources and separated from oxidizing agents.

**Additional Remarks**

The vapor is denser than air and can travel long distances; it is explosive when mixed with air. At ordinary temperatures the vapor pressure of acetaldehyde greatly exceeds the limits established by OSHA and ACGIH. Accordingly, users will be likely to be overexposed to the vapor of this compound unless appropriate precautions are rigidly maintained; see the MSDS for details. Note that symptoms of lung edema are not manifest immediately in victims who have inhaled acetaldehyde vapors or mist; some hours may elapse first; physical effort can exaggerate these symptoms. Rest is essential for persons exposed to excess vapor or mist.

**Notes****ReadMe**

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**Reproductive Toxins**

Some substances that in fact are reproductive toxins are not yet recognized as such. For the best readily available and up-to-date information, refer to "DART/ETIC". See the TOXNET home page at [www.sis.nlm.nih.gov](http://www.sis.nlm.nih.gov) and click on "Toxicology search". *Note that some of the data in DART/ETIC have not been peer-reviewed.* See also Linda M. Frazier and Marvin L. Hage, *Reproductive Hazards of the Workplace*; Wiley, 1998; and T. H. Shepard, *Catalog of Teratogenic Agents*, 9th ed.; Johns Hopkins University Press, 1998.

**Abbreviations**

ACGIH TLV—American Conference of Governmental Industrial Hygienists—Threshold Limit Value. C—Ceiling. CAS—Chemical Abstracts Service. mg/m<sup>3</sup>—milligrams per cubic meter. NA—Not applicable. NE—Not established. NI—No information. NTP-9—National Toxicology Program, Ninth Annual Report on Carcinogens. OSHA PEL—Occupational Safety and Health Administration—Permissible Exposure Limit. ppm—parts per million. STEL/C—Short-term exposure limit and ceiling.

Prepared by: Jay A. Young

Date of preparation: January 10, 2002

## CLIP, Chemical Laboratory Information Profile

"Only when you know the hazards, can you take the necessary precautionary measures."

## Acetic Acid (glacial)



CAS No.: 64-19-7

Synonyms: ethanoic acid, ethylic acid, methanecarboxylic acid

## Physical Properties

Colorless combustible liquid (or solid at or below room temperatures) with a pungent odor  
 Vapor pressure at 20 °C: 12 Torr  
 Melting point: 16 °C  
 Boiling point: 118 °C  
 Flash point: 40 °C

## Exposure Limits

OSHA PEL: 10 ppm  
 ACGIH TLV: 10 ppm  
 ACGIH STEL/C: 15 ppm

## Hazardous Characteristics

Overall toxicity	Flammability	Destructive to skin/eye	Absorbed through skin	Sensitizer?	Self-reactive?	Incompatible with:
2	2	3	No	No	No	Bases, oxidizing agents, many metals*

0: None (or very low); 1: Slight; 2: Moderate; 3: High; 4: Severe

## \*Reaction with:

• Bases and with oxidizing agents is exothermic and can be violent. • Many metals produce hydrogen, a flammable and explosive gas. See Bretherick's *Handbook of Reactive Chemical Hazards* for details and for other incompatibilities.

Cited as known to be or reasonably anticipated to be carcinogenic in NTP-9? No Identified as a reproductive toxin in Frazier and Hage, *Reproductive Hazards of the Workplace*? No

## Typical symptoms of acute exposures:

Tissue destruction of eyes, skin, or mucous membranes with pain, severe discomfort, or stinging sensation. Coughing, sore throat, difficulty in breathing if inhaled; may cause lung oedema but symptoms may be delayed. Acidic or sour taste if in mouth with destruction of teeth and mouth tissues. Sore throat and/or abdominal pain if swallowed.

## Principal target organ(s) or system(s):

Eyes, skin, respiratory system.

## Storage Requirements

Separate from bases, oxidizing acids, and other oxidizing agents; with other organic acids in a cool, dry, well-ventilated location away from ignition sources.

## Additional Remarks

Vapors are denser than air and can travel long distances, collecting in low spots. Forms explosive vapor-air mixtures above 40 °C. The information in this CLIP should not be construed as applying in entirety to vinegar, a 4–5% aqueous solution of acetic acid with other substances also present.

## Notes

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Prepared by: Jay A. Young

Date of preparation: January 16, 2001

## CLIP, Chemical Laboratory Information Profile

"Only when you know the hazards, can you take the necessary precautionary measures."

## Acetic Anhydride



CAS No.: 108-24-7

Synonyms: Acetic acid anhydride, Acetic oxide, Acetyl oxide, Ethanoic anhydride

## Physical Properties

## Exposure Limits

Colorless liquid with a pungent odor.  
Vapor pressure at 20 °C: 4 Torr  
Melting point: -73 °C  
Boiling point: 140 °C

OSHA PEL: 5 ppm  
ACGIH TLV: 5 ppm

## Hazardous Characteristics

Overall toxicity	Flammability	Destructive to skin/eye	Absorbed through skin	Sensitizer?	Self-reactive?	Incompatible with:
3	2	3	0	No	No	Water, alcohols, oxidizing agents*

0: None (or very low); 1: Slight; 2: Moderate; 3: High; 4: Severe.

## \*Reaction with:

water, alcohols, oxidizing agents can be violent and is exacerbated in the presence of acid or higher temperatures; even mild oxidizers, e.g. boric acid, can cause an eruption. See Bretherick's *Handbook of Reactive Chemical Hazards* for details and for other incompatibilities.

Cited as known to be or reasonably anticipated to be carcinogenic in NTP-9?

No

Identified as a reproductive toxin in Frazier and Hage, *Reproductive Hazards of the Workplace*?

No

## Typical symptoms of acute exposures:

Sore throat, coughing, labored breathing if inhaled. Inflammation, burns if on skin; dermatitis if contact is prolonged. Tearing, redness, pain, blurred vision if in eyes. Sore throat, abdominal pain, vomiting, diarrhea if swallowed.

## Principal target organ(s) or system(s):

Eyes, skin, respiratory system.

## Storage Requirements

Store separately in a cool, dry, well-ventilated and locked location that is *not* protected by a water sprinkling system outlet.

## Additional Remarks

Forms explosive air-vapor mixtures above 48 °C. Often, the symptoms of lung edema do not appear until a few hours after exposure to the vapor.

## Notes

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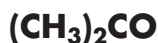
Prepared by: Jay A. Young

Date of preparation: January 15, 2001

## CLIP, Chemical Laboratory Information Profile

"Only when you know the hazards, can you take the necessary precautionary measures."

## Acetone



CAS No.: 67-64-1

Synonyms: Dimethyl ketone, 2-Propanone, Ketone propane

## Physical Properties

## Exposure Limits

Colorless, flammable liquid with a distinctive odor  
 Vapor pressure at 20 °C: 179 Torr  
 Melting point: -95 °C  
 Boiling Point: 56 °C  
 Flash point: -19 °C

OSHA PEL: 1000 ppm  
 ACGIH TLV: 500 ppm  
 ACGIH STEL/C: 750 ppm

## Hazardous Characteristics

Overall toxicity	Flammability	Destructive to skin/eye	Absorbed through skin	Sensitizer?	Self-reactive?	Incompatible with:
1	3	1	1	No	No	Oxidizing agents, chloroform (in basic environment), many plastics*

0: None (or very low); 1: Slight; 2: Moderate; 3: High; 4: Severe.

## \*Reaction with:

oxidizing agents can be violent and exothermic, particularly with strong oxidizing agents; chloroform and other haloforms with an activated hydrogen is, in the presence of base, spontaneous, exothermic, and violent; compressed air can be spontaneous and exothermic. See Bretherick's *Handbook of Reactive Chemical Hazards* for details and for other incompatibilities.

Cited as known to be or reasonably anticipated to be carcinogenic in NTP-9? No

Identified as a reproductive toxin in Frazier and Hage, *Reproductive Hazards of the Workplace*? No

## Typical symptoms of acute exposures:

Irritation of the eyes and skin, nose, throat. Dizziness, nausea, headache.

## Principal target organ(s) or system(s):

Eyes, skin, respiratory system, central nervous system.

## Storage Requirements

With other flammables in a cool, dry, well-ventilated location, away from ignition sources and separated from oxidizing agents.

## Additional Remarks

Vapors are heavier than air and can travel long distances; they are explosive when mixed with air. The liquid develops a static charge when poured or pumped. The charge can be large enough to generate a spark sufficient to ignite the ever-present vapors, causing an explosion and/or fire. Exposure to ethyl alcohol enhances the toxic effects of exposure to acetone.

## Notes

## ReadMe

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Prepared by: Jay A. Young

Date of preparation: January 16, 2001

## CLIP, Chemical Laboratory Information Profile

"Only when you know the hazards, can you take the necessary precautionary measures."

**Acrylonitrile****CAS No.: 107-13-1**

Synonyms: 2-Propenenitrile, Vinyl cyanide, Cyanoethylene

**Physical Properties****Exposure Limits**

Volatile colorless liquid with characteristic odor. For most persons the odor threshold is greater than the TLV.

Vapor pressure at 20 °C: 85 torr

Melting point: -83 °C

Boiling point: 77 °C

OSHA PEL: 2 ppm

OSHA STEL/C 10 ppm

ACGIH TLV: 2 ppm

**Hazardous Characteristics**

Overall toxicity	Flammability	Destructive to skin/eye	Absorbed through skin	Sensitizer?	Self-reactive?	Incompatible with:
4	3	3	3	No	Yes	Oxidizing agents, strong bases and acids, halogens, peroxide.*

0: None (or very low); 1: Slight; 2: Moderate; 3: High; 4: Severe.

**\*Reactivity Hazards**

The monomer polymerizes readily, especially in the presence of strong bases or acids, peroxides, halogens, and other substances. When exposed to light, the monomer, even if inhibited, will polymerize when the temperature is greater than 200 °C. The polymerization is exothermic and often is vigorous, even violently explosive. See Bretherick's *Handbook of Reactive Chemical Hazards* for details and for other incompatibilities.

Cited as known to be or reasonably anticipated to be carcinogenic in NTP-9? Yes

Identified as a reproductive toxin in Frazier and Hage, *Reproductive Hazards of the Workplace?* Yes

**Typical symptoms of acute exposures:**

If inhaled, dizziness, faintness, labored breathing, coma, asphyxia (cessation of breathing), death. In the eyes, inflammation, pain. If on the skin, blistering, dermatitis, and absorption through the skin causing symptoms similar to those from inhalation.

**Principal target organ(s) or system(s):**

Eyes, respiratory system, central nervous system.

**Storage Requirements**

Store inhibited acrylonitrile in a cool, dry, well-ventilated, locked location, away from ignition sources and separated from oxidizing agents, acids, and bases. Never store uninhibited acrylonitrile.

**Additional Remarks**

Victims poisoned by acrylonitrile require specific first aid treatment, usually described in the MSDS for this compound. At ordinary temperatures, the vapor pressure of acrylonitrile greatly exceeds the limits established by OSHA and ACGIH. Accordingly, users will be likely to be over-exposed to the vapors of this compound unless appropriate precautions are rigidly maintained; see MSDS for details. The vapor is heavier than air and can travel long distances; it is explosive when mixed with air.

**Notes****ReadMe**

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Prepared by: Jay A. Young

Date of preparation: November 27, 2002

## CLIP, Chemical Laboratory Information Profile

"Only when you know the hazards, can you take the necessary precautionary measures."

## Aluminum oxide



CAS No.: 1344-28-1

Synonyms: Alumina

## Physical Properties

White amorphous solid, insoluble in water.  
 Vapor pressure at 20 °C: negligible  
 Melting point: 2050 °C  
 Boiling point: 3500 °C

## Exposure Limits

OSHA PEL: 15 mg/m<sup>3</sup>, total dust  
 5 mg/m<sup>3</sup>, respirable fraction  
 ACGIH TLV: 10 mg/m<sup>3</sup>

## Hazardous Characteristics

Overall toxicity	Flammability	Destructive to skin/eye	Absorbed through skin	Sensitizer?	Self-reactive?	Incompatible with:
1	0	1	0	No	No	Inter halogens such as chloride trifluoride, halocarbon compounds, many monomers that can be catalytically polymerized.*

0: None (or very low); 1: Slight; 2: Moderate; 3: High; 4: Severe.

## \*Reactivity Hazards

Aluminum oxide is an adsorbent and catalyzes a variety of reactions that occur when monomers are adsorbed or when two or more species are adsorbed together on aluminum oxide surfaces. Not infrequently, the so catalyzed reactions are rapid and can be violent. See Bretherick's *Handbook of Reactive Chemical Hazards* for details and for other incompatibilities.

Cited as known to be or reasonably anticipated to be carcinogenic in NTP-9? No

Identified as a reproductive toxin in Frazier and Hage, *Reproductive Hazards of the Workplace*? No

## Typical symptoms of acute exposures:

In the eyes, redness, discomfort. If inhaled, coughing, shortness of breath.

## Principal target organ(s) or system(s):

Eyes, lungs.

## Storage Requirements

Store with other chemicals in a cool, dry, well-ventilated general storage location.

## Additional Remarks

Except for the descriptions of the adsorbent properties of amorphous aluminum oxide, above, the information given here also applies to corundum, a very hard crystalline form of aluminum oxide, typically used in the manufacture of grinding wheels and other abrasive materials such as sandpaper.

## Notes

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Prepared by: Jay A. Young

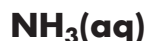
Date of preparation: November 26, 2002



## CLIP, Chemical Laboratory Information Profile

"Only when you know the hazards, can you take the necessary precautionary measures."

## Ammonia, aqueous



CAS No.: 1336-21-6

(approximately 30% NH<sub>3</sub>)

Synonyms: Aqua ammonia, ammonia water, Spirit of Hartshorn, ammonium hydroxide

Physical Properties		Exposure Limits	
A colorless alkaline liquid with a pungent odor.		Limits pertain to the vapor, CAS No. 7664-41-7, not the liquid:	
Vapor pressure at 20 °C:	118 torr	OSHA PEL:	50 ppm
Melting point:	-77 °C	ACGIH TLV:	25 ppm
Boiling point:	36 °C	STEL:	35 ppm

## Hazardous Characteristics

Overall toxicity	Flammability	Destructive to skin/eye	Absorbed through skin	Sensitizer?	Self-reactive?	Incompatible with:
3	1	3	0	No	No	Acids, halogens and other oxidizing agents; aluminum, zinc, mercury, and other metals; silver oxide, hypochlorite solution.*

0: None (or very low); 1: Slight; 2: Moderate; 3: High; 4: Severe.

## \*Reactivity Hazards

Although generally considered a weak base, aqueous ammonia reacts violently with most acids. It forms explosive compounds with mercury, silver oxide, and other compounds of silver. It corrodes many metals, notably those in Groups IIA, IIB, IIIA, and IIIB. With the halogens it forms the shock-sensitive, explosive nitrogen trihalides. With household bleach (sodium hypochlorite solution) it forms toxic and explosively unstable chloramines. The concentration of ammonia in the air above solutions of aqueous ammonia can be within the explosive limits for ammonia (15–28%). See Bretherick's *Handbook of Reactive Chemical Hazards* for details and for other incompatibilities.

Cited as known to be or reasonably anticipated to be carcinogenic in NTP-9? No

Identified as a reproductive toxin in Frazier and Hage, *Reproductive Hazards of the Workplace*? No

## Typical symptoms of acute exposures:

Irritation of skin and eyes, which can be severe. Sore throat, abdominal pain, nausea if ingested. Coughing, labored breathing if inhaled; inhalation can result in lung edema but the symptoms often are delayed up to a few hours. Physical exertion during this period can aggravate the symptoms when they do appear. Rest and hospitalization are essential.

## Principal target organ(s) or system(s):

Respiratory system, eyes, skin.

## Storage Requirements

Store separately, away from acids and oxidizing agents, in a cool, dry, well-ventilated location.

## Additional Remarks

In a warm environment, high pressures can develop within a closed container. The aqueous ammonia solutions sold for household uses typically contain approximately 14% ammonia along with a little soap or detergent and perfume. The formula, NH<sub>4</sub>OH, sometimes used for aqueous ammonia solutions, is incorrect; the molecular species, NH<sub>3</sub>, does not exist.

## Notes

## ReadMe

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## Reproductive Toxins

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## Abbreviations

ACGIH TLV—American Conference of Governmental Industrial Hygienists—Threshold Limit Value. C—Ceiling. CAS—Chemical Abstracts Service. mg/m<sup>3</sup>—milligrams per cubic meter. NA—Not applicable. NE—Not established. NI—No information. NTP-9—National Toxicology Program, Ninth Annual Report on Carcinogens. OSHA PEL—Occupational Safety and Health Administration—Permissible Exposure Limit. ppm—parts per million. STEL/C—Short-term exposure limit and ceiling.

Prepared by: Jay A. Young

Date of preparation: October 10, 2002

## CLIP, Chemical Laboratory Information Profile

"Only when you know the hazards, can you take the necessary precautionary measures."

**Anthracene****CAS No.: 120-12-7**

Synonyms: Anthracin, Paranaphthalene

**Physical Properties**

White fluorescent crystals or flakes; sublimes readily.  
 Vapor pressure at 145 °C: 1 Torr  
 Melting point: 216 °C  
 Boiling point: 340 °C

**Exposure Limits**

OSHA PEL: NE  
 ACGIH TLV: NE

**Hazardous Characteristics**

Overall toxicity	Flammability	Destructive to skin/eye	Absorbed through skin	Sensitizer?	Self-reactive?	Incompatible with:
1	1	1	2	Yes	No	Strong oxidizing agents. *

0: None (or very low); 1: Slight; 2: Moderate; 3: High; 4: Severe.

**\*Reactivity Hazards**

The reaction of anthracene with strong oxidizing agents is exothermic. See Bretherick's *Handbook of Reactive Chemical Hazards* for details and for other incompatibilities.

Cited as known to be or reasonably anticipated to be carcinogenic in NTP-9?

No

Identified as a reproductive toxin in Frazier and Hage, *Reproductive Hazards of the Workplace*?

No human data available.

**Typical symptoms of acute exposures:**

Skin: redness, pain. Eyes: redness, pain, blurred vision. If inhaled: sore throat, coughing, shortness of breath. If ingested: sore throat, abdominal pain, nausea, diarrhea.

**Principal target organ(s) or system(s):**

Eyes, skin, respiratory system, gastrointestinal tract.

**Storage Requirements**

With other chemicals in a cool, dry, well-ventilated storage location.

**Additional Remarks**

The above information applies only to pure anthracene; crude anthracene and anthracene oil can cause serious skin disorders. Finely dispersed particles form explosive mixtures with air.

**Notes****ReadMe**

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**Reproductive Toxins**

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Prepared by: Jay A. Young

Date of preparation: February 26, 2001

## CLIP, Chemical Laboratory Information Profile

"Only when you know the hazards, can you take the necessary precautionary measures."

## Antimony(III) Chloride



CAS No.: 10025-91-9

## Physical Properties

White hygroscopic crystals with a choking odor.  
 Vapor pressure at 50 °C: 1 torr  
 Melting point: 73 °C  
 Boiling point: 223 °C

## Exposure Limits

OSHA PEL: 0.5 mg/m<sup>3</sup> (as Sb)  
 ACGIH TLV: 0.5 mg/m<sup>3</sup> (as Sb)

## Hazardous Characteristics

Overall toxicity	Flammability	Destructive to skin/eye	Absorbed through skin	Sensitizer?	Self-reactive?	Incompatible with:
3	0	3	0	No	No	Bases.*

0: None (or very low); 1: Slight; 2: Moderate; 3: High; 4: Severe.

## \*Reactivity Hazards

Aqueous solutions are strongly acidic and often react violently with bases. In humid air SbCl<sub>3</sub> hydrolyzes, forming HCl vapor and the oxide. At temperatures near and above the boiling point, SbCl<sub>3</sub> vapors oxidize finely divided metal powders; the reaction can be violent. See Bretherick's *Handbook of Reactive Chemical Hazards* for details and for other incompatibilities.

Cited as known to be or reasonably anticipated to be carcinogenic in NTP-9? No

Identified as a reproductive toxin in Frazier and Hage, *Reproductive Hazards of the Workplace?* No

## Typical symptoms of acute exposures:

If inhaled, coughing, shortness of breath, labored breathing, lung edema (which can be severe). In the eyes, pain, blurred vision, blindness. On the skin, redness, pain, blistering, skin burns. If ingested, nausea, vomiting, abdominal pain.

## Principal target organ(s) or system(s):

Eyes, skin, respiratory system, liver.

## Storage Requirements

Store separated from bases with other inorganic acids in a cool, dry, well-ventilated location.

## Additional Remarks

Symptoms of lung edema are not manifest immediately in victims who have inhaled particles of or mist from a solution of SbCl<sub>3</sub> or who have inhaled HCl vapors from hydrolyzed SbCl<sub>3</sub>. Some hours may elapse before symptoms become evident; physical effort can exaggerate these symptoms. Rest is essential for persons so exposed.

## Notes

## ReadMe

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## Reproductive Toxins

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Prepared by: Jay A. Young

Date of preparation: November 27, 2002

## CLIP, Chemical Laboratory Information Profile

"Only when you know the hazards, can you take the necessary precautionary measures."

**Arsenic(III) Oxide****CAS No.: 1327-53-3**

Synonyms: Arsenic trioxide, Arsenous oxide, Arsenous acid anhydride, Arsenic, White arsenic

**Physical Properties****Exposure Limits**

White soluble powder.		OSHA PEL:	0.01 mg/m <sup>3</sup> as As
Vapor pressure at 20 °C:	negligible	ACGIH TLV:	0.01 mg/m <sup>3</sup> as As
Melting point:	313 °C		
Boiling point:	457 °C		

**Hazardous Characteristics**

Overall toxicity	Flammability	Destructive to skin/eye	Absorbed through skin	Sensitizer?	Self-reactive?	Incompatible with:
4	0	3	3	No	No	Acids, reducing agents, fluorides oxidizing agents, zinc*

0: None (or very low); 1: Slight; 2: Moderate; 3: High; 4: Severe.

**\*Reactivity Hazards**

Arsenic(III) oxide reacts with acids to form arsine, a very toxic gas. Its reaction with reducing agents when in a water solution can form arsine. Reaction with some fluorides, for example HF and ClF<sub>3</sub>, is exothermic. Reaction with some oxidizing agents such as NaNO<sub>3</sub> in the presence of reducing agents can inflame spontaneously. Reaction with finely divided zinc is explosive when heated.

See Bretherick's *Handbook of Reactive Chemical Hazards* for details and for other incompatibilities.

Cited as known to be or reasonably anticipated to be carcinogenic in NTP-9?	Yes	Identified as a reproductive toxin in Frazier and Hage, <i>Reproductive Hazards of the Workplace</i> ?	Probably yes, but information is limited.
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**Typical symptoms of acute exposures:**

Eyes: irritation, pain, blurred vision, severe burns. Skin redness, dermatitis, serious skin burns. Sore throat, coughing. Abdominal pain, cramps, spasm, vomiting, diarrhea. Feeling unwell, headache, weakness, dizziness, convulsions, unconsciousness, death.

**Principal target organ(s) or system(s):**

Eyes, skin, respiratory tract, nervous system, blood, cardiovascular system, bone marrow, liver, kidneys.

**Storage Requirements**

With other poisons in a cool, dry, well-ventilated, and locked location.

**Notes****ReadMe**

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**Reproductive Toxins**

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Prepared by: Jay A. Young

Date of preparation: July 18, 2001

**CLIP, Chemical Laboratory Information Profile**

"Only when you know the hazards, can you take the necessary precautionary measures."

**Asbestos**      **Mixed oxides of Si, Al, Fe, Mg, and H**      **CAS No.: 1332-21-4**

Synonyms: Actinolite, Anthophyllite, Cummingtonite-grunerite, Chrysotile, Amosite, Crocidolite

**Physical Properties**

Grayish-white, fibrous solid.  
Vapor pressure at 20 °C: negligible  
Melting point: >1000 °C

**Exposure Limits**

OSHA PEL: 0.1 respirable fiber/cm<sup>3</sup> See 29 CFR 1910.1001  
OSHA STEL/C 1 respirable fiber/cm<sup>3</sup>  
ACGIH TLV: 0.1 respirable fiber/cm<sup>3</sup>

**Hazardous Characteristics**

Overall toxicity	Flammability	Destructive to skin/eye	Absorbed through skin	Sensitizer?	Self-reactive?	Incompatible with:
4	0	0	0	No	No	No known significant incompatibilities.

0: None (or very low); 1: Slight; 2: Moderate; 3: High; 4: Severe.

Cited as known to be or reasonably anticipated to be carcinogenic in NTP-9?

Yes, by inhalation of respirable fibers.

Identified as a reproductive toxin in Frazier and Hage, *Reproductive Hazards of the Workplace*? No

**Typical symptoms of acute exposures:**

Eye irritation.

**Typical symptoms of chronic exposures:**

Asbestosis, dyspnea (breathing difficulty), restricted pulmonary function, lung cancer.

**Principal target organ(s) or system(s):**

Respiratory system, eyes.

**Storage Requirements**

In a cool, dry, well-ventilated, locked location and in a fully labeled, well-sealed container.

**Additional Remarks**

All four major components of asbestos—Chrysotile, Amosite, Anthophyllite, and Crocidolite—are considered to be carcinogenic. When heated above approximately 1200 °C, asbestos changes to a powdery amorphous solid and is no longer carcinogenic.

**Notes****ReadMe**

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**Abbreviations**

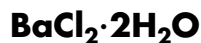
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Prepared by: Jay A. Young

Date of preparation: March 1, 2001

**CLIP, Chemical Laboratory Information Profile**

"Only when you know the hazards, can you take the necessary precautionary measures."

**Barium Chloride Dihydrate****CAS No.: 10326-27-9**

Synonyms: none known

**Physical Properties**

A moderately dense, odorless, soluble white solid.  
 Vapor pressure at 20 °C: negligible  
 Melting point: 960 °C  
 Boiling point: 1560 °C  
 When heated, appears to melt at 113 °C as the hydrate loses water.

**Exposure Limits**

OSHA PEL: 0.5 mg/m<sup>3</sup> (as barium)  
 ACGIH TLV: 0.5 mg/m<sup>3</sup> (as barium)

**Hazardous Characteristics**

Overall toxicity	Flammability	Destructive to skin/eye	Absorbed through skin	Sensitizer?	Self-reactive?	Incompatible with:
3	0	1	0	No	No	No known significant incompatibilities.

0: None (or very low); 1: Slight; 2: Moderate; 3: High; 4: Severe.

Cited as known to be or reasonably anticipated to be carcinogenic in NTP-9?

No

Identified as a reproductive toxin in Frazier

and Hage, *Reproductive Hazards of the Workplace?*

These authors state: "Insufficient data".

**Typical symptoms of acute exposures:**

Eye irritation, tearing pain. Gastroenteritis, nausea, vomiting, muscle spasm, slow pulse. Tingling sensation in the extremities. Cardiac arrhythmia, paralysis, possible death.

**Principal target organ(s) or system(s):**

Respiratory system, heart, central nervous system, kidneys.

**Storage Requirements**

With other poisons in a cool, dry, well-ventilated and locked location.

**Additional Remarks**

Barium chloride can be absorbed into the body by inhalation and/or by ingestion. It is a mild skin irritant. The barium ion is considered to be a muscle poison; via the central nervous system it first stimulates affected muscles and then causes paralysis. The symptoms of barium poisoning are attributed to a barium ion-induced hypokalemia, probably due to a transfer of potassium from extracellular to intracellular components.

**Notes****ReadMe**

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Prepared by: Jay A. Young

Date of preparation: February 13, 2001

## CLIP, Chemical Laboratory Information Profile

"Only when you know the hazards, can you take the necessary precautionary measures."

**Borax****CAS No.: 1303-96-4**

Synonyms: sodium tetraborate decahydrate, sodium borate, borax decahydrate

**Physical Properties****Exposure Limits**

White, odorless crystalline solid; very dusty  
 Vapor pressure at 20 °C: negligible  
 Melting point: approx 75 °C  
 Boiling point: approx 320 °C

OSHA PEL: NE  
 ACGIH TLV: 5 mg/m<sup>3</sup>

**Hazardous Characteristics**

Overall toxicity	Flammability	Destructive to skin/eye	Absorbed through skin	Sensitizer?	Self-reactive?	Incompatible with:
3	0	3	1	No	No	zirconium*

0: None (or very low); 1: Slight; 2: Moderate; 3: High; 4: Severe.

**\*Reaction with:**

Zirconium is violent, particularly when the metal is heated or finely powdered.  
 See Bretherick's *Handbook of Reactive Chemical Hazards* for details and for other incompatibilities.

Cited as known to be or reasonably anticipated to be carcinogenic in NTP-9?

No

Reproductive toxin? Frazier and Hage state that some limited studies "suggest that boron compounds other than boric acid may be toxic to the reproductive system".

**Typical symptoms of acute exposures:**

Eye irritation, skin irritation, skin rash, respiratory distress caused by exposure to borax dust or solution mists. Respiratory distress can be long lasting. Also causes nosebleeding, coughing, and breathing difficulty.

**Principal target organ(s) or system(s):**

Eyes, skin, respiratory system.

**Storage Requirements**

Store with other poisons in a cool, dry, well-ventilated, and locked location.

**Additional Remarks**

If ingested, borax can adversely affect the central nervous system, kidneys, and liver. Repeated or prolonged skin contact can cause dermatitis.

**Notes****ReadMe**

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Prepared by: Jay A. Young

Date of preparation: October 19, 2000

## CLIP, Chemical Laboratory Information Profile

"Only when you know the hazards, can you take the necessary precautionary measures."

## Calcium carbide



CAS No.: 75-20-7

Synonyms: Calcium acetylide

Physical Properties		Exposure Limits	
Dark gray flammable solid with a characteristic odor.		OSHA PEL:	NE
Vapor pressure at 20 °C:	negligible	ACGIH TLV:	NE
Melting point:	2300 °C		

## Hazardous Characteristics

Overall toxicity	Flammability	Destructive to skin/eye	Absorbed through skin	Sensitizer?	Self-reactive?	Incompatible with:
2	4	2	0	No	No	Water, oxidizing agents, magnesium, sulfur, selenium, silver nitrate.*

0: None (or very low); 1: Slight; 2: Moderate; 3: High; 4: Severe.

## \*Reactivity Hazards

CaC<sub>2</sub> reacts exothermically with water forming calcium hydroxide and acetylene, an extremely flammable gas. The heat of the reaction can be sufficient to raise the temperature above the ignition point for acetylene (305 °C) whereupon the mixture of acetylene with air is likely to explode. Nitrogen is adsorbed by CaC<sub>2</sub>; closed containers of CaC<sub>2</sub> may contain an excess of oxygen in the entrapped air as well as some acetylene; in such cases it is hazardous to open the container. Reactions with magnesium, sulfur, and selenium are vigorous and exothermic. With silver nitrate, CaC<sub>2</sub> forms silver acetylide, a shock-sensitive explosive. See Bretherick's *Handbook of Reactive Chemical Hazards* for details and for other incompatibilities.

Cited as known to be or reasonably anticipated to be carcinogenic in NTP-9? No

Identified as a reproductive toxin in Frazier and Hage, *Reproductive Hazards of the Workplace*? No

## Typical symptoms of acute exposures:

If the dust is inhaled, sore throat, coughing, shortness of breath, lung edema. In the eyes, inflammation, pain. On the skin, inflammation, pain, skin burns.

## Principal target organ(s) or system(s):

Eyes, skin, respiratory system.

## Storage Requirements

Storage of calcium carbide is not recommended.

## Additional Remarks

Symptoms of lung edema are not manifest immediately in victims who have inhaled calcium carbide dust; some hours may elapse first; physical effort can exaggerate these symptoms. Rest is essential for persons exposed to an excess of the dust.

## Notes

## ReadMe

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Prepared by: Jay A. Young

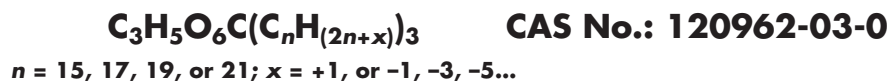
Date of preparation: December 2, 2002



## CLIP, Chemical Laboratory Information Profile

"Only when you know the hazards, can you take the necessary precautionary measures."

## Canola Oil



Synonyms: Cooking oil

Physical Properties		Exposure Limits	
A combustible, colorless (sometimes with a yellow tint) viscous oil.		OSHA PEL:	NE
Smoke point:	220–230 °C	ACGIH TLV:	NE
Flash point:	275–290 °C		

## Hazardous Characteristics

Overall toxicity	Flammability	Destructive to skin/eye	Absorbed through skin	Sensitizer?	Self-reactive?	Incompatible with:
0	1	0	0	0	0	Oxidizing agents.*

0: None (or very low); 1: Slight; 2: Moderate; 3: High; 4: Severe.

## \*Reactivity Hazards

Similar to other combustible substances, canola oil reacts with oxidizing agents, more vigorously with stronger agents. At temperatures near to and greater than the flash point, canola oil vapors will catch fire in the presence of an ignition source.

Cited as known to be or reasonably anticipated to be carcinogenic in NTP-9? No      Identified as a reproductive toxin in Frazier and Hage, *Reproductive Hazards of the Workplace*? No

## Typical symptoms of acute exposures:

Under typical conditions of use in the laboratory, over exposure to canola oil itself is not foreseeable; however, see Additional Remarks, below.

## Storage Requirements

If used as a laboratory chemical, store in an explosion-proof refrigerator reserved and labeled as reserved for the storage of chemicals only.

## Additional Remarks

At the smoke point and at temperatures greater than the smoke point, canola oil decomposes into various decomposition and oxidized-decomposition products. One such product is acrolein, a causative agent for pulmonary edema as well as a skin irritant. Canola oil is a natural product produced by pressing the seeds of the rapeseed plant; the exudate is filtered, bleached, and further otherwise processed to produce the commercial product. Approximately 95–99% (variability depends upon the genetic composition of the source plants, the processing details, the maturity of the plants when harvested, etc.) of the commercial product conforms to the formula given in the heading of this CLIP, above. Other components include sulfur-bearing polycyclic fatty acids, nitrogenous fatty acids, phospholipids, high molecular weight alcohols, tocopherols, sterols, pigments (for instance chlorophyll, carotenes), and ppm trace amounts of P and Pb compounds. Typically and approximately, the fatty acid components of the triglycerides present in canola oil consist of 6% C-16, C-18, C-20, and C-22 saturated fatty acids, 62% similar mono-unsaturated fatty acids, and 30% C-18 polyunsaturated fatty acids. The rapeseed plant is a member of the Brassica botanical family, which also includes cauliflower, horseradish, turnip, cabbage, Brussels sprouts, and mustard. The edible parts of some varieties of these plants contain sinigrin, a mutant agent, as well as various allergic components; there is no recognized evidence that canola oil contains sinigrin or any allergic components. Canola oil does contain trace quantities of vitamin E.

## Notes

## ReadMe

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## Reproductive Toxins

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## Abbreviations

ACGIH TLV—American Conference of Governmental Industrial Hygienists—Threshold Limit Value. C—Ceiling. CAS—Chemical Abstracts Service. mg/m<sup>3</sup>—milligrams per cubic meter. NA—Not applicable. NE—Not established. NI—No information. NTP-9—National Toxicology Program, Ninth Annual Report on Carcinogens. OSHA PEL—Occupational Safety and Health Administration—Permissible Exposure Limit. ppm—parts per million. STEL/C—Short-term exposure limit and ceiling.

Prepared by: Jay A. Young

Date of preparation: February 28, 2003

## CLIP, Chemical Laboratory Information Profile

"Only when you know the hazards, can you take the necessary precautionary measures."

**Carbon Disulfide****CAS No.: 75-15-0**

Synonym: Carbon bisulfide

**Physical Properties****Exposure Limits**

Extremely flammable highly volatile colorless liquid with a strong disagreeable odor.

Vapor pressure at 20 °C: 308 torr

Melting point: -110 °C

Boiling point: 46 °C

ACGIH TLV: 10 ppm

OSHA PEL: 20 ppm

OSHA STEL/C: 30 ppm

**Hazardous Characteristics**

Overall toxicity	Flammability	Destructive to skin/eye	Absorbed through skin	Sensitizer?	Self-reactive?	Incompatible with:
3	4	3	3	No	No	Hot surfaces, compressed air, oxidizing agents, Group I metals.*

0: None (or very low); 1: Slight; 2: Moderate; 3: High; 4: Severe.

**\*Reactivity Hazards**

Carbon disulfide catches fire spontaneously upon contact with a hot surface at temperatures approximating or exceeding 100 °C. It reacts violently and explosively with compressed air and with oxidizing agents. Mixtures of carbon disulfide and Group I metals are explosively shock sensitive. See Bretherick's *Handbook of Reactive Chemical Hazards* for details and for other incompatibilities.

Cited as known to be or reasonably anticipated to be carcinogenic in NTP-9? No

Identified as a reproductive toxin in Frazier and Hage, *Reproductive Hazards of the Workplace*? Yes

**Typical symptoms of acute exposures:**

On the skin, inflammation, pain. In the eyes, pain, blurred vision. If inhaled, headache, dizziness, dullness, drowsiness.

**Principal target organ(s) or system(s):**

Eyes, skin, respiratory system, vascular system, central nervous system.

**Storage Requirements**

Store under water or an inert gas in a dark, cool, dry, well-ventilated location, away from ignition sources and separated from oxidizing agents.

**Additional Remarks**

The vapor is heavier than air and can travel long distances; when CS<sub>2</sub> mixes with air and an ignition source is present, it will explode at all temperatures warmer than -30 °C. Since carbon disulfide is a poor conductor of electricity, pouring the liquid, or even stirring or otherwise agitating it, can generate a static electrical spark with sufficient energy to ignite the vapor-air mixture above the liquid. At ordinary temperatures, the vapor pressure of carbon disulfide greatly exceeds the limits established by OSHA and ACGIH. Accordingly, users will be likely to be over-exposed to the vapors of this compound unless appropriate precautions are rigidly maintained; see the MSDS for details.

**Notes****ReadMe**

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**Reproductive Toxins**

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Prepared by: Jay A. Young

Date of preparation: December 3, 2002

## CLIP, Chemical Laboratory Information Profile

"Only when you know the hazards, can you take the necessary precautionary measures."

## Chromium(VI) oxide



CAS No.: 1333-82-0

Synonyms: Chromium trioxide, Chromic acid, Chromic anhydride

## Physical Properties

Red to violet solid deliquescent crystals.  
 Vapor pressure at 20 °C: negligible  
 Melting point: 197 °C  
 Boiling point: 250 °C (decomposes)

## Exposure Limits

OSHA PEL: 0.1 mg/m<sup>3</sup> (as CrO<sub>3</sub>)  
 ACGIH TLV: 0.05 mg/m<sup>3</sup> (as Cr)

## Hazardous Characteristics

Overall toxicity	Flammability	Destructive to skin/eye	Absorbed through skin	Sensitizer?	Self-reactive?	Incompatible with:
4	0	3	0	No	No	Combustible and flammable substances, other reducing agents, and with bases. Also with alkali metals and with nitric acid and nitrates.*

0: None (or very low); 1: Slight; 2: Moderate; 3: High; 4: Severe.

## \*Reactivity Hazards

Chromium(VI) oxide is a strong oxidizing agent. It is a strong acid as well when dissolved in water. Typically, reactions with combustibles, flammables, other reducing agents and with bases are rapid and violent, even explosive, and often also resulting in fires that are difficult to extinguish. This compound decomposes when heated, forming the trivalent oxide and oxygen, which increases the fire hazard. Chromium(VI) oxide reacts vigorously with nitrates and with nitric acid, probably forming chromyl nitrates. See Bretherick's *Handbook of Reactive Chemical Hazards* for details and for other incompatibilities.

Cited as known to be or reasonably anticipated to be carcinogenic in NTP-9? Yes

Identified as a reproductive toxin in Frazier and Hage, *Reproductive Hazards of the Workplace?* Insufficient data

## Typical symptoms of acute exposures:

Severe skin burns. In the eyes, pain, blurred vision, blindness. If inhaled, sore throat, coughing, labored breathing, lung edema. If ingested, sore throat, abdominal spasm, vomiting, diarrhea.

## Principal target organ(s) or system(s):

Skin, respiratory system, kidneys.

## Storage Requirements

Store with other poisons in a cool, dry, well-ventilated and locked location, away from bases, flammables, combustibles, and other reducing agents.

## Additional Remarks

Symptoms of lung edema are not manifest immediately in victim who have inhaled chromium(VI) oxide dust or solution mist; some hours may elapse first; physical effort can exaggerate these symptoms. Rest is essential for persons exposed to excessive inhalation of dust particles or solution mist.

## Notes

## ReadMe

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## Reproductive Toxins

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## Abbreviations

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Prepared by: Jay A. Young

Date of preparation: November 26, 2002

## CLIP, Chemical Laboratory Information Profile

"Only when you know the hazards, can you take the necessary precautionary measures."

## Citric Acid



CAS No.: 77-92-9

Synonyms: 2-hydroxy-1,2,3-propanetricarboxylic acid,  $\beta$ -hydroxytricarballic acid

## Physical Properties

Weakly acidic, colorless to white crystalline solid.  
 Vapor pressure at 20 °C: negligible  
 Melting point: 153 °C  
 Boiling point: decomposes

## Exposure Limits

OSHA PEL: NE  
 ACGIH TLV: NE

## Hazardous Characteristics

Overall toxicity	Flammability	Destructive to skin/eye	Absorbed through skin	Sensitizer?	Self-reactive?	Incompatible with:
0	1	1	0	0	0	Strong bases, oxidizing agents.*

0: None (or very low); 1: Slight; 2: Moderate; 3: High; 4: Severe.

## \*Reactivity Hazards

Similar to other combustible substances, citric acid reacts with oxidizing agents: the stronger the agent, the greater the vigor of the reaction. See Bretherick's *Handbook of Reactive Chemical Hazards* for details and for other incompatibilities.

Cited as known to be or reasonably

anticipated to be carcinogenic in NTP-9?

No

Identified as a reproductive toxin in Frazier and Hage,

*Reproductive Hazards of the Workplace?*

No

## Typical symptoms of acute exposures:

Irritating if in eyes or on skin, coughing if inhaled, sore throat or abdominal pain if gram quantities are ingested.

Ingestion of approximately 0.5 kg or more can be fatal; in the blood, citric acid precipitates as calcium citrate and the consequent severe reduction of the concentration of ionic calcium in the plasma induces cardiac arrhythmias.

## Principal target organ(s) or system(s):

Eyes, skin, respiratory system.

## Storage Requirements

Store with other chemicals in a cool, dry, well-ventilated general storage location.

## Additional Remarks

Citric acid is used as a flavoring agent in some foods. As noted above, calcium citrate is only very slightly soluble in aqueous media. The frequent, regular, and consistent ingestion of small amounts of citric acid can be inimical to the development and maintenance of the skeletal system. Note that the information in the CLIP also applies to citric acid monohydrate, CAS No. 5949-29-1.

## Notes

## ReadMe

This Chemical Laboratory Information Profile is *not* a Material Safety Data Sheet. It is a brief summary for teachers and their students that describes some of the hazards of this chemical as it is typically used in laboratories. On the basis of your knowledge of these hazards and before using or handling this chemical, *you need to select the precautions and first-aid procedures to be followed*. For that information as well as for other useful information, refer to Material Safety Data Sheets, container labels, and references in the scientific literature that pertain to this chemical.

## Reproductive Toxins

Some substances that in fact are reproductive toxins are not yet recognized as such. For the best readily available and up-to-date information, refer to "DART/ETIC". See the TOXNET home page at <http://www.sis.nlm.nih.gov> and click on "Toxicology search".

*Note that some of the data in DART/ETIC have not been peer-reviewed.* See also Linda M. Frazier and Marvin L. Hage, *Reproductive Hazards of the Workplace*; Wiley, 1998; and T. H. Shepard, *Catalog of Teratogenic Agents*, 9th ed.; Johns Hopkins University Press, 1998.

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Prepared by: Jay A. Young

Date of preparation: February 27, 2003

## CLIP, Chemical Laboratory Information Profile

"Only when you know the hazards, can you take the necessary precautionary measures."

**Cobalt(II) Chloride Hexahydrate**  $\text{CoCl}_2 \cdot 6(\text{H}_2\text{O})$ **CAS No.: 7791-13-1**

Synonyms: Cobaltous chloride hexahydrate, Cobalt dichloride hexahydrate

**Physical Properties**

Solid red (or pink) crystals that lose water of hydration and become blue in an environment with low humidity; the process is reversible.  
 Vapor pressure at 20 °C: negligible  
 Melting point: 110 °C, loses water at 118 °C  
 Decomposes when heated 1049 °C

**Exposure Limits**

OSHA PEL: 0.1 mg/m<sup>3</sup> (as Co<sup>†</sup>)  
 ACGIH TLV: 0.02 mg/m<sup>3</sup> (as Co)

† Applicable to metal dust and fumes

**Hazardous Characteristics**

Overall toxicity	Flammability	Destructive to skin/eye	Absorbed through skin	Sensitizer?	Self-reactive?	Incompatible with: Alkali metals.*
3	0	2	0	No	No	

0: None (or very low); 1: Slight; 2: Moderate; 3: High; 4: Severe.

**\*Reactivity Hazards**

The reaction with alkali metals can be violent; in addition, the finely divided cobalt that is produced is pyrophoric. See Bretherick's *Handbook of Reactive Chemical Hazards* for details and for other incompatibilities.

Cited as known to be or reasonably anticipated to be carcinogenic in NTP-9? No Identified as a reproductive toxin in Frazier and Hage, *Reproductive Hazards of the Workplace?* Insufficient data

**Typical symptoms of acute exposures:**

In the eyes, inflammation, pain. On the skin, inflammation. If inhaled, coughing, nausea, red complexion, ringing in the ears. If ingested, abdominal pain, red complexion, ringing in the ears, vomiting.

**Principal target organ(s) or system(s):**

Skin, heart, kidney, thyroid gland.

**Storage Requirements**

Store with other poisons in a cool, dry, well-ventilated and locked location.

**Additional Remarks**

The OSHA PEL cited above does not apply to cobalt(II) chloride, it applies to some other inorganic forms of cobalt; it has been cited here for information purposes. The ACGIH TLV however, applies to all inorganic compounds of cobalt.

**Notes****ReadMe**

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**Reproductive Toxins**

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**Abbreviations**

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Prepared by: Jay A. Young

Date of preparation: December 10, 2002

## CLIP, Chemical Laboratory Information Profile

"Only when you know the hazards, can you take the necessary precautionary measures."

**Cobalt(II) Oxide****CoO****CAS No.: 1307-296-6**

Synonyms: Cobaltous oxide, Cobalt monoxide, Cobalt oxide, Gray cobalt oxide

**Physical Properties****Exposure Limits**

Usually a dark gray solid, but color can vary from olive green to red, depending upon particle size.

Vapor pressure at 20 °C: negligible

Melting point: 1935 °C

OSHA PEL: 0.1 mg/m<sup>3</sup>, as CoACGIH TLV: 0.02 mg/m<sup>3</sup>, as Co**Hazardous Characteristics**

Overall toxicity	Flammability	Destructive to skin/eye	Absorbed through skin	Sensitizer?	Self-reactive?	Incompatible with:
3	0	1	0	No	No	Hydrogen peroxide. Most reducing agents, especially when heated*

0: None (or very low); 1: Slight; 2: Moderate; 3: High; 4: Severe.

**\*Reactivity Hazards**

Cobalt(II) oxide catalyzes the decomposition of hydrogen peroxide. The decomposition can be explosively rapid. Cobalt(II) oxide oxidizes the "drying" of unsaturated oils, e.g. tung oil, linseed oil; the reaction is exothermic. When heated, cobalt(II) oxide evolves O, not O<sub>2</sub>; consequently, hot CoO is a very active oxidizing agent.

See Bretherick's *Handbook of Reactive Chemical Hazards* for details and for other incompatibilities.

Cited as known to be or reasonably anticipated to be carcinogenic in NTP-9?

No

Identified as a reproductive toxin in Frazier and Hage, *Reproductive Hazards of the Workplace*?

Insufficient data.

**Typical symptoms of acute exposures:**

Coughing, wheezing, breathing difficulty.

**Principal target organ(s) or system(s):**

Respiratory system.

**Storage Requirements**

Store in a cool, dry, well-ventilated location, away from hydrogen peroxide and other peroxides and also away from flammables, combustibles, and other reducing agents.

**Additional Remarks**

Considered to be possibly a human carcinogen by the International Agency for Research on Cancer. "Cobalt driers", sold in artist supply stores, are very toxic; this product contains a high proportion of CoO as well as other cobalt compounds.

**Notes****ReadMe**

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Prepared by: Jay A. Young

Date of preparation: July 19, 2001

## News & Announcements

### News from Journal House

#### Thanks!

As readers will have discovered by now, this issue is a special one. In honor of National Chemistry Week 2001, it celebrates Chemistry and Art.

The *Journal* staff acknowledges the special efforts of those authors, artists, photographers, graphic artists, testers, historians, researchers, collectors, and museums who have contributed so generously to this issue.

The issue has been even more of a team effort than usual, calling on the talents, time, patience, and hard drive space of the entire *Journal* staff. Our plans were ambitious, perhaps grandiose—but we hope readers think the result is simply grand!

Of course National Chemistry Week does not occur until the week of November 4th, leaving us time to get you even more information about chemistry and art next month in the November issue.

Some information about what else to expect is below. See you next month!

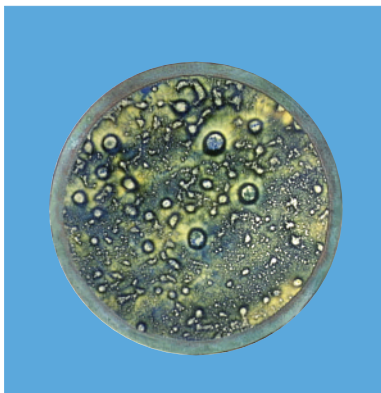


Photo by J. J. Jacobsen and R. J. Willmann

### Awards Announced

#### Mettler Toledo Thermal Analysis Education Grant

Mettler Toledo has announced that Brian C. Benicewicz and Chang Y. Ryu are the 2001 recipients of their Thermal Analysis Education Grant in honor of Professor Edith Turi. Both Benicewicz and Ryu are at the NYS Center for Polymer Synthesis at Rensselaer Polytechnic Institute; Benicewicz is the director of the Center.

#### Award Deadlines

#### 2002 Pittsburgh Conference Memorial National College Grant Program

The Pittsburgh Conference on Analytical Chemistry and Applied Spectroscopy and its co-sponsoring technical societies, the Spectroscopy Society of Pittsburgh (SSP) and the Society for Analytical Chemists of Pittsburgh (SACP) announce the 2002 Memorial National College Grants Program.

Grants will be awarded to small college science departments for the purchase of scientific equipment, audio-visual or other teaching aids, or library materials for use in the teaching of science at the undergraduate level. On the basis of their submitted proposals, at least 12 colleges will be selected to receive grants, each grant having a maximum of \$9,000.

To be eligible for an award, schools must meet certain criteria, which are available along with application forms from Hyman Schultz, The Pittsburgh Conference—



### Coming in November on Chemistry and Art...

**More!** Wonderful, colorful materials for  
National Chemistry Week

#### Hands-on Activity

- ★ **New Paper from Newspaper, a JCE Classroom Activity,**  
by Erica Jacobsen (with additional material as *JCE Online* supplements)

#### Colorful Articles

- ★ **Biology of the Blues: The Snails behind the Ancient Blue and Purple Dyes,**  
by Carol Steinhart



Photo: Paul Morfitts

*Hexaplex trunculus*

## News & Announcements

PCMNCG, 300 Penn Center Boulevard, Suite 332, Pittsburgh, PA 15235-5503; phone: 412/825-3220, ext. 189; fax: 412/825-3224; email: [schultzb@pittcon.org](mailto:schultzb@pittcon.org).

The deadline for grant applications is December 1, 2001. Announcement of awards will be made by February 2002.

### American Oil Chemists' Awards

#### Supelco/Nicholas Pelick—AOCS Research Award

The AOCS announces the call for nominations for the Supelco/Nicholas Pelick—AOCS Research Award that recognizes outstanding original research in fats, oils, lipid chem-

istry, or biochemistry. The nominee must have published the results in technical papers of high quality.

The award, consisting of a plaque and an honorarium of \$8,000, will be presented following an award address at the AOCS Annual Meeting in Montréal in May 2002. Nomination materials should be submitted before November 1, 2001, to Pamela White, P. O. Box 3489, Champaign, IL 61826-3489; [general@aocs.org](mailto:general@aocs.org).

#### AOCS Young Scientist Research Award

The AOCS Young Scientist Research Award is established to recognize a young scientist (younger than 36 years of age or receiving his or her highest degree within the pre-

## Proposal Deadlines

### National Science Foundation Division of Undergraduate Education (DUE)

These NSF deadlines have been established or are anticipated.\*

- Advanced Technological Education (ATE)  
Formal October 18, 2001  
Preliminary April 24, 2002\*  
Formal October 16, 2002\*
- NSF Computer Science, Engineering, and Mathematics Scholarships Program (CSEMS) Feb. 15, 2002\*
- Science, Technology, Engineering, and Mathematics Teacher Preparation (STEMTP)  
Proposals October 25, 2001\*
- Course, Curriculum, and Lab. Improvement (CCLI)  
CCLI-EMD and CCLI-ND June 6, 2002\*  
CCLI-A&I November 13, 2002\*
- National Science, Mathematics, Engineering, and Technology Education Digital Library (NSDL)  
Proposals April 17, 2002\*
- Assessment of Student Achievement in Undergraduate Education (ASA)  
Letter of Intent (optional) October 16, 2001  
Proposals November 20, 2001
- NSF Director's Award for Distinguished Teaching Scholars (DTS)  
Letter of Intent (optional) September 17, 2001\*  
Proposals November 14, 2001\*
- Federal Cyber Service: Scholarship for Service (SFS)  
Letter of Intent (optional) November 7, 2001\*  
Proposals December 5, 2001\*

\* Official deadline dates for proposals will be specified in the new program solicitation for each program, to be published at least three months before the relevant deadline date. Program solicitations are available electronically through NSF's Online Document System at <http://www.nsf.gov/cgi-bin/pubsys/browser/odbrowse.pl> and through the NSF DUE site <http://www.ehr.nsf.gov/EHR/DUE/>; phone: 703/292-8670; email: [undergrad@nsf.gov](mailto:undergrad@nsf.gov).

### The Camille and Henry Dreyfus Foundation, Inc.

- Camille Dreyfus Teacher-Scholar Awards Program: November 15, 2001
- Faculty Start-Up Grants for Undergraduate Institutions: May 15, 2002
- Henry Dreyfus Teacher-Scholar Awards Program: June 28, 2002
- New Faculty Awards Program: May 15, 2002
- Postdoctoral Program in Environmental Chemistry: March 1, 2002
- Scholar/Fellow Program for Undergraduate Institutions: June 28, 2002 (*note revised guidelines*)
- Senior Scientist Mentor: August 31, 2001
- Special Grant Program in the Chemical Sciences: Completed Proposals: August 31, 2001

Further information may be obtained from The Camille and Henry Dreyfus Foundation, Inc., 555 Madison Avenue, Suite 1305, New York, NY 10022; phone: 212/753-1760; email: [admin@dreyfus.org](mailto:admin@dreyfus.org); WWW: <http://www.dreyfus.org/>

### Research Corporation

- Cottrell College Science Awards: May 15 and November 15
- Cottrell Scholars: First regular business day in September
- Research Innovation Awards: May 1
- Research Opportunity Awards: May 1 and October 1

Further information may be obtained from Research Corporation, 101 North Wilmot Road, Suite 250, Tucson, AZ 85711-3332; phone: 520/571-1111; fax: 520/571-1119; email: [awards@rescorp.org](mailto:awards@rescorp.org); WWW: <http://www.rescorp.org>



vious 10 years) who has made a significant and substantial research contribution in one of the areas represented by the divisions of AOCS. The award consists of a plaque, an honorarium, and funding for travel and registration to the annual meeting in Montréal in May 2002. Further information or nomination materials should be directed to Fereidoon Shahidi, P. O. Box 3489, Champaign, IL 61826-3489; [general@aocs.org](mailto:general@aocs.org).

## Courses, Seminars, Meetings, Opportunities

### CUR Registry of Undergraduates

The Council on Undergraduate Research (CUR) has initiated a Registry of Undergraduate Researchers at [www.cur.org/UGRegistryselect.html](http://www.cur.org/UGRegistryselect.html). The purpose of this registry is to facilitate matchmaking between undergraduates who have research experience and a desire to pursue an advanced degree with graduate schools seeking high-quality students who are well prepared for research. At present the Registry is open to students and graduate schools/employers in the fields of Astronomy, Chemistry, Biochemistry, Biology, Physics, Mathematics, Computer Science, Geosciences, Engineering, Psychology, Sociology, and Anthropology/Archaeology.

Any undergraduate may go to [www.cur.org/ugreg/](http://www.cur.org/ugreg/) to fill out a simple vitae form. *There is no charge to the student.* Student information records will be made available to graduate schools that contract with CUR for this service. Funds raised in this way will go directly to support CUR summer research fellowships ([www.cur.org/UGSF.html](http://www.cur.org/UGSF.html)). With each increment of \$4500 received from graduate school subscriptions to this registry, CUR will be able to offer one summer fellowship including student stipend and funds for small equipment/supplies or travel to a scientific meeting.

CUR believes that this service will be beneficial in narrowing the search for the right match between students and graduate school, thus benefiting both. Students interested in graduate school for the fall of 2002 or 2003 should register now. For more information, visit the CUR Web site at [www.cur.org](http://www.cur.org).

### Conference on Safety in Science and Science Education

The first International Conference on Safety in Science and Science Education will take place July 7–13, 2002 at Sacred Heart University in Fairfield, CT. Participants from more than 25 countries are expected to attend.

The main conference, which will be held July 8–10, will feature training seminars, short courses, invited and contributed papers, and keynote addresses. The registration fee

is \$200 (U.S.). Lodging and food service are available on the campus or nearby.

Participants have the option of attending a pre-conference One-Day Safety Seminar on July 7 or a post-conference Safety Course on July 10–13.

The conference is organized jointly by the Department of Chemistry at Sacred Heart University and The Laboratory Safety Institute (LSI) of Natick, MA. Conference co-chairs are Babu George of Sacred Heart University and James Kaufman of LSI. For conference information and registration contact George at 203/371-7795 or [georgeb@sacredheart.edu](mailto:georgeb@sacredheart.edu) or Kaufman at 508/647-1900 or [Labsafe@aol.com](mailto:Labsafe@aol.com).

### New England Section Meeting, APS and AAPT

A joint meeting of the American Physical Society and the American Association of Physics Teachers will be held November 2–3, 2001, at Keene State College, Keene, NH. The theme of the conference is the Confluence of Chemistry and Physics. There will be talks on condensed matter, surface science, applied and physical chemistry, thin films, nanotechnology, and cross-disciplinary education. The banquet will be followed by a popular talk on the physics and chemistry of ice by George Ewing of Indiana University.

For further information contact the local program chairs, J. Russell Harkay ([rharkay@keene.edu](mailto:rharkay@keene.edu)) and Jerry Jasinski ([jjasinsk@keene.edu](mailto:jjasinsk@keene.edu)).

## Materials Available

### National Chemistry Week Safety Guidelines

The American Chemical Society has made available these *Guidelines*, which were written by the Safety Subcommittee of the National Chemistry Week-2000 Task Force. The *Guidelines* have been endorsed by the ACS Committee on Chemical Safety and the National Chemistry Week Task Force.

The pamphlet is divided into four sections, two for types of facilities and two for types of activities.

- Guidelines for Presentation and Activities at **Scientifically Equipped Facilities**
- Guidelines for Presentation and Activities at **Nonscientifically Equipped Facilities**
- Guidelines for **Hands-On Activities**
- Guidelines for **Chemical Demonstrations** (from the ACS Division of Chemical Education)

To obtain a copy contact Office of Community Activities, American Chemical Society, 1155 Sixteenth Street, NW, Washington, DC 20036; phone: 1-800-227-5558, ext. 6097; email: [ncw@acs.org](mailto:ncw@acs.org).

## CLIP, Chemical Laboratory Information Profile

"Only when you know the hazards, can you take the necessary precautionary measures."

**Copper(I) oxide****CAS No.: 1317-39-1**

Synonyms: Cuprous oxide

**Physical Properties**

Usually a fine, red-brown, dusty powder, insoluble in water.  
 Vapor pressure at 20 °C: negligible  
 Melting point: 1235 °C  
 Decomposes at: 1800 °C

**Exposure Limits**

OSHA PEL: 1 mg/m<sup>3</sup> (as Cu)  
 ACGIH TLV: 1 mg/m<sup>3</sup> (as Cu)

**Hazardous Characteristics**

Overall toxicity	Flammability	Destructive to skin/eye	Absorbed through skin	Sensitizer?	Self-reactive?	Incompatible with:
2	0	1	0	No	No	No known significant incompatibilities.

0: None (or very low); 1: Slight; 2: Moderate; 3: High; 4: Severe.

Cited as known to be or reasonably anticipated to be carcinogenic in NTP-9? No

Identified as a reproductive toxin in Frazier and Hage, *Reproductive Hazards of the Workplace?* No

**Typical symptoms of acute exposures:**

On skin, skin becomes dry. If inhaled, coughing, fever. If ingested, abdominal pain, metallic taste, diarrhea, nausea, vomiting. In the eyes, inflammation, pain.

**Principal target organ(s) or system(s):**

Eyes, skin, respiratory system, kidneys, liver.

**Storage Requirements**

Store with other chemicals in a cool, dry, well-ventilated general storage location.

**Additional Remarks**

The symptom of fever due to inhalation, if experienced, is known as "metal fume fever" and usually is not experienced until a few hours or more after exposure.

**Notes****ReadMe**

This Chemical Laboratory Information Profile is *not* a Material Safety Data Sheet. It is a brief summary for teachers and their students that describes some of the hazards of this chemical as it is typically used in laboratories. On the basis of your knowledge of these hazards and before using or handling this chemical, *you need to select the precautions and first-aid procedures to be followed*. For that information as well as for other useful information, refer to Material Safety Data Sheets, container labels, and references in the scientific literature that pertain to this chemical.

**Reproductive Toxins**

Some substances that in fact are reproductive toxins are not yet recognized as such. For the best readily available and up-to-date information, refer to "DART/ETIC". See the TOXNET home page at <http://www.sis.nlm.nih.gov> and click on "Toxicology search". *Note that some of the data in DART/ETIC have not been peer-reviewed.* See also Linda M. Frazier and Marvin L. Hage, *Reproductive Hazards of the Workplace*; Wiley, 1998; and T. H. Shepard, *Catalog of Teratogenic Agents*, 9th ed.; Johns Hopkins University Press, 1998.

**Abbreviations**

ACGIH TLV—American Conference of Governmental Industrial Hygienists—Threshold Limit Value. C—Ceiling. CAS—Chemical Abstracts Service. mg/m<sup>3</sup>—milligrams per cubic meter. NA—Not applicable. NE—Not established. NI—No information. NTP-9—National Toxicology Program, Ninth Annual Report on Carcinogens. OSHA PEL—Occupational Safety and Health Administration—Permissible Exposure Limit. ppm—parts per million. STEL/C—Short-term exposure limit and ceiling.

Prepared by: Jay A. Young

Date of preparation: December 11, 2002

## CLIP, Chemical Laboratory Information Profile

"Only when you know the hazards, can you take the necessary precautionary measures."

**Copper(II) Sulfate Pentahydrate**  $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$ 

CAS No.: 7758-99-8

Synonyms: Cupric sulfate pentahydrate, Copper sulfate, Blue vitriol

**Physical Properties**

Blue crystalline solid. Dissolves in water forming an acidic, blue solution.

Vapor pressure at 20 °C: negligible

Melting point (anhydrous): 560 °C

Note: Pseudo melting at 30, 110, and 150 °C is caused by loss of water.

**Exposure Limits**

OSHA PEL: NE

ACGIH TLV: NE

**Hazardous Characteristics**

Overall toxicity	Flammability	Destructive to skin/eye	Absorbed through skin	Sensitizer?	Self-reactive?	Incompatible with:
2	0	2 (eyes)	0	No	No	No known significant incompatibilities.

0: None (or very low); 1: Slight; 2: Moderate; 3: High; 4: Severe.

Cited as known to be or reasonably anticipated to be carcinogenic in NTP-9?

No

Identified as a reproductive toxin in Frazier and Hage, *Reproductive Hazards of the Workplace*?

No

**Typical symptoms of acute exposures:**

Irritation of skin (rarely, dermatitis). Sore throat, coughing, if dust inhaled. Can be corrosive to eyes; otherwise, eye irritation, pain, blurred vision. Abdominal pain, vomiting, diarrhea, if ingested.

**Principal target organ(s) or system(s):**

Skin, eyes, respiratory tract, blood, liver, kidneys.

**Storage Requirements**

With other chemicals in a cool, dry, well-ventilated general storage location.

**Notes****ReadMe**

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**Reproductive Toxins**

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**Abbreviations**

ACGIH TLV—American Conference of Governmental Industrial Hygienists—Threshold Limit Value. C—Ceiling. CAS—Chemical Abstracts Service.  $\text{mg}/\text{m}^3$ —milligrams per cubic meter. NA—Not applicable. NE—Not established. NI—No information. NTP-9—National Toxicology Program, Ninth Annual Report on Carcinogens. OSHA PEL—Occupational Safety and Health Administration—Permissible Exposure Limit. ppm—parts per million. STEL/C—Short-term exposure limit and ceiling.

Prepared by: Jay A. Young

Date of preparation: January 13, 2001

## CLIP, Chemical Laboratory Information Profile

"Only when you know the hazards, can you take the necessary precautionary measures."

**Diethyl Phthalate****CAS No.: 84-66-2**

Synonym: Diethyl terephthalate

**Physical Properties**

White, combustible powder.  
 Vapor pressure at 20 °C: negligible  
 Melting point: 44 °C  
 Boiling point: 302 °C

**Exposure Limits**

OSHA PEL: 5 mg/m<sup>3</sup>  
 ACGIH TLV: 5 mg/m<sup>3</sup>

**Hazardous Characteristics**

Overall toxicity	Flammability	Destructive to skin/eye	Absorbed through skin	Sensitizer?	Self-reactive?	Incompatible with: Oxidizing agents*
1	1	1	0	No	No	

0: None (or very low); 1: Slight; 2: Moderate; 3: High; 4: Severe.

**\*Reactivity Hazards**

With strong oxidizing agents, the reaction can be vigorous; less so with weaker oxidizing agents.

Cited as known to be or reasonably anticipated to be carcinogenic in NTP-9?

No

Identified as a reproductive toxin in Frazier and Hage, *Reproductive Hazards of the Workplace*?

No

**Typical symptoms of acute exposures:**

In the eyes, inflammation, pain. On the skin, inflammation. If ingested, nausea, abdominal pain, dizziness. If inhaled, dizziness, dullness.

**Principal target organ(s) or system(s):**

Eyes, skin, central nervous system.

**Storage Requirements**

Store with other chemicals in a cool, dry, well-ventilated general storage location.

**Additional Remarks**

At room temperature, the vapor pressure of diethyl phthalate is so low that inhalation of the vapor is unlikely; at higher temperatures this is not the case.

**Notes****ReadMe**

This Chemical Laboratory Information Profile is *not* a Material Safety Data Sheet. It is a brief summary for teachers and their students that describes some of the hazards of this chemical as it is typically used in laboratories. On the basis of your knowledge of these hazards and before using or handling this chemical, *you need to select the precautions and first-aid procedures to be followed*. For that information as well as for other useful information, refer to Material Safety Data Sheets, container labels, and references in the scientific literature that pertain to this chemical.

**Reproductive Toxins**

Some substances that in fact are reproductive toxins are not yet recognized as such. For the best readily available and up-to-date information, refer to "DART/ETIC". See the TOXNET home page at <http://www.sis.nlm.nih.gov> and click on "Toxicology search". *Note that some of the data in DART/ETIC have not been peer-reviewed*. See also Linda M. Frazier and Marvin L. Hage, *Reproductive Hazards of the Workplace*; Wiley, 1998; and T. H. Shepard, *Catalog of Teratogenic Agents*, 9th ed.; Johns Hopkins University Press, 1998.

**Abbreviations**

ACGIH TLV—American Conference of Governmental Industrial Hygienists—Threshold Limit Value. C—Ceiling. CAS—Chemical Abstracts Service. mg/m<sup>3</sup>—milligrams per cubic meter. µg/m<sup>3</sup>—micrograms per cubic meter. NA—Not applicable. NE—Not established. NI—No information. NTP-9—National Toxicology Program, Ninth Annual Report on Carcinogens. OSHA PEL—Occupational Safety and Health Administration—Permissible Exposure Limit. ppm—parts per million. STEL/C—Short-term exposure limit and ceiling.

Prepared by: Jay A. Young

Date of preparation: December 11, 2002

## CLIP, Chemical Laboratory Information Profile

"Only when you know the hazards, can you take the necessary precautionary measures."

### Ethylenediaminetetraacetic Acid [(HOOCCH<sub>2</sub>)<sub>2</sub>NCH<sub>2</sub>]<sub>2</sub>

CAS No.: 60-00-4

Synonyms: EDTA, (Ethylenedinitrilo)tetraacetic acid

#### Physical Properties

White crystals  
Vapor pressure at 20 °C: negligible  
Melting point: decomposes at approx 240 °C

#### Exposure Limits

OSHA PEL: NE  
ACGIH TLV: NE

#### Hazardous Characteristics

Overall toxicity	Flammability	Destructive to skin/eye	Absorbed through skin	Sensitizer?	Self-reactive?	Incompatible with:
1	1	1	0	No	No	Strong oxidizing agents, strong bases*

0: None (or very low); 1: Slight; 2: Moderate; 3: High; 4: Severe.

#### \*Reactivity Hazards

The reaction of EDTA with strong oxidizing agents and bases is exothermic. See suppliers' Material Safety Data Sheets for further details and for other incompatibilities.

Cited as known to be or reasonably anticipated to be carcinogenic in NTP-9?

No

Identified as a reproductive toxin in Frazier and Hage, *Reproductive Hazards of the Workplace*?

No

#### Typical symptoms of acute exposures:

Redness, inflammation, pain if in eyes or on skin. Sore throat, coughing if ingested or inhaled.

#### Principal target organ(s) or system(s):

Eyes, skin, respiratory system, (kidneys, if ingested).

#### Storage Requirements

Keep with other chemicals in a cool, dry, well-ventilated general storage location.

#### Additional Remarks

Ethylenediaminetetraacetic acid produces irritating, toxic nitrogen oxides when heated.

#### Notes

#### ReadMe

This Chemical Laboratory Information Profile is **not** a Material Safety Data Sheet. It is a brief summary for teachers and their students that describes some of the hazards of this chemical as it is typically used in laboratories. On the basis of your knowledge of these hazards and before using or handling this chemical, *you need to select the precautions and first-aid procedures to be followed.* For that information as well as for other useful information, refer to Material Safety Data Sheets, container labels, and references in the scientific literature that pertain to this chemical.

#### Reproductive Toxins

Some substances that in fact are reproductive toxins are not yet recognized as such. For the best readily available and up-to-date information, refer to "DART/ETIC". See the TOXNET home page at [www.sis.nlm.nih.gov](http://www.sis.nlm.nih.gov) and click on "Toxicology search". *Note that some of the data in DART/ETIC have not been peer-reviewed.* See also Linda M. Frazier and Marvin L. Hage, *Reproductive Hazards of the Workplace*; Wiley, 1998; and T. H. Shepard, *Catalog of Teratogenic Agents*, 9th ed.; Johns Hopkins University Press, 1998.

#### Abbreviations

ACGIH TLV—American Conference of Governmental Industrial Hygienists—Threshold Limit Value. C—Ceiling. CAS—Chemical Abstracts Service. mg/m<sup>3</sup>—milligrams per cubic meter. NA—Not applicable. NE—Not established. NI—No information. NTP-9—National Toxicology Program, Ninth Annual Report on Carcinogens. OSHA PEL—Occupational Safety and Health Administration—Permissible Exposure Limit. ppm—parts per million. STEL/C—Short-term exposure limit and ceiling.

Prepared by: Jay A. Young

Date of preparation: February 24, 2001

## CLIP, Chemical Laboratory Information Profile

"Only when you know the hazards, can you take the necessary precautionary measures."

## Formic Acid (85–95%)

## HCOOH

CAS No.: 64-18-6

Synonyms: Methanoic acid, Formylic acid, Aminic acid, Hydrogen carboxylic acid

## Physical Properties

## Exposure Limits

Colorless liquid with pungent, irritating odor. *The odor threshold for formic acid is no greater than 10 ppm for most persons!*

Vapor pressure at 20 °C: approx 35 Torr

Melting point: approx 8 °C

Boiling point: approx 101 °C

OSHA PEL: 5 ppm

ACGIH TLV: 5 ppm

ACGIH STEL/C: 10 ppm

## Hazardous Characteristics

Overall toxicity	Flammability	Destructive to skin/eye	Absorbed through skin	Sensitizer?	Self-reactive?	Incompatible with:
2	2	3	2	No	No	Oxidizing agents, bases, some plastics, sulfuric acid, metals.*

0: None (or very low); 1: Slight; 2: Moderate; 3: High; 4: Severe.

## \*Reactivity Hazards

The reaction of formic acid with oxidizing agents, especially strong oxidizers, can be violent. Its reaction with bases is exothermic and can be violent. It reacts violently with strong bases, causing fires and explosions. With concentrated and partially diluted sulfuric acid it produces carbon monoxide. Formic acid corrodes most metals and attacks many plastics. See Bretherick's *Handbook of Reactive Chemical Hazards* for details and for other incompatibilities.

Cited as known to be or reasonably anticipated to be carcinogenic in NTP-9?

No

Identified as a reproductive toxin in Frazier and Hage, *Reproductive Hazards of the Workplace?*

No

## Typical symptoms of acute exposures:

Severe damage if splashed in eyes, up the nose, or on skin. Discharge of tears from the eyes, discharge of mucus from the nose, dermatitis, burns, blisters. Coughing, difficulty in breathing, unconsciousness, lung edema, if sufficient vapor or mist is inhaled at levels exceeding the OSHA PEL or ACGIH TLV. If swallowed, sore throat, burning sensations, abdominal pain, vomiting, diarrhea.

## Principal target organ(s) or system(s):

Eyes, skin, respiratory system.

## Storage Requirements

With other flammables in a cool, dry, well-ventilated location, away from ignition sources, separated from oxidizing agents and bases.

## Additional Remarks

At concentrations in air between 18 and 57%, formic acid vapors will explode if ignited. Formic acid decomposes forming carbon monoxide when strongly heated. Symptoms of lung edema are not manifest immediately in victims who have inhaled formic acid vapors or mist; some hours may elapse before they appear; physical effort can exaggerate these symptoms. Rest is essential for persons exposed to excess vapor or mist.

## Notes

## ReadMe

This Chemical Laboratory Information Profile is *not* a Material Safety Data Sheet. It is a brief summary for teachers and their students that describes some of the hazards of this chemical as it is typically used in laboratories. On the basis of your knowledge of these hazards and before using or handling this chemical, *you need to select the precautions and first-aid procedures to be followed*. For that information as well as for other useful information, refer to Material Safety Data Sheets, container labels, and references in the scientific literature that pertain to this chemical.

## Reproductive Toxins

Some substances that in fact are reproductive toxins are not yet recognized as such. For the best readily available and up-to-date information, refer to "DART/ETIC". See the TOXNET home page at [www.sis.nlm.nih.gov](http://www.sis.nlm.nih.gov) and click on "Toxicology search". *Note that some of the data in DART/ETIC have not been peer-reviewed*. See also Linda M. Frazier and Marvin L. Hage, *Reproductive Hazards of the Workplace*; Wiley, 1998; and T. H. Shepard, *Catalog of Teratogenic Agents*, 9th ed.; Johns Hopkins University Press, 1998.

## Abbreviations

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Prepared by: Jay A. Young

Date of preparation: January 15, 2001

## CLIP, Chemical Laboratory Information Profile

"Only when you know the hazards, can you take the necessary precautionary measures."

## Glass Wool

CAS No.: not established

Synonym: Fiber glass

## Physical Properties

An odorless, fibrous solid; may contain a binder or oil for dust suppression.  
Vapor pressure at 20 °C: negligible

## Exposure Limits

OSHA PEL: 15 mg/m<sup>3</sup> total dust  
5 mg/m<sup>3</sup> respirable dust  
ACGIH TLV: 1 respirable fiber/cc

## Hazardous Characteristics

Overall toxicity	Flammability	Destructive to skin/eye	Absorbed through skin	Sensitizer?	Self-reactive?	Incompatible with:
1 (see carcinogenicity below)	0	1	0	No	No	Hydrofluoric acid, concentrated alkaline solutions*

0: None (or very low); 1: Slight; 2: Moderate; 3: High; 4: Severe.

## \*Reactivity Hazards

Hydrofluoric acid destroys glass wool. Glass wool fibers slowly dissolve in concentrated alkaline solutions.

Cited as known to be or reasonably anticipated to be carcinogenic in NTP-9? Yes, for respirable-sized fibers  
Identified as a reproductive toxin in Frazier and Hage, *Reproductive Hazards of the Workplace*? No

## Typical symptoms of acute exposures:

Under typical conditions of use in the laboratory, glass wool is not expected to be a significant hazard. However, if misused, the resulting dust can cause eye irritation, skin irritation, and/or irritation of the nose or throat with possible accompanying breathing difficulty.

## Principal target organ(s) or system(s):

Eyes, skin, and, for particles of respirable size, the lungs and respiratory tract.

## Storage Requirements

Store in a cool, dry, well-ventilated general storage location.

## Notes

## ReadMe

This Chemical Laboratory Information Profile is *not* a Material Safety Data Sheet. It is a brief summary for teachers and their students that describes some of the hazards of this chemical as it is typically used in laboratories. On the basis of your knowledge of these hazards and before using or handling this chemical, *you need to select the precautions and first-aid procedures to be followed.* For that information as well as for other useful information, refer to Material Safety Data Sheets, container labels, and references in the scientific literature that pertain to this chemical.

## Reproductive Toxins

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Prepared by: Jay A. Young

Date of preparation: January 8, 2002

## CLIP, Chemical Laboratory Information Profile

"Only when you know the hazards, can you take the necessary precautionary measures."

**Glycerol****CAS No.: 56-81-5**

Synonyms: Glycerin, 1,2,3,-propanetriol

**Physical Properties**

Colorless, odorless, hygroscopic, viscous, combustible liquid.  
 Vapor pressure at 20 °C: negligible  
 Melting point: 18 °C  
 Boiling point: 290 °C

**Exposure Limits**

OSHA PEL: 5 mg/m<sup>3</sup> (as mist)  
 ACGIH TLV: 10 mg/m<sup>3</sup> (as mist)

**Hazardous Characteristics**

Overall toxicity	Flammability	Destructive to skin/eye	Absorbed through skin	Sensitizer?	Self-reactive?	Incompatible with:
1	1	1	0	No	No	Nitric acid, halogens, potassium permanganate, other oxidizing agents; also potassium triiodide, sodium borohydride.*

0: None (or very low); 1: Slight; 2: Moderate; 3: High; 4: Severe.

**\*Reactivity Hazards**

The reaction of glycerin with an incompatible substance is usually violent; glycerin has three reactive centers, is a viscous liquid in intimate contact with the other species, and has a high boiling point. Consequently, the released heat tends to be retained, thus driving the temperature higher with a resultant increase in the violence of the reaction. See Bretherick's *Handbook of Reactive Chemical Hazards* for details and for other incompatibilities.

Cited as known to be or reasonably anticipated to be carcinogenic in NTP-9? No  
 Identified as a reproductive toxin in Frazier and Hage, *Reproductive Hazards of the Workplace*? No

**Typical symptoms of acute exposures:**

Skin and eye irritation, headache, nausea if ingested.

**Principal target organ(s) or system(s):**

Skin, eyes, and kidneys if ingested.

**Storage Requirements**

Store with other chemicals in a cool, dry, well-ventilated general storage location.

**Additional Remarks**

When heated above 280 °C, glycerin decomposes forming acrolein, a toxic, corrosive gas. Acrolein is assigned a PEL and a TLV of 0.1 ppm; the PEL limit is a ceiling limit.

**Notes****ReadMe**

This Chemical Laboratory Information Profile is *not* a Material Safety Data Sheet. It is a brief summary for teachers and their students that describes some of the hazards of this chemical as it is typically used in laboratories. On the basis of your knowledge of these hazards and before using or handling this chemical, *you need to select the precautions and first-aid procedures to be followed.* For that information as well as for other useful information, refer to Material Safety Data Sheets, container labels, and references in the scientific literature that pertain to this chemical.

**Reproductive Toxins**

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**Abbreviations**

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Prepared by: Jay A. Young

Date of preparation: October 10, 2002



## CLIP, Chemical Laboratory Information Profile

"Only when you know the hazards, can you take the necessary precautionary measures."

**Graphite****C****CAS No.: 7782-42-5**

Synonyms: Plumbago, Black lead, Mineral carbon

**Physical Properties****Exposure Limits**

Dark gray to black, slippery feeling, odorless flakes or lumps.  
Vapor pressure at 20 °C: negligible  
Sublimes when heated to temperatures exceeding 3700 °C

OSHA PEL: 2.5 mg/m<sup>3</sup> (respirable fraction)  
ACGIH TLV: 2 mg/m<sup>3</sup> (respirable dust)

**Hazardous Characteristics**

Overall toxicity	Flammability	Destructive to skin/eye	Absorbed through skin	Sensitizer?	Self-reactive?	Incompatible with: Oxidizing agents*
1	2	0	0	No	No	

0: None (or very low); 1: Slight; 2: Moderate; 3: High; 4: Severe.

**\*Reactivity Hazards**

With very strong oxidizing agents such as fluorine, chlorine dioxide, and potassium peroxide, the reaction with graphite is violent. Mixtures of graphite dust and air are explosive when ignited. In bulk forms such as graphite crucibles, graphite is almost inert.

Cited as known to be or reasonably anticipated to be carcinogenic in NTP-9? No

Identified as a reproductive toxin in Frazier and Hage, *Reproductive Hazards of the Workplace*? No

**Typical symptoms of acute exposures:**

In the eyes, discomfort. If inhaled, coughing, breathing difficulty.

**Principal target organ(s) or system(s):**

Eyes, respiratory system.

**Storage Requirements**

Store with other combustibles in a cool, dry, well-ventilated location, away from ignition sources and separated from oxidizing agents.

**Additional Remarks**

The PEL value cited above pertains to natural graphite containing less than 1% quartz; it does not pertain to graphite containing 1% or more than 1% quartz, nor does it pertain to graphite fibers. The TLV cited above pertains to all forms of graphite except graphite fibers. Some crystalline silica is likely present in graphite; exposure to crystalline silica should meet the TLV requirement for the form(s) of silica present in the graphite (see the MSDS for details).

**Notes****ReadMe**

This Chemical Laboratory Information Profile is *not* a Material Safety Data Sheet. It is a brief summary for teachers and their students that describes some of the hazards of this chemical as it is typically used in laboratories. On the basis of your knowledge of these hazards and before using or handling this chemical, *you need to select the precautions and first-aid procedures to be followed*. For that information as well as for other useful information, refer to Material Safety Data Sheets, container labels, and references in the scientific literature that pertain to this chemical.

**Reproductive Toxins**

Some substances that in fact are reproductive toxins are not yet recognized as such. For the best readily available and up-to-date information, refer to "DART/ETIC". See the TOXNET home page at <http://www.sis.nlm.nih.gov> and click on "Toxicology search". *Note that some of the data in DART/ETIC have not been peer-reviewed*. See also Linda M. Frazier and Marvin L. Hage, *Reproductive Hazards of the Workplace*, Wiley, 1998; and T. H. Shepard, *Catalog of Teratogenic Agents*, 9th ed.; Johns Hopkins University Press, 1998.

**Abbreviations**

ACGIH TLV—American Conference of Governmental Industrial Hygienists—Threshold Limit Value. C—Ceiling. CAS—Chemical Abstracts Service. mg/m<sup>3</sup>—milligrams per cubic meter. µg/m<sup>3</sup>—micrograms per cubic meter. NA—Not applicable. NE—Not established. NI—No information. NTP-9—National Toxicology Program, Ninth Annual Report on Carcinogens. OSHA PEL—Occupational Safety and Health Administration—Permissible Exposure Limit. ppm—parts per million. STEL/C—Short-term exposure limit and ceiling.

Prepared by: Jay A. Young

Date of preparation: December 11, 2002

**CLIP, Chemical Laboratory Information Profile**

"Only when you know the hazards, can you take the necessary precautionary measures."

**Hydrochloric Acid (approx 36%) HCl(aq)****CAS No.: 7647-01-0**

Synonyms: concentrated hydrochloric acid, muriatic acid

**Physical Properties**

A strong and corrosive acid. A colorless, fuming liquid with a sharp, painful odor  
 Vapor pressure at 20 °C: 215 Torr (368 ppm)  
 Boiling point: 110 °C

**Exposure Limits**

OSHA STEL/C: 5 ppm  
 ACGIH STEL/C: 5 ppm

**Hazardous Characteristics**

Overall toxicity	Flammability	Destructive to skin/eye	Absorbed through skin	Sensitizer?	Self-reactive?	Incompatible with:
3	0	3	0	No	No	Bases, oxidizing agents, most metals*

0: None (or very low); 1: Slight; 2: Moderate; 3: High; 4: Severe.

**\*Reaction with:**

Bases is exothermic and can be violent; oxidizing agents produces chlorine, a severely toxic gas and oxidizing agent; most metals produces hydrogen, which is flammable and explosive. See Bretherick's *Handbook of Reactive Chemical Hazards* for details and for other incompatibilities.

Cited as known to be or reasonably anticipated to be carcinogenic in NTP-9?

No

Identified as a reproductive toxin in Frazier and Hage, *Reproductive Hazards of the Workplace*?

No

**Typical symptoms of acute exposures:**

Tissue destruction of eyes, skin, or mucous membranes with pain, severe discomfort, or stinging sensation. Difficulty in breathing if vapor or mist is inhaled; may cause lung edema but symptoms may be delayed. Acidic or sour taste if in mouth, with destruction of teeth and mouth tissues. Sore throat and/or abdominal pain if swallowed.

**Principal target organ(s) or system(s):**

Eyes, skin, respiratory system.

**Storage Requirements**

Separate from bases and oxidizing agents with other inorganic acids (except oxidizing acids such as nitric, perchloric, etc.) in a cool, dry, well-ventilated location.

**Additional Remarks**

Hydrochloric acid vapor is corrosive and denser than air. Consequently, the vapor can travel long distances and will tend to collect in lower areas, especially if partially enclosed. The vapor also forms toxic  $\text{NH}_4\text{Cl}$  when vapors from  $\text{NH}_3(\text{aq})$  are present. The National Institute for Occupational Safety and Health considers vapor concentrations greater than or equal to 50 ppm to be immediately dangerous to life and health.

**Notes****ReadMe**

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**Reproductive Toxins**

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**Abbreviations**

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Prepared by: Jay A. Young

Date of preparation: January 15, 2001

## CLIP, Chemical Laboratory Information Profile

"Only when you know the hazards, can you take the necessary precautionary measures."

Hydrogen Peroxide, 3%

 $H_2O_2(aq)$ 

CAS No.: 7722-84-1

## Physical Properties

## Exposure Limits

Colorless liquid continuously evolving oxygen when in an open vessel.

Vapor pressure at 20 °C: 20 Torr

OSHA PEL: 1 ppm (as  $H_2O_2$ )ACGIH TLV: 1 ppm (as  $H_2O_2$ )

## Hazardous Characteristics

Overall toxicity	Flammability	Destructive to skin/eye	Absorbed through skin?	Sensitizer?	Self-reactive?	Incompatible with:
1	0	1	No	No	No	Combustibles, flammables, finely divided solids, rough surfaces, water-soluble alkaline metallic compounds.*

0: None (or very low); 1: Slight; 2: Moderate; 3: High; 4: Severe.

## \*Reactivity Hazards

Even at 3% concentration in aqueous solution, hydrogen peroxide is a potent oxidizing agent. It decomposes, forming oxygen rapidly upon heating and also when almost any finely divided solid or rough-surfaced material is introduced into the liquid. The oxygen released in this way is atomic, not molecular, and consequently is a hazardous oxidizing agent that can react violently with oxidizable substances. See Bretherick's *Handbook of Reactive Chemical Hazards* for details and for other incompatibilities.

Cited as known to be or reasonably

anticipated to be carcinogenic in NTP-10? No

Identified as a reproductive toxin in Frazier and Hage,

*Reproductive Hazards of the Workplace?*

No

## Typical symptoms of acute exposures:

In the eyes, irritation, pain. On the skin, inflammation. If inhaled, sore throat, coughing. If ingested, discomfort, sore throat, abdominal pain, vomiting.

## Principal target organ(s) or system(s):

Skin, eyes, respiratory system.

## Storage Requirements

Store separately in a cool, dry, well-ventilated location away from flammables, combustibles, and other reducing agents.

## Additional Remarks

Aqueous hydrogen peroxide solutions at concentrations greater than 3% are more reactive: the greater the concentration, the more reactive. This does not mean that 3% solutions are "safe". Thus, even a 3% solution can decompose violently if its pH is made to be greater than 7 by the addition of, say, a few pellets of solid NaOH.

## Notes

## ReadMe

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## Reproductive Toxins

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## Abbreviations

ACGIH TLV—American Conference of Governmental Industrial Hygienists—Threshold Limit Value. C—Ceiling. CAS—Chemical Abstracts Service. mg/m<sup>3</sup>—milligrams per cubic meter. NA—Not applicable. NE—Not established. NI—No information. NTP-10—National Toxicology Program, Tenth Annual Report on Carcinogens. OSHA PEL—Occupational Safety and Health Administration—Permissible Exposure Limit. ppm—parts per million. STEL/C—Short-term exposure limit and ceiling.

Prepared by: Jay A. Young

Date of preparation: July 22, 2003

## CLIP, Chemical Laboratory Information Profile

"Only when you know the hazards, can you take the necessary precautionary measures."

**Iron(II) Sulfate Heptahydrate**  $\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$ **CAS No.: 7782-63-0**

Synonyms: Ferrous sulfate 7-hydrate, iron sulfate

Physical Properties	Exposure Limits
Green crystals, slightly acidic, soluble in water, easily oxidized when exposed to air.	OSHA PEL: 1 mg/m <sup>3</sup> (as Fe)
Vapor pressure at 20 °C: negligible	ACGIH TLV: 1 mg/m <sup>3</sup> (as Fe)
No melting point; decomposes at 90 °C	

**Hazardous Characteristics**

Overall toxicity	Flammability	Destructive to skin/eye	Absorbed through skin	Sensitizer?	Self-reactive?	Incompatible with: Oxidizing agents.*
2	0	0	0	No	No	

0: None (or very low); 1: Slight; 2: Moderate; 3: High; 4: Severe.

**\*Reactivity Hazards**

Even mild oxidizing agents can react vigorously with iron(II) sulfate. See Bretherick's *Handbook of Reactive Chemical Hazards* for details and for other incompatibilities.

Cited as known to be or reasonably anticipated to be carcinogenic in NTP-9? No Identified as a reproductive toxin in Frazier and Hage, *Reproductive Hazards of the Workplace?* Doubtful

**Typical symptoms of acute exposures:**

In the eyes and on skin, irritation. Hacking cough if inhaled. Abdominal pain, vomiting, constipation, diarrhea if ingested.

**Principal target organ(s) or system(s):**

Eyes, skin, respiratory system, and if ingested: gastrointestinal tract, liver, cardiovascular/peripheral circulation, and central nervous system.

**Storage Requirements**

Store with other chemicals in a cool, dry, well-ventilated general storage location.

**Notes****ReadMe**

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**Reproductive Toxins**

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**Abbreviations**

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Prepared by: Jay A. Young

Date of preparation: October 11, 2002

## CLIP, Chemical Laboratory Information Profile

"Only when you know the hazards, can you take the necessary precautionary measures."

## Iron(III) Oxide



CAS No.: 1309-37-1

Synonyms: Iron oxide, Ferric oxide, Rouge, Hematite, Iron ore

## Physical Properties

## Exposure Limits

Red-colored solid		OSHA PEL:	10 mg/m <sup>3</sup> , as Fe
Vapor pressure at 20 °C:	negligible	ACGIH TLV:	5 mg/m <sup>3</sup> , as Fe
Melting point:	1565 °C		

## Hazardous Characteristics

Overall toxicity	Flammability	Destructive to skin/eye	Absorbed through skin	Sensitizer?	Self-reactive?	Incompatible with:
1	0	0	0	No	No	Aluminum, magnesium, hydrogen peroxide, carbon monoxide*

0: None (or very low); 1: Slight; 2: Moderate; 3: High; 4: Severe.

## \*Reactivity Hazards

Reaction with aluminum, magnesium, and other group II and III metals can be vigorously exothermic (thermite reaction). Iron(III) oxide catalyzes the decomposition of hydrogen peroxide; the reaction can be explosive if the concentration of hydrogen peroxide is greater than 3%.

Reaction with carbon monoxide, when heated, has produced iron pentacarbonyl, a toxic, flammable, explosive gas.

See Bretherick's *Handbook of Reactive Chemical Hazards* for details and for other incompatibilities.

Cited as known to be or reasonably anticipated to be carcinogenic in NTP-9?	No	Identified as a reproductive toxin in Frazier and Hage, <i>Reproductive Hazards of the Workplace</i> ?	Declines in semen parameters among welders
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## Typical symptoms of acute exposures:

Under typical conditions of use in the lab, overexposure to iron(III) oxide is not foreseeable.

## Principal target organ(s) or system(s):

Respiratory system.

## Storage Requirements

With other chemicals in a cool, dry, well-ventilated general storage location.

## Notes

## ReadMe

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## Reproductive Toxins

Some substances that in fact are reproductive toxins are not yet recognized as such. For the best readily available and up-to-date information, refer to "DART/ETIC". See the TOXNET home page at [www.sis.nlm.nih.gov](http://www.sis.nlm.nih.gov) and click on "Toxicology search". *Note that some of the data in DART/ETIC have not been peer-reviewed.* See also Linda M. Frazier and Marvin L. Hage, *Reproductive Hazards of the Workplace*; Wiley, 1998; and T. H. Shepard, *Catalog of Teratogenic Agents*, 9th ed.; Johns Hopkins University Press, 1998.

## Abbreviations

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Prepared by: Jay A. Young

Date of preparation: July 21, 2001

## CLIP, Chemical Laboratory Information Profile

"Only when you know the hazards, can you take the necessary precautionary measures."

## Isopropyl Ether



CAS No.: 108-20-3

Synonyms: diisopropyl ether, 2,2'-oxybis(propane), 2-isopropoxypropane

## Physical Properties

## Exposure Limits

Colorless, extremely flammable liquid with a characteristic odor.  
 Vapor pressure at 20 °C: 138 Torr  
 Melting point: -86 °C  
 Boiling point: 68 °C

OSHA PEL: 500 ppm  
 ACGIH TLV: 250 ppm  
 STEL: 310 ppm

## Hazardous Characteristics

Overall toxicity	Flammability	Destructive to skin/eye	Absorbed through skin	Sensitizer?	Self-reactive?	Incompatible with:
1	3	1	0	No	No	Air, oxygen, oxidizing agents*

0: None (or very low); 1: Slight; 2: Moderate; 3: High; 4: Severe.

## \*Reactivity Hazards

Isopropyl ether is extremely flammable. It reacts violently with oxidizing agents. With air or oxygen itself it very readily forms light-, friction-, and shock-sensitive isopropyl ether peroxide. See Bretherick's *Handbook of Reactive Chemical Hazards* for details and for other incompatibilities.

Cited as known to be or reasonably anticipated to be carcinogenic in NTP-9? No

Identified as a reproductive toxin in Frazier and Hage, *Reproductive Hazards of the Workplace?* No

## Typical symptoms of acute exposures:

Skin and eye irritation; it is a general anesthetic if inhaled.

## Principal target organ(s) or system(s):

Central nervous system.

## Storage Requirements

Store with other flammables in a cool, dry, well-ventilated location, away from ignition sources and separated from oxidizing agents.

## Additional Remarks

The dangerous nature of the propensity of isopropyl ether to form unstable, explosive peroxides cannot be over-emphasized.

## Notes

## ReadMe

This Chemical Laboratory Information Profile is *not* a Material Safety Data Sheet. It is a brief summary for teachers and their students that describes some of the hazards of this chemical as it is typically used in laboratories. On the basis of your knowledge of these hazards and before using or handling this chemical, *you need to select the precautions and first-aid procedures to be followed*. For that information as well as for other useful information, refer to Material Safety Data Sheets, container labels, and references in the scientific literature that pertain to this chemical.

## Reproductive Toxins

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Prepared by: Jay A. Young

Date of preparation: October 11, 2002

## CLIP, Chemical Laboratory Information Profile

"Only when you know the hazards, can you take the necessary precautionary measures."

### Manganese(IV) Oxide



CAS No.: 1313-13-9

Synonyms: Manganese dioxide, Manganese black

Physical Properties		Exposure Limits	
Black powder, insoluble in water.		OSHA PEL:	5 mg/m <sup>3</sup> , as Mn
Vapor pressure at 20 °C:	negligible	OSHA CEILING	5 mg/m <sup>3</sup> , as Mn
Melting point:	decomposes at 535 °C	ACGIH TLV:	5 mg/m <sup>3</sup> , as Mn

### Hazardous Characteristics

Overall toxicity	Flammability	Destructive to skin/eye	Absorbed through skin	Sensitizer?	Self-reactive?	Incompatible with:
3	0	2	0	No	No	Hydrochloric acid, finely divided metals, acetylides, azides, hydrides, sulfides, and peroxides and other oxidizing agents*

0: None (or very low); 1: Slight; 2: Moderate; 3: High; 4: Severe.

#### \*Reactivity Hazards

Manganese(IV) oxide is a strong oxidizing agent; it oxidizes HCl forming Cl<sub>2</sub>; it reacts violently with flammables, combustibles, and other reducing agents; it catalytically decomposes other oxidants, e.g., potassium chlorate, usually violently or even explosively; when heated it reacts violently with finely divided metals and with charcoal.

See Bretherick's *Handbook of Reactive Chemical Hazards* for details and for other incompatibilities.

Cited as known to be or reasonably anticipated to be carcinogenic in NTP-9?	No	Identified as a reproductive toxin in Frazier and Hage, <i>Reproductive Hazards of the Workplace</i> ?	No convincing evidence.
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#### Typical symptoms of acute exposures:

Inflammation of the skin and/or eyes, coughing, abdominal pain, nausea.

#### Principal target organ(s) or system(s):

Skin, eyes, respiratory tract, central nervous system, brain.

### Storage Requirements

In a cool, dry, well-ventilated location, away from hydrochloric acid, flammables, combustibles, and other reducing agents.

### Additional Remarks

At 535 °C manganese(IV) oxide decomposes into manganese(III) oxide and oxygen; consequently when it is involved in a fire the hazard is increased.

### Notes

#### ReadMe

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#### Reproductive Toxins

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Prepared by: Jay A. Young

Date of preparation: July 20, 2001

## CLIP, Chemical Laboratory Information Profile

"Only when you know the hazards, can you take the necessary precautionary measures."

**Mercury(II) chloride****CAS No.: 10112-91-1**

Synonym: Calomel

**Physical Properties****Exposure Limits**

White powder; when exposed to light forms Hg and HgCl<sub>2</sub>.  
 Vapor pressure at 20 °C: negligible  
 Melting point: 302 °C  
 Mercury(II) chloride sublimates at 273 °C

OSHA PEL: 0.1 mg/m<sup>3</sup>  
 ACGIH TLV: 0.025 mg/m<sup>3</sup> as Hg

**Hazardous Characteristics**

Overall toxicity	Flammability	Destructive to skin/eye	Absorbed through skin	Sensitizer?	Self-reactive?	Incompatible with:
3	0	2	3	No	No	No known significant incompatibilities.

0: None (or very low); 1: Slight; 2: Moderate; 3: High; 4: Severe.

Cited as known to be or reasonably anticipated to be carcinogenic in NTP-9?

No

Identified as a reproductive toxin in Frazier and Hage, *Reproductive Hazards of the Workplace*?

Yes

**Typical symptoms of acute exposures:**

Sore throat, coughing, shortness of breath, skin redness and/or pain, eye redness and/or pain, metallic taste, abdominal pain, diarrhea, vomiting, unconsciousness.

**Principal target organ(s) or system(s):**

Central nervous system, brain, kidneys, eyes, skin, respiratory tract.

**Storage Requirements**

Keep with other poisons in a cool, dry, well-ventilated, and locked location.

**Additional Remarks**

At room temperature, inhalation of air-borne dust is possible; at high temperatures, vapor inhalation becomes an additional hazard.

**Notes****ReadMe**

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**Reproductive Toxins**

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Prepared by: Jay A. Young

Date of preparation: January 9, 2002



## CLIP, Chemical Laboratory Information Profile

"Only when you know the hazards, can you take the necessary precautionary measures."

***n*-Hexane****CAS No.: 110-54-3**

Synonyms: hexane, normal-hexane, hexyl hydride

**Physical Properties****Exposure Limits**

Colorless volatile liquid, mild odor at concentrations >130 ppm  
 Vapor pressure at 20 °C: approx 124 Torr  
 Melting point: approx -95 °C  
 Boiling point: approx 69 °C

OSHA PEL: 500 ppm  
 ACGIH TLV: 50 ppm

**Hazardous Characteristics**

Overall toxicity	Flammability	Destructive to skin/eye	Absorbed through skin	Sensitizer?	Self-reactive?	Incompatible with:
3	3	1	0	No	No	Oxidizing agents*

0: None (or very low); 1: Slight; 2: Moderate; 3: High; 4: Severe

**\*Reaction with:**

Oxidizing agents can start fires.

See Bretherick's *Handbook of Reactive Chemical Hazards* for details and for other incompatibilities.

Cited as known to be or reasonably anticipated to be carcinogenic in NTP-9?

No

Reproductive toxin? Frazier and Hage describe rat pups that "weighed less than expected" when dams were exposed during pregnancy.

**Typical symptoms of acute exposures:**

Irritation of the eyes, nose; light-headedness, dizziness, nausea, headache; numbness in the hands, fingers, feet, toes; muscle weakness; dermatitis; giddiness. Chemical pneumonia if swallowed and then vomited.

**Principal target organ(s) or system(s):**

Eyes, skin, respiratory system, central nervous system, peripheral nervous system.

**Storage Requirements**

Store with other flammables in a cool, dry, well-ventilated location, away from ignition sources and separated from oxidizing agents.

**Additional Remarks**

Commercial hexane (mixtures of hexane isomers) usually contains from 20% to 80% *n*-hexane. Repeated overexposure to *n*-hexane vapors causes peripheral polyneuropathy (unpleasantly frequent tingling sensations in hands, fingers, feet, and/or toes). The vapor is heavier than air and can travel long distances; it is explosive when mixed with air.

**Notes****ReadMe**

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**Reproductive Toxins**

Some substances that in fact are reproductive toxins are not yet recognized as such. For the best readily available and up-to-date information, refer to "DART/ETIC". See the TOXNET home page at [www.sis.nlm.nih.gov](http://www.sis.nlm.nih.gov) and click on "Toxicology search". *Note that some of the data in DART/ETIC have not been peer-reviewed.* See also Linda M. Frazier and Marvin L. Hage, *Reproductive Hazards of the Workplace*; Wiley, 1998; and T. H. Shepard, *Catalog of Teratogenic Agents*, 9th ed.; Johns Hopkins University Press, 1998.

**Abbreviations**

ACGIH TLV—American Conference of Governmental Industrial Hygienists—Threshold Limit Value. C—Ceiling. CAS—Chemical Abstracts Service. mg/m<sup>3</sup>—milligrams per cubic meter. NA—Not applicable. NE—Not established. NI—No information. NTP-9—National Toxicology Program, Ninth Annual Report on Carcinogens. OSHA PEL—Occupational Safety and Health Administration—Permissible Exposure Limit. ppm—parts per million. STEL/C—Short-term exposure limit and ceiling.

Prepared by: Jay A. Young

Date of preparation: October 19, 2000

## CLIP, Chemical Laboratory Information Profile

"Only when you know the hazards, can you take the necessary precautionary measures."

## Nitric Acid (approx. 70%)



CAS No.: 7697-37-2

Synonyms: Concentrated nitric acid, Aqua fortis

Physical Properties		Exposure Limits	
Colorless to yellow-brown liquid with a pungent odor.		OSHA PEL:	2 ppm
Vapor pressure at 20 °C:	9.4 torr	ACGIH TLV:	2 ppm
Melting point:	-42 °C	STEL:	4 ppm
Boiling point:	122 °C		

## Hazardous Characteristics

Overall toxicity	Flammability	Destructive to skin/eye	Absorbed through skin	Sensitizer?	Self-reactive?	Incompatible with:
3	0	4	0	No	No	Flammables, combustibles, other reducing agents; bases; most metals; many organic compounds; rubber; wood.*

0: None (or very low); 1: Slight; 2: Moderate; 3: High; 4: Severe.

## \*Reactivity Hazards

Nitric acid is a very strong oxidizing agent. As such, it is frequently involved in reactive chemical accidents. Even when dilute, it is a relatively strong oxidizing agent. Often, the reaction products include carbon dioxide and nitrogen dioxide; consequently, reactions in closed vessels and in vessels with restricted openings can result in explosions. See Bretherick's *Handbook of Reactive Chemical Hazards* for details and for other incompatibilities.

Cited as known to be or reasonably anticipated to be carcinogenic in NTP-9? No

Identified as a reproductive toxin in Frazier and Hage, *Reproductive Hazards of the Workplace*. No, however some reactions with nitric acid produce N<sub>2</sub>O (so-called nitrous oxide) that is identified by Frazier and Hage as a reproductive toxin.

## Typical symptoms of acute exposures:

When inhaled: coughing, sore throat, lung edema. When ingested: sore throat, abdominal pain. On the skin: pain, yellow necrotic patches that slough off, severe burns. In the eyes: pain, blurred vision, blindness. CAUTION: Even 1M acid is destructive.

## Principal target organ(s) or system(s):

Respiratory system, skin, eyes.

## Storage Requirements

Store separately, in a cool, dry, well-ventilated location, away from other oxidizing agents (such as perchloric acid, potassium permanganate), away from flammables, combustibles, and other reducing agents including acetic and other organic acids.

## Additional Remarks

At ordinary temperatures, the vapor pressure of nitric acid greatly exceeds the limits established by OSHA and ACGIH. Accordingly, users will be likely to be over-exposed to the vapors of this compound unless appropriate precautions are rigidly maintained; see the MSDS for details. Symptoms of lung edema are not manifest immediately in victims who have inhaled nitric acid vapors or mist; some hours may elapse first; physical effort can exaggerate these symptoms. Rest is essential for persons exposed to excess vapor or mist. Note that the properties of fuming (more hazardous) nitric acid are not described in this CLIP.

## Notes

## ReadMe

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## Reproductive Toxins

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Prepared by: Jay A. Young

Date of preparation: June 20, 2002

## CLIP, Chemical Laboratory Information Profile

"Only when you know the hazards, can you take the necessary precautionary measures."

## Nitrogen, liquid



CAS No.: 7727-37-9

## Physical Properties

## Exposure Limits

Extremely cold, colorless liquid that evaporates rapidly producing cold gaseous nitrogen, a denser-than-air asphyxiant that accumulates in nearby low areas.  
Vapor pressure at -195.8 °C: 760 Torr  
Boiling point: -195.8 °C

OSHA PEL: NE  
ACGIH TLV: "Simple asphyxiant"  
See Additional Remarks, below

## Hazardous Characteristics

Overall toxicity	Flammability	Destructive to skin/eye	Absorbed through skin?	Sensitizer?	Self-reactive?	Incompatible with:
0	0	3	No	No	No	Objects and substances at or above room temperature as well as those at temperatures between -195.8 °C and room temperature.*

0: None (or very low); 1: Slight; 2: Moderate; 3: High; 4: Severe.

## \*Reactivity Hazards

Liquid nitrogen is not chemically reactive, but under typical laboratory conditions it is at its normal boiling point. Consequently, if it comes in contact with any object or substance that is at a temperature greater than -195.8 °C, it will boil vigorously, more vigorously the greater the mass or the higher the temperature of the object or substance. For example, liquid nitrogen boils explosively if mixed with water. Dewar flasks made of glass can break (implode) if liquid nitrogen is poured over the rim. Use a siphon to empty a glass Dewar; often, the rim cannot withstand sudden temperature change. The boiling point of oxygen is -183 °C. Therefore, liquid nitrogen that is open to the air will condense oxygen as a liquid and the mixture of liquid oxygen and liquid nitrogen is a powerful oxidizing agent that reacts violently with most flammables, combustibles, and other reducing agents. See Bretherick's *Handbook of Reactive Chemical Hazards* for details and for other incompatibilities.

Cited as known to be or reasonably anticipated to be carcinogenic in NTP-10? No  
Identified as a reproductive toxin in Frazier and Hage, *Reproductive Hazards of the Workplace*? No

## Typical symptoms of acute exposures:

From contact with the liquid: frostbite. From inhalation of nitrogen-rich atmosphere: dizziness, coma, death.

## Principal target organ(s) or system(s):

Skin, eyes.

## Storage Requirements

For short-term (overnight) storage, use insulated containers designed for the purpose. For long-term storage, follow the recommendations of the supplier.

## Additional Remarks

Nitrogen is rated as a "simple asphyxiant" by the ACGIH. Hence, when using or handling liquid nitrogen, make sure that the concentration of oxygen in the breathing air of all persons involved is at least 18% by volume (or that the partial pressure of O<sub>2</sub> is at least 135 Torr).

## Notes

## ReadMe

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## Reproductive Toxins

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Prepared by: Jay A. Young

Date of preparation: July 23, 2003

## CLIP, Chemical Laboratory Information Profile

"Only when you know the hazards, can you take the necessary precautionary measures."

## Oleic Acid



CAS No.: 112-80-1

Synonyms: (Z)-9-Octadecenoic acid, cis-9-Octadecenoic acid, Red oil

Physical Properties		Exposure Limits	
An oily, colorless to brown liquid.		OSHA PEL:	NE
Vapor pressure at 175 °C:	1 Torr	ACGIH TLV:	NE
Melting point:	13 °C		
Boiling point:	360 °C		

## Hazardous Characteristics

Overall toxicity	Flammability	Destructive to skin/eye	Absorbed through skin	Sensitizer?	Self-reactive?	Incompatible with:
0	1	0	0	No	No	Strong oxidizing agents.*

0: None (or very low); 1: Slight; 2: Moderate; 3: High; 4: Severe.

## \*Reactivity Hazards

The reaction of oleic acid with strong oxidizing agents is exothermic and can be violent. Its reaction with finely divided metals (e.g., aluminum flakes) and with other reducing agents can be violent if the oleic acid has become peroxidized. See Bretherick's *Handbook of Reactive Chemical Hazards* for details and for other incompatibilities.

Cited as known to be or reasonably anticipated to be carcinogenic in NTP-9? No Identified as a reproductive toxin in Frazier and Hage, *Reproductive Hazards of the Workplace*? No

## Typical symptoms of acute exposures:

None expected as a consequence of typical laboratory use and handling.

## Principal target organ(s) or system(s):

Eyes, skin, respiratory system.

## Storage Requirements

With other chemicals in a cool, dry, well-ventilated general storage location. There is some evidence that oleic acid may be subject to peroxide formation when it is stored for long periods and its container has been imperfectly sealed. Accordingly, oleic acid should either be used up within one year after receipt or properly disposed of at that time.

## Additional Remarks

Do not confuse oleic acid, also known as "Red Oil", with the quite different and moderately toxic, "Turkey Red Oil". Oleic acid is a component of many edible foods. However, ingestion of large amounts of oleic acid would produce unpleasant gastrointestinal disorders.

## Notes

## ReadMe

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## Reproductive Toxins

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Prepared by: Jay A. Young

Date of preparation: February 14, 2001

## CLIP, Chemical Laboratory Information Profile

"Only when you know the hazards, can you take the necessary precautionary measures."

**Osmium Tetroxide****CAS No.: 20816-12-0**

Synonyms: Osmium(VIII) oxide, Osmic acid anhydride, osmium oxide

**Physical Properties****Exposure Limits**

Two allotropes, white and pale yellow solids with acrid, irritating odor; both forms sublime readily.  
 Vapor pressure at 20 °C: approx. 5 torr, both allotropes  
 Melting point: 39.5 and 41 °C  
 Boiling point: 130 °C

OSHA PEL: 0.002 mg/m<sup>3</sup>  
 ACGIH TLV: 0.0002 mg/m<sup>3</sup>

**Hazardous Characteristics**

Overall toxicity	Flammability	Destructive to skin/eye	Absorbed through skin	Sensitizer?	Self-reactive?	Incompatible with:
3	0	4	No	No	No	Any substance that can burn, all reducing agents. Hydro-halogen acids.*

0: None (or very low); 1: Slight; 2: Moderate; 3: High; 4: Severe.

**\*Reactivity Hazards**

Osmium tetroxide is a strong oxidizing agent. There is a risk of fire and explosion when it is mixed with combustible substances and other reducing agents. The amorphous allotrope itself is pyrophoric. Osmium tetroxide reacts with HCl, HBr, and HI to produce the free halogen. See Bretherick's *Handbook of Reactive Chemical Hazards* for details and for other incompatibilities.

Cited as known to be or reasonably anticipated to be carcinogenic in NTP-9? No Identified as a reproductive toxin in Frazier and Hage, *Reproductive Hazards of the Workplace*? No

**Typical symptoms of acute exposures:**

When inhaled, a burning sensation, coughing, headache, shortness of breath, visual impairment. On the skin, redness, severe burns. In the eyes, redness, pain, gritty sensation, blurred vision, loss of vision, deep burns. If ingested, a burning sensation, abdominal cramps, shock, collapse.

**Principal target organ(s) or system(s):**

Skin, eyes, respiratory system, gastrointestinal tract, kidneys.

**Storage Requirements**

Store separately, away from reducing agents and other poisonous oxidizers in a cool, dry, well-ventilated, locked location.

**Additional Remarks**

At ordinary temperatures, the vapor pressure of osmium tetroxide greatly exceeds the limits established by OSHA and ACGIH. Accordingly, users will be likely to be over-exposed to the vapors of this compound unless appropriate precautions are rigidly maintained; see the MSDS for details.

**Notes****ReadMe**

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**Reproductive Toxins**

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Prepared by: Jay A. Young

Date of preparation: April 28, 2002

**CLIP, Chemical Laboratory Information Profile**

"Only when you know the hazards, can you take the necessary precautionary measures."

**Petroleum Ether****Aliphatic hydrocarbon mixture CAS No.: see synonyms**

Synonyms and CAS Numbers: naphtha 8002-05-9, VM&P naphtha 8032-32-4, rubber solvent 8030-30-6, Stoddard solvent 8052-41-3, petroleum thinner 64742-89-3. Other synonyms: Ligroin, mineral spirits, white spirits, safety solvent, SBP spirits, painter's naphtha.

**Physical Properties**

Colorless to yellow liquid with gasoline- or kerosene-like odor. Vapor pressure, melting point, freezing point, and other properties vary depending upon components, typically mixtures of hydrocarbons within the range from C<sub>5</sub> to C<sub>13</sub>.

**Exposure Limits**

Differ, depending upon CAS No.; range is as listed here. Note: exposure limits have not been established for some petroleum ethers.

OSHA PEL: 100 to 500 ppm  
ACGIH TLV: 100 to 400 ppm

**Hazardous Characteristics**

Overall toxicity	Flammability	Destructive to skin/eye	Absorbed through skin	Sensitizer?	Self-reactive?	Incompatible with:
1	4	1	2	No	No	Oxidizing agents*

0: None (or very low); 1: Slight; 2: Moderate; 3: High; 4: Severe.

**\*Reactivity Hazards**

The reaction of petroleum ether with oxidizing agents is exothermic, and with strong oxidizing agents is often vigorous, including fire and explosion. See Bretherick's *Handbook of Reactive Chemical Hazards* for details and other incompatibilities.

Cited as known to be or reasonably anticipated to be carcinogenic in NTP-9? No, provided that it contains no benzene or polynuclear aromatic hydrocarbons

Identified as a reproductive toxin in Frazier and Hage, *Reproductive Hazards of the Workplace?* No

**Typical symptoms of acute exposures:**

Headache, dizziness, nausea, skin inflammation, dermatitis, eye redness or irritation. Chemical pneumonia if swallowed and then vomited.

**Principal target organ(s) or system(s):**

Central nervous system, eyes, skin, respiratory system.

**Storage Requirements**

With other flammables in cool, dry, well-ventilated location, away from ignition sources and separated from oxidizing agents.

**Additional Remarks**

The vapor is heavier than air and can travel long distances; it is explosive when mixed with air. Develops a static charge when poured or pumped. The charge can be large enough to generate a spark sufficient to ignite the ever-present vapors, causing an explosion and/or fire. Some petroleum ethers, particularly those used as rubber solvents, may contain *n*-hexane; see the CLIP for *n*-hexane for specific hazard information.

**Notes****ReadMe**

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**Reproductive Toxins**

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Prepared by: Jay A. Young

Date of preparation: January 10, 2001

## CLIP, Chemical Laboratory Information Profile

"Only when you know the hazards, can you take the necessary precautionary measures."

## Phenolphthalein Solution

C<sub>20</sub>H<sub>14</sub>O<sub>4</sub> (solute)

CAS No.: 77-09-8 (solute)

Synonyms: Indicator solution

## Physical Properties

Pink liquid @ 8 > pH > 11, colorless otherwise; alcoholic odor.  
Vapor pressure at 20 °C: approx. 30 Torr, depending upon proportions of alcohol and water.

## Exposure Limits

OSHA PEL: NE for the solute  
ACGIH TLV: NE for the solute

## Hazardous Characteristics

Overall toxicity	Flammability	Destructive to skin/eye	Absorbed through skin	Sensitizer?	Self-reactive?	Incompatible with:
3	1	1	1	No	No	No known incompatibilities

0: None (or very low); 1: Slight; 2: Moderate; 3: High; 4: Severe.

Cited as known to be or reasonably anticipated to be carcinogenic in NTP-9? Yes  
Identified as a reproductive toxin in Frazier and Hage's *Reproductive Hazards of the Workplace*? No

## Typical symptoms of acute exposures:

Strong laxative. Under typical conditions of use, over-exposure to phenolphthalein solution is not likely. Ingestion of even small quantities of phenolphthalein or its solutions will purge most persons.

## Storage Requirements

Store in a cool, dry, locked location with other poisons, separated from oxidizers and away from ignition sources.

## Additional Remarks

Degree of flammability varies depending upon the proportions of alcohol and water. Preferably, prepare the solution by first dissolving phenolphthalein in ethanol, then diluting with at least an equal volume of water. Phenolphthalein is highly toxic as defined by the OSHA Laboratory Standard.

## Notes

## ReadMe

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## Reproductive Toxins

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Prepared by: Jay A. Young

Date of preparation: October 17, 2000

**CLIP, Chemical Laboratory Information Profile**

"Only when you know the hazards, can you take the necessary precautionary measures."

**Potassium chlorate****CAS No.: 3811-04-9**

Synonym: Potcrate

**Physical Properties****Exposure Limits**

White crystalline solid.		OSHA PEL:	NE
Vapor pressure at 20 °C:	negligible	ACGIH TLV:	NE
Melting point:	356 °C		
Boiling point:	decomposes at approx. 400 °C		

**Hazardous Characteristics**

Overall toxicity	Flammability	Destructive to skin/eye	Absorbed through skin	Sensitizer?	Self-reactive?	Incompatible with:
1	0	2	0	No	No	Sulfuric acid, any substance that can burn, all reducing agents.*

0: None (or very low); 1: Slight; 2: Moderate; 3: High; 4: Severe.

**\*Reactivity Hazards**

Potassium chlorate reacts vigorously with sulfuric acid producing chlorine dioxide which is unstable and explodes violently. Potassium chlorate is a very strong oxidizing agent; it evolves oxygen when heated to decomposition temperatures. Although not itself combustible, it enhances the combustibility of any combustible substance with which it is mixed. Mixtures of potassium chlorate and a reducing agent are heat-, shock-, friction-, and impact-sensitive; such mixtures often explode violently when they are heated, shocked, ground (as in a mortar), or impacted, and will almost certainly explode if exposed to any source of ignition. See Bretherick's *Handbook of Reactive Chemical Hazards* for details and for other incompatibilities.

Cited as known to be or reasonably anticipated to be carcinogenic in NTP-9? No Identified as a reproductive toxin in Frazier and Hage, *Reproductive Hazards of the Workplace*? No

**Typical symptoms of acute exposures:**

In the eyes, causes pain; on the skin causes mild inflammation; if inhaled causes sore throat, coughing, headache, dizziness and fainting, depending upon the severity of the exposure. If ingested, causes nausea, abdominal pain, diarrhea, and unconsciousness, depending upon the severity of the exposure.

**Principal target organ(s) or system(s):**

Eyes and other mucous membranes, central nervous system, gastrointestinal tract, blood.

**Storage Requirements**

Keep in a cool, dry, well-ventilated location, away from flammables, combustibles, and other reducing agents.

**Additional Remarks**

Mixtures of potassium chlorate and manganese dioxide, sometimes used for the laboratory preparation of oxygen, are prone to explode when heated. When charcoal is mistakenly substituted for the manganese dioxide, the mixture is even more likely to explode, even without heating. Other substances not ordinarily considered to be reducing agents with which potassium chlorate is incompatible include ammonia and ammonium salts, metals, cyanides, and hydroiodic acid.

**Notes****ReadMe**

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**Reproductive Toxins**

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Prepared by: Jay A. Young

Date of preparation: April 28, 2002



## CLIP, Chemical Laboratory Information Profile

"Only when you know the hazards, can you take the necessary precautionary measures."

**Potassium Chromate****CAS No.: 7789-00-6**

Synonym: Potassium chromate(VI)

**Physical Properties****Exposure Limits**

Yellow crystalline solid.

Vapor pressure at 20 °C: negligible

Melting point: 975 °C

Decomposes when heated

OSHA PEL: 0.5 µg/m<sup>3</sup>ACGIH TLV: 0.05 mg/m<sup>3</sup>**Hazardous Characteristics**

Overall toxicity	Flammability	Destructive to skin/eye	Absorbed through skin	Sensitizer?	Self-reactive?	Incompatible with:
4	0	3	Yes	Yes	No	Strong oxidizing agents and with flammables, combustibles, organic compounds, many metals, other reducing agents.*

0: None (or very low); 1: Slight; 2: Moderate; 3: High; 4: Severe.

**\*Reactivity Hazards**

Potassium chromate gives off oxygen when heated. It is a very strong oxidizing agent and reacts violently with any substance that can be oxidized, often spontaneously causing fires and explosions. Many mixtures of potassium chromate and finely divided metals (such as Al or Fe) or non-metals (such as C or S) are pyrophoric. Mixtures of potassium chromate with strong oxidizing agents and solutions of potassium chromate in concentrated sulfuric acid or other oxidizing acids are even stronger oxidizing agents than potassium chromate alone. See Bretherick's *Handbook of Reactive Chemical Hazards* for details and for other incompatibilities.

Cited as known to be or reasonably anticipated to be carcinogenic in NTP-9? Yes

Identified as a reproductive toxin in Frazier and Hage, *Reproductive Hazards of the Workplace*? Some evidence suggests "yes".

**Typical symptoms of acute exposures:**

Severe irritation or destruction upon contact with skin or eyes and, if inhaled, coughing, sore throat, lung edema, and perforation of the nasal septum if inhalation is prolonged. If ingested, causes nausea and/or vomiting.

**Principal target organ(s) or system(s):**

Skin, respiratory system, eyes, kidneys, liver, central nervous system.

**Storage Requirements**

Store in a cool, dry, well-ventilated location, away from other strong oxidizing agents and away from flammables, combustibles, and other reducing agents.

**Additional Remarks**

Symptoms of lung edema are not manifest immediately in victims who have inhaled potassium chromate dust particles; some hours may elapse first; physical effort can exaggerate these symptoms. Rest is essential for exposed persons.

**Notes****ReadMe**

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**Reproductive Toxins**

Some substances that in fact are reproductive toxins are not yet recognized as such. For the best readily available and up-to-date information, refer to "DART/ETIC". See the TOXNET home page at [www.sis.nlm.nih.gov](http://www.sis.nlm.nih.gov) and click on "Toxicology search". *Note that some of the data in DART/ETIC have not been peer-reviewed.* See also Linda M. Frazier and Marvin L. Hage, *Reproductive Hazards of the Workplace*; Wiley, 1998; and T. H. Shepard, *Catalog of Teratogenic Agents*, 9th ed.; Johns Hopkins University Press, 1998.

**Abbreviations**

ACGIH TLV—American Conference of Governmental Industrial Hygienists—Threshold Limit Value. C—Ceiling. CAS—Chemical Abstracts Service. mg/m<sup>3</sup>—milligrams per cubic meter. µg/m<sup>3</sup>—micrograms per cubic meter. NA—Not applicable. NE—Not established. NI—No information. NTP-9—National Toxicology Program, Ninth Annual Report on Carcinogens. OSHA PEL—Occupational Safety and Health Administration—Permissible Exposure Limit. ppm—parts per million. STEL/C—Short-term exposure limit and ceiling.

Prepared by: Jay A. Young

Date of preparation: June 22, 2002

## CLIP, Chemical Laboratory Information Profile

"Only when you know the hazards, can you take the necessary precautionary measures."

**Potassium Cyanide****KCN****CAS No.: 151-50-8****Physical Properties****Exposure Limits**

White hygroscopic crystals with an almond-like odor.  
 Vapor pressure at 20 °C: negligible  
 Melting point: 635 °C

OSHA PEL: NE  
 ACGIH TLV: NE

**Hazardous Characteristics**

Overall toxicity	Flammability	Destructive to skin/eye	Absorbed through skin?	Sensitizer?	Self-reactive?	Incompatible with:
4	0	3	Yes	No	No	Acids, weak oxidizing agents, as well as stronger oxidizing agents.*

0: None (or very low); 1: Slight; 2: Moderate; 3: High; 4: Severe.

**\*Reactivity Hazards**

Potassium cyanide is readily oxidized, even by weak oxidizing agents, and usually with explosive consequences, especially so with stronger oxidizing agents. In acidic environments potassium cyanide hydrolyzes to form HCN, a severely toxic, flammable, colorless gas with an almond-like odor. Aqueous solutions of potassium cyanide are strongly alkaline and are corrosive to metals such as aluminum and zinc. See Bretherick's *Handbook of Reactive Chemical Hazards* for details and for other incompatibilities.

Cited as known to be or reasonably

anticipated to be carcinogenic in NTP-9?

No

Identified as a reproductive toxin in Frazier and Hage,

*Reproductive Hazards of the Workplace*

No

**Typical symptoms of acute exposures:**

Is absorbed through the skin where it causes redness and irritation. If absorbed, inhaled, or ingested can cause death; non-fatal exposures cause impaired mental function that can be permanent as well as other immediate symptoms such as labored breathing if inhaled, and sore throat and stomach ache if ingested. In the eyes causes pain and blurred vision.

**Principal target organ(s) or system(s):**

Potassium cyanide inhibits cellular respiration.

**Storage Requirements**

Store with other poisons in a cool, dry, well-ventilated and locked location.

**Additional Remarks**

Before using, handling, or storing potassium cyanide, make sure that the specific and requisite means for first aid treatment described in the MSDS are on hand and readily available, and that co-workers are competent to administer them. Potassium cyanide is hygroscopic; HCN, the source of the almond-like odor of potassium cyanide, arises from the hydrolysis of the potassium cyanide.

**Notes****ReadMe**

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**Reproductive Toxins**

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**Abbreviations**

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Prepared by: Jay A. Young

Date of preparation: April 19, 2003

## CLIP, Chemical Laboratory Information Profile

"Only when you know the hazards, can you take the necessary precautionary measures."

**Potassium Dichromate**

CAS No.: 7778-50-9

Synonym: Potassium bichromate

Physical Properties		Exposure Limits	
Red-orange hygroscopic crystals		OSHA PEL:	NE
Vapor pressure at 20 °C:	negligible	ACGIH TLV:	NE
Melting point:	398 °C		
Boiling point: (decomposes)	500 °C		

**Hazardous Characteristics**

Overall toxicity	Flammability	Destructive to skin/eye	Absorbed through skin?	Sensitizer?	Self-reactive?	Incompatible with:
4	0	3	No	Yes	No	Combustible materials and other reducing agents.*

0: None (or very low); 1: Slight; 2: Moderate; 3: High; 4: Severe.

**\*Reactivity Hazards**

Potassium dichromate is a very strong oxidizing agent; it attacks almost all oxidizable materials including finely divided metals, often violently and with fire and/or explosive results. In the presence of acetic acid, the reaction is sometimes delayed for a time, and when it does take place, the reaction can be uncontrollable. See Bretherick's *Handbook of Reactive Chemical Hazards* for details and for other incompatibilities.

Cited as known to be or reasonably anticipated to be carcinogenic in NTP-9? Yes Identified as a reproductive toxin in Frazier and Hage, *Reproductive Hazards of the Workplace?* Insufficient information

**Typical symptoms of acute exposures:**

Potassium dichromate is corrosive to the eyes, skin, and respiratory and gastro-intestinal tracts. In the eyes, pain, severe burns, conjunctivitis. On the skin, dermatitis, ulcerated sores, including perforation of the nasal septum. If inhaled, sore throat, labored breathing, shortness of breath.

**Principal target organ(s) or system(s):**

Eyes, skin, respiratory system, gastro-intestinal tract, kidneys.

**Storage Requirements**

Store separately, away from reducing agents in a cool, dry, well-ventilated and locked location.

**Additional Remarks**

The cleaning solution known as "chromic acid", a mixture of concentrated sulfuric acid and potassium dichromate, has been a causative factor in many laboratory accidents. Except in unusual circumstances where adequate precautions can be maintained, its use should be discontinued. Symptoms of lung edema are not manifest immediately in victims who have inhaled potassium dichromate dust or solution mist; some hours may elapse first; physical effort can exaggerate these symptoms. Rest is essential for persons exposed to excess dust or mist.

**Notes****ReadMe**

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**Reproductive Toxins**

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**Abbreviations**

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Prepared by: Jay A. Young

Date of preparation: April 17, 2003

## CLIP, Chemical Laboratory Information Profile

"Only when you know the hazards, can you take the necessary precautionary measures."

## Potassium Permanganate



CAS No.: 7722-64-7

## Physical Properties

Purple crystals  
Vapor pressure at 20 °C: negligible  
Melting point: (decomposes) 240 °C

## Exposure Limits

OSHA PEL: NE  
ACGIH TLV: NE

## Hazardous Characteristics

Overall toxicity	Flammability	Destructive to skin/eye	Absorbed through skin?	Sensitizer?	Self-reactive?	Incompatible with:
2	0	2	No	No	No	Combustibles, powdered metals and non-metals, other reducing agents, certain strong oxidizing agents, concentrated acids such as HCl, HF, H <sub>2</sub> SO <sub>4</sub> , and others.*

0: None (or very low); 1: Slight; 2: Moderate; 3: High; 4: Severe.

## \*Reactivity Hazards

The reaction of potassium permanganate with reducing agents and other reagents is often violent. Mixtures with antimony or with ethanol explode spontaneously. Glycerine or formaldehyde and potassium permanganate, on the other hand, spontaneously ignite. When mixed, potassium permanganate and ammonium nitrate explode after a delay. Other salts of ammonia that are oxidizing agents, for example NH<sub>4</sub>ClO<sub>4</sub>, can be expected to react similarly. Potassium permanganate reacts violently with hydrogen peroxide and with concentrated hydrogen halide and other concentrated acids. See Bretherick's *Handbook of Reactive Chemical Hazards* for details and for other incompatibilities.

Cited as known to be or reasonably anticipated to be carcinogenic in NTP-9? No

Identified as a reproductive toxin in Frazier and Hage, *Reproductive Hazards of the Workplace*? No

## Typical symptoms of acute exposures:

On the skin, redness, pain. In the eyes, redness, pain, blurred vision. If inhaled, sore throat, coughing, shortness of breath. If ingested, sore throat, abdominal pain, vomiting, diarrhea.

## Principal target organ(s) or system(s):

Eyes, skin, respiratory system.

## Storage Requirements

Store in a cool, dry, well-ventilated location, away from flammables, combustibles, and other reducing agents.

## Additional Remarks

When heated, potassium permanganate evolves oxygen, thus increasing the fire/explosion hazard. Symptoms of lung edema are not manifest immediately in victims who have inhaled potassium permanganate dust or mist from solutions; some hours may elapse first; physical effort can exaggerate these symptoms. Rest is essential for persons exposed to excess dust or mist.

## Notes

## ReadMe

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## Reproductive Toxins

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## Abbreviations

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Prepared by: Jay A. Young

Date of preparation: April 17, 2003

## CLIP, Chemical Laboratory Information Profile

"Only when you know the hazards, can you take the necessary precautionary measures."

## Sodium Acetate



CAS No.: 127-09-3

## Physical Properties

White hygroscopic crystals.  
Vapor pressure at 20 °C: negligible  
Decomposes at temperatures above 120 °C

## Exposure Limits

OSHA PEL: NE  
ACGIH TLV: NE

## Hazardous Characteristics

Overall toxicity	Flammability	Destructive to skin/eye	Absorbed through skin	Sensitizer?	Self-reactive?	Incompatible with:
1	1	1	0	No	No	Strong acids, diketene.*

0: None (or very low); 1: Slight; 2: Moderate; 3: High; 4: Severe.

## \*Reactivity Hazards

When sodium acetate reacts with strong acids, irritating, noxious vapors of acetic acid are usually produced. Sodium acetate is sufficiently basic to catalyze the violent polymerization of diketene, perhaps as well as other reactive dimers that are susceptible to polymerization in the presence of a mild base. See Bretherick's *Handbook of Reactive Chemical Hazards* for details and for other incompatibilities.

Cited as known to be or reasonably anticipated to be carcinogenic in NTP-9? No

Identified as a reproductive toxin in Frazier and Hage, *Reproductive Hazards of the Workplace?* No

## Typical symptoms of acute exposures:

Irritation of skin and eyes; coughing and shortness of breath if inhaled.

## Principal target organ(s) or system(s):

Skin, eyes, respiratory system.

## Storage Requirements

Store with other chemicals in a cool, dry, well-ventilated general storage location.

## Notes

## ReadMe

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Prepared by: Jay A. Young

Date of preparation: June 22, 2002

## CLIP, Chemical Laboratory Information Profile

"Only when you know the hazards, can you take the necessary precautionary measures."

Sodium Carbonate (anhydrous)  $\text{Na}_2\text{CO}_3$ 

CAS No.: 497-19-8

Synonym: Soda ash

## Physical Properties

Hygroscopic white powder or crystals.  
Vapor pressure at 20 °C: negligible  
Melting point: 851 °C  
Boiling point: decomposes

## Exposure Limits

OSHA PEL: NE  
ACGIH TLV: NE

## Hazardous Characteristics

Overall toxicity	Flammability	Destructive to skin/eye	Absorbed through skin	Sensitizer?	Self-reactive?	Incompatible with:
1	0	2	0	No	No	Acids, and in aqueous solution, with some metals such as aluminum and zinc*

0: None (or very low); 1: Slight; 2: Moderate; 3: High; 4: Severe.

## \*Reactivity Hazards

Sodium carbonate reacts vigorously with acids, producing carbon dioxide. It behaves as a strong base when dissolved in water. See Bretherick's *Handbook of Reactive Chemical Hazards* for details and for other incompatibilities.

Cited as known to be or reasonably anticipated to be carcinogenic in NTP-9? No

Identified as a reproductive toxin in Frazier and Hage, *Reproductive Hazards of the Workplace?* No

## Typical symptoms of acute exposures:

On the skin: irritation. In the eyes: pain, blurred vision, blindness.

## Principal target organ(s) or system(s):

Skin, eyes.

## Storage Requirements

Store with other chemicals in a cool, dry, well-ventilated general storage location.

## Additional Remarks

Sodium carbonate is also commonly available in the mono- and decahydrate forms (each with its own CAS number); the hazards of all three forms (anhydrous, mono-, and decahydrate) are essentially the same.

## Notes

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Prepared by: Jay A. Young

Date of preparation: June 21, 2002

## CLIP, Chemical Laboratory Information Profile

"Only when you know the hazards, can you take the necessary precautionary measures."

## Sodium Fluoride

## NaF

CAS No.: 7681-49-4

## Physical Properties

White crystalline solid.  
 Vapor pressure at 20 °C: negligible  
 Melting point: 990 °C  
 Boiling point: 1700 °C

## Exposure Limits

OSHA PEL: NE  
 ACGIH TLV: NE

## Hazardous Characteristics

Overall toxicity	Flammability	Destructive to skin/eye	Absorbed through skin	Sensitizer?	Self-reactive?	Incompatible with:
3	0	2	2	No	No	Acids.*

0: None (or very low); 1: Slight; 2: Moderate; 3: High; 4: Severe.

**\*Reactivity Hazards**

Reacts with acids to form hydrogen fluoride, a highly toxic gas.

Cited as known to be or reasonably anticipated to be carcinogenic in NTP-9?	No	Identified as a reproductive toxin in Frazier and Hage, <i>Reproductive Hazards of the Workplace</i> ?	No
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**Typical symptoms of acute exposures:**

Irritation of the eyes, nausea, abdominal pain, sensation of thirst, sweating.

**Principal target organ(s) or system(s):**

Eyes, skin, respiratory system, central nervous system, skeleton, kidneys.

## Storage Requirements

Store with other poisons—but separated from poisonous acids—in a cool, dry, well-ventilated, locked location.

## Additional Remarks

Powdered and finely crystalline sodium fluoride is dusty and when disturbed tends to form a suspension of sodium fluoride particles in the breathing air of nearby persons. When used as a pesticide, sodium fluoride is often dyed blue or green. When used as a decay-preventing additive in toothpaste, the concentration of sodium fluoride in the toothpaste is not considered toxic.

## Notes

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Prepared by: Jay A. Young

Date of preparation: July 28, 2002

## CLIP, Chemical Laboratory Information Profile

"Only when you know the hazards, can you take the necessary precautionary measures."

## Sodium Hydroxide

NaOH

CAS No.: 1310-73-2

Synonyms: Caustic soda, Lye

## Physical Properties

White, waxy, deliquescent solid; v. sol. in water and alcohol  
 Vapor pressure at 20 °C: negligible  
 Melting point: approx 318 °C  
 Boiling point: approx 1390 °C

## Exposure Limits

OSHA PEL: 2mg/m<sup>3</sup> Ceiling  
 ACGIH TLV: 2mg/m<sup>3</sup> Ceiling

## Hazardous Characteristics

Overall toxicity	Flammability	Destructive to skin/eye	Absorbed through skin	Sensitizer?	Self-reactive?	Incompatible with:
3	0	4	0	No	No	Acids, reducing sugars, halogenated hydrocarbons, Al, Zn, other metals*

0: None (or very low); 1: Slight; 2: Moderate; 3: High; 4: Severe

**\*Reaction with:**

Strong and some weak acids is violent and exothermic; less so with weaker acids.  
 Reducing sugars in the presence of air produces carbon monoxide.  
 Halogenated hydrocarbons can be violent and often produces toxic, reactive products, some of which are flammable.  
 Lithium and group II, III, and some IV metals can be violent; typically, hydrogen is a product.  
 See Bretherick's *Handbook of Reactive Chemical Hazards* for details and for other incompatibilities.

Cited as known to be or reasonably anticipated to be carcinogenic in NTP-9? No Identified as a reproductive toxin in Frazier and Hage's *Reproductive Hazards of the Workplace*? No

**Typical symptoms of acute exposures:**

Rapid tissue destruction upon eye or skin contact, typically with no immediate pain or other discomfort, producing severe burns with deep ulcerations. Sore throat, vomiting, diarrhea, abdominal spasm if ingested. From mild irritation to severe pneumonitis depending upon how much dust or solution mist is inhaled.

**Principal target organ(s) or system(s):**

Eyes, skin, respiratory system

## Storage Requirements

Store with other bases in a cool, dry, well-ventilated location, separated from acids, halogenated hydrocarbons, and group I, II, III, and IV metals.

## Additional Remarks

When NaOH dissolves in water, the heat released can be sufficient to cause violent boiling and eruptions.

## Notes

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Prepared by: Jay A. Young

Date of preparation: October 17, 2000



## CLIP, Chemical Laboratory Information Profile

"Only when you know the hazards, can you take the necessary precautionary measures."

## Sodium Hypochlorite Solution NaOCl (for the solute)

CAS No.: 7681-52-9

(approximately 5%)

Synonyms: Bleaching solution, bleach, Clorox™ (and other trade names)

Physical Properties		Exposure Limits	
Pale yellow aqueous solution of NaOCl, approximately 50 g/L.		OSHA PEL:	NE
Vapor pressure at 20 °C:	approx. 16 Torr	ACGIH TLV:	NE
Melting point:	approx. -6 °C		

## Hazardous Characteristics

Overall toxicity	Flammability	Destructive to skin/eye	Absorbed through skin	Sensitizer?	Self-reactive?	Incompatible with:
2	0	2	0	No	No	Ammonia, amines, organic compounds, and other reducing agents.*

0: None (or very low); 1: Slight; 2: Moderate; 3: High; 4: Severe.

## \*Reactivity Hazards

This solution is a reasonably strong oxidizing agent and reacts vigorously with reducing agents. Both with ammonia and with amines the solution forms explosive, toxic chloramines. Solid NaOCl decomposes violently if heated or subjected to friction. See Bretherick's *Handbook of Reactive Chemical Hazards* for details and for other incompatibilities.

Cited as known to be or reasonably anticipated to be carcinogenic in NTP-9? No

Identified as a reproductive toxin in Frazier and Hage, *Reproductive Hazards of the Workplace*? No

## Typical symptoms of acute exposures:

Skin irritation, eye irritation, coughing, vomiting (if ingested).

## Principal target organ(s) or system(s):

Eyes, skin, respiratory tract.

## Storage Requirements

Store with other corrosives in a cool, dry, well-ventilated location; make sure that the container cap is vented and will release the pressure from the gases evolved upon standing.

## Additional Remarks

On standing, bleaching solution slowly evolves gases such as oxygen, chlorine, and chlorine oxides (and consequently loses its "strength"). When heated, bleaching solution evolves chlorine. Moderately dilute solutions can be used to disinfect personal articles such as safety goggles. At greater dilutions the solution is used to "purify" water, thus rendering it potable.

## Notes

## ReadMe

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## Reproductive Toxins

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## Abbreviations

ACGIH TLV—American Conference of Governmental Industrial Hygienists—Threshold Limit Value. C—Ceiling. CAS—Chemical Abstracts Service. mg/m<sup>3</sup>—milligrams per cubic meter. NA—Not applicable. NE—Not established. NI—No information. NTP-9—National Toxicology Program, Ninth Annual Report on Carcinogens. OSHA PEL—Occupational Safety and Health Administration—Permissible Exposure Limit. ppm—parts per million. STEL/C—Short-term exposure limit and ceiling.

Prepared by: Jay A. Young

Date of preparation: July 28, 2002

## CLIP, Chemical Laboratory Information Profile

"Only when you know the hazards, can you take the necessary precautionary measures."

**Sodium Nitrate****CAS No.: 7631-99-4**

Synonyms: Chile saltpeter

**Physical Properties****Exposure Limits**

White hygroscopic crystals.		OSHA PEL:	NE
Vapor pressure at 20 °C:	negligible	ACGIH TLV:	NE
Melting point:	307 °C		
Boiling point:	380 °C (decomposes)		

**Hazardous Characteristics**

Overall toxicity	Flammability	Destructive to skin/eye	Absorbed through skin	Sensitizer?	Self-reactive?	Incompatible with:
1	0	1	0	No	No	Flammables, combustibles, other reducing agents, many organic compounds, metals, strong acids.*

0: None (or very low); 1: Slight; 2: Moderate; 3: High; 4: Severe.

**\*Reactivity Hazards**

Sodium nitrate is a strong oxidizing agent; it reacts violently with flammables, combustibles, many organic compounds, and other reducing agents such as granulated or powdered aluminum, magnesium, and other metals, often causing fires and explosions. When reacted with strong acids, it forms toxic nitrogen dioxide. See Bretherick's *Handbook of Reactive Chemical Hazards* for details and for other incompatibilities.

Cited as known to be or reasonably anticipated to be carcinogenic in NTP-9? No      Identified as a reproductive toxin in Frazier and Hage, *Reproductive Hazards of the Workplace*? No

**Typical symptoms of acute exposures:**

In the eyes: pain, blurred vision. On the skin: irritation. When ingested: abdominal spasm, fainting, blue skin, muscular spasm.

**Principal target organ(s) or system(s):**

Eyes, skin.

**Storage Requirements**

Store in a cool, dry, well-ventilated location, away from flammables, combustibles, and other reducing agents.

**Additional Remarks**

Sodium nitrate decomposes when heated above its boiling point, forming oxygen and toxic nitrogen dioxide.

**Notes****ReadMe**

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**Reproductive Toxins**

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Prepared by: Jay A. Young

Date of preparation: June 21, 2002

## CLIP, Chemical Laboratory Information Profile

"Only when you know the hazards, can you take the necessary precautionary measures."

Sodium thiosulfate pentahydrate  $\text{Na}_2\text{S}_2\text{O}_3 \cdot 5\text{H}_2\text{O}$ 

CAS No.: 10102-17-7

Synonyms: Photo fixer (also incorrectly known as Hypo, or sodium hyposulfite)

## Physical Properties

Colorless to white crystals; readily forms supersaturated aqueous solutions.

Vapor pressure at 20 °C: negligible

Decomposes at: 46–50 °C

## Exposure Limits

OSHA PEL: NE

ACGIH TLV: NE

## Hazardous Characteristics

Overall toxicity	Flammability	Destructive to skin/eye	Absorbed through skin	Sensitizer?	Self-reactive?	Incompatible with:
1	0	1	0	No	No	Acids, oxidizing agents.*

0: None (or very low); 1: Slight; 2: Moderate; 3: High; 4: Severe.

## \*Reactivity Hazards

The reaction with oxidizing agents (e.g., halogens, nitrates, nitrites, oxides) can be vigorous and exothermic. Sulfur dioxide is produced when reacted with acids. The pentahydrate decomposes when heated; products include hydrogen sulfide, sulfur dioxide, sulfur trioxide. Explodes violently if mixed with powdered sodium nitrite and heated sufficiently to drive off most of the water of crystallization. See Bretherick's *Handbook of Reactive Chemical Hazards* for details and for other incompatibilities.

Cited as known to be or reasonably anticipated to be carcinogenic in NTP-9?

No

Identified as a reproductive toxin in Frazier and Hage, *Reproductive Hazards of the Workplace*?

No

## Typical symptoms of acute exposures:

Diarrhea if ingested. Eye irritant.

## Storage Requirements

Keep with other reducing agents and separate from oxidizing agents and acids in a cool, dry, well-ventilated storage location.

## Notes

## ReadMe

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## Reproductive Toxins

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Prepared by: Jay A. Young

Date of preparation: January 7, 2002

## CLIP, Chemical Laboratory Information Profile

"Only when you know the hazards, can you take the necessary precautionary measures."

## Sodium

Na

CAS No.: 7440-23-5

Synonym: Natrium

Physical Properties		Exposure Limits	
Soft, shiny metal; oxide forms rapidly when the surface is exposed to air.		OSHA PEL:	NE
Vapor pressure at 400 °C:	1.4 Torr	ACGIH TLV:	NE
Melting point:	98 °C		
Boiling point:	983 °C		

## Hazardous Characteristics

Overall toxicity	Flammability	Destructive to skin/eye	Absorbed through skin	Sensitizer?	Self-reactive?	Incompatible with:
3	3	4	0	No	No	Water; ethyl alcohol; hydrochloric, hydrofluoric, sulfuric, and nitric acids; halogenated hydrocarbons; hydroxylamine; mercury; metal and non-metal oxides and halides; carbon; sulfur; selenium; tellurium; oxidizing agents.*

0: None (or very low); 1: Slight; 2: Moderate; 3: High; 4: Severe.

## \*Reactivity Hazards

Reaction with water and with ethyl alcohol is vigorous and produces corrosive NaOH or C<sub>2</sub>H<sub>5</sub>ONa and H<sub>2</sub>, which is flammable. Reaction with hydrochloric, hydrofluoric, and sulfuric acids is explosive and with nitric acid it can also cause ignition of the sodium. The reaction with some halogenated hydrocarbons produces shock-sensitive compounds. Reaction with hydroxylamine causes ignition of the sodium. Reaction with mercury to form an amalgam is violently exothermic. Reaction with metal and non-metal oxides and halides is also exothermic, often violently so. Reaction with some non-metals such as carbon, sulfur, selenium, and tellurium is exothermic and can be violent. Reaction with strong and with mild oxidizing agents often is violently exothermic; mixtures of sodium with these oxidizers are usually shock sensitive. See Bretherick's *Handbook of Reactive Chemical Hazards* for details and for other incompatibilities.

Cited as known to be or reasonably anticipated to be carcinogenic in NTP-9?

No

Identified as a reproductive toxin in Frazier and Hage, *Reproductive Hazards of the Workplace*?

No

## Typical symptoms of acute exposures:

Skin: redness, pain, severe burns. Eyes: pain, blurred vision, blindness.

## Principal target organ(s) or system(s):

Skin, eyes.

## Storage Requirements

Keep in a cool, dry, well-ventilated and locked location that is **not** protected by a water sprinkling system. Store sodium by immersion in kerosene in a sealed glass container which is itself placed in an unbreakable leak-proof outer container. The quantity of kerosene should be sufficient to keep the sodium immersed if the inner glass container is broken. Inspect stored sodium at least once every month to ensure its integrity.

## Additional Remarks

Finely divided sodium is pyrophoric (catches fire spontaneously if exposed to air). Subject to EPA regulations, quantities of sodium no larger than 10 g may be destroyed by immersion in isopropyl alcohol containing no more than 2% water.

## Notes

## ReadMe

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## Reproductive Toxins

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Prepared by: Jay A. Young

Date of preparation: March 3, 2001

## CLIP, Chemical Laboratory Information Profile

"Only when you know the hazards, can you take the necessary precautionary measures."

## Sucrose



CAS No.: 57-50-1

Synonyms: saccharose, table sugar, beet sugar, cane sugar

## Physical Properties

## Exposure Limits

White, sweet tasting, odorless crystals, lumps, or powder.

Vapor pressure at 20 °C: negligible

Melting point: decomposes at approx 165 °C

OSHA PEL: 15 mg/m<sup>3</sup> total dust; 5 mg/m<sup>3</sup> respirable dust

ACGIH TLV: 10 mg/m<sup>3</sup> total dust

## Hazardous Characteristics

Overall toxicity	Flammability	Destructive to skin/eye	Absorbed through skin	Sensitizer?	Self-reactive?	Incompatible with:
0	1	0	No	No	No	Strong oxidizing agents

0: None (or very low); 1: Slight; 2: Moderate; 3: High; 4: Severe.

Cited as known to be or reasonably anticipated to be carcinogenic in NTP-9?

No

Identified as a reproductive toxin in Frazier and Hage, *Reproductive Hazards of the Workplace*?

No

## Typical symptoms of chronic exposures:

Studies of groups of industrial workers in occupations that could involve high exposures through inhalation and inadvertent or deliberate ingestion, e.g. bakers, candy makers, report incidence of dermatoses and dental caries.

## Storage Requirements

With other chemicals in a cool, dry, well-ventilated general storage location.

## Additional Remarks

When in the form of fine airborne dust, sucrose will explode if ignited. When "carbonized" by concentrated sulfuric acid, approximately half of the gaseous product is CO, *not* CO<sub>2</sub>. Shepard (see reference below) and others report teratogenic effects in some animal studies.

## Notes

## ReadMe

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## Reproductive Toxins

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Prepared by: Jay A. Young

Date of preparation: February 23, 2001

## CLIP, Chemical Laboratory Information Profile

"Only when you know the hazards, can you take the necessary precautionary measures."

## Sulfur

S<sub>8</sub>

CAS No.: 7704-34-9

## Physical Properties

## Exposure Limits

Yellow solid, chunks or powder; or crystals: rhombic or monoclinic.  
At approximately 140 °C sulfur is a viscous red-brown liquid.  
Vapor pressure at 20 °C: negligible  
Melting point: 113 °C  
Boiling point: 445 °C

OSHA PEL: NE  
ACGIH TLV: NE

## Hazardous Characteristics

Overall toxicity	Flammability	Destructive to skin/eye	Absorbed through skin	Sensitizer?	Self-reactive?	Incompatible with:
1	1	1	0	No	No	Oxidizing agents and reducing agents, including metals such as copper, silver, and mercury.*

0: None (or very low); 1: Slight; 2: Moderate; 3: High; 4: Severe.

## \*Reactivity Hazards

When dispersed in the air, finely powdered sulfur can explode if ignited. Impure sulfur often slowly and spontaneously produces toxic hydrogen sulfide. Sulfur reacts violently with strong oxidizing agents, and can catch fire or explode. Sulfur also reacts with reducing agents, for instance many metals; often, the reaction is notably exothermic, particularly so if the sulfur and the metal are both finely divided, well-mixed, and ignited. See Bretherick's *Handbook of Reactive Chemical Hazards* for details and for other incompatibilities.

Cited as known to be or reasonably anticipated to be carcinogenic in NTP-9? No

Identified as a reproductive toxin in Frazier and Hage, *Reproductive Hazards of the Workplace?* No

## Typical symptoms of acute exposures:

Mildly irritating if on the skin, in the eyes, or inhaled. If ingested, bacterial action *in vivo* produces toxic hydrogen sulfide.

## Principal target organ(s) or system(s):

Eyes, skin.

## Storage Requirements

Store with other chemicals in a cool, dry, well-ventilated general storage location.

## Notes

## ReadMe

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## Reproductive Toxins

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Prepared by: Jay A. Young

Date of preparation: June 20, 2002

## CLIP, Chemical Laboratory Information Profile

"Only when you know the hazards, can you take the necessary precautionary measures."

## Sulfuric Acid (approx. 98%)



CAS No.: 7664-93-9

Synonyms: oil of vitriol, battery acid, hydrogen sulfate

## Physical Properties

Colorless, oily, hygroscopic, viscous liquid  
 Vapor pressure at 20 °C: negligible  
 Melting point: 10.5 °C  
 Boiling point: 290 °C  
 when anhydrous, decomposes at > 330 °C

## Exposure Limits

OSHA PEL: 1 mg/m<sup>3</sup> (mist)  
 ACGIH TLV: 1 mg/m<sup>3</sup> (mist)

## Hazardous Characteristics

Overall toxicity	Flammability	Destructive to skin/eye	Absorbed through skin	Sensitizer?	Self-reactive?	Incompatible with:
3	0	4	No	No	No	Water, bases, flammables, combustibles, some oxidizing agents, many metals*

0: None (or very low); 1: Slight; 2: Moderate; 3: High; 4: Severe

## \*Reaction with:

- Water is violently exothermic.
- Bases is violently exothermic.
- Many organic compounds, causes ignition of those compounds; explosions are possible. Some organic materials, e.g., wood, sugar, cotton fabrics; chars such materials.
- Oxidizers such as chlorates, fulminates, permanganates, is often violent.
- Many metals is corrosive.
- Finely divided metals can be rapid and exothermic.
- The hydrogen so produced is explosive. (Note that diluted acid is less vigorously reactive, but is hazardous nevertheless.) See Bretherick's *Handbook of Reactive Chemical Hazards* for details and for other incompatibilities.

Cited as known to be or reasonably anticipated to be carcinogenic in NTP-9?

No

Identified as a reproductive toxin in Frazier and Hage, *Reproductive Hazards of the Workplace*?

No

## Typical symptoms of acute exposures:

Rapid tissue destruction of eyes, skin, or mucous membranes with pain, severe discomfort, or stinging sensation. Difficulty in breathing if mist is inhaled; may cause lung oedema; note that symptoms of lung oedema may be delayed. Acidic or sour taste if in mouth with destruction of teeth and mouth tissues. Sore throat and/or abdominal pain if swallowed.

## Principal target organ(s) or system(s):

Eyes, skin, respiratory system, teeth.

## Storage Requirements

With other inorganic acids (except oxidizing acids such as nitric, perchloric) separate from organic compounds, strong oxidizing agents, and bases in a cool, dry, well-ventilated location.

## Additional Remarks

Always prepare diluted sulfuric acid only with continuous stirring and slow addition of acid to water. Never add water to acid. When heated strongly and when in a fire, sulfuric acid produces irritating and toxic sulfur oxide fumes.

## Notes

## ReadMe

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Prepared by: Jay A. Young

Date of preparation: January 16, 2001

## CLIP, Chemical Laboratory Information Profile

"Only when you know the hazards, can you take the necessary precautionary measures."

**Turpentine****C<sub>10</sub>H<sub>16</sub> (pinene)****CAS No.: 8006-64-2**

Synonyms: Oil of turpentine, Spirits of turpentine, Gum turpentine

**Physical Properties****Exposure Limits**

Colorless, flammable liquid with a characteristic odor; a mixture consisting mostly of terpenes, principally the isomers of pinene.

Vapor pressure at 20 °C: approximately 4 Torr

Boiling Point: 150–180 °C

OSHA PEL: 100 ppm

ACGIH TLV: 100 ppm

**Hazardous Characteristics**

Overall toxicity	Flammability	Destructive to skin/eye	Absorbed through skin	Sensitizer?	Self-reactive?	Incompatible with:
2	3	2	2	No	No	Oxidizing agents, rubber*

0: None (or very low); 1: Slight; 2: Moderate; 3: High; 4: Severe.

**\*Reactivity Hazards**

Reaction with strong oxidizing agents is usually violent. Attacks rubber, causing it to swell.

See Bretherick's *Handbook of Reactive Chemical Hazards* for details and for other incompatibilities.

Cited as known to be or reasonably anticipated to be carcinogenic in NTP-9?

No

Identified as a reproductive toxin in Frazier and Hage, *Reproductive Hazards of the Workplace?*

No

**Typical symptoms of acute exposures:**

Dermatitis, shortness of breath, coughing, eye discomfort, headache, dizziness, sore throat, abdominal pain, diarrhea.

**Principal target organ(s) or system(s):**

Skin, eyes, respiratory tract, central nervous system, kidneys.

**Storage Requirements**

With other flammables in a cool, dry, well-ventilated location, away from ignition sources and separated from oxidizing agents.

**Notes****ReadMe**

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**Reproductive Toxins**

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Prepared by: Jay A. Young

Date of preparation: July 20, 2001



## CLIP, Chemical Laboratory Information Profile

"Only when you know the hazards, can you take the necessary precautionary measures."

## Water



CAS No.: 7732-18-5

Synonyms: aitch-two-oh, dihydrogen oxide, diprotium oxide

## Physical Properties

Colorless, odorless, tasteless liquid; immiscible with nonpolar liquids; dissolves many ionic, polar, and slightly polar compounds.  
 Vapor pressure at 20 °C: 17.5 Torr  
 Melting point: 0 °C  
 Boiling point: 100 °C

## Exposure Limits

OSHA PEL: NE  
 ACGIH TLV: NE

## Hazardous Characteristics

Overall toxicity	Flammability	Destructive to skin/eye	Absorbed through skin	Sensitizer?	Self-reactive?	Incompatible with:
0	0	0	0	No	No	A very large number of compounds, many of which it reacts with violently and/or exothermically, yielding toxic and/or flammable products in some instances. See below.*

0: None (or very low); 1: Slight; 2: Moderate; 3: High; 4: Severe.

## \*Reaction with:

The specific enumeration of the substances with which water is incompatible is too lengthy to be listed in this CLIP. Examples of such elements and compounds include group I, group II, and other metals, including some finely divided metals (e.g., Al); hydrogen, a flammable gas, is produced. Many hydrides, carbides, and phosphides; hydrogen is produced. Some metal halides (e.g.,  $\text{AlCl}_3$ ); nonmetal halides (e.g.,  $\text{BBr}_3$ ). Some cyanides and sulfides, with regeneration of the toxic, and flammable, acids (e.g.,  $\text{HCN}$ ,  $\text{H}_2\text{S}$ ). Group I hydroxides (as these solids dissolve). Group II and other metal oxides and some nonmetal oxides (e.g.,  $\text{P}_4\text{O}_{10}$ —also known as  $\text{P}_2\text{O}_5$ ). Acid anhydrides (e.g., acetic anhydride, sulfur trioxide). Acyl halides (e.g., acetyl chloride). Alkyl aluminum derivatives (e.g., diethylaluminumchloride). See Bretherick's *Handbook of Reactive Chemical Hazards* for details and for other incompatibilities.

Cited as known to be or reasonably anticipated to be carcinogenic in NTP-9? No Identified as a reproductive toxin in Frazier and Hage, *Reproductive Hazards of the Workplace*? No

## Storage Requirements

Store in sealed containers above 0 °C and away from incompatible elements and compounds such as those identified above.

## Additional Remarks

Liquid water is subject to superheating, as when it is heated without being disturbed to a temperature above its boiling point in a microwave oven. If, under such circumstance, the water (still a liquid at a temperature greater than 100 °C) is then mechanically or otherwise disturbed, a portion will instantaneously change into steam with harmful consequences. Unlike almost all other liquids, which contract as they solidify, water expands as it becomes ice and can burst its container.

## Notes

## ReadMe

This Chemical Laboratory Information Profile is *not* a Material Safety Data Sheet. It is a brief summary for teachers and their students that describes some of the hazards of this chemical as it is typically used in laboratories. On the basis of your knowledge of these hazards and before using or handling this chemical, *you need to select the precautions and first-aid procedures to be followed*. For that information as well as for other useful information, refer to references in the scientific literature that pertain to this chemical. (Available Material Safety Data Sheets purporting to be for water are likely to be parodies—supposedly humorous—instead of a discussion of the hazards presented by a common substance and the related precautions and first aid procedures to be taken in its use and handling in the laboratory or industrial process.)

## Reproductive Toxins

Some substances that in fact are reproductive toxins are not yet recognized as such. For the best readily available and up-to-date information, refer to "DART/ETIC". See the TOXNET home page at [www.sis.nlm.nih.gov](http://www.sis.nlm.nih.gov) and click on "Toxicology search". *Note that some of the data in DART/ETIC have not been peer-reviewed*. See also Linda M. Frazier and Marvin L. Hage, *Reproductive Hazards of the Workplace*; Wiley, 1998; and T. H. Shepard, *Catalog of Teratogenic Agents*, 9th ed.; Johns Hopkins University Press, 1998.

## Abbreviations

ACGIH TLV—American Conference of Governmental Industrial Hygienists—Threshold Limit Value. C—Ceiling. CAS—Chemical Abstracts Service.  $\text{mg}/\text{m}^3$ —milligrams per cubic meter. NA—Not applicable. NE—Not established. NI—No information. NTP-9—National Toxicology Program, Ninth Annual Report on Carcinogens. OSHA PEL—Occupational Safety and Health Administration—Permissible Exposure Limit. ppm—parts per million. STEL/C—Short-term exposure limit and ceiling.

Prepared by: Jay A. Young

Date of preparation: January 15, 2001

## CLIP, Chemical Laboratory Information Profile

"Only when you know the hazards, can you take the necessary precautionary measures."

**Zirconium(IV) Oxide****CAS No.: 1314-23-4**

Synonyms: Zirconia, zircon, zirconium dioxide, zirconium oxide

**Physical Properties****Exposure Limits**

White amorphous powder, insoluble in water, slightly soluble in acid.

Vapor pressure at 20 °C: negligible

Melting point: 2710 °C

OSHA PEL: 5 mg/m<sup>3</sup> (as Zr)ACGIH TLV: 5 mg/m<sup>3</sup> (as Zr)STEL: 10 mg/m<sup>3</sup> (as Zr)**Hazardous Characteristics**

Overall toxicity	Flammability	Destructive to skin/eye	Absorbed through skin	Sensitizer?	Self-reactive?	Incompatible with:
1	0	0	0	No	No	No known significant incompatibilities

0: None (or very low); 1: Slight; 2: Moderate; 3: High; 4: Severe.

Cited as known to be or reasonably anticipated to be carcinogenic in NTP-9?

No

Identified as a reproductive toxin in Frazier and Hage, *Reproductive Hazards of the Workplace*?

No

**Typical symptoms of acute exposures:**

Sneezing, coughing if the dust is inhaled.

**Principal target organ(s) or system(s):**

Lungs.

**Storage Requirements**

Store with other chemicals in a cool, dry, well-ventilated general storage location.

**Notes****ReadMe**

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**Reproductive Toxins**

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Prepared by: Jay A. Young

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