

MATERIAL SAFETY DATA SHEET

Prepared to U.S. OSHA, CMA, ANSI and Canadian WHMIS, and European Community Standards

PART I *What is the material and what do I need to know in an emergency?*

1. PRODUCT IDENTIFICATION

TRADE NAME (AS LABELED): JAX COPPER PLATING SOLUTION
CHEMICAL NAME/CLASS: Not Applicable
SYNONYMS: Not Applicable
PRODUCT USE: Metal Finishing
SUPPLIER/MANUFACTURER'S NAME: JAX CHEMICAL COMPANY
ADDRESS: 640 South Fulton Avenue
Mount Vernon, NY 10550
CHEMTREC EMERGENCY NO.: 1-800-424-9300 (United States)
1-202-483-7616 (International Collect)
BUSINESS PHONE: (914) 668-1818 • (914) 668-8490 fax
DATE OF PREPARATION: May 28, 1993
DATE OF REVISION: January 10, 2001

2. COMPOSITION and INFORMATION ON INGREDIENTS

CHEMICAL NAME	CAS #	EINECS #	% w/w	EXPOSURE LIMITS IN AIR					
				ACGIH-TLV		OSHA-PEL		NIOSH IDLH mg/m ³	OTHER mg/m ³
				TWA mg/m ³	STEL mg/m ³	TWA mg/m ³	STEL mg/m ³		
Copper Sulfate Exposure limits are for Copper, dusts & mists, as Cu	7758-98-7	231-847-6	10-14%	1	NE	1	NE	100 (as Cu)	NIOSH REL: TWA = 1 DFG MAKs: TWA = 1 (inhalable fraction) PEAK = 2•MAK, 30 min., average value Carcinogen: EPA-D
Sulfuric Acid	7664-93-9	231-639-5	2.5-3.5%	1	3	1	NE	15	NIOSH REL: TWA = 1 DFG MAKs: TWA = 0.1 (inhalable fraction) PEAK = 2•MAK, 5 min., momentary value Carcinogen: IARC-1*, MAK-4, TLV-A2* (*in strong inorganic acid mists)
Water and other components which are present in less than 1 percent concentration (0.1% concentration for potential carcinogens, reproductive toxins, respiratory tract sensitizers and mutagens).			Balance	None of the other components contribute significant additional hazards at the concentrations present in this product. All pertinent hazard information has been provided in this document, per the requirements of the Federal Occupational Safety and Health Administration Standard (29 CFR 1910.1200), U.S. State equivalent Standards; Canadian Workplace Hazardous Materials Identification System Standards (CPR 4); and the applicable Council Directives of the European Community.					

NE = Not Established.

See Section 16 for Definitions of Terms Used.

NOTE: ALL WHMIS required information is included in appropriate sections based on the ANSI Z400.1-1998 format. This product has been classified in accordance with the hazard criteria of the CPR and the MSDS contains all the information required by the CPR, and EC Directives.

3. HAZARD IDENTIFICATION

EMERGENCY OVERVIEW: This product is a light blue, corrosive liquid. **Health Hazards:** This product is corrosive; overexposures may moderately to severely irritate the skin, eyes, and respiratory system or cause burns, depending on the duration and concentration of exposure. **Flammability Hazards:** This product is not flammable. When involved in a fire, thermal decomposition of this product produces irritating vapors and toxic gases (e.g., copper oxides and sulfur oxides). **Reactivity Hazards:** Care should be taken when adding water to this product, as the Sulfur Dioxide component evolves heat upon contact with water. **Environmental Hazards:** Releases of this product can cause harm to the environment, due to the presence of Copper Sulfate. **Emergency Recommendations:** Emergency responders must wear proper personal protective equipment for the releases to which they are responding.

SYMPTOMS OF OVEREXPOSURE BY ROUTE OF EXPOSURE: The most significant routes of occupational overexposure are inhalation and contact with skin and eyes. The symptoms of overexposure to this product, via route of exposure, are as follows:

INHALATION: If low levels of vapors, mists, or sprays of this solution are inhaled, difficulty in breathing, irritation of the mucus membranes, coughing, nasal congestion, and a sore throat may occur. Inhalation of higher levels of the product may cause burns to the respiratory system, chemical pneumonitis, pulmonary edema (potentially fatal lung conditions). Chronic inhalation of low levels of this product may result in bronchial hyperactivity and erosion of dental enamel.

CONTACT WITH SKIN or EYES: Depending on the duration of skin contact, skin overexposures may cause redness, discomfort, moderate to severe irritation, or chemical burns. Repeated skin overexposures to this product may cause dermatitis (dry, red skin). Direct eye contact with the liquid can cause stinging, tearing, and redness. Severe eye overexposures may cause burns, pain, reddening, watering, and (in severe cases) blindness.

SKIN ABSORPTION: No component of this product is known to be absorbed via intact skin.

INGESTION: Ingestion is not anticipated to be a likely route of exposure to this product. If this product is swallowed, burns of the mouth, throat, esophagus and other tissues of the digestive system can occur immediately upon ingestion. Chronic ingestion of low levels of copper compounds can result in "Wilson's Disease", a form of induced blood anemia in susceptible individuals. Ingestion of large volumes of this product may be fatal.

INJECTION: Accidental injection of this product can cause burning, reddening, and swelling in addition to the wound.




HEALTH EFFECTS OR RISKS FROM EXPOSURE: An Explanation in **Lay Terms.**

ACUTE: Inhalation exposure may cause coughing, sneezing, and difficulty breathing. Depending on the duration of contact, overexposures can severely irritate or burn tissues of the eyes, skin, mucous membranes and any other contaminated tissue. Ingestion may cause stomach pains, cramps, irritation, damage to the tissues of the digestive system, or may be fatal.

CHRONIC: Prolonged or repeated skin overexposure to this product may cause dermatitis (dry, red skin). Prolonged inhalation of vapors or mists generated by this product may cause respiratory disorders (e.g., bronchitis). Chronic ingestion or inhalation of this product can lead to blood anemia in susceptible individuals. Chronic inhalation of low levels of this product may also result in bronchial hyperactivity and erosion of dental enamel. Refer to Section 11 (Toxicology Information) for additional information on this product's components.

TARGET ORGANS: Acute: Skin, eyes, respiratory system.

Chronic: Skin, respiratory system, blood system, teeth.

HAZARDOUS MATERIAL IDENTIFICATION SYSTEM			
HEALTH		(BLUE)	3
FLAMMABILITY		(RED)	0
REACTIVITY		(YELLOW)	1
PROTECTIVE EQUIPMENT			C
EYES	RESPIRATORY	HANDS	BODY
	SEE SECTION 8		
For routine industrial use.			

See Section 16 for Definition of Ratings

PART II *What should I do if a hazardous situation occurs?*

4. FIRST-AID MEASURES

Victims of chemical exposure must be taken for medical attention if any adverse effects occur. Rescuers should be taken for medical attention if necessary. Take a copy of label and MSDS to physician or health professional with victim.

SKIN EXPOSURE: If this product contaminates the skin, immediately begin decontamination with running water. Remove exposed or contaminated clothing, taking care not to contaminate eyes. Victim should seek immediate medical attention if any adverse exposure symptoms develop.

4. FIRST-AID MEASURES (Continued)

EYE EXPOSURE: If this product enters the eyes, open victim's eyes while under gently running water. Use sufficient force to open eyelids. Have victim "roll" eyes. Minimum flushing is for 15 minutes. Victim must seek medical attention.

INHALATION: If vapors, mists, or sprays of this product are inhaled, remove victim to fresh air. If necessary, use artificial respiration to support vital functions. Remove or cover gross contamination to avoid exposure to rescuers.

INGESTION: If this product is swallowed, CALL PHYSICIAN OR POISON CONTROL CENTER FOR MOST CURRENT INFORMATION. DO NOT INDUCE VOMITING unless direct by medical personnel. Have victim rinse mouth with water, if conscious. Never induce vomiting or give a diluent (e.g., water) to someone who is unconscious, having convulsions, or unable to swallow. If contaminated individual is convulsing, maintain an open airway and obtain immediate medical attention.

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: Preexisting dermatitis, other skin conditions, and respiratory conditions may be aggravated by exposures to this product.

RECOMMENDATIONS TO PHYSICIANS: For Basic Treatment: Establish a patent airway. Suction if necessary. Watch for signs of respiratory insufficiency and assist respirations if needed. Administer oxygen by non-rebreather mask at 10 to 15 L/min. Monitor for pulmonary edema and treat if necessary. Monitor for shock and treat if necessary. For eye contamination, flush eyes immediately with water. Irrigate each eye continuously with normal saline during transport. Do not use emetics. Activated charcoal is not effective. For ingestion, rinse mouth and administer 5 mL/kg up to 200 mL of water for dilution if the patient can swallow, has a strong gag reflex, and does not drool. Do not attempt to neutralize because of exothermic reaction. Cover skin burns with dry, sterile dressings after decontamination.

For Advanced Treatment: Consider orotracheal or nasotracheal intubation for airway control in the patient who is unconscious, has severe pulmonary edema, or is in respiratory arrest. Early intubation, at the first sign of upper airway obstruction, may be necessary. Positive-pressure ventilation techniques with a bag-valve-mask device may be beneficial.

Monitor cardiac rhythm and treat arrhythmias as necessary. Start an IV with D5W TKO. Use lactated Ringer's if signs of hypovolemia are present. Watch for signs of fluid overload. Consider drug therapy for pulmonary edema. For hypotension with signs of hypovolemia, administer fluid cautiously. Consider vasopressors if patient is hypotensive with a normal fluid volume. Watch for signs of fluid overload. Use proparacaine hydrochloride to assist eye irrigation.

5. FIRE-FIGHTING MEASURES

FLASH POINT: Not applicable.

AUTOIGNITION TEMPERATURE: Not applicable.

FLAMMABLE LIMITS (in air by volume, %): Lower: Not applicable.
Upper: Not applicable.

FIRE EXTINGUISHING MATERIALS: This material will not contribute to the intensity of a fire. Use extinguishing material suitable to the surrounding fire.

Water Spray: YES **Carbon Dioxide:** YES
Foam: YES **Dry Chemical:** YES
Halon: YES **Other:** Any "ABC" Class

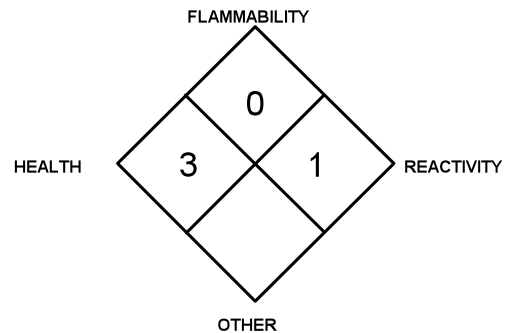
UNUSUAL FIRE AND EXPLOSION HAZARDS: This product is corrosive and presents a severe contact hazard to firefighters. When involved in a fire, this product may decompose and produce irritating fumes and toxic gases (e.g., copper oxides and sulfur oxides). Contact with common metals can generate flammable hydrogen gas.

Explosion Sensitivity to Mechanical Impact: Not applicable.

Explosion Sensitivity to Static Discharge: Not applicable.

SPECIAL FIRE-FIGHTING PROCEDURES: Care should be taken when water is directed on a fire involving this product, as the Sulfuric Acid component reacts with water, generating heat. Incipient fire responders should wear eye protection. Structural firefighters must wear Self-Contained Breathing Apparatus and full protective equipment. Move containers from fire area if it can be done without risk to personnel. If possible, prevent runoff water from entering storm drains, bodies of water, or other environmentally sensitive areas.

NFPA RATING



**See Section 16 for
Definition of Ratings**

6. ACCIDENTAL RELEASE MEASURES

SPILL AND LEAK RESPONSE: Uncontrolled releases should be responded to by trained personnel using pre-planned procedures. Proper protective equipment should be used. In case of a spill, clear the affected area and protect people. Releases of this material may be slippery. In the event of an incidental release of this product, personnel should wear gloves and safety glasses (or goggles). In the event of a non-incidental release, Minimum Personal Protective Equipment should be **Level C: triple-gloves, chemical resistant apron, boots, and splash goggles and an Air-Purifying respirator with organic vapor cartridge**. **Level B, which includes the use of Self-Contained Breathing Apparatus, should be worn when oxygen levels are below 19.5% or are unknown.**

6. ACCIDENTAL RELEASE MEASURES (Continued)

Absorb spilled liquid with polypads or other suitable absorbent materials. Neutralize residue with sodium bicarbonate or other neutralizing agent for acids. Decontaminate the area thoroughly. Prevent spill rinsates from contaminating storm drains, sewers, soil and groundwater. Place all spill residues in a suitable container and seal. Dispose of in accordance with applicable U.S. Federal, State, or local procedures or appropriate standards of Canada, and those of member states of the European Economic Community (see Section 13, Disposal Considerations).

PART III *How can I prevent hazardous situations from occurring?*

7. HANDLING and STORAGE

WORK PRACTICES AND HYGIENE PRACTICES: As with all chemicals, avoid getting this product ON YOU or IN YOU. Wash thoroughly after handling this product. Do not eat or drink while handling this material. Avoid generating mists and sprays of this product. Remove contaminated clothing immediately.

STORAGE AND HANDLING PRACTICES: All employees who handle this material should be trained to handle it safely. Open containers carefully on a stable surface. Empty containers may contain residual liquid; therefore, empty containers should be handled with care. Store containers in a cool, dry location, away from direct sunlight, sources of intense heat, or where freezing is possible. Store away from incompatible materials (see Section 10, Stability and Reactivity). Material should be stored in secondary containers, or in a diked area, as appropriate. Storage and use areas should be covered with impervious materials. Storage areas should be made of fire-resistant materials. Keep container tightly closed when not in use. If appropriate, post warning signs in storage and use areas. Inspect all incoming containers before storage, to ensure containers are properly labeled and not damaged.

PROTECTIVE PRACTICES DURING MAINTENANCE OF CONTAMINATED EQUIPMENT: Follow practices indicated in Section 6 (Accidental Release Measures). Make certain that application equipment is locked and tagged-out safely if necessary. Collect all rinsates and dispose of according to applicable U.S. Federal, State, or local procedures or appropriate Canadian standards and those of member states of the European Economic Community.

8. EXPOSURE CONTROLS - PERSONAL PROTECTION

VENTILATION AND ENGINEERING CONTROLS: Use with adequate ventilation to ensure exposure levels are maintained below the limits provided in Section 2 (Composition and Information on Ingredients). Ensure eyewash/safety shower stations are available near areas where this product is used.

INTERNATIONAL OCCUPATIONAL EXPOSURE LIMITS: Currently, the following international exposure limits are in place for products of this product:

COPPER SULFATE:

Arab Republic of Egypt: TWA = 0.1 mg(Cu)/m³ (fume), JAN 1993
Australia :TWA = 0.2 mg(Cu)/m³ (fume), JAN 1993
Australia :TWA = 1 mg(Cu)/m³ (dust), JAN 1993
Belgium: TWA = 0.2 mg(Cu)/m³ (fume), JAN 1993
Belgium: TWA = 1 mg(Cu)/m³ (dust), JAN 1993
Finland: TWA = 0.2 mg(Cu)/m³ (fume), JAN 1999
Finland: TWA = 1 mg(Cu)/m³ (dust), JAN 1999
France: VME = 0.2 mg(Cu)/m³ (fume), JAN 1993
France: VME = 1 mg(Cu)/m³, STEL = 2 mg(Cu)/m³ (dust), JAN 1993
Germany: MAK = 0.1 mg(Cu)/m³ (fume), JAN 1999
Germany: MAK = 1 mg(Cu)/m³ (dust), JAN 1999
Hungary: TWA = 0.2 mg(Cu)/m³, STEL = 0.4 mg(Cu)/m³ (dust), JAN 1993
India: TWA = 0.2 mg(Cu)/m³ (fume), JAN 1993
The Netherlands: MAC-TGG = 0.2 mg(Cu)/m³ (fume), JAN 1999
The Netherlands: MAC-TGG = 1 mg(Cu)/m³ (dust), JAN 1999
The Philippines: TWA = 1.0 mg(Cu)/m³ (fume), JAN 1993

COPPER SULFATE (continued):

Russia: STEL = 0.5 mg/m³, JAN 1993
Russia: STEL = 0.5 ppm (1 mg(Cu)/m³) (dust), JAN 1993
Sweden: NGV = 0.2 mg(Cu)/m³ (resp. dust), JAN 1999
Sweden: NGV = 1 mg(Cu)/m³ (total dust), JAN 1999
Switzerland: TWA = 0.1 mg(Cu)/m³, STEL = 0.2 mg(Cu)/m³ (fume), JAN 1999
Switzerland: TWA = 1 mg(Cu)/m³, STEL = 1 mg(Cu)/m³, JAN 1999
Thailand: TWA = 0.1 mg(Cu)/m³ (fume), JAN 1993
Thailand: TWA = 1 mg(Cu)/m³, JAN 1993
United Kingdom: LTEL = 0.2 mg(Cu)/m³ (fume), JAN 1993
United Kingdom: LTEL = 1 mg(Cu)/m³, JAN 1993
SULFURIC ACID:
ARAB Republic of Egypt: TWA = 1 mg/m³ JAN 1993
Austria: MAK = 1 mg/m³, JAN 1999
Australia: TWA = 1 mg/m³ JAN 1993
Belgium: TWA = 1 mg/m³, STEL = 3 mg/m³ JAN 1993

SULFURIC ACID (continued):

Denmark: TWA = 1 mg/m³, JAN 1999
France: VME = mg/m³, VLE = 3 mg/m³, JAN 1999
Finland: TWA = 1 mg/m³; STEL = 3 mg/m³; Skin JAN 1993
Japan: OEL = 1 mg/m³, JAN 1999
Germany: TWA = 1 mg/m³ JAN 1993
Hungary: STEL = 1 mg/m³ JAN 1993
Poland: MAC (TWA) = 1 mg/m³, MAC (STEL) = 3 mg/m³, JAN 1999
Japan: TWA = 1 mg/m³ JAN 1993
The Netherlands: TWA = 1 mg/m³ JAN 1993
The Philippines: TWA = 1 mg/m³ JAN 1993
Russia: STEL = 1 mg/m³; Skin JAN 1993
Sweden: TWA = 1 mg/m³, STEL = 3 mg/m³ JAN 1993
Switzerland: TWA = 1 mg/m³; STEL = 2 mg/m³ JAN 1993
Thailand: TWA = 1 mg/m³ JAN 1993
Turkey: TWA = 1 mg/m³ JAN 1993
United Kingdom: TWA = 1 mg/m³ JAN 1993
In Bulgaria, Colombia, Jordan, Korea, New Zealand, Singapore, Vietnam check ACGIH TLV

RESPIRATORY PROTECTION: None needed under normal conditions of use. Use NIOSH approved respirators if ventilation is inadequate to control mists. Maintain airborne contaminate concentrations below guidelines listed in Section 2 (Composition and Information on Ingredients). If respiratory protection is needed, use only respiratory protection authorized in the U.S. Federal OSHA Respiratory Protection Standard (29 CFR 1910.134), equivalent U.S. State standards, Canadian CSA Standard Z94.4-93, the European Standard EN149, or EC member states.

(continued on the following page)

8. EXPOSURE CONTROLS - PERSONAL PROTECTION (Continued)

RESPIRATORY PROTECTION (continued): Oxygen levels below 19.5% are considered IDLH by OSHA. In such atmospheres, use of a full-facepiece pressure/demand SCBA or a full facepiece, supplied air respirator with auxiliary self-contained air supply is required under OSHA's Respiratory Protection Standard (1910.134-1998). The following are NIOSH Respiratory Guideline Protection Equipment recommendations for the Sulfuric Acid component, and are provided for additional information:

SULFURIC ACID

CONCENTRATION

RESPIRATORY PROTECTION

Up to 15 mg/m³: Any Supplied-Air Respirator (SAR) operated in a continuous-flow mode; any Powered, Air-Purifying Respirator (PAPR) with acid gas cartridge(s) in combination with a high-efficiency particulate (HEPa) filter; any chemical cartridge respirator with a full facepiece and acid gas cartridge(s) in combination with a HEPa filter; any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted acid gas canister having a HEPa filter; any Self-Contained Breathing Apparatus (SCBA) with a full facepiece; or any SAR with a full facepiece.

Emergency or Planned Entry into Unknown Concentrations or IDLH Conditions: Any SCBA that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode or any SAR that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary SCBA operated in pressure-demand or other positive-pressure mode.

Escape: Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted acid gas canister having a HEPa filter or any (appropriate escape-type, SCBA).

EYE PROTECTION: Splash goggles or safety glasses. If more than 1 gallon of this product is to be used, a face shield should be considered. If necessary, refer to U.S. OSHA 29 CFR 1910.133, Canadian Standards, or the European Standard EN166.

HAND PROTECTION: Wear Neoprene Rubber gloves for routine industrial use. Polyvinyl gloves are not recommended due to presence of Sulfuric Acid. Use triple gloves for spill response, as stated in Section 6 (Accidental Release Measures) of this MSDS. If necessary, refer to U.S. OSHA 29 CFR 1910.138 appropriate Standards of Canada, or appropriate Standards of the European Economic Community.

BODY PROTECTION: Use body protection appropriate for task. If necessary, refer to appropriate Standards of Canada or the European Economic Community. If a hazard of injury to the feet exists due to falling objects, rolling objects, where objects may pierce the soles of the feet or where employee's feet may be exposed to electrical hazards, as described in U.S. OSHA 29 CFR 1910.136.

HMIS PERSONAL PROTECTIVE EQUIPMENT RATING: C (Safety glasses, gloves, apron)

9. PHYSICAL and CHEMICAL PROPERTIES

RELATIVE VAPOR DENSITY (air = 1): Not available.

EVAPORATION RATE (water = 1): Similar to water.

SPECIFIC GRAVITY: 1.17

MELTING/FREEZING POINT: > 0°C (32°F)

SOLUBILITY IN WATER: Soluble.

BOILING POINT: > 100°C (> 212°F)

VAPOR PRESSURE, mm Hg @ 20°C: Not available.

pH: 1.4

ODOR THRESHOLD: Not applicable.

COEFFICIENT OF OIL/WATER DISTRIBUTION (PARTITION COEFFICIENT): Not available.

APPEARANCE, ODOR AND COLOR: This product is a light blue, odorless liquid.

HOW TO DETECT THIS SUBSTANCE (warning properties): The color may act as a warning property associated with this product in the event of an accidental release.

10. STABILITY and REACTIVITY

STABILITY: Stable.

DECOMPOSITION PRODUCTS: Thermal decomposition of this product may generate copper oxides and sulfur oxides.

MATERIALS WITH WHICH SUBSTANCE IS INCOMPATIBLE: Strong bases, oxidizers, reducing materials, and water reactive materials. The Sulfuric Acid component is not compatible with acrylonitrile, alkali solutions, carbides, chlorates, fulminates, nitrates, perchlorates, permanganates, picrates, powdered metals, metal acetylides or carbides, epichlorohydrin, aniline, ethylenediamine, alcohols with strong hydrogen peroxide, chlorosulfonic acid, cyclopentadiene, hydrofluoric acid, nitromethane, 4-nitrotoluene, phosphorus (III) oxide, potassium, sodium, ethylene glycol, isoprene, styrene.

HAZARDOUS POLYMERIZATION: Will not occur.

CONDITIONS TO AVOID: Avoid contact with incompatible chemicals.

PART IV *Is there any other useful information about this material?*

11. TOXICOLOGICAL INFORMATION

TOXICITY DATA: The following toxicology information is available for the components of this product greater than 1 % in concentration.

COPPER SULFATE (continued):

LD₅₀ (Oral-Rat) 300 mg/kg
LD₅₀ (Oral-Mouse) 369 mg/kg: Behavioral: somnolence (general depressed activity), convulsions or effect on seizure threshold
LD₅₀ (Intraperitoneal-Rat) 20 mg/kg: Behavioral: somnolence (general depressed activity), convulsions or effect on seizure threshold
LD₅₀ (Intraperitoneal-Mouse) 7182 µg/kg
LD₅₀ (Subcutaneous-Rat) 43 mg/kg
LD₅₀ (Unreported-Rat) 520 mg/kg
LD₅₀ (Intravenous-Rat) 48,900 µg/kg: Behavioral: somnolence (general depressed activity), convulsions or effect on seizure threshold
LD₅₀ (Intravenous-Mouse) 23,300 µg/kg: Behavioral: somnolence (general depressed activity), convulsions or effect on seizure threshold
LD₅₀ (Intravenous-Rabbit) 10 mg/kg: Behavioral: convulsions or effect on seizure threshold, food intake (animal); Gastrointestinal: hypermotility, diarrhea
LDLo (Intravenous-Guinea Pig) 2 mg/kg
LDLo (Intravenous-Frog) 25 mg/kg
LDLo (Oral-Woman) 47,320 µL/kg: Gastrointestinal: hypermotility, diarrhea; Liver: hepatitis (hepatocellular necrosis), diffuse; Kidney, Ureter, Bladder: changes in tubules (including acute renal failure, acute tubular necrosis)
LDLo (Oral-Man) 857 mg/kg: Gastrointestinal: nausea or vomiting
LDLo (Oral-Human) 50 mg/kg: Behavioral: somnolence (general depressed activity); Kidney, Ureter, Bladder: changes in tubules (including acute renal failure, acute tubular necrosis); Blood: hemorrhage
TDLo (Oral-Rat) 915 mg/kg/1 year-intermittent: Cardiac: changes in coronary arteries; Blood: changes in serum composition (e.g. TP, bilirubin, cholesterol)
TDLo (Oral-Woman) 2100 µg/kg/5 weeks-intermittent: Gastrointestinal: hypermotility, diarrhea, nausea or vomiting, other changes
TDLo (Oral-Child) 150 mg/kg: Kidney, Ureter, Bladder: changes in tubules (including acute renal failure, acute tubular necrosis); Blood: other hemolysis with or without anemia
TDLo (Oral-Rat) 157 mg/kg/6 weeks-intermittent: Endocrine: changes in adrenal weight; Nutritional and Gross Metabolic: weight loss or decreased weight gain; Biochemical: Enzyme inhibition, induction, or change in blood or tissue levels: dehydrogenases
TDLo (Oral-Rat) 7530 mg/kg/30 days-intermittent: Blood: changes in serum composition (e.g. TP, bilirubin, cholesterol), changes in erythrocyte (RBC) count; Biochemical: Enzyme inhibition, induction, or change in blood or tissue levels: multiple enzyme effects

COPPER SULFATE (continued):

TDLo (Oral-Human) 11 mg/kg: Gastrointestinal: gastritis, hypermotility, diarrhea, nausea or vomiting
TDLo (Oral-Rat) 2 gm/kg/20 days-intermittent: Liver: other changes; Biochemical: Enzyme inhibition, induction, or change in blood or tissue levels: phosphatases, Enzyme inhibition, induction, or change in blood or tissue levels: other Enzymes
TDLo (Oral-Rat) 3 gm/kg/8 weeks-continuous: Blood: changes in spleen; Immunological Including Allergic: decrease in cellular immune response, decrease in humoral immune response
TDLo (Oral-Mouse) 2 gm/kg/3 weeks-continuous: Blood: changes in spleen; Immunological Including Allergic: decrease in cellular immune response, decrease in humoral immune response
TDLo (Oral-Pig) 140 mg/kg: female 1-15 week(s) after conception lactating female 4 week(s) post-birth: Reproductive: Effects on Newborn: biochemical and metabolic
TDLo (Intraperitoneal-Rat) 791 mg/kg/18 weeks-intermittent: Nutritional and Gross Metabolic: weight loss or decreased weight gain
TDLo (Intraperitoneal-Rat) 7500 µg/kg: female 3 day(s) after conception: Reproductive: Fertility: other measures of fertility
TDLo (Subcutaneous-Rat) 12,768 µg/kg: male 1 day(s) pre-mating: Reproductive: Paternal Effects: testes, epididymis, sperm duct
TDLo (Subcutaneous-Mouse) 12,768 µg/kg: male 30 day(s) pre-mating: Reproductive: Paternal Effects: testes, epididymis, sperm duct
TDLo (Intrasticular-Rat) 3192 µg/kg: male 1 day(s) pre-mating: Reproductive: Paternal Effects: spermatogenesis (incl. genetic material, sperm morphology, motility, and count), testes, epididymis, sperm duct
TDLo (Intravenous-Mouse) 3200 µg/kg: female 8 day(s) after conception: Reproductive: Effects on Embryo or Fetus: fetotoxicity (except death, e.g., stunted fetus); Specific Developmental Abnormalities: Central Nervous System, cardiovascular (circulatory) system
TDLo (Intravenous-Mouse) 3200 µg/kg: female 7 day(s) after conception: Reproductive: Fertility: post-implantation mortality (e.g. dead and/or resorbed implants per total number of implants)
TDLo (Intravenous-Hamster) 2130 µg/kg: female 8 day(s) after conception: Reproductive: Fertility: post-implantation mortality (e.g. dead and/or resorbed implants per total number of implants); Specific Developmental Abnormalities: Central Nervous System, body wall

COPPER SULFATE (continued):

TDLo (Parenteral-Chicken) 10 mg/kg: Tumorigenic: equivocal tumorigenic agent by RTECS criteria; Endocrine: tumors
Mutation in Microorganisms (Bacteria-*Escherichia coli*) 7500 ppt/3 hours
Mutation in Microorganisms (Bacteria-*Bacillus subtilis*) 400 µmol/L
Mutation Test Systems-not otherwise (Bacteria-*Bacillus subtilis*) 400 µmol/L
Sex Chromosome Loss and Nondisjunction (Parenteral-*Drosophila melanogaster*) 1000 ppm
Sex Chromosome Loss and Nondisjunction (Unreported-*Drosophila melanogaster*) 7100 ppm
DNA Damage (Rat-*Ascites tumor*) 500 µmol/L
DNA Damage (Rat-Liver) 1 mmol/L
DNA Inhibition (Intraperitoneal-Mouse) 20 gm/kg
Morphological Transformation (Hamster-Embryo) 80 µmol/L
Unscheduled DNA Synthesis (Hamster-Embryo) 200 µmol/L
SULFURIC ACID:
Cytogenetic Analysis (ovary, hamster) = 4 mmol/L
Standard Draize Test (eye, rabbit) = 250 µg; severe
Eye Irritancy (rabbit) = 5 mg/30 seconds/rinsed; severe
TCLo (inhalation, human) = 3 mg/m³/24 weeks; Musculoskeletal: changes in teeth and supporting structures
TCLo (inhalation, rat) = 784 µg/m³/24 hours/84 days/continuous; Behavioral: muscle contraction or spasticity, Kidney, Urethra, Bladder: other changes in urine composition; Biochemical: Enzyme inhibition, induction, or change in blood or tissue levels: true cholinesterase
TCLo (inhalation, dog) = 900 µg/m³/21 hours/89 weeks/intermittent; Cardiac: changes in heart weight; Lungs, Thorax, or Respiration: other changes; Lungs, Thorax, or Respiration: changes in lung weight
TCLo (inhalation, monkey) = 2 mg/m³/23 hours/78 weeks/intermittent; Lungs, Thorax, or Respiration: other changes
TCLo (inhalation, guinea pig) = 30 mg/m³/7 days/continuous; Lungs, Thorax, or Respiration: acute pulmonary edema; Related to Chronic Data: death
TCLo (inhalation, rabbit) = 20 mg/m³/7 hours/female 6–18 days after conception; Reproductive: Specific Developmental Abnormalities: musculoskeletal system
LDLo (unreported, man) = 135 mg/kg
LD₅₀ (oral, rat) = 2140 mg/kg
LC₅₀ (inhalation, rat) = 510 mg/m³/2 hours
LC₅₀ (inhalation, mouse) = 320 mg/m³/2 hours
LC₅₀ (inhalation, guinea pig) = 18 mg/m³; Lungs, Thorax, or Respiration: other changes

IRRITANCY OF PRODUCT: This product is corrosive and can irritate and burn contaminated tissue.

11. TOXICOLOGICAL INFORMATION (Continued)

SUSPECTED CANCER AGENT: The components of this product are listed by agencies tracking carcinogenic potential as follows:

COPPER SULFATE (as a copper compound): EPA-D (Not Classifiable as to Human Carcinogenicity)

SULFURIC ACID: ACGIH-TLVA2 (Suspected Human Carcinogen-Human data are accepted as adequate in quality, but are conflicting or insufficient to classify the agent as a continued human carcinogen, OR the agent is carcinogenic in experimental in experimental animals at dose(s) by route(s) of exposure, at site(s), of histologic type(s), or by mechanism(s) considered relevant to worker exposure. This classification refers to sulfuric acid contained in strong inorganic acid mists); IARC-1 (Carcinogenic to Humans(refers to sulfuric acid contained in strong inorganic acid mists)); MAK-4 (Substances with Carcinogenic Effects in which genotoxicity play no or at most a minor role).

SENSITIZATION TO THE PRODUCT: The components of this product are not known to be skin or respiratory sensitizers.

REPRODUCTIVE TOXICITY INFORMATION: Listed below is information concerning the effects of this product and its components on the human reproductive system.

Mutagenicity: This product is not reported to produce mutagenic effects in humans. There are mutagenic data in microorganisms and animals for the Copper Sulfate component of this product.

Embryotoxicity: This product is not reported to produce embryotoxic effects in humans. There are embryotoxic data for the Copper Sulfate component of this product. These data were obtained from animal test studies in which specific animal tissues were exposed to high concentrations of these compounds.

Teratogenicity: This product is not reported to cause teratogenic effects in humans.

Reproductive Toxicity: This product is not reported to cause reproductive effects in humans. There are reproductive toxicity data from animal studies of the Copper Sulfate and Sulfuric Acid components of this product.

A *mutagen* is a chemical that causes permanent changes to genetic material (DNA) such that the changes will propagate through generational lines. An *embryotoxin* is a chemical that causes damage to a developing embryo (i.e. within the first eight weeks of pregnancy in humans), but the damage does not propagate across generational lines. A *teratogen* is a chemical that causes damage to a developing fetus, but the damage does not propagate across generational lines. A *reproductive toxin* is any substance that interferes in any way with the reproductive process.

BIOLOGICAL EXPOSURES INDICES (BEIs): Currently, there are no Biological Exposure Indices (BEIs) determined for any component of this product.

12. ECOLOGICAL INFORMATION

ALL WORK PRACTICES MUST BE AIMED AT ELIMINATING ENVIRONMENTAL CONTAMINATION.

ENVIRONMENTAL STABILITY: The components of this product will decompose into other organic and inorganic compounds over time under normal environmental conditions. Additional environmental data are available as follows:

COPPER SULFATE:

Persistence: May persist at toxic levels indefinitely.

Biodegradation: No evidence was found to indicate that there is any biotransformation process for copper compounds which would have a significant bearing on the fate of copper in aquatic environments (soluble copper salts).

Bioconcentration: As an essential nutrient, copper is accumulated by all plants, and animals (The following) bioconcentration factors are the ratio derived from the concentrations of the element in the aquatic organism (in ppm of wet wt) divided by the concentration of the element in water (in ppm) (Tabular data) Algae: *Scenedesmus quadricarda*, 12; *Anabaena variabilis*, 300; *Scenedesmus sp.*, 2,400; and *Chlorella sp.*, 2,400; Bacteria 630-1,567; plants (marine, and fresh), 1,000; invertebrates (marine), 1,670, and invertebrates (freshwater), 1,000; molluscs, 30,000; insects, 546; Fish (marine), 667, and fish (freshwater), 200 (soluble copper salts).

Terrestrial Fate: In soil, Copper Sulfate is partly washed down to lower levels, partly bound by soil components, and partly oxidatively transformed.

Aquatic Fate: Several processes determine the fate of copper in the aquatic environment: complex formation, especially with humic substances; sorption to hydrous metal oxides, clays, and organic materials; and bioaccumulation. The formation of complexes with organic ligands modifies the solubility and precipitation behavior of copper such that solid copper species probably do not precipitate under normal circumstances. Furthermore, complexed copper is more easily adsorbed by clay and other surfaces than the free (hydrated) cation. The aquatic fate of copper is highly dependent on such variables as pH, Eh /oxidation-reduction potential in millivolts/, concentrations of organic materials and adsorbents, availability of precipitating iron and manganese oxides, biological activity, and competition with other heavy metals.

SULFURIC ACID:

Chronic Hazard Level: Repeated exposure may compound local effects. Harmless concentrations have been reported as below: 3.68 ppm, 1 month, distilled, bluegills; 17 ppm, 4 day, soft, goldfish; 20 ppm, 24 hour, minnows 100 ppm; 100 hour, hard, goldfish; moderate hazard with chronic inhalation or contact.

Persistence: If released to bodies of water, sulfuric acid will ultimately react with calcium and magnesium to form sulfate salts. If released to soil, the acid will migrate downward to the water table. Upon reaching the groundwater table, the acid will continue to move in the direction of the groundwater flow and downward since its mass density exceeds that of water. A contaminated plume will be produced, with diffusion and dispersion serving to reduce the acid concentration to a degree. If released to the atmosphere, Sulfuric Acid will form an aerosol nuclei and be up-taken by cloud droplets. Ultimately, the acid will return via both dry and wet deposition via rainfall.

Mobility/Soil Adsorption: When spilled onto soil, Sulfuric Acid can dissolve some of the soil material, particularly carbonate-based materials.

EFFECT OF MATERIAL ON PLANTS or ANIMALS: This product may be harmful to plant and animal in the natural environment life if large volumes of it are released into the environment.

12. ECOLOGICAL INFORMATION (Continued)

EFFECT OF CHEMICAL ON AQUATIC LIFE: This product may be harmful to contaminated aquatic life (especially if large volumes of it are released into an aquatic environment. Additional aquatic toxicity data are available as follows:

COPPER SULFATE:

LC₅₀ (*Anguilla rostrata* American eel) 96 hours = 3.20 mg/L (conditions of bioassay not specified)
LC₅₀ (*Schistosoma mansoni miracidia* larvae) 8.5 mg/L per hr (conditions of bioassay not specified)
LC₉₀ (*Schistosoma mansoni miracidia*) 15.75 mg/L per hr (conditions of bioassay not specified)
LC₅₀ (*Puntius conchoni*) 48 hours = 0.709 mg/L in water hardness of 310 mg/L calcium carbonate (static bioassay)
LC₅₀ (*Puntius conchoni*) 72 hours = 0.646 mg/L in water hardness of 310 mg/L calcium carbonate (static bioassay)
LC₅₀ (*Puntius conchoni*) 96 hours = 0.571 mg/L in water hardness of 310 mg/L calcium carbonate (static bioassay)
LC₅₀ (*Crassostrea gigas* oyster) 96 hours = 0.56 mg/L (Flow through system, natural seawater at 13°C)
LC₅₀ (*Corbicula manilensis* Asiatic clam) 96 hours = 2,600 mg/L (conditions of bioassay not specified)

COPPER SULFATE (continued):

EC₅₀ (*Selenastrum capricornatum* green alga) 14 days = 85 mg/L (Cell volume bioassay)
LC₅₀ (*Oncorhynchus kisutch* coho salmon) 96 hours = 286 mg/L (conditions of bioassay not specified)
LC₅₀ (*Rangia cuneata* clam) 96 hours = 7.4 mg/L (Synthetic and natural seawater at 24°C; other conditions not specified)
LC₅₀ (*Haliotis cracherodii* abalone) 96 hours = 0.05 mg/L (Static system, natural seawater at 14°C)
EC₁₀ (*Salmo gairdneri* rainbow trout; embryo, larvae) 28 days = 16.5 mg/L; death, and deformity (conditions of bioassay not specified)
EC₅₀ (*Thalassiosira pseudonana* alga, saltwater) 72 hours = 5 mg/L (Growth rate bioassay)
EC₅₀ (*Nitzschia closterium* alga, saltwater) 96 hours = 33 mg/L (Growth rate bioassay)
EC₅₀ (*Chlorella stigmatophora* alga, saltwater) 21 days = 70 mg/L (Cell volume bioassay)

SULFURIC ACID:

TLm (*Gambusia affinis*, mosquito fish) 48 hours = 42 mg/L/ turbid water
TLm (*Lepomis macrochirus* bluegill) 48 hours = 49 mg/L (tap water 20°C; Conditions of bioassay not specified)
TLm (*Lepomis macrochirus* bluegill) 24 hours = 24.5 ppm (fresh water; Conditions of bioassay not specified)
LC₅₀ (Flounder) 48 hours = 100 to 330 mg/L (aerated water; Conditions of bioassay not specified)
LC₅₀ (Shrimp) 48 hours = 80 to 90 mg/L (aerated water; Conditions of bioassay not specified)
LC₅₀ (Prawn) 48 hours = 42.5 ppm (salt water; Conditions of bioassay not specified)
Acute Hazard Level: pH = 4.5; fish survive; pH = 5.5, other aquatic lifeforms survive
Chronic Hazard Level: Harmless concentrations have been reported as below 3.68 ppm/ distilled/ 1 month/ bluegills; 17 ppm/ soft/ 4 days/ goldfish; 20 ppm/ 24 hours/ minnows; 100 ppm/ hard/ goldfish

13. DISPOSAL CONSIDERATIONS

PREPARING WASTES FOR DISPOSAL: Waste disposal must be in accordance with appropriate U.S. Federal, State, and local regulations or with regulations of Canada. This product, if unaltered by the handling, may be disposed of by treatment at a permitted facility or as advised by your local waste regulatory authority.

EPA WASTE NUMBER: Wastes of this product should be tested for Waste Characteristic-Corrosivity (D002).

14. TRANSPORTATION INFORMATION

THIS PRODUCT IS HAZARDOUS AS DEFINED BY 49 CFR 172.101 BY THE U.S. DEPARTMENT OF TRANSPORTATION.

PROPER SHIPPING NAME: Corrosive liquids, acidic, inorganic, n.o.s. (sulfuric acid)

HAZARD CLASS NUMBER and DESCRIPTION: 8 (Corrosive)

UN IDENTIFICATION NUMBER: UN 3264

DOT LABEL(S) REQUIRED: Corrosive (Class 8)

PACKAGING GROUP: III

NORTH AMERICAN RESPONSE GUIDEBOOK NUMBER (2000): 154

MARINE POLLUTANT: The components of this product are not designated as Marine Pollutants, as per 49 CFR, Appendix B to § 172.101.

Small Quantity Exception (49 CFR 173.4): Small quantities of Class 8 materials are not subjected to other requirements of the Hazardous Materials Regulations (Subchapter C) when the maximum quantity per inner receptacle is limited to 30 mL (liquids). Refer to 49 CFR 173.4 for specific information in packaging small quantity materials.

Limited Quantity Exceptions [49 CFR 173.154(b)(2)]: Limited quantities for Class 8, Packing Group III materials have inner packagings not over 4.0 L [1 gal] (liquids) net capacity each, packed in strong outer packaging.

TRANSPORT CANADA, TRANSPORTATION OF DANGEROUS GOODS REGULATIONS: This product is considered as dangerous goods, per regulations of Transport Canada. Refer to above U.S. information for Canadian shipments.

INTERNATIONAL AIR TRANSPORT ASSOCIATION (IATA): This product is considered as dangerous goods under rules of IATA.

PROPER SHIPPING NAME: Corrosive liquid, acidic, inorganic, n.o.s. (sulfuric acid)

HAZARD CLASS NUMBER and DESCRIPTION: 8 (Corrosive)

UN IDENTIFICATION NUMBER: UN 3264

PACKING GROUP: PG III

HAZARD LABEL(S) REQUIRED: Class 8 (Corrosive)

ERG CODE: 8L

(continued on following page)

14. TRANSPORTATION INFORMATION (Continued)

INTERNATIONAL AIR TRANSPORT ASSOCIATION (IATA) [continued]:

The following Packaging Information is applicable to this product:

PROPER SHIPPING NAME	PASSENGER AND CARGO AIRCRAFT				CARGO AIRCRAFT ONLY	
	Limited Quantity		Packing Instruction	Max. Qty per Pkg	Packing Instruction	Max. Qty per Pkg
	Packing Instruction	Max. Qty per Pkg				
Corrosive liquids, acidic, inorganic, n.o.s. (sulfuric acid)	Y818	1 L	818	5 L	820	60 L

EUROPEAN AGREEMENT CONCERNING THE INTERNATIONAL CARRIAGE OF DANGEROUS GOODS BY ROAD (ADR): This product is considered by the United Nations Economic Commission for Europe to be dangerous goods.

Additional information is as follows:

<u>Name of Substance:</u>	Corrosive liquid, acidic, inorganic, n.o.s. (sulfuric acid)
<u>Substance Identification No.:</u>	3264
<u>Hazard Identification No. (Description):</u>	80
<u>Label:</u>	Class 8 (Corrosive)
<u>Class and Item Number:</u>	8, 17° (c)

15. REGULATORY INFORMATION

ADDITIONAL U.S. REGULATIONS:

U.S. SARA REPORTING REQUIREMENTS: The components of this product are subject to the reporting requirements of Sections 302, 304 and 313 of Title III of the Superfund Amendments and Reauthorization Act, as follows:

COMPONENT	SARA 302 (40 CFR 355, Appendix A)	SARA 304 (40 CFR Table 302.4)	SARA 313 (40 CFR 372.65)
Copper Sulfate	No	Yes	No
Sulfuric Acid	Yes	Yes	No

U.S. SARA THRESHOLD PLANNING QUANTITY: Sulfuric Acid = 454 kg (1000 lb)

U.S. SARA HAZARD CATEGORIES (SECTION 311/312, 40 CFR 370-21): ACUTE: Yes; CHRONIC: Yes; FIRE: No; REACTIVE: No; SUDDEN RELEASE: No

U.S. CERCLA REPORTABLE QUANTITY (RQ): Copper Sulfate = 4.54 kg (10 lb); Sulfuric Acid = 454 kg (1000 lb); Pursuant to the requirements of 40 CFR part 355. Sulfuric Acid is an extremely hazardous substance (EHS) subject to reporting requirements when stored in amounts in excess of its threshold planning quantity (TPQ) of 454 kg (1,000 lb).

U.S. TSCA INVENTORY STATUS: All components of this product are listed on the TSCA Inventory.

OTHER U.S. FEDERAL REGULATIONS: The components of this product have requirements under other U.S. Federal regulations, as follows:

COPPER SULFATE:

EPA: Copper Sulfate is designated as a toxic pollutant, pursuant to section 307(a)(1) of the Clean Water Act and is subject to effluent limitations.

SULFURIC ACID:

EPA: Sulfuric Acid is designated as a hazardous substance under Section 311(b)(2)(A) of the Federal Water Pollution Control Act and further regulated by the Clean Water Act Amendments of 1977 and 1978. These regulations apply to discharges of Sulfuric Acid.

U.S. STATE REGULATORY INFORMATION: Components of this product are covered under specific State regulations, as denoted below:

Alaska - Designated Toxic and Hazardous Substances: Sulfuric Acid.

California - Permissible Exposure Limits for Chemical Contaminants: Sulfuric Acid.

Florida - Substance List: Sulfuric Acid.

Illinois - Toxic Substance List: Sulfuric Acid.

Kansas - Section 302/313 List: Sulfuric Acid.

Massachusetts - Substance List: Sulfuric Acid.

Michigan - Critical Materials Register: No.

Minnesota - List of Hazardous Substances: Sulfuric Acid.

Missouri - Employer Information/Toxic Substance List: Copper Sulfate, Sulfuric Acid.

New Jersey - Right to Know Hazardous Substance List: Copper Sulfate, Sulfuric Acid.

North Dakota - List of Hazardous Chemicals, Reportable Quantities: Copper Sulfate, Sulfuric Acid.

Pennsylvania - Hazardous Substance List: Copper Sulfate, Sulfuric Acid.

Rhode Island - Hazardous Substance List: Sulfuric Acid.

Texas - Hazardous Substance List: Sulfuric Acid.

West Virginia - Hazardous Substance List: Sulfuric Acid.

Wisconsin - Toxic and Hazardous Substances: Sulfuric Acid.

CALIFORNIA SAFE DRINKING WATER AND TOXIC ENFORCEMENT ACT (PROPOSITION 65): This product does not contain any chemicals on the California Proposition 65 lists.

15. REGULATORY INFORMATION (Continued)

ADDITIONAL U.S. REGULATIONS (continued):

ANSI LABELING (Z129.1): **DANGER!** CORROSIVE LIQUID. MAY BE FATAL IF SWALLOWED. MAY BE HARMFUL IF INHALED OR BY SKIN CONTACT. CAUSES SKIN, RESPIRATORY SYSTEM AND EYE BURNS. Do not taste or swallow. Do not get on skin or in eyes. Avoid breathing vapors or mist. Keep container closed. Use only with adequate ventilation. Wash thoroughly after handling. Wear gloves, goggles, faceshields, suitable body protection, and NIOSH-approved respiratory protection, as appropriate. **FIRST-AID:** In case of contact, immediately flush skin or eyes with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. If inhaled, remove to fresh air. If ingested, do not induce vomiting. Get medical attention. **IN CASE OF FIRE:** Use water fog, dry chemical, CO₂, or "alcohol" foam. **IN CASE OF SPILL:** Absorb spill with inert material or neutralizing agent for acids. Place residue in suitable container. Consult Material Safety Data Sheet for additional information.

ADDITIONAL CANADIAN REGULATIONS:

CANADIAN DSL/NDSL INVENTORY STATUS: The components of this product are listed on the DSL Inventory.

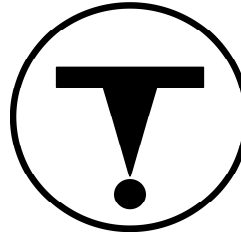
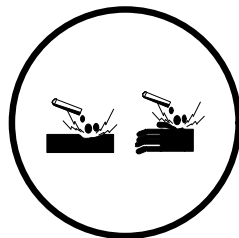
OTHER CANADIAN REGULATIONS: Not applicable.

CANADIAN ENVIRONMENTAL PROTECTION ACT (CEPA) PRIORITY SUBSTANCES LISTS: No component of this product is on the Priority Substances lists under the Canadian Environmental Protection Act (CEPA).

CANADIAN WHMIS SYMBOLS:

Class E: Corrosive Material

Class D2B: Material Causing Other Toxic Effects (Chronic Effects)



This product has been classified in accordance with the hazard criteria of the Canadian Controlled Products Regulations (CPR) and the MSDS contains all the information required by the CPR.

EUROPEAN COMMUNITY INFORMATION FOR PRODUCT:

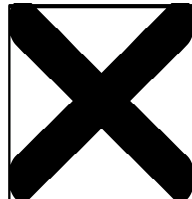
PRODUCT: Based on the information of the products components described above and an assessment of the physical and health hazards associated with this material, the following assignments have been made (per Council Directive 67/548/EEC). It is important to note this substance has not been fully tested.

CODE LETTER AND HAZARD DESIGNATION OF PRODUCT: C [Corrosive]; Xn [Harmful]; N [Dangerous for the Environment]

RISK PHRASES: [R20]: Harmful by Inhalation. [R: 22]: Harmful if swallowed. [R: 35]: Causes severe burns. [R: 51/52]: Toxic to aquatic organisms; may cause long-term adverse effects in the aquatic environment.

SAFETY PHRASES: [S: (1/2-)]: Keep out of reach of children. (*This safety phrase can be omitted from the label when the substance or preparation is sold for industrial use only.*) [S: 16]: Keep container tightly closed. [S: 24/25]: Avoid contact with skin and eyes. [S: 26]: In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. [S: 36/37/39]: Wear suitable protective clothing, gloves, and eye/face protection. [S: 45]: In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible). [S: 46] If swallowed, seek medical advice immediately and show this container or label. [S: 60]: This material and its container must be disposed of as a hazardous waste. [S:61]: Avoid release to the environment. Refer to special instructions/Safety data sheets.

EUROPEAN COMMUNITY ANNEX II HAZARD SYMBOLS:



15. REGULATORY INFORMATION (Continued)

EUROPEAN COMMUNITY INFORMATION FOR PRODUCT (continued):

EUROPEAN COMMUNITY INFORMATION FOR CONSTITUENTS: The following information is available for this product.

COPPER SULFATE

EC EINECS/ELINCS NUMBER: 231-847-6

HAZARD CLASSIFICATION: [Xn] Harmful. [Xi]: Irritant. [N]: Dangerous for the Environment.

RISK PHRASES: [R: 22]: Harmful if swallowed. [R: 36/38]: Irritating to eyes and skin. [50/53]: Very toxic to aquatic organisms; may cause long-term adverse effects in the aquatic environment.

SAFETY PHRASES: [S: 2½-]: Keep out of reach of children. (*This safety phrase can be omitted from the label when the substance or preparation is sold for industrial use only.*) [S: 22]: Do not breathe dust. [S: 60]: This material and its container must be disposed of as a hazardous waste. [S:61]: Avoid release to the environment. Refer to special instructions/Safety data sheets.

SULFURIC ACID:

EC EINECS/ELINCS NUMBER: 231-639-5

HAZARD CLASSIFICATION: [C]: Corrosive.

RISK PHRASES: [R: 35]: Causes severe burns.

AT CONCENTRATIONS GREATER THAN OR EQUAL TO 15%:

HAZARD CLASSIFICATION: [C]: Corrosive.

RISK PHRASES: [R: 35]: causes severe burns.

AT CONCENTRATIONS EQUAL TO OR MORE THAN 5% AND LESS THAN 15%:

HAZARD CLASSIFICATION: [Xi] Irritating.

RISK PHRASES: [R: 36/38]: Irritating to eyes and skin.

SAFETY PHRASES: [S: 2½-]: Keep out of reach of children. (*This safety phrase can be omitted from the label when the substance or preparation is sold for industrial use only.*) [26]: In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. [S: 30]: Never add water to this product. [S: 45]: In case of accident or if you feel unwell, seek medical advice immediately (show label where possible). [S: 45]: IN case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).

16. OTHER INFORMATION

PREPARED BY:

CHEMICAL SAFETY ASSOCIATES, Inc.
9163 Chesapeake Drive, San Diego, CA 92123-1002
858/565-0302

DATE OF PRINTING

August 27, 2011

DEFINITIONS OF TERMS

A large number of abbreviations and acronyms appear on a MSDS. Some of these, which are commonly used, include the following:

CAS #: This is the Chemical Abstract Service Number that uniquely identifies each compound.

ACGIH - American Conference of Governmental Industrial Hygienists, a professional association which establishes exposure limits.

TLV - Threshold Limit Value - an airborne concentration of a substance that represents conditions under which it is generally believed that nearly all workers may be repeatedly exposed without adverse effect. The duration must be considered, including the 8-hour Time Weighted Average (**TWA**), the 15-minute Short Term Exposure Limit, and the instantaneous Ceiling Level (**C**). Skin absorption effects must also be considered.

OSHA - U.S. Occupational Safety and Health Administration.

PEL - Permissible Exposure Limit - This exposure value means exactly the same as a TLV, except that it is enforceable by OSHA. The OSHA Permissible Exposure Limits are based in the 1989 PELs and the June, 1993 Air Contaminants Rule (Federal Register: 58: 35338-35351 and 58: 40191). Both the current PELs and the vacated PELs are indicated. The phrase, "Vacated 1989 PEL," is placed next to the PEL that was vacated by Court Order.

IDLH - Immediately Dangerous to Life and Health - This level represents a concentration from which one can escape within 30-minutes without suffering escape-preventing or permanent injury. **The DFG - MAK** is the Republic of Germany's Maximum Exposure Level, similar to the U.S. PEL. **NIOSH** is the National Institute of Occupational Safety and Health, which is the research arm of the U.S. Occupational Safety and Health Administration (**OSHA**). NIOSH issues exposure guidelines called **Recommended Exposure Levels (RELs)**. When no exposure guidelines are established, an entry of **NE** is made for reference.

HAZARD RATINGS:

HAZARDOUS MATERIALS IDENTIFICATION SYSTEM: Health Hazard: **0** (minimal acute or chronic exposure hazard); **1** (slight acute or chronic exposure hazard); **2** (moderate acute or significant chronic exposure hazard); **3** (severe acute exposure hazard; onetime overexposure can result in permanent injury and may be fatal); **4** (extreme acute exposure hazard; onetime overexposure can be fatal). Flammability Hazard: **0** (minimal hazard); **1** (materials that require substantial pre-heating before burning); **2** (combustible liquid or solids; liquids with a flash point of 38-93°C [100-200°F]); **3** (Class IB and IC flammable liquids with flash points below 38°C [100°F]); **4** (Class IA flammable liquids with flash points below 23°C [73°F] and boiling points below 38°C [100°F]). Reactivity Hazard: **0** (normally stable); **1** (material that can become unstable at elevated temperatures or which can react slightly with water); **2** (materials that are unstable but do not detonate or which can react violently with water); **3** (materials that can detonate when initiated or which can react explosively with water); **4** (materials that can detonate at normal temperatures or pressures).

NATIONAL FIRE PROTECTION ASSOCIATION: Health Hazard: **0** (material that on exposure under fire conditions would offer no hazard beyond that of ordinary combustible materials); **1** (materials that on exposure under fire conditions could cause irritation or minor residual injury); **2** (materials that on intense or continued exposure under fire conditions could cause temporary incapacitation or possible residual injury); **3** (materials that can on short exposure could cause serious temporary or residual injury); **4** (materials that under very short exposure could cause death or major residual injury). Flammability Hazard and Reactivity Hazard: Refer to definitions for "Hazardous Materials Identification System".

FLAMMABILITY LIMITS IN AIR:

Much of the information related to fire and explosion is derived from the National Fire Protection Association (**NFPA**). Flash Point - Minimum temperature at which a liquid gives off sufficient vapors to form an ignitable mixture with air. Autoignition Temperature: The minimum temperature required to initiate combustion in air with no other source of ignition. LEL - the lowest percent of vapor in air, by volume, that will explode or ignite in the presence of an ignition source. UEL - the highest percent of vapor in air, by volume, that will explode or ignite in the presence of an ignition source.

TOXICOLOGICAL INFORMATION:

Possible health hazards as derived from human data, animal studies, or from the results of studies with similar compounds are presented. Definitions of some terms used in this section are: **LD₅₀** - Lethal Dose (solids & liquids) which kills 50% of the exposed animals; **LC₅₀** - Lethal Concentration (gases) which kills 50% of the exposed animals; **ppm** concentration expressed in parts of material per million parts of air or water; **mg/m³** concentration expressed in weight of substance per volume of air; **mg/kg** quantity of material, by weight, administered to a test subject, based on their body weight in kg. Data from several sources are used to evaluate the cancer-causing potential of the material. The sources are: **IARC** - the International Agency for Research on Cancer; **NTP** - the National Toxicology Program, **RTECS** - the Registry of Toxic Effects of Chemical Substances, **OSHA** and **CAL/OSHA**. IARC and NTP rate chemicals on a scale of decreasing potential to cause human cancer with rankings from 1 to 4. Subrankings (2A, 2B, etc.) are also used. Other measures of toxicity include **TDLo**, the lowest dose to cause a symptom and **TCLo** the lowest concentration to cause a symptom; **TDo**, **LDLo**, and **LDo**, or **TC**, **TCo**, **LCLo**, and **LCo**, the lowest dose (or concentration) to cause lethal or toxic effects. **BEI** - Biological Exposure Indices, represent the levels of determinants which are most likely to be observed in specimens collected from a healthy worker who has been exposed to chemicals to the same extent as a worker with inhalation exposure to the TLV. Ecological Information: **EC** is the effect concentration in water.

REGULATORY INFORMATION:

U.S. and CANADA: This section explains the impact of various laws and regulations on the material. **EPA** is the U.S. Environmental Protection Agency. **WHMIS** is the Canadian Workplace Hazardous Materials Information System. **DOT** and **TC** are the U.S. Department of Transportation and the Transport Canada, respectively. Superfund Amendments and Reauthorization Act (**SARA**); the Canadian Domestic/Non-Domestic Substances List (**DSL/NDSL**); the U.S. Toxic Substance Control Act (**TSCA**); Marine Pollutant status according to the **DOT**; the Comprehensive Environmental Response, Compensation, and Liability Act (**CERCLA** or **Superfund**); and various state regulations. This section also includes information on the precautionary warnings which appear on the material's package label.

EUROPEAN: **EC** is the European Community (formerly known as the **EEC**, European Economic Community). **EINECS**: This is the European Inventory of Now-Existing Chemical Substances. The **ARD** is the European Agreement Concerning the International Carriage of Dangerous Goods by Road and the **RID** are the International Regulations Concerning the Carriage of Dangerous Goods by Rail.