CUPRIC SULFATE
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MATERIAL SAFETY DATA SHEET

FISHER SCIENTIFIC
CHEMICAL DIVISION
1 REAGENT LANE
FAIR LAWN NJ 07410
(201) 796-7100

EMERGENCY NUMBER: (201) 796-7100
CHEMTREC ASSISTANCE: (800) 424-9300

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SUBSTANCE IDENTIFICATION

CAS-NUMBER 7758-98-7

SUBSTANCE: **CUPRIC SULFATE**

TRADE NAMES/SYNONYMS:
SULFURIC ACID COPPER(2+) SALT (1:1); COPPER(II) SULFATE; COPPER MONOSULFATE; COPPER SULFATE; COPPER SULFATE (CUSO4); COPPER SULFATE (1:1); COPPER(2+) SULFATE; COPPER(2+) SULFATE (1:1); CUPRIC SULFATE ANHYDROUS; CUPRIC SULPHATE; HYDROCYANITE; BLUE STONE; BLUE VITRIOL; ROMAN VITRIOL; C495; CuSO4; ACC05670

CHEMICAL FAMILY:
Inorganic salt

MOLECULAR FORMULA: CU-S-O4

MOLECULAR WEIGHT: 159.61

CERCLA RATINGS (SCALE 0-3): HEALTH=3 FIRE=0 REACTIVITY=0 PERSISTENCE=3
NFPA RATINGS (SCALE 0-4): HEALTH=3 FIRE=0 REACTIVITY=0

COMPONENTS AND CONTAMINANTS

COMPONENT: CUPRIC SULFATE PERCENT: 100.0
CAS# 7758-98-7

OTHER CONTAMINANTS: May contain traces of sulfuric acid.

EXPOSURE LIMITS:
COPPER DUST AND MIST (as Cu):
1 mg/m3 OSHA TWA
1 mg/m3 ACGIH TWA
1 mg/m3 NIOSH recommended 10 hour TWA
1 mg/m3 DFG MAK TWA (total dust);
2 mg/m3 DFG MAK 30 minute peak, average value, 4 times/shift

Measurement method: Particulate filter; acid; atomic absorption spectrometry; (NIOSH III # 7029).

Subject to SARA Section 313 Annual Toxic Chemical Release Reporting

CUPRIC SULFATE:
10 pounds CERCLA Section 103 Reportable Quantity
Subject to SARA Section 313 Annual Toxic Chemical Release Reporting

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PHYSICAL DATA

DESCRIPTION: Grayish-white to greenish-white or blue, hygroscopic, rhombic crystals or amorphous powder. BOILING POINT: 1040 F (560 C) decomposes

MELTING POINT: 392 F (200 C) SPECIFIC GRAVITY: 3.603 VOLATILITY: 0%

SOLUBILITY IN WATER: 14.3% @ 0 C

SOLVENT SOLUBILITY: Soluble in glycerol and methanol; slightly soluble in ethanol; insoluble in alcohol.

pH: 4.0 (0.2 M solution @ 4 C)

FIRE AND EXPLOSION DATA

FIRE AND EXPLOSION HAZARD:
Negligible fire hazard when exposed to heat or flame.

FIREFIGHTING MEDIA:
Dry chemical, carbon dioxide, water spray or regular foam
(1993 Emergency Response Guidebook, RSPA P 5800.6).

For larger fires, use water spray, fog or regular foam
(1993 Emergency Response Guidebook, RSPA P 5800.6).

FIREFIGHTING:
Move container from fire area if you can do it without risk (1993 Emergency Response Guidebook, RSPA P 5800.6, Guide Page 53).

Extinguish using agent suitable for type of surrounding fire. Avoid breathing vapors and dusts. Keep upwind.

TRANSPORTATION DATA

U.S. DEPARTMENT OF TRANSPORTATION SHIPPING NAME-ID NUMBER, 49 CFR 172.101:
Environmentally hazardous substances, solid, n.o.s. (cupric sulfate)-UN 3077

U.S. DEPARTMENT OF TRANSPORTATION HAZARD CLASS OR DIVISION, 49 CFR 172.101:
9 - Miscellaneous hazardous material

U.S. DEPARTMENT OF TRANSPORTATION PACKING GROUP, 49 CFR 172.101:
PG III

U.S. DEPARTMENT OF TRANSPORTATION LABELING REQUIREMENTS, 49 CFR 172.101 AND SUBPART E:
Class 9

U.S. DEPARTMENT OF TRANSPORTATION PACKAGING AUTHORIZATIONS:
EXCEPTIONS: 49 CFR 173.155
NON-BULK PACKAGING: 49 CFR 173.213
BULK PACKAGING: 49 CFR 173.240

U.S. DEPARTMENT OF TRANSPORTATION QUANTITY LIMITATIONS 49 CFR 172.101:
PASSENGER AIRCRAFT OR RAILCAR: None
CARGO AIRCRAFT ONLY: None

TOXICITY

CUPRIC SULFATE (COPPER SULFATE):
TOXICITY DATA:
ANHYDROUS: 50 mg/kg oral-human LDLo; 857 mg/kg oral-man LDLo; 11 mg/kg oral-human TDLo; 150 mg/kg oral-child TDLo; 300 mg/kg oral-rat LD50; 3 gm/kg/8 weeks continuous oral-mouse TDLo; 2 gm/kg/3 weeks continuous oral-mouse TDLo; 43 mg/kg subcutaneous-rat LD50; 500 ug/kg subcutaneous-mouse LDLo; 10 mg/kg intravenous-rabbit LD50; 50 mg/kg intravenous-mouse LDLo; 2 mg/kg intravenous-guinea pig LDLo; 18 mg/kg intraperitoneal-mouse LD50; 520 mg/kg unreported-rat LD50; mutagenic data (RTECS); reproductive effects data (RTECS); tumorigenic data (RTECS).
MONOHYDRATE: No data available.
PENTAHYDRATE: 1088 mg/kg oral-human LDLo; 272 mg/kg oral-human TDLo; 300 mg/kg oral-rat LD50; 60 mg/kg oral-dog LDLo; 5 mg/kg oral-domestic animal LDLo; 62 mg/kg subcutaneous-guinea pig LDLo; 18700 ug/kg intraperitoneal-rat LD50; 33 mg/kg intraperitoneal-mouse LD50; 7500 ug/kg intraperitoneal-mammal LD50; 221 mg/kg unreported-man LDLo; mutagenic data (RTECS).
CARCINOGEN STATUS: None.
LOCAL EFFECTS: Corrosive- eyes and ingestion; Irritant- inhalation and skin.
ACUTE TOXICITY LEVEL: Toxic by ingestion.
TARGET EFFECTS: Poisoning may affect the liver, kidneys, and blood.
AT INCREASED RISK FROM EXPOSURE: Persons with pre-existing respiratory, liver, kidney, skin, or Wilson's disease, or hematopoietic disorders.*
ADDITIONAL DATA: May be excreted in breast milk.

* Based on general information on copper salts.

HEALTH EFFECTS AND FIRST AID

INHALATION:
CUPRIC SULFATE (COPPER SULFATE):
IRRITANT.
See information on copper salts. In addition to the effects described in copper salts, copper sulfate may cause sore throat, coughing, shortness of breath, and can be corrosive to mucous membranes. Chronic exposure can also cause sloughing of nasal mucosa. Workers exposed over the years to bordeaux mixture, containing copper sulfate as the principle toxic agent, have developed copper containing nodules and greenish tumors in the liver and lungs.

COPPER SALTS:
100 mg/m3 Immediately Dangerous to Life or Health.
ACUTE EXPOSURE- Mists of copper salts may cause irritation of the upper respiratory tract or an illness similar to the common cold with chills and stuffiness of the head. Chest pain, dyspnea, a metallic taste and

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gastrointestinal disturbances may occur.
CHRONIC EXPOSURE- Repeated or prolonged exposure to dusts or mists of copper salts may cause irritation of the upper respiratory tract, rhinitis, sneezing, coughing, fever, metallic taste and digestive disorders. Ulceration and perforation of the nasal septum has been reported on occasion. Congestion and atrophic changes in nasal mucosa have been reported from longterm exposure. Mild anemia, possibly hemolytic, has been observed in workers exposed to copper in the air. Greenish discoloration of the skin, hair and teeth has occurred. In animals inhalation of copper salts has caused injury to the lungs and liver with hemochromatosis.

FIRST AID- Remove from exposure area to fresh air immediately. Perform artificial respiration if necessary. Keep person warm and at rest. Treat symptomatically and supportively. Get medical attention immediately.

SKIN CONTACT:
CUPRIC SULFATE (COPPER SULFATE):
IRRITANT.
See information on copper salts. In addition to the effects described in copper salts, copper sulfate may cause redness, pain, and itching papulovesicular and eczematoid lesions. Strong solutions of copper sulfate can be corrosive. Rarely, sensitization may occur. Hemolytic anemia has been observed when the crystals were applied to burned skin.

COPPER SALTS:
ACUTE EXPOSURE- Direct contact with copper salts may cause irritation, erythema, and dermatitis, and some have been reported to cause an itching eczema; continued contact may cause some degree of necrosis. Absorption through burned or eczematous skin has occurred with some salts. Systemic effects may be possible.
CHRONIC EXPOSURE- Repeated and prolonged contact with some copper salts has resulted in irritation, necrosis, and greenish skin discoloration. Allergic contact dermatitis, although rare, has been reported.

FIRST AID- Remove contaminated clothing and shoes immediately. Wash with soap or mild detergent and large amounts of water until no evidence of chemical remains (at least 15-20 minutes). Get medical attention immediately.

EYE CONTACT:
CUPRIC SULFATE (COPPER SULFATE):
CORROSIVE.
See information on copper salts. In addition to the effects described in copper salts, copper sulfate may cause irritation, redness, pain and blurred vision. Copper sulfate solutions can be corrosive to the eye. Repeated application of copper sulfate to the eye has caused temporary inflammation and a purulent reaction with discoloration of the cornea. If a particle of copper sulfate is left in the conjunctival sac, it can cause local inflammation and necrosis, corneal opacity and symblepharon.

COPPER SALTS:
ACUTE EXPOSURE- Some copper salts have been reported to cause conjunctivitis, corneal ulcerations and turbidity, and possibly palpebral edema. Copper particles embedded in the eye may result in a pronounced foreign-body response with characteristic discoloration of ocular tissue.
CHRONIC EXPOSURE- Prolonged or repeated exposure to copper salts may cause irritation and conjunctivitis.

FIRST AID- Wash eyes immediately with large amounts of water or normal saline, occasionally lifting upper and lower lids, until no evidence of chemical remains (at least 15-20 minutes). Get medical attention immediately.

INGESTION:
CUPRIC SULFATE (COPPER SULFATE):
TOXIC/CORROSIVE.
See information on copper salts. In addition to the effects described in copper salts, copper sulfate if not removed immediately can be corrosive. Copper sulfate can also cause sore throat, gastroenteric pain, blue discoloration of gums and tongue, prostration, loss of consciousness, and convulsions. Other reported effects include hematemesis, melena, hematuria, an increase in white blood cells, sulphaemoglobinaemia and septicemia. A study using mice exposed to copper sulfate in their drinking water resulted in dose dependent impairment of the immune response.

COPPER SALTS:
ACUTE EXPOSURE- May cause an immediate metallic taste, salivation, nausea, epigastric burning, violent vomiting which may be bluish-green, diarrhea with bloody stools, colic, ulceration, and hemorrhagic gastritis. If sufficient vomiting does not occur, some copper salts may cause systemic poisoning with severe headache, cold sweat, weak pulse, hypotension, and other symptoms of shock. Jaundice may appear in a few days due to liver injury and/or a hemolytic crisis; anemia may also develop. Oliguria, anuria and other signs of renal injury may occur. Diffuse myalgias, rhabdomyolysis, methemoglobinemia, metabolic acidosis, and pancreatitis have also been reported. In fatal cases, death may be preceded by convulsions, paralysis and coma. Early death is usually associated with shock; later it is likely to be caused by hepatorenal failure.
CHRONIC EXPOSURE- Repeated ingestion of copper salts has produced hemolytic anemia, hemochromatosis, impaired immune response, liver, kidney, lung, and spleen damage and death in animals.

FIRST AID- Dilute the poison immediately with large amounts of water or milk and remove by gastric lavage unless the victim is already vomiting. (Dreisbach, Handbook of Poisoning, 12th Ed.) Get medical attention immediately. Administration of gastric lavage should be performed by qualified medical personnel.

ANTIDOTE:
The following antidote has been recommended. However, the decision as to whether the severity of poisoning requires administration of any antidote and actual dose required should be made by qualified medical personnel.

COPPER POISONING:
Give calcium disodium edetate 15-25 mg/kg (0.08-0.125 mL of 20% solution per kilogram body weight) in 250-500 mL of 5% dextrose intravenously over a 1 to 2 hour period twice daily. The maximum dose should not exceed 50 mg/kg/day. The drug should be given in 5-day courses with a rest period of at least 2 days between courses. After the first course, subsequent courses should not exceed 50 mg/kg/day. Daily urinalyses should not be done during the treatment period. The dosage should be reduced if any unusual urinary findings appear. Intravenous administration is contraindicated in the presence of elevated cerebrospinal fluid pressure. Penicillamine is also effective in copper poisoning. Give up to 100 mg/kg/day (maximum 1 g/day) divided into 4 doses for no longer than 1 week. If a longer administration period is warranted, dosage should not exceed 40 mg/kg/day. Give the drug orally, half an hour before meals (Dreisbach, Handbook of Poisoning, 12th Ed.). Antidote should be administered by qualified medical personnel.

REACTIVITY

REACTIVITY:
Stable under normal temperatures and pressures.

INCOMPATIBILITIES:
CUPRIC SULFATE (COPPER SULFATE):
HYDROXYLAMINE: May ignite.
MAGNESIUM: Produces hydrogen.
METALS: Corrosive.
OXIDIZERS (STRONG): Incompatible.
REDUCING AGENTS: Reacts vigorously.
SODIUM HYPOBROMITE: Solutions of sodium hypobromite are decomposed by powerful catalytic action of cupric ions
See also copper salts.

COPPER SALTS:
ACETYLENE: May form explosive acetylides.
HYDRAZINE: Decomposes.
NITROMETHANE: Forms explosive mixtures.

DECOMPOSITION:
Thermal decomposition products may include oxides of copper and sulfur.

POLYMERIZATION:
Hazardous polymerization has not been reported to occur under normal temperatures and pressures.

STORAGE AND DISPOSAL

Observe all federal, state and local regulations when storing or disposing of this substance.

Storage

Keep in a tightly closed container. Store in a cool, dry, ventilated area.

Avoid direct sunlight.

Store away from incompatible substances.

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CONDITIONS TO AVOID

May burn but does not ignite readily. Prevent dispersion of dust in air. Do not allow spilled material to contaminate water sources.

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SPILL AND LEAK PROCEDURES

OCCUPATIONAL SPILL:
Do not touch spilled material. Stop leak if you can do it without risk. For small spills, take up with sand or other absorbent material and place into containers for later disposal. For small dry spills, with a clean shovel place material into clean, dry container and cover. Move containers from spill area. For larger spills, dike far ahead of spill for later disposal. Keep unnecessary people away, isolate hazard area and deny entry.

Reportable Quantity (RQ): 10 pounds

The Superfund Amendments and Reauthorization Act (SARA) Section 304 requires that a release equal to or greater than the reportable quantity for this substance be immediately reported to the local emergency planning committee and the state emergency response commission (40 CFR 355.40). If the release of this substance is reportable under CERCLA Section 103, the National Response Center must be notified immediately at (800) 424-8802 or (202) 426-2675 in the metropolitan Washington, D.C. area (40 CFR 302.6).

PROTECTIVE EQUIPMENT

VENTILATION:
Provide local exhaust ventilation system to meet published exposure limits.

RESPIRATOR:
The following respirators and maximum use concentrations are recommendations by the U.S. Department of Health and Human Services, NIOSH Pocket Guide to Chemical Hazards; NIOSH criteria documents or by the U.S. Department of Labor, 29 CFR 1910 Subpart Z.
The specific respirator selected must be based on contamination levels found in the work place, must not exceed the working limits of the respirator and be jointly approved by the National Institute for Occupational Safety and Health and the Mine Safety and Health Administration (NIOSH-MSHA).

COPPER DUST AND MIST (as Cu):
5 mg/m3- Any dust and mist respirator.

10 mg/m3- Any dust and mist respirator except single-use and quarter-mask respirators (if not present as a fume).
Any supplied-air respirator.

25 mg/m3- Any supplied-air respirator operated in a continuous-flow mode.
Any powered, air-purifying respirator with a dust and mist filter.

50 mg/m3- Any air-purifying, full-facepiece respirator with a high-efficiency particulate filter.
Any powered, air-purifying respirator with a tight-fitting facepiece and a high-efficiency particulate filter.
Any self-contained breathing apparatus with a full facepiece.
Any supplied-air respirator with a full facepiece.

100 mg/m3- Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode.

Escape- Any air-purifying, full-facepiece respirator with a high-efficiency particulate filter.
Any appropriate escape-type, self-contained breathing apparatus.

FOR FIREFIGHTING AND OTHER IMMEDIATELY DANGEROUS TO LIFE OR HEALTH CONDITIONS:

Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode.

Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained breathing apparatus operated in pressure-demand or other positive-pressure mode.

CLOTHING:
Employee must wear appropriate protective (impervious) clothing and equipment to prevent repeated or prolonged skin contact with this substance.

GLOVES:
Employee must wear appropriate protective gloves to prevent contact with this substance.

EYE PROTECTION:
Employee must wear splash-proof or dust-resistant safety goggles to prevent eye contact with this substance.

Emergency eye wash: Where there is any possibility that an employee's eyes may be exposed to this substance, the employer should provide an eye wash fountain within the immediate work area for emergency use.

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-ADDITIONAL INFORMATION-