MATERIAL SAFETY DATA SHEET

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Section 1 - Product and Company Information

Product Name	COPPER(II) SULFATE, ANHYDROUS, POWDER, 99.99+%
Product Number	451657
Brand	ALDRICH
Company	Sigma-Aldrich
Address	3050 Spruce Street SAINT LOUIS MO 63103 US
Technical Phone:	800-325-5832
Fax:	800-325-5052
Emergency Phone:	314-776-6555

Section 2 - Composition/Information on Ingredient

Substance Name	CAS #
COPPER SULFATE	7758-98-7

Formula	CuSO4
Synonyms	BCS copper fungicide * Blue Copper * Blue stone * Blue vitriol * Copper monosulfate * Copper sulfate * Copper sulfate (1:1) * Copper(II) sulfate * Copper(2+) sulfate * Copper(2+) sulfate (1:1) * Cupric sulfate anhydrous * Cupric sulphate * Griffin super Cu * Incracide 10A * Incracide E 51 * Kilcop 53 * Kobasic * Phyto-bordeaux * Roman vitriol * Sulfate de cuivre (French) * Sulfuric acid, copper(2+) salt (1:1) * TNCS 53 * Trinagle
RTECS Number:	GL8800000

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Toxic (USA) Harmful (EU). Dangerous for the environment. Harmful if swallowed. Irritating to eyes and skin. Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.
Possible sensitizer. Target organ(s): Liver. Kidneys.

HMIS RATING

HEALTH: 2*
FLAMMABILITY: 0
REACTIVITY: 1

NFPA RATING

HEALTH: 2
FLAMMABILITY: 0
REACTIVITY: 1

*additional chronic hazards present.

For additional information on toxicity, please refer to Section 11.

Section 4 - First Aid Measures

ORAL EXPOSURE
If swallowed, wash out mouth with water provided person is conscious. Call a physician.

INHALATION EXPOSURE
If inhaled, remove to fresh air. If not breathing give artificial respiration. If breathing is difficult, give oxygen.

DERMAL EXPOSURE
In case of skin contact, flush with copious amounts of water for at least 15 minutes. Remove contaminated clothing and shoes. Call a physician.

EYE EXPOSURE
In case of contact with eyes, flush with copious amounts of water for at least 15 minutes. Assure adequate flushing by separating the eyelids with fingers. Call a physician.

Section 5 - Fire Fighting Measures

FLASH POINT
N/A

AUTOIGNITION TEMP
N/A

FLAMMABILITY
N/A

EXTINGUISHING MEDIA
Suitable: Water spray. Carbon dioxide, dry chemical powder, or appropriate foam.

FIREFIGHTING
Protective Equipment: Wear self-contained breathing apparatus and protective clothing to prevent contact with skin and eyes.
Specific Hazard(s): Emits toxic fumes under fire conditions.

Section 6 - Accidental Release Measures

PROCEDURE TO BE FOLLOWED IN CASE OF LEAK OR SPILL
Evacuate area.

PROCEDURE(S) OF PERSONAL PRECAUTION(S)
Wear respirator, chemical safety goggles, rubber boots, and heavy rubber gloves.

METHODS FOR CLEANING UP
Sweep up, place in a bag and hold for waste disposal. Avoid raising dust. Ventilate area and wash spill site after material pickup is complete.

Section 7 - Handling and Storage

HANDLING
User Exposure: Do not breathe dust. Avoid contact with eyes, skin, and clothing. Avoid prolonged or repeated exposure.

STORAGE
Suitable: Keep tightly closed. Handle and store under argon.
Store in a cool dry place.

SPECIAL REQUIREMENTS
Air sensitive. Hygroscopic. Handle and store under inert gas.

Section 8 - Exposure Controls / PPE

ENGINEERING CONTROLS
Safety shower and eye bath. Mechanical exhaust required.

PERSONAL PROTECTIVE EQUIPMENT
Respiratory: Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU). Where risk assessment shows air-purifying respirators are appropriate use a dust mask type N95 (US) or type P1 (EN 143) respirator.
Hand: Compatible chemical-resistant gloves.
Eye: Chemical safety goggles.

GENERAL HYGIENE MEASURES
Wash thoroughly after handling.

Section 9 - Physical/Chemical Properties

Appearance	Physical State: Solid Color: Very faintly grey

Property	Value	At Temperature or Pressure
Molecular Weight	159.6 AMU	
pH	N/A	
BP/BP Range	N/A	
MP/MP Range	200 °C	
Freezing Point	N/A	
Vapor Pressure	7.3 mmHg	25 °C
Vapor Density	N/A	
Saturated Vapor Conc.	N/A	
SG/Density	3.603 g/cm3	
Bulk Density	1 kg/l	
Odor Threshold	N/A	
Volatile%	N/A	
VOC Content	N/A	
Water Content	N/A	
Solvent Content	N/A	
Evaporation Rate	N/A	
Viscosity	N/A	
Surface Tension	N/A	
Partition Coefficient	N/A	
Decomposition Temp.	200 °C	
Flash Point	N/A	
Explosion Limits	N/A	
Flammability	N/A	
Autoignition Temp	N/A	
Refractive Index	N/A	
Optical Rotation	N/A	
Miscellaneous Data	N/A	
Solubility	N/A	

N/A = not available

Section 10 - Stability and Reactivity

STABILITY
Stable: Stable.
Conditions to Avoid: Air sensitive. Hygroscopic.
Materials to Avoid: Anhydrous copper(II) sulfate reacts violently with: hydroxylamine, magnesium, Finely powdered metals.

HAZARDOUS DECOMPOSITION PRODUCTS
Hazardous Decomposition Products: Copper oxide, Sulfur oxides.

HAZARDOUS POLYMERIZATION
Hazardous Polymerization: Will not occur

Section 11 - Toxicological Information

ROUTE OF EXPOSURE
Skin Contact: Causes skin irritation.
Skin Absorption: May be harmful if absorbed through the skin.
Eye Contact: Causes eye irritation.
Inhalation: Material may be irritating to mucous membranes and upper respiratory tract. May be harmful if inhaled.
Ingestion: Harmful if swallowed.

SENSITIZATION
Skin: Prolonged or repeated exposure may cause allergic reactions in certain sensitive individuals.

TARGET ORGAN(S) OR SYSTEM(S)
Liver. Kidneys. Blood.

SIGNS AND SYMPTOMS OF EXPOSURE
To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated. Chronic copper poisoning is typified by hepatic cirrhosis, brain damage and demyelination, kidney defects, and copper deposition in the cornea as exemplified by humans with Wilson's disease. It has also been reported that copper poisoning has lead to hemolytic anemia and accelerates arteriosclerosis.

TOXICITY DATA

Oral
Woman
47320 UL/KG
LDLO
Remarks: Kidney, Ureter, Bladder:Changes in tubules (including acute renal failure, acute tubular necrosis). Liver:Hepatitis (hepatocellular necrosis), diffuse.
Gastrointestinal:Hypermotility, diarrhea.

Oral
Man
857 mg/kg
LDLO
Remarks: Gastrointestinal:Nausea or vomiting.

Oral
Human
50 mg/kg
LDLO
Remarks: Behavioral:Somnolence (general depressed activity).

Kidney, Ureter, Bladder:Changes in tubules (including acute renal failure, acute tubular necrosis). Blood: Hemorrhage.

Oral
Rat
300 mg/kg
LD50

Intraperitoneal
Rat
20 MG/KG
LD50
Remarks: Behavioral:Somnolence (general depressed activity). Behavioral:Convulsions or effect on seizure threshold.

Subcutaneous
Rat
43 MG/KG
LD50

Intravenous
Rat
48900 UG/KG
LD50
Remarks: Behavioral:Somnolence (general depressed activity). Behavioral:Convulsions or effect on seizure threshold.

Oral
Mouse
369 mg/kg
LD50
Remarks: Behavioral:Somnolence (general depressed activity). Behavioral:Convulsions or effect on seizure threshold.

Intraperitoneal
Mouse
7182 UG/KG
LD50

Intravenous
Mouse
23300 UG/KG
LD50
Remarks: Behavioral:Somnolence (general depressed activity). Behavioral:Convulsions or effect on seizure threshold.

Intravenous
Rabbit
10 MG/KG
LD50
Remarks: Gastrointestinal:Hypermotility, diarrhea. Behavioral:Convulsions or effect on seizure threshold. Behavioral:Food intake (animal).

CHRONIC EXPOSURE - CARCINOGEN

Species: Chicken
Route of Application: Parenteral
Dose: 10 MG/KG
Result: Endocrine:Tumors. Tumorigenic:Equivocal tumorigenic agent by RTECS criteria.

CHRONIC EXPOSURE - TERATOGEN
Result: Possible risk of congenital malformation in the fetus.

Species: Mouse
Dose: 3200 UG/KG
Route of Application: Intravenous
Exposure Time: (8D PREG)
Result: Specific Developmental Abnormalities: Cardiovascular (circulatory) system. Specific Developmental Abnormalities: Central nervous system. Effects on Embryo or Fetus: Fetotoxicity (except death, e.g., stunted fetus).

CHRONIC EXPOSURE - MUTAGEN

Species: Rat
Dose: 500 UMOL/L
Cell Type: Ascites tumor
Mutation test: DNA damage

Species: Rat
Dose: 1 MMOL/L
Cell Type: liver
Mutation test: DNA damage

Species: Mouse
Route: Intraperitoneal
Dose: 20 GM/KG
Mutation test: DNA inhibition

Species: Hamster
Dose: 80 UMOL/L
Cell Type: Embryo
Mutation test: Morphological transformation.

Species: Hamster
Dose: 200 UMOL/L
Cell Type: Embryo
Mutation test: Unscheduled DNA synthesis

CHRONIC EXPOSURE - REPRODUCTIVE HAZARD
Result: Overexposure may cause reproductive disorder(s) based on tests with laboratory animals.

Species: Rat
Dose: 7500 UG/KG
Route of Application: Intraperitoneal
Exposure Time: (3D PREG)
Result: Effects on Fertility: Other measures of fertility

Species: Rat
Dose: 12768 UG/KG
Route of Application: Subcutaneous
Exposure Time: (1D MALE)
Result: Paternal Effects: Testes, epididymis, sperm duct.

Species: Rat
Dose: 3192 UG/KG
Route of Application: Intratesticular
Exposure Time: (1D MALE)
Result: Paternal Effects: Spermatogenesis (including genetic material, sperm morphology,motility, and count). Paternal Effects: Testes, epididymis, sperm duct.

Species: Mouse
Dose: 12768 UG/KG
Route of Application: Subcutaneous
Exposure Time: (30D MALE)
Result: Paternal Effects: Testes, epididymis, sperm duct.

Species: Mouse
Dose: 3200 UG/KG
Route of Application: Intravenous
Exposure Time: (7D PREG)
Result: Effects on Fertility: Post-implantation mortality (e.g., dead and/or resorbed implants per total number of implants).

Species: Pig
Dose: 140 MG/KG
Route of Application: Oral
Exposure Time: (1-15W PREG/4W POST)
Result: Effects on Newborn: Biochemical and metabolic.

Species: Hamster
Dose: 2130 UG/KG
Route of Application: Intravenous
Exposure Time: (8D PREG)
Result: Effects on Fertility: Post-implantation mortality (e.g., dead and/or resorbed implants per total number of implants).
Specific Developmental Abnormalities: Central nervous system.
Specific Developmental Abnormalities: Body wall.

Section 12 - Ecological Information

ACUTE ECOTOXICITY TESTS

Test Type: LC50 Fish
Time: 96 h
Value: 1.0 - 2.5 mg/l

Test Type: EC50 Daphnia
Species: Daphnia magna
Time: 48 h
Value: 0.024 mg/l

Section 13 - Disposal Considerations

APPROPRIATE METHOD OF DISPOSAL OF SUBSTANCE OR PREPARATION
Contact a licensed professional waste disposal service to dispose of this material. Dissolve or mix the material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber. Observe all federal, state, and local environmental regulations.

Section 14 - Transport Information

DOT
Proper Shipping Name: Environmentally hazardous substances, solid, n.o.s.
UN#: 3077
Class: 9
Packing Group: Packing Group III
Hazard Label: Class 9
PIH: Not PIH

IATA
Proper Shipping Name: Environmentally hazardous substance, solid, n.o.s
IATA UN Number: 3077
Hazard Class: 9
Packing Group: III

Section 15 - Regulatory Information

EU DIRECTIVES CLASSIFICATION
Symbol of Danger: Xn-N
Indication of Danger: Harmful. Dangerous for the environment.
R: 22-36/38-50/53
Risk Statements: Harmful if swallowed. Irritating to eyes and skin. Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.
S: 22-60-61
Safety Statements: Do not breathe dust. This material and its container must be disposed of as hazardous waste. Avoid release to the environment. Refer to special instructions/safety data sheets.

US CLASSIFICATION AND LABEL TEXT
Indication of Danger: Toxic (USA) Harmful (EU). Dangerous for the environment.
Risk Statements: Harmful if swallowed. Irritating to eyes and skin. Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.
Safety Statements: Do not breathe dust. This material and its container must be disposed of as hazardous waste. Avoid release to the environment. Refer to special instructions/safety data sheets.
US Statements: Possible sensitizer. Target organ(s): Liver. Kidneys.

UNITED STATES REGULATORY INFORMATION
TSCA INVENTORY ITEM: Yes

CANADA REGULATORY INFORMATION
WHMIS Classification: 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.
DSL: Yes
NDSL: No

Section 16 - Other Information

DISCLAIMER
For R&D use only. Not for drug, household or other uses.

WARRANTY
The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Inc., shall not be held liable for any damage resulting from handling or from contact with the above product. See reverse side of invoice or packing slip for additional terms and conditions of sale.