CUPROUS BROMIDE

Section 1 - CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME
CUPROUS BROMIDE

OTHER NAMES

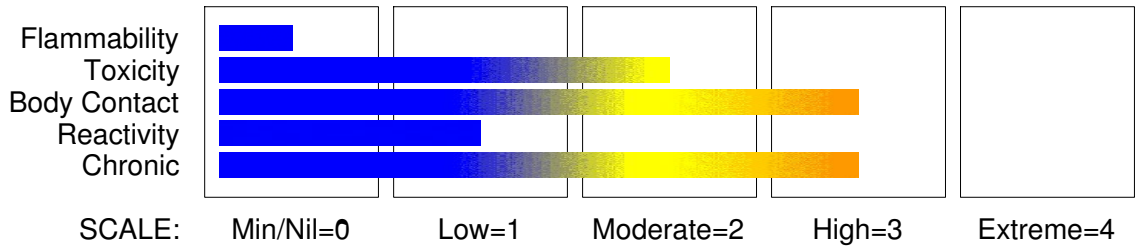
Cu-Br, Br-Cu

PROPER SHIPPING NAME
CORROSIVE SOLID, ACIDIC, INORGANIC, N.O.S.

PRODUCT USE
Catalyst for organic reactions.

SUPPLIER
Company: S D FINE- CHEM LIMITED
Address:
315- 317, T.V. INDUSTRIAL ESTATE,
248, WORLI,
MUMBAI- 400030.INDIA.
technical@sdfine.com
Telephone: 91- 22- 24959898
Telephone: 91- 22- 24959899
Fax: 91- 22- 24937232

HAZARD RATINGS



Section 2 - HAZARDS IDENTIFICATION

GHS Classification
Metal Corrosion Category 1
Reproductive Toxicity Category 1B
Skin Corrosion/Irritation Category 1C

continued...

EMERGENCY OVERVIEW

HAZARD

DANGER
Determined by using GHS criteria:
H360 H290 H314
May damage the unborn child
May be corrosive to metals
Causes severe skin burns and eye damage

PRECAUTIONARY STATEMENTS

Prevention

Obtain special instructions before use.
Wash thoroughly after handling.
Do not breathe dust or mist.
Wear protective gloves/clothing and eye/face protection.
Use personal protective equipment as required.
Do not handle until all safety precautions have been read and understood.

Response

Wash contaminated clothing before reuse.
If exposed or concerned: Get medical attention advice.
IF SWALLOWED: Rinse mouth. Do NOT induce vomiting.
IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
Specific treatment: refer to Label or MSDS.
Absorb spillage to prevent material damage.
If on skin or hair: remove/take off immediately all contaminated clothing. Rinse with water/shower.
Immediately call a POISON CENTER or doctor/physician.
IF INHALED: Remove to fresh air and keep at rest in a position comfortable for breathing.

Storage

Store locked up.
Store in a corrosive resistant container with a resistant inliner.

Disposal

Dispose of contents and container in accordance with relevant legislation.

continued...

Section 3 - COMPOSITION / INFORMATION ON INGREDIENTS

NAME	CAS RN	%
copper(I) bromide	7787-70-4	100

Section 4 - FIRST AID MEASURES

SWALLOWED

· IF SWALLOWED, REFER FOR MEDICAL ATTENTION, WHERE POSSIBLE, WITHOUT DELAY.
· For advice, contact a Poisons Information Centre or a doctor.
· Urgent hospital treatment is likely to be needed.
· In the mean time, qualified first-aid personnel should treat the patient following observation and employing supportive measures as indicated by the patient's condition.
· If the services of a medical officer or medical doctor are readily available, the patient should be placed in his/her care and a copy of the MSDS should be provided. Further action will be the responsibility of the medical specialist.
· If medical attention is not available on the worksite or surroundings send the patient to a hospital together with a copy of the MSDS.
· Where medical attention is not immediately available or where the patient is more than 15 minutes from a hospital or unless instructed otherwise:
· INDUCE vomiting with fingers down the back of the throat, ONLY IF CONSCIOUS. Lean patient forward or place on left side (head-down position, if possible) to maintain open airway and prevent aspiration.
NOTE: Wear a protective glove when inducing vomiting by mechanical means.

EYE

If this product comes in contact with the eyes:
· Immediately hold eyelids apart and flush the eye continuously with running water.
· Ensure complete irrigation of the eye by keeping eyelids apart and away from eye and moving the eyelids by occasionally lifting the upper and lower lids.
· Continue flushing until advised to stop by the Poisons Information Centre or a doctor, or for at least 15 minutes.
· Transport to hospital or doctor without delay.
· Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.

SKIN

If skin contact occurs:
· Immediately remove all contaminated clothing, including footwear.
· Flush skin and hair with running water (and soap if available).
· Seek medical attention in event of irritation.

INHALED

· If dust is inhaled, remove from contaminated area.
· Encourage patient to blow nose to ensure clear passage of breathing.
· If irritation or discomfort persists seek medical attention.

NOTES TO PHYSICIAN

Treatment of intoxication by the bromide ion includes hydration, the maintenance of mild water diuresis, and sodium, or even better, ammonium chloride (10-15 gm. daily in divided doses) with an osmotic or high ceiling diuretic. Haemodialysis may be of value. [GOSSELIN , SMITH, HODGE: Clinical Toxicology of Commercial Products]

continued...

In acute poisoning the stomach should be emptied by aspiration and lavage and sodium chloride given by intravenous infusion. Dextrose has also been administered and frusemide may be given to aid diuresis. In severe cases of bromide intoxication or when usual treatments cannot be used haemodialysis or peritoneal dialysis may be of value.
[MARTINDALE: The Extra Pharmacopoeia].
for copper intoxication:
· Unless extensive vomiting has occurred empty the stomach by lavage with water, milk, sodium bicarbonate solution or a 0.1% solution of potassium ferrocyanide (the resulting copper ferrocyanide is insoluble).
· Administer egg white and other demulcents.
· Maintain electrolyte and fluid balances.
· Morphine or meperidine (Demerol) may be necessary for control of pain.
· If symptoms persist or intensify (especially circulatory collapse or cerebral disturbances, try BAL intramuscularly or penicillamine in accordance with the supplier's recommendations.
· Treat shock vigorously with blood transfusions and perhaps vasopressor amines.
· If intravascular haemolysis becomes evident protect the kidneys by maintaining a diuresis with mannitol and perhaps by alkalinising the urine with sodium bicarbonate.
· It is unlikely that methylene blue would be effective against the occassional methaemoglobinemia and it might exacerbate the subsequent haemolytic episode.
· Institute measures for impending renal and hepatic failure.
[GOSSELIN, SMITH & HODGE: Commercial Toxicology of Commercial Products]
· A role for activated for charcoals or emesis is, as yet, unproven.
· In severe poisoning CaNa2EDTA has been proposed.
[ELLENHORN & BARCELOUX: Medical Toxicology].

Section 5 - FIRE FIGHTING MEASURES

EXTINGUISHING MEDIA
· There is no restriction on the type of extinguisher which may be used.

FIRE FIGHTING
· Alert Fire Brigade and tell them location and nature of hazard.
· Wear breathing apparatus plus protective gloves.
· Prevent, by any means available, spillage from entering drains or water courses.
· Use fire fighting procedures suitable for surrounding area.
· DO NOT approach containers suspected to be hot.
· Cool fire exposed containers with water spray from a protected location.
· If safe to do so, remove containers from path of fire.
· Equipment should be thoroughly decontaminated after use.

FIRE/EXPLOSION HAZARD
· Non combustible.
· Not considered to be a significant fire risk, however containers may burn.
· In a fire may decompose on heating and produce toxic / corrosive fumes.

FIRE INCOMPATIBILITY
Avoid contamination with oxidising agents i.e. nitrates, oxidising acids, chlorine bleaches, pool chlorine etc. as ignition may result.

Personal Protective Equipment
Breathing apparatus.

continued...

Gas tight chemical resistant suit.
Limit exposure duration to 1 BA set 30 mins.

Section 6 - ACCIDENTAL RELEASE MEASURES

EMERGENCY PROCEDURES

MINOR SPILLS
· Clean up all spills immediately.
· Avoid contact with skin and eyes.
· Wear protective clothing, gloves, safety glasses and dust respirator.
· Use dry clean up procedures and avoid generating dust.
· Sweep up or
· Vacuum up (consider explosion-proof machines designed to be grounded during storage and use).
· Place in clean drum then flush area with water.

MAJOR SPILLS
· Clear area of personnel and move upwind.
· Alert Fire Brigade and tell them location and nature of hazard.
· Wear breathing apparatus plus protective gloves.
· Prevent, by any means available, spillage from entering drains or water course.
· Stop leak if safe to do so.
· Contain spill with sand, earth or vermiculite.
· Collect recoverable product into labelled containers for recycling.
· Neutralise/decontaminate residue.
· Collect solid residues and seal in labelled drums for disposal.
· Wash area and prevent runoff into drains.
· After clean up operations, decontaminate and launder all protective clothing and equipment before storing and re-using.
· If contamination of drains or waterways occurs, advise emergency services.

SAFE STORAGE WITH OTHER CLASSIFIED CHEMICALS

\+ + + + + +

+: May be stored together
O: May be stored together with specific preventions
X: Must not be stored together

Personal Protective Equipment advice is contained in Section 8 of the MSDS.

Section 7 - HANDLING AND STORAGE

PROCEDURE FOR HANDLING

· Avoid all personal contact, including inhalation.
· Wear protective clothing when risk of exposure occurs.

continued...

· Use in a well-ventilated area.
· Prevent concentration in hollows and sumps.
· DO NOT enter confined spaces until atmosphere has been checked.
· DO NOT allow material to contact humans, exposed food or food utensils.
· Avoid contact with incompatible materials.
· When handling, DO NOT eat, drink or smoke.
· Keep containers securely sealed when not in use.
· Avoid physical damage to containers.
· Always wash hands with soap and water after handling.
· Work clothes should be laundered separately. Launder contaminated clothing before re -use.
· Use good occupational work practice.
· Observe manufacturer's storing and handling recommendations.
· Atmosphere should be regularly checked against established exposure standards to ensure safe working conditions are maintained.

SUITABLE CONTAINER

Glass container.
Multi-ply woven plastic or paper bag with sealed plastic liner
NOTE: Bags should be stacked, blocked, interlocked, and limited in height so that they are stable and secure against sliding or collapse.
Plastic drum.
Polyethylene or polypropylene container.
Polylined drum.
· Check that containers are clearly labelled.
Packaging as recommended by manufacturer.

STORAGE INCOMPATIBILITY

Avoid reaction with oxidising agents.
Avoid storage with potassium, sodium, hydrazine, nitromethane, acetylene and sodium hypobromite.

STORAGE REQUIREMENTS

· Store in original containers.
· Keep containers securely sealed.
· Store in a cool, dry, well-ventilated area.
· Store away from incompatible materials and foodstuff containers.
· Protect containers against physical damage and check regularly for leaks.
· Observe manufacturer's storing and handling recommendations.
DO NOT use aluminium or galvanised containers.

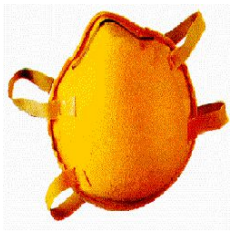
Section 8 - EXPOSURE CONTROLS / PERSONAL PROTECTION

EXPOSURE CONTROLS

The following materials had no OELs on our records
• copper(I) bromide: CAS:7787- 70- 4 CAS:62431- 55- 4

PERSONAL PROTECTION

continued...

EYE
· Chemical goggles.
· Full face shield may be required for supplementary but never for primary protection of eyes
· Contact lenses may pose a special hazard; soft contact lenses may absorb and concentrate irritants. A written policy document, describing the wearing of lens or restrictions on use, should be created for each workplace or task. This should include a review of lens absorption and adsorption for the class of chemicals in use and an account of injury experience. Medical and first-aid personnel should be trained in their removal and suitable equipment should be readily available. In the event of chemical exposure, begin eye irrigation immediately and remove contact lens as soon as practicable. Lens should be removed at the first signs of eye redness or irritation - lens should be removed in a clean environment only after workers have washed hands thoroughly. [CDC NIOSH Current Intelligence Bulletin 59].

HANDS/FEET
Neoprene gloves.
PVC gloves.
Rubber gloves.
Rubber boots.
Safety footwear.

OTHER
· Overalls.
· Barrier cream
· Eyewash unit.

RESPIRATOR

Protection Factor	Half- Face Respirator	Full- Face Respirator	Powered Air Respirator
10 x ES	P1 Air- line*	- -	PAPR- P1 -
50 x ES	Air- line**	P2	PAPR- P2
100 x ES	-	P3	-
		Air- line*	-
100+ x ES	-	Air- line**	PAPR- P3

* - Negative pressure demand ** - Continuous flow.

The local concentration of material, quantity and conditions of use determine the type of personal protective equipment required.
For further information consult your
Occupational Health and Safety Advisor.

continued...

ENGINEERING CONTROLS

General exhaust is adequate under normal operating conditions. Local exhaust ventilation may be required in specific circumstances. If risk of overexposure exists, wear approved respirator. Correct fit is essential to obtain adequate protection. Provide adequate ventilation in warehouse or closed storage areas. Air contaminants generated in the workplace possess varying "escape" velocities which, in turn, determine the "capture velocities" of fresh circulating air required to effectively remove the contaminant.

Type of Contaminant:	Air Speed:
solvent, vapours, degreasing etc., evaporating from tank (in still air).	0.25- 0.5 m/s (50- 100 f/min)
aerosols, fumes from pouring operations, intermittent container filling, low speed conveyer transfers, welding, spray drift, plating acid fumes, pickling (released at low velocity into zone of active generation)	0.5- 1 m/s (100- 200 f/min.)
direct spray, spray painting in shallow booths, drum filling, conveyer loading, crusher dusts, gas discharge (active generation into zone of rapid air motion)	1- 2.5 m/s (200- 500 f/min.)
grinding, abrasive blasting, tumbling, high speed wheel generated dusts (released at high initial velocity into zone of very high rapid air motion).	2.5- 10 m/s (500- 2000 f/min.)

Within each range the appropriate value depends on:

Lower end of the range	Upper end of the range
1: Room air currents minimal or favourable to capture	1: Disturbing room air currents
2: Contaminants of low toxicity or of nuisance value only.	2: Contaminants of high toxicity
3: Intermittent, low production.	3: High production, heavy use
4: Large hood or large air mass in motion	4: Small hood- local control only

Simple theory shows that air velocity falls rapidly with distance away from the opening of a simple extraction pipe. Velocity generally decreases with the square of distance from the extraction point (in simple cases). Therefore the air speed at the extraction point should be adjusted, accordingly, after reference to distance from the contaminating source. The air velocity at the extraction fan, for example, should be a minimum of 1-2 m/s (200-400 f/min) for extraction of solvents generated in a tank 2 meters distant from the extraction point. Other mechanical considerations, producing performance deficits within the extraction apparatus, make it essential that theoretical air velocities are multiplied by factors of 10 or more when extraction systems are installed or used.

Section 9 - PHYSICAL AND CHEMICAL PROPERTIES

APPEARANCE

White powder, turns green or dark-blue on exposure to light; does not mix well with cold water. Decomposes in hot water and nitric acid,
Soluble in hydrochloric acid, hydrobromic acid and ammonia solutions with formation of complexes.

continued...

Section 9 - PHYSICAL AND CHEMICAL PROPERTIES

PHYSICAL PROPERTIES
Solid.
Does not mix with water.
Sinks in water.
Corrosive.

Molecular Weight: 143.46
Melting Range (°C): 504
Solubility in water (g/L): Partly miscible
pH (1% solution): Not available
Volatile Component (%vol): Not applicable.
Relative Vapour Density (air=1): Not applicable.
Lower Explosive Limit (%): Not applicable
Autoignition Temp (°C): Not applicable
State: Divided solid

Boiling Range (°C): 1345
Specific Gravity (water=1): 4.72
pH (as supplied): Not applicable
Vapour Pressure (kPa): Not applicable.
Evaporation Rate: Not applicable
Flash Point (°C): Not applicable
Upper Explosive Limit (%): Not applicable
Decomposition Temp (°C): Not available

Section 10 - CHEMICAL STABILITY AND REACTIVITY INFORMATION

CONDITIONS CONTRIBUTING TO INSTABILITY
- Presence of incompatible materials.
- Product is considered stable.
- Hazardous polymerisation will not occur.

Section 11 - TOXICOLOGICAL INFORMATION

POTENTIAL HEALTH EFFECTS

ACUTE HEALTH EFFECTS

SWALLOWED
Accidental ingestion of the material may be damaging to the health of the individual.
The material can produce chemical burns within the oral cavity and gastrointestinal tract following ingestion.
Numerous cases of a single oral exposure to high levels of copper have been reported. Consumption of copper-contaminated drinking water has been associated with mainly gastrointestinal symptoms including nausea, abdominal pain, vomiting and diarrhoea. A metallic taste, nausea, vomiting and epigastric burning often occur after ingestion of copper and its derivatives. The vomitus is usually green/blue and discolours contaminated skin. Acute poisonings from the ingestion of copper salts are rare due to their prompt removal by vomiting. Vomiting is due mainly to the local and astringent action of copper ion on the stomach and bowel. Emesis usually occurs within 5 to 10 minutes but may be delayed if food is present in the stomach. Should vomiting not occur, or is delayed, gradual absorption from the bowel may result in systemic poisoning with death, possibly, following within several days. Apparent recovery may be followed by lethal relapse.
Systemic effects of copper resemble other heavy metal poisonings and produce wide-spread capillary damage, kidney and liver damage and central nervous system excitation followed by depression. Haemolytic anaemia (a result of red-blood cell damage) has been described in acute human poisoning. [GOSSELIN, SMITH HODGE: Clinical Toxicology of Commercial Products.]
Other symptoms of copper poisoning include lethargy, neurotoxicity, and increased blood

continued...

pressure and respiratory rates. Coma and death have followed attempted suicides using solutions of copper sulfate. Copper is an essential element and most animal tissues have measurable amounts of copper associated with them. Humans have evolved mechanisms which maintain is availability whilst limiting its toxicity (homeostasis). Copper is initially bound in the body to a blood-borne protein, serum albumin and thereafter is more firmly bound to another protein, alpha-ceruloplasmin. Such binding effectively "inactivates" the copper, thus reducing its potential to produce toxic damage. In healthy individuals, bound copper can reach relatively high levels without producing adverse health effects. Excretion in the bile represents the major pathway by which copper is removed from the body when it reaches potentially toxic levels. Copper may also be stored in the liver and bone marrow where it is bound to another protein, metallothionein. A combination of binding and excretion ensures that the body is able to tolerate relatively high loadings of copper.
Acute oral poisoning due to bromide salts (bromism) is rare as vomiting promptly rejects the dose. Blood levels of 125 mg/100 ml are regarded as the minimum intoxicating level. Systemic effects of the bromide ion include drowsiness, irritability, ataxia (loss of muscle co-ordination), vertigo, confusion, mania, hallucinations and coma. Other effects include skin rash, neurological symptoms, sensory disturbances and increased spinal fluid Bromides depress the central nervous system and were once used as sedatives. They also exhibit anticonvulsant activity and were formerly employed against generalised tonic clonic seizures. Both therapeutic uses have been largely discontinued due to substitution by less toxic agents. Toxic levels of bromide can be reached very rapidly if dietary intake of chloride is reduced. Repeated ingestion of bromides may produce bromism a condition characterised by acneform eruptions, confusion, irritability, tremor, memory loss, anorexia, emaciation, headache, slurred speech, delusions, stupor, psychotic behaviour and coma.

EYE
The material can produce chemical burns to the eye following direct contact. Vapours or mists may be extremely irritating.
When applied to the eye(s) of animals, the material produces severe ocular lesions which are present twenty-four hours or more after instillation.
Copper salts, in contact with the eye, may produce conjunctivitis or even ulceration and turbidity of the cornea.
The material may be irritating to the eye, with prolonged contact causing inflammation. Repeated or prolonged exposure to irritants may produce conjunctivitis.

SKIN
The material can produce chemical burns following direct contact with the skin.
Exposure to copper, by skin, has come from its use in pigments, ointments, ornaments, jewellery, dental amalgams and IUDs and as an antifungal agent and an algicide. Although copper algicides are used in the treatment of water in swimming pools and reservoirs, there are no reports of toxicity from these applications. Reports of allergic contact dermatitis following contact with copper and its salts have appeared in the literature, however the exposure concentrations leading to any effect have been poorly characterised. In one study, patch testing of 1190 eczema patients found that only 13 (1.1%) cross -reacted with 2% copper sulfate in petrolatum. The investigators warned, however, that the possibility of contamination with nickel (an established contact allergen) might have been the cause of the reaction. Copper salts often produce an itching eczema in contact with skin. This is, likely, of a non-allergic nature.
The material may cause skin irritation after prolonged or repeated exposure and may produce a contact dermatitis (nonallergic). This form of dermatitis is often characterised by skin redness (erythema) and swelling epidermis. Histologically there may be intercellular oedema of the spongy layer (spongiosis) and intracellular oedema of the epidermis.

continued...

INHALED

Inhalation may produce health damage*.

Evidence shows, or practical experience predicts, that the material produces irritation of the respiratory system in a substantial number of individuals following inhalation.

Copper poisoning following exposure to copper dusts and fume may result in headache, cold sweat and weak pulse. Capillary, kidney, liver and brain damage are the longer term manifestations of such poisoning. Inhalation of freshly formed metal oxide particles sized below 1.5 microns and generally between 0.02 to 0.05 microns may result in "metal fume fever". Symptoms may be delayed for up to 12 hours and begin with the sudden onset of thirst, and a sweet, metallic or foul taste in the mouth. Other symptoms include upper respiratory tract irritation accompanied by coughing and a dryness of the mucous membranes, lassitude and a generalised feeling of malaise. Mild to severe headache, nausea, occasional vomiting, fever or chills, exaggerated mental activity, profuse sweating, diarrhoea, excessive urination and prostration may also occur. Tolerance to the fumes develops rapidly, but is quickly lost. All symptoms usually subside within 24-36 hours following removal from exposure.

The material may produce respiratory tract irritation. Symptoms of pulmonary irritation may include coughing, wheezing, laryngitis, shortness of breath, headache, nausea, and a burning sensation.

Unlike most organs, the lung can respond to a chemical insult or a chemical agent, by first removing or neutralising the irritant and then repairing the damage (inflammation of the lungs may be a consequence).

The repair process (which initially developed to protect mammalian lungs from foreign matter and antigens) may, however, cause further damage to the lungs (fibrosis for example) when activated by hazardous chemicals. Often, this results in an impairment of gas exchange, the primary function of the lungs. Therefore prolonged exposure to respiratory irritants may cause sustained breathing difficulties.

CHRONIC HEALTH EFFECTS

Principal routes of exposure are by accidental skin and eye contact and inhalation of generated dusts.

Chronic copper poisoning is rarely recognised in man although in one instance, at least, symptoms more commonly associated with exposures to mercury, namely infantile acrodynia (pink disease), have been described. Tissue damage of mucous membranes may follow chronic dust exposure. A hazardous situation is exposure of a worker with the rare hereditary condition (Wilson's disease or hereditary hepatolenticular degeneration) to copper exposure which may cause liver, kidney, CNS, bone and sight damage and is potentially lethal. Haemolytic anaemia (a result of red-blood cell damage) is common in cows and sheep poisoned by copper derivatives. Overdosing of copper feed supplements has resulted in pigmentary cirrhosis of the liver. [GOSSELIN, SMITH HODGE: Clinical Toxicology of Commercial Products].

Chronic intoxication with ionic bromides, historically, has resulted from medical use of bromides but not from environmental or occupational exposure; depression, hallucinosis, and schizophreniform psychosis can be seen in the absence of other signs of intoxication. Bromides may also induce sedation, irritability, agitation, delirium, memory loss, confusion, disorientation, forgetfulness (aphasias), dysarthria, weakness, fatigue, vertigo, stupor, coma, decreased appetite, nausea and vomiting, diarrhoea, hallucinations , an acne like rash on the face, legs and trunk (seen in 25-30% of case involving bromide ion), and a profuse discharge from the nostrils (coryza). Ataxia and generalised hyperreflexia have also been observed. Correlation of neurologic symptoms with blood levels of bromide is inexact. The use of substances such as brompheniramine, as antihistamines, largely reflect current day usage of bromides; ionic bromides have been largely withdrawn from therapeutic use due to their toxicity. Several cases of foetal abnormalities have been described in mothers who took large doses of bromides during

continued...

pregnancy.

TOXICITY AND IRRITATION

No significant acute toxicological data identified in literature search.

Section 12 - ECOLOGICAL INFORMATION

Marine Pollutant:Not Determined

Copper is unlikely to accumulate in the atmosphere due to a short residence time for airborne copper aerosols. Airborne coppers, however, may be transported over large distances. Copper accumulates significantly in the food chain.

Drinking Water Standards:
3000 ug/l (UK max)
2000 ug/l (WHO provisional Guideline)
1000 ug/l (WHO level where individuals complain)
Soil Guidelines: Dutch Criteria
36 mg/kg (target)
190 mg/kg (intervention)
Air Quality Standards: no data available.

The toxic effect of copper in the aquatic biota depends on the bio-availability of copper in water which, in turn, depends on its physico-chemical form (ie.speciation). Bioavailability is decreased by complexation and adsorption of copper by natural organic matter, iron and manganese hydrated oxides, and chelating agents excreted by algae and other aquatic organisms. Toxicity is also affected by pH and hardness. Total copper is rarely useful as a predictor of toxicity. In natural sea water, more than 98% of copper is organically bound and in river waters a high percentage is often organically bound, but the actual percentage depends on the river water and its pH.

Copper exhibits significant toxicity in some aquatic organisms. Some algal species are very sensitive to copper with EC50 (96 hour) values as low as 47 ug/litre dissolved copper whilst for other algal species EC50 values of up to 481 ug/litre have been reported. However many of the reportedly high EC50 values may arise in experiments conducted with a culture media containing copper-complexing agents such as silicate, iron , manganese and EDTA which reduce bioavailability.
Toxic effects arising following exposure by aquatic species to copper are typically:

Algae EC50 (96 h)	Daphnia magna LC50 (48- 96 h)	Amphipods LC50 (48- 96 h)	Gastropods LC50 (48- 96 h)	Crab larvae LC50 (48- 96 h)
47- 481 *	7- 54 *	37- 183 *	58- 112 *	50- 100 *

* ug/litre

Exposure to concentrations ranging from one to a few hundred micrograms per litre has led to sublethal effects and effects on long-term survival. For high bioavailability waters, effect concentrations for several sensitive species may be below 10 ug Cu/litre.
In fish, the acute lethal concentration of copper ranges from a few ug/litre to several mg/litre, depending both on test species and exposure conditions. Where the value is less than 50 ug Cu/litre, test waters generally have a low dissolved organic carbon (DOC) level, low hardness and neutral to slightly acidic pH. Exposure to concentrations ranging from one to a few hundred micrograms per litre has led to sublethal effects and effects on long-term survival. Lower effect concentrations are generally associated with test waters of high bioavailability.
In summary:

continued...

Responses expected for high concentration ranges of copper *

Total dissolved Cu concentration range (ug/litre)	Effects of high availability in water
1- 10	Significant effects are expected for diatoms and sensitive invertebrates, notably cladocerans. Effects on fish could be significant in freshwaters with low pH and hardness.
10- 100	Significant effects are expected on various species of microalgae, some species of macroalgae, and a range of invertebrates, including crustaceans, gastropods and sea urchins. Survival of sensitive fish will be affected and a variety of fish show sublethal effects.
100- 1000	Most taxonomic groups of macroalgae and invertebrates will be severely affected. Lethal levels for most fish species will be reached.
>1000	Lethal concentrations for most tolerant organisms are reached.

* Sites chosen have moderate to high bioavailability similar to water used in most toxicity tests.
In soil, copper levels are raised by application of fertiliser, fungicides, from deposition of highway dusts and from urban, mining and industrial sources. Generally, vegetation rooted in soils reflects the soil copper levels in its foliage. This is dependent upon the bioavailability of copper and the physiological requirements of species concerned.
Typical foliar levels of copper are:

Uncontaminated soils (0.3- 250 mg/kg)	Contaminated soils (150- 450 mg/kg)	Mining/smelting soils
6.1- 25 mg/kg	80 mg/kg	300 mg/kg

Plants rarely show symptoms of toxicity or of adverse growth effects at normal soil concentrations of copper. Crops are often more sensitive to copper than the native flora, so protection levels for agricultural crops range from 25 mg Cu/kg to several hundred mg/kg, depending on country. Chronic and or acute effects on sensitive species occur at copper levels occurring in some soils as a result of human activities such as copper fertiliser addition, and addition of sludge.
When soil levels exceed 150 mg Cu/kg, native and agricultural species show chronic effects. Soils in the range 500-1000 mg Cu/kg act in a strongly selective fashion allowing the survival of only copper-tolerant species and strains. At 2000 Cu mg/kg most species cannot survive. By 3500 mg Cu/kg areas are largely devoid of vegetation cover. The organic content of the soil appears to be a key factor affecting the bioavailability of copper.
On normal forest soils, non-rooted plants such as mosses and lichens show higher copper concentrations. The fruiting bodies and mycorrhizal sheaths of soil fungi associated with higher plants in forests often accumulate copper to much higher levels than plants at the same site. International Programme on Chemical Safety (IPCS): Environmental Health Criteria 200.

continued...

Section 13 - DISPOSAL CONSIDERATIONS

- Recycle wherever possible or consult manufacturer for recycling options.
- Consult State Land Waste Management Authority for disposal.
- Treat and neutralise at an effluent treatment plant.
- Use soda ash or slaked lime to neutralise.
- Recycle containers, otherwise dispose of in an authorised landfill.

Section 14 - TRANSPORTATION INFORMATION

Labels Required: CORROSIVE
HAZCHEM: 2X

UNDG:

Dangerous Goods Class:	8	Subrisk:	None
UN Number:	3260	Packing Group:	III

Shipping Name:CORROSIVE SOLID, ACIDIC, INORGANIC, N.O.S.

Air Transport IATA:

ICAO/IATA Class:	8	ICAO/IATA Subrisk:	None
UN/ID Number:	3260	Packing Group:	III
ERG Code:	8L		

Shipping name:CORROSIVE SOLID, ACIDIC, INORGANIC, N.O.S.

Maritime Transport IMDG:

IMDG Class:	8	IMDG Subrisk:	None
UN Number:	3260	Packing Group:	III
EMS Number:	F- A, S- B	Marine Pollutant:	Not Determined

Shipping name:CORROSIVE SOLID, ACIDIC, INORGANIC, N.O.S.

Section 15 - REGULATORY INFORMATION

REGULATIONS

No regulations applicable
No data available for copper(I) bromide as CAS: 7787-70-4, CAS: 62431-55-4.

continued...

Section 16 - OTHER INFORMATION

INGREDIENTS WITH MULTIPLE CAS NUMBERS

Ingredient Name	CAS
copper(I) bromide	7787- 70- 4, 62431- 55- 4

The above information is believed to be accurate and represent the best information currently available to us, but does not represent any warranty expressed or implied of the properties of the product. User should make their own investigation to determine the suitability of the information for their particular purpose.

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