

CUPROUS CYANIDE

GHS Safety Data Sheet

Version No:2.0

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Section 1 - CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME

CUPROUS CYANIDE

OTHER NAMES

CuCN, "copper (I) cyanide", "copper (I) cyanide", "copper cyanamide", "copper cyanide", cupricin

PROPER SHIPPING NAME

COPPER CYANIDE

PRODUCT USE

Electroplating, antifouling paints, insecticide, catalyst.

SUPPLIER

Company: S D FINE- CHEM LIMITED

Address:

315- 317, T.V. INDUSTRIAL ESTATE,

248, WORLI,

MUMBAI- 400030.INDIA.

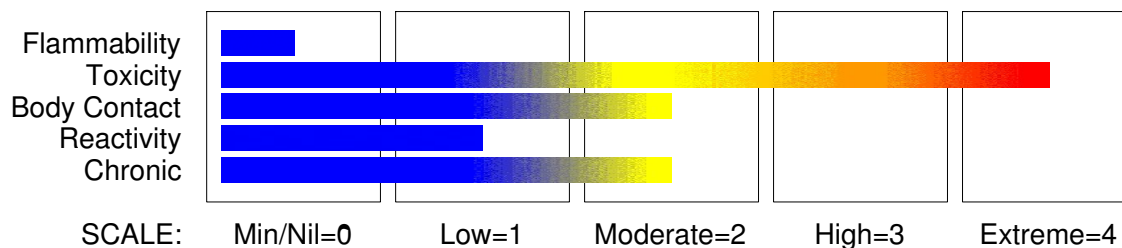
technical@sdfine.com

Telephone: 91- 22- 24959898

Telephone: 91- 22- 24959899

Fax: 91- 22- 24937232

HAZARD RATINGS



Section 2 - HAZARDS IDENTIFICATION

GHS Classification

Acute Toxicity (Dermal) Category 1

Acute Toxicity (Inhalation) Category 2

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Section 2 - HAZARDS IDENTIFICATION

Acute Toxicity (Oral) Category 2
Chronic Aquatic Hazard Category 1
Eye Irritation Category 2B
Skin Corrosion/Irritation Category 3



EMERGENCY OVERVIEW

HAZARD

DANGER

Determined by using GHS criteria:
H310 H330 H300 H316 H320 H410

Fatal in contact with skin

Fatal if inhaled

Fatal if swallowed

Causes mild skin irritation

Causes eye irritation

Very toxic to aquatic life with long lasting effects

PRECAUTIONARY STATEMENTS

Prevention

Use only outdoors or in a well ventilated area.

Wash hands thoroughly after handling.

Wear respiratory protection.

Do not get in eyes, on skin or on clothing

Wear protective gloves/clothing

Do not eat, drink or smoke when using this product.

Do not breathe dust/fume/gas/mist/vapours/spray.

Response

Immediately call a POISON CENTER or doctor/physician.

If skin irritation occurs, seek medical advice/attention.

If eye irritation persists, get medical advice/attention.

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.

IF INHALED: Remove to fresh air and keep at rest in a position comfortable for breathing.

Keep container tightly closed.

Remove/Take off immediately all contaminated clothing

IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician.

Specific treatment: refer to Label or MSDS.

IF ON SKIN: Gently wash with plenty of soap and water.

Wash/Decontaminate removed clothing before reuse.

Storage

Store locked up.

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Section 2 - HAZARDS IDENTIFICATION

Disposal

Dispose of contents and container in accordance with relevant legislation.

Section 3 - COMPOSITION / INFORMATION ON INGREDIENTS

NAME	CAS RN	%
cuprous cyanide	544-92-3	100

Section 4 - FIRST AID MEASURES

SWALLOWED

IMPORTANT: ESTABLISH A FIRST AID PLAN BEFORE WORKING WITH CYANIDES. ANTIDOTES SHOULD BE AVAILABLE ON SITE.

- Prompt response in an emergency is vital.
- All workers are to be trained and refresher trained in procedures.
- Rescuers might need the protection of breathing apparatus where there is the potential of exposure to airborne cyanide.
- Use the buddy system and avoid becoming a casualty.

In all cases of cyanide exposure get medical help urgently after administering first aid.

For cyanide poisonings by any route:

- Contact Poisons Advisory Centre or a doctor.
- Seek immediate medical attention.
- Place casualty in coma position.
- Give oxygen when available.
- Consider external cardiac compression, mechanical resuscitation and use of antidote kit.

If breathing stops mouth-to-mouth resuscitation (also called expired air resuscitation - EAR) may be given only as a last resort. Should such resort prove necessary, first wash the casualty's mouth and lips. A first aid attendant giving EAR must not inhale the expired air of the casualty.

US Practice as employed by DuPont:-

FIRST AID Swallowed/ Inhaled /Skin Contact

- If no symptoms, no treatment is necessary; decontaminate patient.
- If conscious but with symptoms present (nausea, shortness of breath, dizziness) give oxygen.
- If consciousness is impaired (slurred speech, drowsiness) give oxygen and amyl nitrite.
- If unconscious but breathing, give oxygen and amyl nitrite by means of a respirator. To give amyl nitrite, break an ampoule in a cloth and insert into lip of mask for 15 seconds, then take away for 15 seconds. Repeat 5-6 times.

First Aid Supplies for cyanide poisoning should be conveniently placed throughout cyanide areas and should be IMMEDIATELY accessible at all times. They should be routinely inspected (typically daily) by people who would use them in an emergency. The total numbers of any item listed below should be adequate to handle the largest number of exposure cases that can reasonably be anticipated, taking into account that some supplies may be wasted, destroyed or inaccessible during an emergency.

Oxygen Resuscitators - The Flynn Series III Model from O-Two Systems has been found satisfactory, being lightweight, rugged and easy to use.

Amyl Nitrite Ampoules - One box of one dozen ampoules per station is usually satisfactory. Stations should be located throughout the cyanide area.

CAUTION: Amyl nitrite is not stable and must be replaced every 1 to 2 years. Store in the original dated box away from heat. (can be stored with the resuscitator).

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Section 4 - FIRST AID MEASURES

Avoid storage on vehicles where cabin temperatures can reach 60 deg. C. Storage in high temperature climates may require replacement before the expiry date on the box. Also avoid excessive cold storage which may limit the vapour pressure and reduce its evaporating property. Kits and amyl nitrite should be accessible, but secured against tampering or theft (an increase in the use of nitrite "poppers", as aphrodisiacs, introduces substance abuse concerns).

A set of cyanide first aid instructions should be located at each amyl nitrite storage location. Workers should be fully trained since in real emergency situations there will be insufficient time to "read the book".

Notes on the use of amyl nitrite:-

- AN is highly volatile and flammable - do not smoke or use around a source of ignition.
- If treating patient in a windy or draughty area provide some shelter or protection (shirt, wall, drum, cupped hand etc.) to prevent amyl nitrite vapour from being blown away. Keep ampoule upwind from the nose, the objective is to get amyl nitrite into the patient's lungs.
- Rescuers should avoid AN inhalation to avoid becoming dizzy and losing competence.
- Lay the patient down. Since AN dilates blood vessels and lowers blood pressure, lying down will help keep the patient conscious.
- DO NOT overuse - excessive use might put the patient into shock.
- Vasodilatory effects of amyl nitrate may promote fatal cardiac arrhythmias (particularly if the patient is not really poisoned by cyanide).
- the role of amyl nitrate as a competitive inducer of methaemoglobin in the blood stream is highly variable and, alone, may produce levels of methaemoglobin as low as 5% only. Experience at DuPont plants has not shown any serious after-effects from treatment with amyl nitrite.

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 or hair contact occurs:

- Quickly but gently, wipe material off skin with a dry, clean cloth.
- Immediately remove all contaminated clothing, including footwear.
- Wash skin and hair with running water. Continue flushing with water until advised to stop by the Poisons Information Centre.
- Transport to hospital, or doctor.

INHALED

For cyanide poisonings by any route:

- Contact Poisons Advisory Centre or a doctor.
- Seek immediate medical attention.
- Place casualty in coma position.
- Give oxygen when available.
- Consider external cardiac compression, mechanical resuscitation and use of antidote kit.

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Section 4 - FIRST AID MEASURES

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NOTES TO PHYSICIAN

- Signs symptoms of acute cyanide poisoning reflect cellular hypoxia and are often non-specific.
- Cyanosis may be a late finding.
- A bradycardic, hypertensive and tachypneic patient suggests poisoning especially if CNS

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Section 4 - FIRST AID MEASURES

and cardiovascular depression subsequently occurs.

- Immediate attention should be directed towards assisted ventilation, administration of 100% oxygen, insertion of intravenous lines and institution of cardiac monitoring.
- Obtain an arterial blood gas immediately and correct any severe metabolic acidosis (pH below 7.15).

- Mildly symptomatic patients generally require supportive care alone. Nitrites should not be given indiscriminately - in all cases of moderate to severe poisoning, they should be given in conjunction with thiosulfate. As a temporizing measure supply amyl nitrite perles (0.2ml inhaled 30 seconds every minute) until intravenous lines for sodium nitrite are established. 10 ml of a 3% solution is administered over 4 minutes to produce 20% methaemoglobin in adults. Follow directly with 50 ml of 25% sodium thiosulfate, at the same rate, IV. If symptoms reappear or persist within 1/2-1 hour, repeat nitrite and thiosulfate at 50% of initial dose. As the mode of action involves the metabolic conversion of the thiosulfate to thiocyanate, renal failure may enhance thiocyanate toxicity.

- Methylene blue is not an antidote. [Ellenhorn and Barceloux: Medical Toxicology]
If amyl nitrite intervention is employed then Medical Treatment Kits should contain the following:

- One box containing one dozen amyl nitrite ampoules
- Two sterile ampoules of sodium nitrite solution (10 mL of a 3% solution in each)
- Two sterile ampoules of sodium thiosulfate solution (50 mL of a 25% solution in each)
- One 10 mL sterile syringe. One 50 mL sterile syringe. Two sterile intravenous needles.

One tourniquet.

- One dozen gauze pads.

- Latex gloves

- A "Biohazard" bag for disposal of bloody/contaminated equipment.

- A set of cyanide instructions on first aid and medical treatment.

- Notes on the use of amyl nitrite:-

- AN is highly volatile and flammable - do not smoke or use around a source of ignition.

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- DO NOT overuse - excessive use might put the patient into shock. Experience at DuPont plants has not shown any serious after-effects from treatment with amyl nitrite.

ADDITIONAL NOTES:

- Major medical treatment procedures may vary e.g. US (FDA method as recommended by DuPont) uses amyl nitrite as a methaemoglobin generator, followed by treatment with sodium nitrite and then sodium thiosulfate.

MODES OF ACTION: Amyl nitrite (AN) reacts with haemoglobin (HB) to form about 5% methaemoglobin (MHB). Sodium nitrite (NaNO_2) reacts with haemoglobin to form approximately 20-30% methaemoglobin. Methaemoglobin attracts cyanide ions (CN) from tissue and binds with them to become cyanmethaemoglobin (CNMHB). Sodium thiosulfate ($\text{Na}_2\text{S}_2\text{O}_3$) converts cyanmethaemoglobin to thiocyanate (HSCN) which is excreted by the kidneys. i.e. $\text{AN} + \text{HB} = \text{MHB}$ $\text{NaNO}_2 + \text{HB} = \text{MHB}$ $\text{CN} + \text{MHB} = \text{CNMHB}$ $\text{Na}_2\text{S}_2\text{O}_3 + \text{CNMHB} + \text{O}_2 = \text{HSCN}$

- The administration of the antidote salts is intravenous in normal saline, Ringers lactate or other available IV fluid.

- European practice may use 4-dimethylaminophenol (DMAP) as a methaemoglobin generator. Also hydroxycobalamin (Vitamin B12a) is used. Hydroxycobalamin works by reacting with cyanide to form cyanocobalamin (Vitamin B12) which is excreted in the urine.

- European and Australian NOHSC (Worksafe) propose dicobalt edetate (Kelocyanor) as antidote. This acts by chelating cyanide to form stable cobaltcyanide, which is excreted

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Section 4 - FIRST AID MEASURES

in the urine. In all cases hyperbaric therapy may increase the efficiency of a cyanide antidote kit.

Section 5 - FIRE FIGHTING MEASURES

EXTINGUISHING MEDIA

- Dry chemical powder.
- BCF (where regulations permit).
- Carbon dioxide.

FIRE FIGHTING

- Alert Fire Brigade and tell them location and nature of hazard.
- Wear full body protective clothing with breathing apparatus.
- Prevent, by any means available, spillage from entering drains or water course.
- 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

Pollutant.

- Non combustible.
- Not considered to be a significant fire risk.
- Expansion or decomposition on heating may lead to violent rupture of containers.
- Decomposes on heating and may produce toxic fumes of carbon monoxide (CO).
- May emit acrid smoke.

May emit poisonous fumes.

Decomposes on heating and produces toxic fumes of: hydrogen cyanide and nitrogen oxides (NO_x).

Contact with acids produces toxic 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.

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

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Section 6 - ACCIDENTAL RELEASE MEASURES

- 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

Environmental hazard - contain spillage.

- Clear area of personnel and move upwind.
- Alert Fire Brigade and tell them location and nature of hazard.
- Wear full body protective clothing with breathing apparatus.
- 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.

EMERGENCY RESPONSE PLANNING GUIDELINES (ERPG)

The maximum airborne concentration below which it is believed that nearly all individuals could be exposed for up to one hour WITHOUT experiencing or developing

life-threatening health effects is:

cuprous cyanide 25 mg/m³

irreversible or other serious effects or symptoms which could impair an individual's ability to take protective action is:

cuprous cyanide 6 mg/m³

other than mild, transient adverse effects without perceiving a clearly defined odour is:

cuprous cyanide 4 mg/m³

The threshold concentration below which most people will experience no appreciable risk of health effects:

cuprous cyanide 1.25 mg/m³

American Industrial Hygiene Association (AIHA)

Ingredients considered according to the following cutoffs

Very Toxic (T+)	>= 0.1%	Toxic (T)	>= 3.0%
R50	>= 0.25%	Corrosive (C)	>= 5.0%
R51	>= 2.5%		
else	>= 10%		

where percentage is percentage of ingredient found in the mixture

SAFE STORAGE WITH OTHER CLASSIFIED CHEMICALS



X X + X X +

+: May be stored together

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Section 6 - ACCIDENTAL RELEASE MEASURES

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.
- 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.
- Plastic container.
- Metal can or drum
- Packaging as recommended by manufacturer.
- Check all containers are clearly labelled and free from leaks.

STORAGE INCOMPATIBILITY

- Avoid reaction with oxidising agents.
- Avoid strong acids, bases.
- Contact with acids produces toxic fumes.

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.

Section 8 - EXPOSURE CONTROLS / PERSONAL PROTECTION

EXPOSURE CONTROLS

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Section 8 - EXPOSURE CONTROLS / PERSONAL PROTECTION

EMERGENCY EXPOSURE LIMITS

Material	Revised IDLH Value (mg/m3)	Revised IDLH Value (ppm)
cuprous cyanide	25	

MATERIAL DATA

NOTE: Detector tubes for cyanides, measuring CN in excess of 2mg are commercially available.

PERSONAL PROTECTION



EYE

- Safety glasses with side shields
- Chemical goggles.
- 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

Wear chemical protective gloves, eg. PVC.
Wear safety footwear.

OTHER

- Overalls.
 - PVC Apron.
 - PVC protective suit may be required if exposure severe.
 - Eyewash unit.
 - Ensure there is ready access to a safety shower.
- Ensure that there is ready access to cyanide antidote kits.

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.

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CUPROUS CYANIDE

Section 8 - EXPOSURE CONTROLS / PERSONAL PROTECTION

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.

ENGINEERING CONTROLS

Local exhaust ventilation usually required. If risk of overexposure exists, wear approved respirator. Correct fit is essential to obtain adequate protection. Supplied-air type respirator may be required in special circumstances. Correct fit is essential to ensure adequate protection.

An approved self contained breathing apparatus (SCBA) may be required in some situations. Provide adequate ventilation in warehouse or closed storage area. 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.

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Section 8 - EXPOSURE CONTROLS / PERSONAL PROTECTION

Section 9 - PHYSICAL AND CHEMICAL PROPERTIES

APPEARANCE

Odourless white to light tan fine powder; insoluble in water.
Soluble in sodium and potassium cyanides, hydrochloric acid and ammonium hydroxide.

PHYSICAL PROPERTIES

Solid.
Does not mix with water.
Sinks in water.
Contact with acids liberates very toxic gas.

Molecular Weight: 89.56
Melting Range (°C): 475
Solubility in water (g/L): Immiscible
pH (1% solution): Not applicable
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): Decomposes.
Specific Gravity (water=1): 2.92
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

Severely toxic effects may result from the accidental ingestion of the material; animal experiments indicate that ingestion of less than 5 gram may be fatal or may produce serious damage to the health of the individual.

Considered an unlikely route of entry in commercial/industrial environments.

Symptoms of poisoning may include salivation, nausea without vomiting, anxiety, confusion, vertigo, giddiness, lower jaw stiffness, convulsions, spasm (opisthotonos), paralysis, coma and cardiac arrhythmias Cyanide readily forms stable complexes with biologically active metal ions, notably the ferric ion of cytochrome oxidase, producing significant inhibition of enzyme activity with a consequent loss of a cell's ability to utilise oxygen. Cyanosis (blue-grey discolouration of the skin and lips) is often present in

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Section 11 - TOXICOLOGICAL INFORMATION

cyanide and nitrile poisonings but may be a late finding. Non-lethal doses of cyanide are eventually released from the complex to be transformed to thiocyanate and excreted in the urine.

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 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 its 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.

EYE

Limited evidence exists, or practical experience suggests, that the material may cause eye irritation in a substantial number of individuals and/or is expected to produce significant ocular lesions which are present twenty-four hours or more after instillation into the eye(s) of experimental animals. Repeated or prolonged eye contact may cause inflammation characterised by temporary redness (similar to windburn) of the conjunctiva (conjunctivitis); temporary impairment of vision and/or other transient eye damage/ulceration may occur.

Copper salts, in contact with the eye, may produce conjunctivitis or even ulceration and turbidity of the cornea.

SKIN

Skin contact with the material may produce severely toxic effects; systemic effects may result following absorption and these may be fatal.

Limited evidence exists, or practical experience predicts, that the material either produces inflammation of the skin in a substantial number of individuals following direct contact, and/or produces significant inflammation when applied to the healthy intact skin of animals, for up to four hours, such inflammation being present twenty-four hours or more after the end of the exposure period. Skin irritation may also be present after prolonged or repeated exposure; this may result in a form of contact dermatitis (nonallergic). The dermatitis is often characterised by skin redness (erythema) and

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swelling (oedema) which may progress to blistering (vesiculation), scaling and thickening of the epidermis. At the microscopic level there may be intercellular oedema of the spongy layer of the skin (spongiosis) and intracellular oedema of the epidermis.

Toxic effects may result from skin absorption.

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 alginates 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.

INHALED

The material is not thought to produce respiratory irritation (as classified by EC Directives using animal models). Nevertheless inhalation, of the material, especially for prolonged periods, may produce respiratory discomfort and occasionally, distress. 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.

CHRONIC HEALTH EFFECTS

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

Chronic exposure to cyanides and certain nitriles may result in interference to iodine uptake by thyroid gland and its consequent enlargement. This occurs following metabolic conversion of the cyanide moiety to thiocyanate. Thyroid insufficiency may also occur as a result of metabolic conversion of cyanides to the corresponding thiocyanate. Exposure to small amounts of cyanide compounds over long periods are reported to cause loss of appetite, headache, weakness, nausea, dizziness, abdominal pain, changes in taste and smell, muscle cramps, weight loss, flushing of the face, persistent runny nose and irritation of the upper respiratory tract and eyes. These symptoms are not specific to cyanide exposure and therefore the existence of a chronic cyanide toxicity remains speculative. Repeated minor contact with cyanides produces a characteristic rash with itching, papules (small, superficial raised spots on the skin) and possible sensitisation. Concerns have been expressed that low-level, long term exposures may result in damage to the nerves of the eye.

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

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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].

TOXICITY AND IRRITATION

No significant acute toxicological data identified in literature search.

Section 12 - ECOLOGICAL INFORMATION

Marine Pollutant:Extreme

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	Amphipods LC50	Gastropods LC50	Crab larvae LC50
	(48- 96 h)	(48- 96 h)	(48- 96 h)	(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

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Section 12 - ECOLOGICAL INFORMATION

on long-term survival. Lower effect concentrations are generally associated with test waters of high bioavailability.

In summary:

Responses expected for high concentration ranges of copper *

Total dissolved Cu concentration range
(ug/litre)

1- 10

Effects of high availability in water

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)

6.1- 25 mg/kg

Contaminated soils (150- 450
mg/kg)

80 mg/kg

Mining/smelting soils

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.

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Section 13 - DISPOSAL CONSIDERATIONS

Recycle wherever possible.
Consult manufacturer for recycling options.
Consult State Land Waste Management Authority for disposal.
Decontaminate empty containers.
Puncture containers to prevent re-use.
Bury empty containers at an authorised landfill.

Section 14 - TRANSPORTATION INFORMATION



Labels Required: TOXIC
HAZCHEM: 2X

UNDG:

Dangerous Goods Class: 6.1
UN Number: 1587
Shipping Name: COPPER CYANIDE

Subrisk: None
Packing Group: II

Air Transport IATA:

ICAO/IATA Class: 6.1
UN/ID Number: 1587
ERG Code: 6L
Shipping name: COPPER CYANIDE

ICAO/IATA Subrisk: None
Packing Group: II

Maritime Transport IMDG:

IMDG Class: 6.1
UN Number: 1587
EMS Number: F- A, S- A
Shipping name: COPPER CYANIDE

IMDG Subrisk: None
Packing Group: II
Marine Pollutant: Extreme

Section 15 - REGULATORY INFORMATION

REGULATIONS

No regulations applicable
No data available for cuprous cyanide as CAS: 544-92-3, CAS: 13092-67-6.

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Section 16 - OTHER INFORMATION

INGREDIENTS WITH MULTIPLE CAS NUMBERS

Ingredient Name	CAS
cuprous cyanide	544- 92- 3, 13092- 67- 6

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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