

running water for at least 20 minutes.
 Get medical advice/attention if you feel unwell.
 IF exposed or concerned: Get medical advice/attention.

B. Skin contact

Remove contaminated clothing and shoes and restrict entry to contaminated area.
 In case of contact with substance, wipe from skin immediately; flush skin or eyes with running water for at least 20 minutes.

C. Inhalation

Keep victim warm and quiet.
 Get medical advice/attention.
 Get medical advice/attention if you feel unwell.

D. Ingestion

Do not use mouth-to-mouth method if victim ingested or inhaled the substance;
 give artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device.
 Get medical advice/attention.
 Get medical advice/attention if you feel unwell.

E. Indication of immediate medical attention □ Effects of contact or inhalation may be delayed.

Exposures require specialized first aid with contact and medical follow-up .

SECTION 5 Fire fighting measures

A. Suitable (and unsuitable) extinguishing media

Suitable extinguishing media: Covered fire extinguishers and powder fire extinguishers for dry sand, expanded vermiculite, expanded perlite, water spray etc.
 Unsuitable extinguishing media : high pressure water

B. Specific hazards arising from the chemical

May be ignited by heat, sparks or flames.
 Containers may explode when heated.
 Inhalation of material may be harmful.

C. Special protective equipment and precautions for fire-fighters

Move containers from fire area if you can do it without risk.
 Runoff from fire control or dilution water may cause pollution.
 Dike fire-control water for later disposal; do not scatter the material.
 Fire involving Tanks; Cool containers with flooding quantities of water until well after fire is out.
 Fire involving Tanks; Withdraw immediately in case of rising sound from venting safety devices or discoloration of tank.
 In case of fire: Use personal protective equipment as required.
 Fire involving Tanks; Always stay away from tanks engulfed in fire.

SECTION 6 Accidental release measures

A. Personal precautions, protective equipment and emergency procedures

Clean up spills immediately, observing precautions in Protective Equipment section.
 Keep unnecessary and unprotected personnel from entering.
 Do not breathe dust/fume/gas/mist/vapours/spray.
 Wear protective gloves/protective clothing/eye protection/face protection.

B. Environmental precautions and protective procedures

Prevent entry to waterways

C. The methods of purification and removal

Absorb spills with inert material (e.g., dry sand or earth), then place in a chemical waste container.
 Absorb the liquid and scrub the area with detergent and water.
 Avoid release to the environment.
 Collect spillage.

SECTION 7 Handling and storage

A. Precautions for safe handling

Obtain special instructions before use.
 Follow all MSDS/label precautions even after container is emptied because they may retain product residues.
 Avoid release to the environment.
 Please note that materials and conditions to avoid.
 Please work with reference to engineering controls and personal protective equipment.
 Do not handle until all safety precautions have been read and understood.

Do not eat, drink or smoke when using this product.
Wash the handling area thoroughly after handling.

B. Conditions for safe storage

Store locked up.
Store in a closed container.
Store in cool and dry place.
Empty drums should be completely drained, properly bunged, and promptly returned to a drum control, or properly placed.
Keep away from food and drinking water.

SECTION 8 Exposure controls/personal protection

A. Occupational Exposure limits

* Domestic regulations

Copper	TWA 1mg/m ³ , STEL 2mg/m ³ (dust and mist) TWA 0.1mg/m ³ (fume)
Manganese	TWA 1mg/m ³ (inorganic compounds) TWA 1mg/m ³ , STEL 3mg/m ³ (fume)

* ACGIH regulation

Copper	TWA 0.2mg/m ³ (fume) TWA 1mg/m ³ (metal dust)
Manganese	TWA 0.1mg/m ³ (inhalable) TWA 0.02mg/m ³ (respirable)

* Biological exposure index

Not available(No Data)

B. Appropriate engineering controls

Provide local exhaust ventilation system or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value.

C. Personal protective equipment

* Respiratory protection

Wear NIOSH or European Standard EN 149 approved full or half face piece (with goggles) respiratory protective equipment when necessary.
In case exposed to particulate material, the respiratory protective equipments as follow are recommended. ; facepiece filtering respirator or air-purifying respirator, high-efficiency particulate air(HEPA) filter media or respirator equipped with powered fan, filter media of use(dust, fume)
In lack of oxygen(< 19.6%), wear the supplied-air respirator or self-contained breathing apparatus.

* Eye protection

Wear safety goggles as follow if eye irritation or other disorder occur.
- In case of gaseous state organic material: enclosed safety goggles
- In case of vapour state organic material: safety goggles or breathable safety goggles
- In case of particulate material: breathable safety goggles

* Hand protection

An eye wash unit and safety shower station should be available nearby work place.
Wear appropriate protective gloves by considering physical and chemical properties of chemicals.

* Body protection

Wear appropriate protective clothing by considering physical and chemical properties of chemicals.

SECTION 9 Physical and chemical properties

A. Appearance

- * Description
- * Color

Solid
Gold

B. Odor

Odorless

C. Odor threshold

Not available(No Data)

D. pH

Not available(No Data)

E. Melting point/freezing point

876 °C

F. Initial boiling point and boiling range

Not available(No Data)

G. Flash point	Not available(No Data)
H. Evaporation rate	Not available(No Data)
I. Flammability (solid, gas)	Zinc: Non-flammable (less than 20um ~ less than 40um) (ECHA)
J. Upper/lower flammability or explosive limits	Not available(No Data)
K. Vapor pressure	Not available(No Data)
L. Solubility (ies)	Insoluble
M. Vapor density	Not available(No Data)
N. Specific gravity	8.3 (Water=1)
O. Partition coefficient n-octanol/water	Not available(No Data)
P. Auto ignition temperature	Zinc: Not classified as pyrophoric (Nr 4, section 14.4.2.2.4.) (ECHA)
Q. Decomposition temperature	Not available(No Data)
R. Viscosity	Not available(No Data)
S. Molecular weight	Not available(No Data)

SECTION 10	Stability and reactivity
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A. Chemical stability and Possibility of hazardous reactions	May decompose at high temperatures into forming toxic gases. Stable at room temperature, normal pressure and normal use. Inhalation of material may be harmful. Containers may explode when heated.
B. Conditions to avoid	Ignition sources (heat, sparks or flames)
C. Incompatible materials	Flammable material, acids, oxidizing agents, alkalis
D. Hazardous decomposition products	Irritating, corrosive and/or toxic gases

SECTION 11	Toxicological information
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A. Information of Health Hazardous

* Acute toxicity

- Oral

ATEmix >2000 (mg/kg) → Not classified

Copper	LD50 >2500mg/kg rat(male)(OECD Guideline 423)(read-across: Copper oxide)(ECHA)
Zinc	LD50 >2000 mg/kg bw rat (OECD Guideline 401)(ECHA)
Manganese	LD50 >2000 mg/kg rat(female)(ECHA)

- Dermal

ATEmix >2000 (mg/kg) → Not classified

Copper	LD50 >2000mg/kg rat(OECD Guideline 402)(read-across: Copper oxide)(ECHA)
Zinc	Not available(No Data)
Manganese	Not available(No Data)

- Inhalation

Dust/mist ATEmix >5 (mg/L) → Not classified

Copper	Dust/mist LC50 >5.11mg/L 4hr rat (OECD Guideline 436)(Coated copper flakes)(ECHA)
Zinc	Dust LC50 >5.41mg/L 4hr rat (OECD Guideline 403)(ECHA)
Manganese	LC50 >5.14mg/L 4hr rat (ECHA)

* Skin corrosion/ irritation

Not classified

Copper	No irritation observed (Species: rabbit) (OECD Guideline 404) (read-across: Copper oxide) (ECHA)
Zinc	Not classified as an irritant (Species: rabbit) (ECHA)
Manganese	Not classified as an irritant (species: rabbit)(OECD Guideline 404,EU Method B.4)(ECHA)

* Serious eye damage/ irritation

Not classified

Copper	No irritation observed (Species: rabbit) (OECD Guideline 405) (read-across: Copper oxide) (ECHA)
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Zinc	Not classified as an irritant (species: rabbit) (OECD Guideline 405) (ECHA)
Manganese	Not classified as an irritant (species: rabbit)(OECD Guideline 404,EU Method B.4)(ECHA)
* Respiratory sensitization	Not available(No Data)
* Skin sensitization	Not classified
Copper	Not sensitizing (species: guinea pig) (OECD Guideline 406) (analog: Copper oxide) (ECHA)
Zinc	Not available(No Data)
Manganese	Not sensitizing (species: guinea pig) (OECD Guideline 429,EU Method B.42)(ECHA)
* Carcinogenicity	Not classified
- ACGIH	Manganese: A4
* Mutagenicity	Not classified
Copper	in vitro- gene mutation study in bacteria results : NEGATIVE(Species: S. typhimurium TA 1535, TA 1537, TA 98 and TA 100 and S. typhimurium TA 1538)(OECDGuideline 471)(ECHA)(read-across: Copper sulphate pentahydrate CAS No. 7758-99-8)(ECHA) in vivo- mammalian somatic cell study: cytogenicity / erythrocyte micronucleus results NEGATIVE(Species: mouse)(EU Method B.12)(read-across: Copper sulphate pentahydrate CAS No. 7758-99-8)(ECHA)
Zinc	Not available(No Data)
Manganese	in vitro- gene mutation study in mammalian cells : NEGATIVE(species: mouse lymphoma L5178Y cells)(OECD Guideline 476)(read-across:manganese chloride)(ECHA)
* Reproductive toxicity	Not classified
Copper	As a result of the second generation reproductive toxicity test, no reproductive toxicity was observed at any concentration (species: rat) (OECD Guideline 416) (read-across: Copper sulphate pentahydrate CAS No. 7758-99-8) (ECHA) As a result of the developmental toxicity test, the mean fetal weight was slightly lower and the incidence of skeletal mutation was slightly increased, but was not related to teratogenesis, preimplantation loss, or fetal death 6 mg/kg (Species: rabbit) (OECD Guideline 414) (read-across: copper (1+) hydroxide CAS No. 1344-69-0) (ECHA)
Zinc	Not available(No Data)
Manganese	Reproductive effects observed: not specified(read-across:managanese dichloride)(ECHA)
* Specific target organ toxicity (single exposure)	Not classified
Copper	As a result of the dermal acute toxicity test, no clinical signs indicative of harmful or serious toxicity were observed, no deaths were found (read-across: Copper sulphate pentahydrate) (ECHA)
Zinc	Not available(No Data)
Manganese	Not available(No Data)
* Specific target organ toxicity (repeat exposure)	Not classified
Copper	Oral (subchronic)- LOAELs for liver damage were 1000 ppm (cancer) and 2000 ppm (male), and results for kidney damage were considered toxicologically insignificant due to their species-specific tendencies (species: rat). (EU Method B.26) (read-across: Copper sulphate pentahydrate CAS No. 7758-99-8) (ECHA) Inhalation (subacute)- Not classified as no serious effects were observed as a result of the test (Species: rat) (OECD Guideline 412) (read-across: Copper oxide) (ECHA)
Zinc	Not available(No Data)
Manganese	Inhalation- NOAEL was 0.5 µg/L(species: rat)(ECHA)
* Aspiration Hazard	Not available(No Data)

SECTION 12

Ecological information

A. Ecological toxicity

* Fish

Copper	LC50 38.4~256.2µg/L 96hr Pimephales promelas (read-across: copper sulfate CAS No. 7758-98-7)(ECHA)
Zinc	LC50 439µg/L 96hr (ECHA)
Manganese	LC50 > 3.6 mg/L 96hr Oncorhynchus mykiss (ECHA)

* Crustacean

Copper	EC50 31.8µg/L 48hr Ceriodaphnia dubia(ECHA)
Zinc	EC50 860µg/L 48hr (ECHA)
Manganese	EC50 > 1.6 mg/L 48hr Daphnia magna(OECD Guideline 202)(ECHA)

* Algae

Copper	EC50 32~245µg/L 72hr Pseudokirchneriella subcapitata (read-across: Copper sulphate pentahydrate CAS No. 7758-99-8)(ECHA)
Zinc	Not available(No Data)
Manganese	EC50 4.5 mg/L 72 hr Desmodesmus subspicatus(OECD Guideline 201)(ECHA)

B. Persistence and degradability

- * Persistence Not available(No Data)
- * Degradability Not available(No Data)

C. Bioaccumulative potential

- * Bioaccumulation Not available(No Data)
- * Biodegradation Not available(No Data)

D. Mobility in soil

Not available(No Data)

E. Other hazardous effect

Copper	Fish: NOEC 57.8, 109µg/L 96hr 32day Cyprinodon variegatus (OECD Guideline 210) (read-across: Copper (II) chloride dihydrate CAS No. 10125-13-0)(ECHA) Crustacean: NOEC 21.5~181µg/L 21day Daphnia magna (OECD Guideline 211) (read-across: Copper sulphate CAS No. 7758-98-7)(ECHA) Algae: NOEC 37.6~170.8µg/L 72hr Pseudokirchneriella subcapitata (read-across: copper chloride)(OECD Guideline 201)(ECHA)
Zinc	Fish: NOEC 50µg/L 5month Phoxinus phoxinus (ECHA) Crustacean: NOEC 25µg/L 1week Ceriodaphnia dubia (ECHA) Algae: NOEC 50µg/L 3day Pseudokirchneriella subcapitata (OECD Guideline 201)(ECHA)
Manganese	Fish: NOEC 3.6 mg/L, 96hr Oncorhynchus mykiss (OECD Guideline 203)(ECHA)

SECTION 13

Disposal considerations

- A. Disposal method Waste must be disposed of in accordance with federal, state and local environmental control regulations.
- B. Disposal precaution Dispose of contents/container in accordance with relevant regulation.
Refer to manufacturer or supplier for information on recovery or recycling.

SECTION 14

Transport information

- A. UN Number Not regulated
- B. UN Proper shipping name Not regulated
- C. Transport Hazard class Not regulated
- D. Packing group Not regulated
- E. Environmental hazards Not regulated
- F. Special precautions Not regulated
- * in case of fire
 - * in case of leakage

SECTION 15

Regulatory information

- A. U.S.A Regulatory information & Other regulations
- * U.S.A Regulatory information
 - U.S.A management information Copper(2270 kg (5000 lb))
 - (CERCLA Regulation) Zinc(454 kg (1000 lb))
 - U.S.A management information Not regulated
 - (EPCRA 302 Regulation)
 - U.S.A management information Not regulated
 - (EPCRA 304 Regulation)
 - U.S.A management information□ Copper(regulated)
 - (EPCRA 313 Regulation) Zinc(regulated)
 - * Other regulations

- Substance of Rotterdam Convention	Not regulated
- Substance of Stockholm Convention	Not regulated
- Substance of Montreal Protocol	Not regulated
- Harmonised classification	Copper(Aquatic Chronic 2(H411))
- Annex VI of Regulation (EC) No 1272/2008 (CLP Regulation)	Zinc(zinc dust (pyrophoric): Pyr. Sol. 1, Water-react. 1, Aquatic Acute 1, Aquatic Chronic 1) (zinc dust (stabilised): Aquatic Acute 1, Aquatic Chronic 1)

SECTION 16	Other information
A. Information source and references	<p>CAMEO Chemicals (steam pressure)</p> <p>ECHA (Generative toxicity, crustaceans, epigrams, percutaneous, other harmful effects, melting points/fish points, reproductive cell mutation, severe eye damage or irritation, fish, spontaneous combustion temperature, algae, specific target organ toxicity (repetitive exposure), dermatologic toxicity, skin corrosion or irritation, inhalation)</p> <p>ECHA Registered substances(Weight, characteristics)</p> <p>EPISUITE(Partition coefficient n-octanol / water (kow))</p> <p>HSDB(Odor, color, initial boiling point and boiling point range)</p> <p>ICSC(solubility)</p> <p>pubchem(molecular weight)</p> <p>Self test analysis data (Ulsan site Quality Assurance Team)</p> <p>Zinc (Flammability, pyrophoric, water reactivity)(ECHA)</p>
B. Issuing date	March 25, 2022
C. Revision number and date	
* revision number	Ver. 2
* date of the latest revision	May 30, 2025
D. Others	<p>This Material Safety Data Sheet (SDS) is prepared according to the GHS (Globally Harmonized System of Classification and Labeling of Chemicals) standards of Korea.</p> <p>This data does not guarantee product quality, but describes safety, health and environmental issues for handling under normal conditions. If the properties of the product are changed due to heating or processing according to the usage method, please check the additional safety and health information before use.</p> <p>In addition, this information may be revised without prior notice, and materials can be provided through our website (www.poongsan.co.kr).</p> <p>For other details, please contact our Safety Environment Team or Quality Assurance Team.</p>