



# Material safety Data Sheet

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Product name (Brand-name)

Cu-Zn alloys

【 This document has been prepared in accordance with 'Article 41 of Korean Occupational Health and Safety Act' and 'Annex 4. Guidance on the Preparation of Safety Data Sheet(SDS)' in 'Globally Harmonized System of Classification and Labelling of Chemicals(GHS) - 4th edition(2011) according to 1907/2006/EC (REACH) and 1272/2008/EC (CLP) 】

## SECTION 1 : Identification

1.1 GHS Product identifier : Cu-Zn alloys (Copper-Zinc Alloys; Brass; UNS/CDA C20000-C29999)

1.2 Other means of identification :

No.	UNS/CDA Alloy No.	Common Name	KS D 5201/JIS H3100	Typical Composition
1	(C20500, inactive)	Detonator	C2051	Cu 98.5%, Zn 1.5%
2	C21000	Gilding Metal	C2100	Cu 95%, Zn 5%
3	C22000	Commercial Bronze	C2200	Cu 90%, Zn 10%
4	C23000	Red Brass	C2300	Cu 85%, Zn 15%
5	C26000	Cartridge Brass	C2600	Cu 70%, Zn 30%
6	C26800	Yellow Brass	C2680	Cu 65%, Zn 35%
7	C27200 or C27400	Yellow Brass	C2720	Cu 63%, Zn 37%

※ Categories of this material : Metal > Nonferrous Metal > Copper Alloy

1.3 Recommended use of the chemical and restrictions on use :

1.3.1 Recommended use :

- C2051 : for detonator,
- C2100 / C2200 / C2300 : for construction, accessories, cosmetic case, etc.
- C2600 / C2680 / C2720 : for terminals, connectors, deep-drawing, radiator, relay, etc.

1.3.2 Restrictions on use : can not be used such as a pulverization(powder-processing), eating and feeding, inhalation etc. (can not be used for any purpose except common use of nonferrous metal and copper alloy)

1.4 Supplier's details

1.4.1 Manufacturer/Supplier : LEEKU Industrial Co., Ltd. (south Korea)

1.4.2 Address :

1.4.2.1 Head Office and Factory :

42, Poseunggongdan-ro, Poseung-eup, Pyeongtaek-si, Gyeonggi-do, Korea (Republic of)

1.4.2.2 Further information obtainable from : Q.C Team of LEEKU

1.5 Emergency telephone number : Call your local emergency number !

ex) In USA 9-1-1, In Korea or Japan 1-1-9

But, If you are not faced with an emergency situation, you can contact the following.

1.5.1 Company's Technical Information :

- Head Office : +82-31-494-2929(Rep.) (Fax. +82-31-494-2930)
- Factory (Q.C Team) : +82-70-4687-6565 (Fax. +82-31-647-0729)

1.5.2 Support Hours for KOREA : Monday ~ Friday, 9:00 a.m.- 6:00 p.m., local time

## SECTION 2 : Hazard identification

- ※ 1. Emergency Overview : Copper alloy products in the natural state do not present a hazard for emergency response personnel.
- 2. Potential Health Effects : Copper alloy products in the natural state do not present an inhalation, ingestion, or contact hazard. However, operations such as burning, welding, sawing, brazing, or grinding may release fumes and/or dusts which may present health hazards if occupational exposure limits are exceeded.

### 2.1 Classification of the Globally Harmonized System(GHS)

- 2.1.1 Substances and Mixtures which in contact with Water, Emit Flammable Gases : Category 1
- 2.1.2 Pyrophoric Solids : Category 1
- 2.1.3 Acute Toxicity (Oral) : Category 4
- 2.1.4 Specific Target Organ Toxicity (Single Exposure) : Category 3 (respiratory tract irritation)
- 2.1.5 Specific Target Organ Toxicity (Repeated Exposure) : Category 1
- 2.1.6 Aquatic Hazard (Acute) : Category 1
- 2.1.7 Aquatic Hazard (Long-term) : Category 1

### 2.2 GHS label elements, including precautionary statements

#### 2.2.1 Pictograms



#### 2.2.2 Signal word : **Danger**

#### 2.2.3 Hazard statement codes for physical hazards :

- H250 : Catches fire spontaneously if exposed to air.
- H260 : In contact with water releases flammable gases which may ignite spontaneously.

#### 2.2.4 Hazard statement codes for health hazards :

- H302 : Harmful if swallowed.
- H335 : May cause respiratory irritation.
- H372 : Cause damage to organs(state all organs affected, if known) through prolonged or repeated exposure(state route of exposure if it is conclusively proven that no other routes of exposure cause the hazard)

#### 2.2.5 Hazard statement codes for environmental hazards :

- ※ Copper alloy products in the natural state(such as plate, sheet, strip, and rolled bar etc.) do not present a hazard.(Below hazard statement do not apply)
- H400 : Very toxic to aquatic life.
- H410 : Very toxic to aquatic with long lasting effects.

#### 2.2.6 Codification of prevention precautionary statements :

- P210 : Keep away from heat/sparks/open flames/hot surfaces. – No smoking.
- P222 : Do not allow contact with water.
- P223 : Keep away from any possible contact with water, because of violent reaction and possible flash fire.
- P231+ P232 : Handle under inert gas. Protect from moisture.
- P260 : Do not breathe dust / fume / gas / mist / vapours / spray.

- P261 : Avoid breathing dust / fume / gas / mist / vapours / spray.
- P264 : Wash ... thoroughly after handling.
- P270 : Do not eat, drink or smoke when using this product.
- P271 : Use only outdoors or in a well-ventilated area.
- P273 : Avoid release to the environment.
- P280 : Wear protective gloves / protective clothing / eye protection / face protection.
- P301+P312 : IF SWALLOWED :  
Call a POISON CENTER or doctor / physician if you feel unwell.
- P304+P340 : IF INHALED :  
Remove victim to fresh air and keep at rest in a position comfortable for breathing.
- P312 : Call a POISON CENTER or doctor / physician if you feel unwell.
- P314 : Get medical advice / attention if you feel unwell.
- P330 : Rinse mouth.
- P335+P334 : Brush off loose particles from skin.  
Immerse in cool water / wrap in wet bandages.
- P370+P378 : In case of fire : Use (carbon dioxide / sand / soil or water spray) for extinction.
- P391 : Collect spillage.
- P402+P404 : Store in a dry place. Store in a closed container.
- P403+P233 : Store in a well-ventilated place. Keep container tightly closed.
- P405 : Store locked up.
- P422 : Store contents under ...(appropriate liquid or inert gas – no data for dust or fume)
- P501 : Dispose of contents/container to ...(in accordance with local / regional / national / international regulation(to be specified))

## 2.3 Other hazards which do not result in classification

### 2.3.1 Linkely Routes of exposure : Inhalation, Eye contact, Skin Contact

**INHALATION :** Short-term exposure to fumes/dust may produce irritation of the respiratory system. Exposure to high concentrations of oxide fumes of copper, tin, zinc may cause metal fume fever.

**EYE :** Short-term exposure to fumes/dust may produce irritation.

**SKIN :** Repeated or prolonged exposure to copper dusts or mists may cause irritant or allergic contact dermatitis.

**INGESTION :** Abdominal pain, nausea, vomiting.

**2.3.2 Medical conditions aggravated by exposure :** Exposure to fumes or dust may aggravate existing respiratory disease or dermatitis.

**2.3.3 Target organs :** Upper respiratory tract, eyes, skin.

### 2.3.4 Signs and Symptoms :

Metal fume fever – metallic taste in mouth, dryness, and irritation of the throat, and influenza-like symptoms. The effects may be delayed.

### 2.3.5 Carcinogenicity

Classification	ACGIH	IARC	NTP
Copper (fume, dust & mist)	No	No	No
Zinc oxide fume	No	No	No

\* See Toxicological Information(Section #11).

### 2.3.6 Potential Environmental effects :

None known. Product has not been tested for environmental properties.

### 2.3.7 Hazard ratings

Degree of hazard (0 = low, 4 = extreme)

- Hazardous Materials Identification System(HMIS) :

Health : 2*	Flammability : 0	Physical Hazard : None
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- National Fire Protection Association(NFPA) :

Division	Health (Blue)	Flammability (Red)	Instability/Reactivity (Yellow)	Special (White)
This alloy (Brass)	Mixture. Not rated.			
Copper	2	3	0	—
Zinc	2	0	0	—W—

### 2.3.8 Human threshold response data

Odor threshold :

Unknown.

Irritation threshold :

Unknown.

Immediately dangerous to life or health(IDLH)  
Value(s) :

The IDLH for this product is not known.  
※ The IDLH for copper is 100mg/m<sup>3</sup>

## SECTION 3 : Composition/information on ingredients

NOTE : This MSDS applies to a range of alloys. For actual compositions refer to the material test report or the alloy specification. All percentages are by weight.

Product Name	Component Name	CAS Name	CAS No.	wt %
C2051 (UNS C20500 (inactive))	Copper	Metallic Copper	7440-50-8	98.0 – 99.0 (Typically 98.5)
	Zinc	Zinc, elemental	7440-66-6	Remainder (Typically 1.5)
C2100 (UNS C21000)	Copper	Metallic Copper	7440-50-8	94.0 – 96.0 (Typically 95)
	Zinc	Zinc, elemental	7440-66-6	Remainder (Typically 5)
C2200 (UNS C22000)	Copper	Metallic Copper	7440-50-8	89.0 – 91.0 (Typically 90)
	Zinc	Zinc, elemental	7440-66-6	Remainder (Typically 10)
C2300 (UNS C23000)	Copper	Metallic Copper	7440-50-8	84.0 – 86.0 (Typically 85)
	Zinc	Zinc, elemental	7440-66-6	Remainder (Typically 15)
C2600 (UNS C26000)	Copper	Metallic Copper	7440-50-8	68.5 – 71.5 (Typically 70)
	Zinc	Zinc, elemental	7440-66-6	Remainder (Typically 30)
C2680 (UNS C26800)	Copper	Metallic Copper	7440-50-8	64.0 – 68.0 (Typically 65)
	Zinc	Zinc, elemental	7440-66-6	Remainder (Typically 35)

Product Name	Component Name	CAS Name	CAS No.	wt %
C2720 (UNS C27200 or UNS C27400)	Copper	Metallic Copper	7440-50-8	62.0 – 64.0 (Typically 63)
	Zinc	Zinc, elemental	7440-66-6	Remainder (Typically 37)

- ※ 1. Each impurity (P, Pb, Fe etc.) is controlled under 300ppm(0.03wt%)
2. The total impurities are allowed range that does not spoil the above composition table of ingredients or the functional characteristics(processability, etc.) of the products(alloy).
3. Not allowed any impurity which are themselves classified and which contribute to the classification in GHS.

## SECTION 4 : First-aid measures

### 4.1 In case of eye contact :

- Immediately flush out fume and dust particles with large amounts of water for at least 20 minutes, occasionally lifting the upper and lower eyelids.
- If eye irritation develops, call a physician at once.

### 4.2 In case of skin contact :

- If exposed to dust or fumes, wash skin with plenty of water.
- Remove contaminated clothing and shoes and launder before reuse.
- If skin irritation or rash develops and persists or recurs, get medical attention.

### 4.3 If inhaled :

- If symptoms of lung irritation occur(coughing, wheezing or breathing difficulty), remove from exposure area to fresh air immediately.
- If breathing has stopped, perform artificial respiration.
- Keep affected person warm and at rest. Get medical attention or call a physician at once.

### 4.4 If swallowed :

- Not a likely route of exposure for finished metal alloy. If dust is ingested, immediately drink water to dilute. Consult a physician if symptoms develop.

### 4.5 Note to physicians :

- There is no specific antidote to the active ingredients in this product.
- Use symptomatic treatment.

### 4.6 Potential health effects

#### 4.6.1 Acute effects

- Eye : Dust or fume can cause irritation consisting of redness, swelling, and pain.  
May cause conjunctivitis with repeated exposures.
- Skin : Material not expected to be absorbed through the skin.  
Contact with dust may cause mild irritation consisting of redness and/or swelling.
- Inhalation : Harmful if inhaled. Inhalation of high concentrations of powder, dust, or fume may cause respiratory and nasal irritation, coughing, and difficulty breathing.  
Inhalation of high concentrations of metallic copper dusts or fumes may cause nasal irritation and/or nausea, vomiting and stomach pain.  
The metal fume may also produce influenza-like symptoms, known as metal fume fever. Symptoms of this reaction may include metallic taste, runny nose, nausea, fever and chills. These effects usually disappear within 24 hours.



- Ingestion : Ingestion of large amounts of dust may cause nausea, vomiting, constipation, cramps, and or stomach pain.

4.6.2 Chronic effects : Prolonged or repeated skin contact with dust may cause more severe irritation or dermatitis. Prolonged or repeated inhalation of dust or fume may cause more severe irritation and possibly lung damage. Repeated exposure may cause an allergic skin reaction consisting of itching, redness, swelling, and rash or urticaria (hives) in sensitized individuals. Chronic exposure to very high concentrations of manganese dust has caused nervous system effects including muscle weakness, tremors, and behavioral changes. Epidemiological studies in humans have shown an association between lung and nasal cancers and prolonged occupational exposures to high concentrations of nickel. Chronic exposure to lead can cause kidney damage, anemia, reproductive effects, developmental effects and permanent nervous system damage in humans including changes in cognitive function.

4.6.3 Medical conditions aggravated by exposure : Exposure to dust or fume may aggravate an existing dermatitis, blood or neurological condition, asthma, emphysema, or other respiratory disease.

## SECTION 5 : Fire-fighting measures

### 5.1 Flammable properties

Property	Value	Property	Value
Explosive	No	Flammable	No
Combustible	No	Pyrophoric	No
Flash Point(°C)	Not applicable	Burnig Rate of Material	Not applicable
Lower Explosive Limit	Not applicable	Autoignition Temp.	Not applicable
Upper Explosive Limit	Not applicable	Flammability Classification (defined by 29 CFR 1910.1200)	Not applicable

5.2 Unusual fire and explosion hazards: Dust may cause an ignitable and/or an explosive atmosphere.

5.3 Extinguishing media : For localized powder fires, smother with dry sand, dry dolomite, sodium chloride or soda ash. Use fire-extinguishing media appropriate to fight surrounding fire.

5.4 Special fire-fighting procedures : None required.

## SECTION 6 : Accidental release measures

6.1 Personal precautionsm protective equipment and emergency procedures :

6.1.1 Emergency Overview : Copper alloy products in the natural state do not present a hazard for emergency response personnel.

6.1.2 Potential Health Effects : Copper alloy products in the natural state do not present an inhalation, ingestion, or contact hazard. However, operations such as burning, welding, sawing, brazing, or grinding may release fumes and/or dusts which may present health hazards if occupational exposure limits are exceeded.

6.2 Environmental precautions : see 2.2.5 article in Section 2.

6.3 For dust & mist(or fume) form : This product may be an explosion hazard. Remove all sources of ignition. Dust of fume may be suppressed by the use of a local exhaust system. Dispose of per guidelines under Section 13, Waste Disposal.

6.4 Steps to be taken in the event of spills, leaks, or releases : Not applicable.

## SECTION 7 : Handling and Storage

7.1 Precautions for safe handling : Avoid dispersion of dust in air. Particularly in welding, precautions should be taken for airborne contaminants that may originate from components of the welding rod.

7.2 Conditions for safe storage, including any incompatibilities : No special requirements.

Shelf Life Limitations : None known.

Incompatible Materials for Packaging : None known.

Incompatible Materials for Storage or Transport : None known.

7.3 Other precautions : Do not shake clothing, rags or other items to remove dust. Dust should be removed by washing or HEPA vacuuming.

## SECTION 8 : Exposure controls/personal protection

8.1 Components with workplace control parameter (exposure guidelines)

CHEMICAL NAME	ACGIH TLV	OSHA PEL	INTERNATIONAL OELS
Copper	0.2mg/m <sup>3</sup> (fume), 1mg/m <sup>3</sup> (dusts and mists)	0.1mg/m <sup>3</sup> (fume)  1mg/m <sup>3</sup> (dusts and mists)	Korea : TWA 1mg/m <sup>3</sup> (dusts), TWA : 0.1mg/m <sup>3</sup> (fume), STEL : 2mg/m <sup>3</sup> (dusts and mists) Austria, Belgium, Canada: 0.2 mg/m <sup>3</sup> (fume), 1mg/m <sup>3</sup> (dust) Denmark: 1.0mg/m <sup>3</sup> (dusts and powder) Germany (MAK): 0.1mg/m <sup>3</sup> (fume), 1mg/m <sup>3</sup> (dusts and mists)
Zinc	None established	None established	None established

- \* 1) TWA : Time Weighted Average, STEL : Short Term Exposure Limit
- 2) This substance is regulated by OSHA as a Particulate Not Otherwise Regulated (PNOR).
- 3) The exposure limits listed for both OSHA and ACGIH refer to total dust; the OSHA PEL for the respirable fraction is 5mg/m<sup>3</sup>.
- 4) If this product is heated and fumes are generated, zinc oxide fumes could be formed. The ACGIH TLV and OSHA PEL for zinc oxide fume is 5mg/m<sup>3</sup>(TWA). (ACGIH TLV for zinc oxide fume is STEL 10mg/m<sup>3</sup>)

8.2 Appropriate engineering controls / Individual protection measures

Engineering controls: Local exhaust ventilation is recommended if significant dusting occurs or fumes are generated (when welding, burning, sawing, brazing, grinding, or machining when exposure exceeds occupational exposure limits. Otherwise, use general exhaust ventilation.

Eye / Face protection: Use safety glasses or goggles. Other protective equipment should be utilized as required by welding standards.

Skin protection: Wear impervious (cut-resistant) gloves and other protective clothing (aprons, coveralls) as appropriate to prevent skin contact when using this product. If generating a dust, wash thoroughly after handling, especially before eating, drinking, or smoking.






Respiratory protection:

Respiratory protection not normally needed. If dusting occurs or fumes are generated above the PEL/TLV, use a NIOSH-approved half-face or full-face respirator equipped with High Efficiency Particulate (HEPA) filter cartridges.



General hygiene considerations:

Do not eat, drink, or smoke while using this product in dust form

## SECTION 9 : Physical and chemical properties

Property	Product				
	C2051 (C20500)	C2100 (C21000)	C2200 (C22000)	C2300 (C23000)	C2600 (C26000)
Appearance	Brown or Red, Copperish-colored, lustrous metal 	Brown or Red, Copperish-colored, lustrous metal 	Light Brown or Tawny color, Salmon-colored, lustrous metal 	Light Brown or Tawny color, Salmon-colored, lustrous metal 	Yellow colored, lustrous metal 
Odour	None	None	None	None	None
Odour threshold	No data	No data	No data	No data	No data
pH	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
Melting point/ freezing point	(No data, estimate 1060–1080°C)	1050–1065°C <sup>14)</sup>	1020–1045°C <sup>14)</sup>	990–1025°C <sup>14)</sup>	915–955°C <sup>14)</sup>
Initial boiling point and boiling range	No data	No data	No data	No data	No data
Flash point	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
Evaporation rate	No data	No data	No data	No data	No data
Flammability (solid, gas)	No data	No data	No data	No data	No data
Upper/lower flammability or explosive limits	No data	No data	No data	No data	No data
Vapour pressure	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
Vapour density	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
Relative density (Specific gravity)	(No Data, estimate 8.9)	8.86 <sup>14)</sup>	8.80 <sup>14)</sup>	8.75 <sup>14)</sup>	8.53 <sup>14)</sup>
Solubility	No data (Negligible)	No data (Negligible)	No data (Negligible)	No data (Negligible)	No data (Negligible)
Partition coefficient: n-octanol/water	No data	No data	No data	No data	No data
Auto-ignition temperature	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
Decomposition temperature	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
Viscosity	Not applicable (No Data)	Not applicable (No Data)	Not applicable (No Data)	Not applicable (No Data)	Not applicable (No Data)
Molecular weight	Not applicable – mixture	Not applicable – mixture	Not applicable – mixture	Not applicable – mixture	Not applicable – mixture



Property	Product		Each Component	
	C2680 (C26800)	C2720 (C27200 or C27400)	Copper	Zinc
Appearance	Yellow colored, lustrous metal 	Yellow colored, lustrous metal 	Red powder or solid <sup>1)</sup> (change color when exposed to humid air) <sup>1)</sup>	Gray, White Bluish metal or solid <sup>9)</sup>
Odour	None	None	None <sup>2)</sup>	None <sup>2)</sup>
Odour threshold	No data	No data	No data	No data
pH	Not applicable	Not applicable	Not applicable	Not applicable
Melting point/ freezing point	905–930℃ <sup>14)</sup>	(No data, estimate 890–920℃)	1083℃ <sup>1)</sup>	419℃ <sup>9)</sup>
Initial boiling point and boiling range	No data	No data	2595℃ <sup>1)</sup>	907℃ <sup>9)</sup>
Flash point	Not applicable	Not applicable	Not applicable	Not applicable
Evaporation rate	No data	No data	No data	No data
Flammability (solid, gas)	No data	No data	Flammable <sup>1)</sup>	Not applicable <sup>9)</sup>
Upper/lower flammability or explosive limits	No data	No data	No data	Not applicable <sup>9)</sup>
Vapour pressure	Not applicable	Not applicable	1mmHg @1628℃ <sup>9)</sup>	1mmHg @487℃ <sup>9)</sup>
Vapour density	Not applicable	Not applicable	No data	>1 (air=1) <sup>9)</sup>
Relative density (Specific gravity)	8.78 <sup>15)</sup>	8.53 <sup>15)</sup>	8.9 <sup>1)</sup>	7.13–7.14 <sup>9)</sup>
Solubility	No data (Negligible)	No data (Negligible)	insoluble <sup>1)</sup>	insoluble (water) <sup>9)</sup> (but, react to acid / alkali)
Partition coefficient: n-octanol/water	No data	No data	–0.57 (estimate) <sup>4)</sup>	Not applicable
Auto-ignition temperature	Not applicable	Not applicable	No data	460℃ (powder) <sup>9)</sup>
Decomposition temperature	Not applicable	Not applicable	No data	No data
Viscosity	Not applicable (No Data)	Not applicable (No Data)	No data	No data
Molecular weight	Not applicable – mixture	Not applicable – mixture	63.55 <sup>8)</sup>	65.38 <sup>9)</sup>

## SECTION 10 : Stability and reactivity

<u>Stability:</u>	Stable under normal temperatures and pressure.
<u>Conditions to avoid:</u>	Not affect by mechanical impact or shock by electrical discharge.
<u>Incompatible materials:</u>	Mercury, chlorine, Ammonia, Acetylene acids, Acetylene. Contact with strong acids, bases, or oxidizing agents
<u>Hazardous decomposition products:</u>	When heated to decomposition (Metallic dust or fumes may be produced during welding, burning, grinding, and machining), may produce metal oxides and fumes. Inhalation of high concentrations of metal fumes may cause a condition known as "metal fume fever" which is characterized by flu-like symptoms.
<u>Hazardous polymerization and other possibility of hazardous reactions:</u>	Will not occur.

## SECTION 11 : Toxicological information

### 11.1 Potential exposure routes :

11.1.1 For dust : ingestion, inhalation, and eye contact.

11.1.2 For fume : inhalation and eye contact.

11.1.3 For the finished alloy metal (rolled bar, strip, sheet etc) : is not hazardous.

### 11.2 Acute animal toxicity data :

For Product :		For Components (>1%)	
		Copper	Zinc
Oral LD <sub>50</sub>	Believed to be > 5g/kg	3.5 mg/kg (mouse, intraperitoneal)	No data
Dermal LD <sub>50</sub>	Believed to be > 2g/kg	375 mg/kg (rabbit, subcutaneous)	No data
Inhalation LC <sub>50</sub>	Believed to be slightly to moderately toxic	No data	No data
Irritation	Eye and respiratory irritant	Respiratory irritant	Eye irritant

※	Copper	TDLo :	120 µg/kg (human, oral-gastrointestinal effects)
		LD50 :	0.07 mg/kg (mouse, intraperitoneal)
	Zinc	TCLo :	124 mg/m <sup>3</sup> / 50 minutes (human, inhalation-respiratory effects)
		LDLo :	388 mg/kg (bird, oral)

### 11.3 Subchronic/Chronic Toxicity : No information for product.

※ Chronic effects : Repeated or prolonged over exposure to copper fume may cause the skin and hair to change color.

### 11.4 Carcinogenicity : This product is not known or reported to be carcinogenicity,

### 11.5 Mutagenicity : This product is not known or reported to be mutagenic.

### 11.6 Reproductive, teratogenicity, or developmental effects : This product is not known or reported to cause reproductive or developmental effects.

### 11.7 Neurological effects : This product is not known or reported to cause neurological effects.

### 11.8 Interactions with other chemicals which enhance toxicity : None known or reported.

## 11.9 For each component :

Classification	Copper	Zinc
Information on the likely routes of exposure	No data	No data
Toxicological(health) effects Information		
○ Acute toxicity		
- Oral	No data	LD <sub>50</sub> 630mg/kg Rat (Elemental)
- Injectant	No data	No data
- Inhalation	No data	No data
○ Skin corrosion/irritation	No data	human/inexcitable
○ Serious eye damage/irritation	No data	No data
○ Respiratory sensitization	No data	No data
○ Skin sensitization	No data	No data
○ Carcinogenicity		
- Korean Industrial Safety and Health Act	No data	No data
- Korean Ministry of Labor examination	No data	No data
- IARC	No data	No data
- OSHA	No data	No data
- ACGIH	No data	No data
- NTP	No data	No data
- EU CLP	No data	No data
○ Germ cell mutagenicity	No data	No data
○ Reproductive toxicity	No data	No data
○ STOT-single exposure	fume Irritate to upper respiratory tract	No data
○ STOT-repeated exposure; and	Liver damage in humans appears.	No data
○ Aspiration hazard	No data	No data

## SECTION 12 : Ecological information

## 12.1 Eco-toxicity : No data is available on this product. Individual constituents are as follows :

Classification	Copper	Zinc
Fishes	LC <sub>50</sub> 0.37mg/l 96hr	LC <sub>50</sub> 0.24mg/l 96hr Oncorhynchus mykiss
Crustacean	EC <sub>50</sub> 0.0318mg/l 48hr	EC <sub>50</sub> 0.354mg/l 48hr Daphnia magna
Alga	LC <sub>50</sub> 0.092mg/l 15hr	EC <sub>50</sub> 0.106mg/l 72hr Pseudokirchneriella subcapitata

- ※ Copper : The toxicity of copper to aquatic organisms varies significantly not only with the species, but also with the physical and chemical characteristics of the water, such as its temperature, hardness, turbidity and carbon dioxide content. Copper concentrations varying from 0.1 to 1.0 mg/l have been found by various investigators to be not toxic for most fish. However, concentrations of 0.015 to 3.0 mg/l have been reported as toxic, particularly in soft water to many kinds of fish, crustaceans, mollusks, insects, and plankton.

12.2 Persistence / Degradability : Not biodegradable. Individual constituents are as follows :

Classification	Copper	Zinc
Persistence	log Kow -0.57 (estimate)	log Kow -0.47 (estimate)
Degradability	No data	No data

12.3 Bioaccumulative potential : No data is available on this product.

- ※ Individual constituents are as follows :

Classification	Copper	Zinc
Bioaccumulation	BCF 5830	BCF 600 (fishes)
Biodegradability	No data	Not applicable

12.4 Mobility in soil / Other adverse effects : No data is available on this product.

- ※ Individual constituents are as follows :

Classification	Copper	Zinc
Mobility in soil	No data	No data
Other adverse effects	No data	No data

## SECTION 13 : Disposal considerations

If this product becomes a waste, it DOES NOT meet the criteria of a hazardous waste as defined under 40 CFR 261, in that it does not exhibit the characteristics of hazardous waste of Subpart C, nor is it listed as a hazardous waste under Subpart D. Care must be taken to prevent environmental contamination from the use of this material. The user of this material has the responsibility to dispose of unused material, residues and containers in compliance with all relevant local, state and federal laws and regulations regarding treatment, storage and disposal for hazardous and nonhazardous wastes. This product may be a candidate for metal reclamation.

## SECTION 14 : Transport information

No data is available(=not regulated) on this product. (U.S. DOT, RID/ADR, IMDG, IATA, IMO, Canada TDG)

## SECTION 15 : Regulatory information

### 15.1 Global Inventories

Classification	Copper	Zinc
TSCA : United States	Included	Included
DSL : Canada	Included	Included
EINECS : European Union	Included	Included

## 15.2 US Federal

TSCA	The components of this product are listed on the Toxic Substance Control Act inventory.				
CERCLA:	Copper, R.Q. <sup>1)</sup> = 5000 lbs.; Zinc, R.Q. <sup>1)</sup> = 1000 lbs (No reporting is required if diameter of the pieces of metal is equal to or exceeds 100 micrometers (0.004 inches).				
SARA 313:	Copper, Zinc (dust or fume)				
SARA 313 Hazard Class:	<u>Health:</u> For dust or fume only	<u>Acute –</u> Yes, <u>Chronic –</u> Yes	<u>Fire:</u> None	<u>Reactivity:</u> None	<u>Release of Pressure:</u> None
SARA 302 EHS List:	None of the components of this product are listed.				

※ 1) RQ = Reportable Quantity

2) SARA TITLE III SECTION 302 EXTREMELY HAZARDOUS SUBSTANCES (40 CFR 355):

These alloys are not regulated under Section 302 of SARA and 40 CFR 355.

3) 15.3 SARA TITLE III SECTION 311/312 HAZARDOUS CATEGORIZATION (40 CFR 370):

OSHA defines these alloys as hazardous under 29 CFR 1910.1200(d).

4) SARA TITLE III SECTION 313 TOXIC CHEMICALS (40 CFR 372):

These alloys may contain the following toxic chemical(s) subject to reporting requirements under this section of SARA and of 40 CFR 372:

Component	CAS #	% by weight
Copper	7440-50-8	66 – 95
Zinc (fume of dust only)	7440-66-6	5 – 34

5) State Right-to-know status

Classification	*CA Prop. 65 Chemical	NJ Hazardous Substances List	PA Right-to-know List	MA Toxic Substance List	MI Critical Materials Register
Copper	Not listed	Yes	Yes	Yes	Yes
Zinc	Not listed	Yes	Yes	Yes	Yes

\* “WARNING: This product contains detectable amounts of a chemical(s) known to the State of California to cause cancer and/or birth defects or other reproductive harm.”

15.3 European Regulations : This material in its massive solid form is not required to be labeled under EC regulations.

15.4 German WGK Classification : Unknown

15.5 Canadian Regulations :

DSL LIST:	The components of this product are on the DSL or are exempt from reporting under the New Substances Notification Regulations.
IDL:	Copper
WHMIS:	This product is considered to be a manufactured article and therefore not subject to WHMIS requirements.



## 15.6 Korea

### 15.6.1 Korea Industrial Safety and Health Act :

Copper	Administered substance	Exposure limits set substance
	Working environment measurement (Measuring cycle : 6 months)	
	Special medical examination (Diagnostic cycle : 12 months)	
Zinc	Administered substance	

### 15.6.2 Korea Chemical Management Act :

Copper	No data (=not regulated)
Zinc	No data (=not regulated)

### 15.6.3 Korea Toxic Chemicals Control Act :

Copper	No data (=not regulated)
Zinc	(If it is applicable) 2 <sup>nd</sup> grade metal powder 500kg

### 15.6.4 Korea Wastes Control Act :

Copper	Specified Waste
Zinc	No data (=not regulated)

## 15.7 Other regulations :

Classification	Copper	Zinc
Korea Persistent Organic Pollutants Control Act	Not listed	Not listed
US Federal – Rotterdam Convention	Not listed	Not listed
US Federal – Stockholm Convention	Not listed	Not listed
US Federal – Montreal Protocol	Not listed	Not listed
EU Classification – General	Not applicable	F; R15–17/N; R50–53
EU Classification – Risk Phrase	Not applicable	R15, R17, R50/53
EU Classification – Safety Phrase	Not applicable	S2, S43, S46, S60, S61

## SECTION 16 : Other information

### 16.1 Reference

- 1) ICSC (1993); (<http://www.nihs.go.jp/ICSC>)
- 2) HSDB (2003)
- 3) IUCLID (2000); IUCLID5 Chemical Data Sheet, EC-ECB
- 4) SRC
- 5) ACGIH (7th;2001)
- 6) EHC200 (1998)
- 7) Metals Handbook (10th;1990) ASM
- 8) IUPAC (1992) *Pure & Appl. Chem.*
- 9) KISChem (<http://ccsms.nier.go.kr/>)
- 10) ECOTOX Database, EPA(<http://cfpub.epa.gov/ecotox>)
- 11) TOXNET, U.S. National Library of Medicine(<http://toxnet.nlm.nih.gov>)
- 12) Korea Chemical Information System, National Institute of Environmental Research (<http://ncis.nier.go.kr>)
- 13) ASTM Database (<http://www.copper.org>)

- 14) STANDARD MANUAL For Copper and Copper\_base Alloy MILL PRODUCTS (3rd: 1958) *CABRA*
- 15) MatWeb(searchable online database of material properties) (<http://www.matweb.com>)
- 16) ACGIH® Threshold Limit Values (TLV®) (2004)
- 17) Agency for Toxic Substances and Disease Registry (ATSDR):  
 Toxicological Profile for Copper, September 2002  
 Draft Toxicological Profile for Tin, September 2003  
 Draft Toxicological Profile for Zinc, September 2003
- 18) International Agency for Research on Cancer (IARC) Monographs
- 19) National Library of Medicine (NLM) Databases:  
 ChemID  
 Integrated Risk Information (IRIS)  
 International Toxicity Estimates for Risk (ITER)  
 Chemical Carcinogenesis Risk Information System (CCRIS)  
 Hazardous Substances Data Bank (HSDB)
- 20) National Toxicology Program (NTP) Reports
- 21) NIOSH Pocket Guide to Chemical Hazards (2003)
- 22) NIOSH/OSHA Occupational Health Guideline for Copper Fume
- 23) NIOSH/OSHA Occupational Health Guideline for Copper Dusts and Mists
- 24) NIOSH/OSHA Occupational Health Guideline for Inorganic Tin Compounds (as Tin)
- 25) NIOSH/OSHA Occupational Health Guideline for Zinc Oxide Fume
- 26) OSHA General Industry Standards (29 CFR 1910)
- 27) Registry of Toxic Effects of Chemical Substances (RTECS®)

16.2 Disclaimer of expressed and Implied warranties : Although reasonable care has been taken in the preparation of this document, we extend no warranties and make no representations as to the accuracy or completeness of the information contained therein, and assume no responsibility regarding the suitability of this information for the user's intended purposes or for the consequences of its use. Each individual should make a determination as to the suitability of the information for their particular purpose(s)

16.3 Issued Date : September 11, 2013

16.4 Revision No. : 2

16.5 Revision Date : Jan. 02, 2018.

16.6 Approved Date : Jan. 02, 2018.

16.7 Change Log

Rev. No.	Summary of Changes	Date
2	Changing the supplier's details(4.1).	2018.01.02
1	Changing the supplier's details(4.1) and changing the name of the law(15.6.2).	2017.04.12
0	First established.	2013.09.11

< End of MSDS >