

AA01219-0000000011

Hazard.Risk Statement	H300 : Fatal if swallowed.	
	H331 : Toxic if inhaled.	
	H350 : May cause cancer.	
	H360 : May damage fertility or the unborn child.	
	H372 : Causes damage to organs.	
	H400 : Very toxic to aquatic life.	
	H410 : Very toxic to aquatic life with long lasting effects.	
Precautionary Statement	Precautionary	P201 : Obtain special instructions before use.
		P202 : Do not handle until all safety precautions have been read and understood.

Precautionary Statement	Precautionary	P260 : Do not handle until all safety precautions have been read and understood.
		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/hearing protection/
	Response	P301+P310 : IF SWALLOWED: Immediately call a POISON CENTER/doctor
		P304+P340 : IF INHALED: Remove person to fresh air and keep comfortable for breathing.
		P308+P313 : IF exposed or concerned: Get medical advice/ attention.
		P311 : Call a POISON CENTER/doctor.
		P314 : Get medical advice/attention if you feel unwell.
		P321 : give first aid
		P330 : Rinse mouth.
		P391 : Collect spillage.
	Storage	P403+P233 : Store in a well- ventilated place. Keep container tightly closed.
		P405 : Store locked up.
	Disposal	P501 : Dispose of contents/ container to related regulations

c. Other hazards/danger not included in the hazard/danger classification criteria

In the case of dust, powder, and fine particles, there is a possibility of an explosion when in contact with an ignition source.

3. Composition/ Information on ingredients

Alloy No.	Chemical Name	Other name	CAS number	Content (%)
C3533	Copper	-	7440-50-8	59.5-64.0
	Lead	-	7439-92-1	1.5-3.5
	Tin	-	7440-31-5	-
	Asenic	-	7440-38-2	0.02-0.25
	Zinc	-	7440-66-6	32.25-38.98
C4860 (C48600)	Copper	-	7440-50-8	59.0-62.0
	Lead	-	7439-92-1	1.0-2.5
	Tin	-	7440-31-5	0.3-1.5
	Asenic	-	7440-38-2	0.02-0.25
	Zinc	-	7440-66-6	33.75-39.68
C35200	Copper	-	7440-50-8	59.5-64.0
	Lead	-	7439-92-1	0.5-3.5
	Tin	-	7440-31-5	-
	Asenic	-	7440-38-2	0.02-0.25
	Zinc	-	7440-66-6	32.25-39.98
Alloy No.	Chemical Name	Other name	CAS number	Content (%)
C48645	Copper	-	7440-50-8	60.0-63.0
	Lead	-	7439-92-1	1.0-2.5
	Tin	-	7440-31-5	0.1-1.5
	Asenic	-	7440-38-2	-
	Zinc	-	7440-66-6	33.0-38.9
CuZn36Pb2As (CW602N)	Copper	-	7440-50-8	61.0-63.0
	Lead	-	7439-92-1	1.7-2.8
	Tin	-	7440-31-5	-
	Asenic	-	7440-38-2	0.02-0.15
	Zinc	-	7440-66-6	34.05-37.28
C3531	Copper	-	7440-50-8	59.0-64.0
	Lead	-	7439-92-1	1.0-4.0
	Tin	-	7440-31-5	0.0-2.3
	Asenic	-	7440-38-2	-
	Zinc	-	7440-66-6	29.7-40.0

4. First aid measures

A. Eye contact

Get medical advice/attention if you feel unwell.

Get emergency medical action.

IF exposed or concerned: Get medical advice/attention.

In case of contact with substance, wipe from skin immediately; flush skin or eyes with running water for at least 20 minutes.

B. Skin contact

In case of contact with substance, wipe from skin immediately; flush skin or eyes with running water for at least 20 minutes.

Get emergency medical action.

IF skin irritation occurs: Get medical advice/attention.

Remove contaminated clothing and shoes and restrict entry to contaminated area

C. Inhalation

Keep victim warm and quiet.

Get medical advice/attention if you feel unwell.

Get medical advice/attention.

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.

Rinse mouth.

Get medical advice/attention.

E. Indication of immediate medical attention and notes for physician

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

Make sure healthcare professionals are aware of the substance and take protective measures.

5. Fire- Fighting measures

a) Suitable (and unsuitable) extinguishing media

Unsuitable extinguishing media : high pressure water

Using dry sand or earth during suffocation and digestion.

Using alcohol foam, carbon dioxide or water spray for digestion related to this substance.

b) Specific hazards arising from the chemical (e.g. nature of any hazardous combustion products):

Containers may explode when heated

During combustion, pyrolysis or combustion can generate irritating and highly toxic gases

May be ignited by heat, sparks or flames

Inhalation of material may be harmful

c) Special protective equipment and precautions for fire fighters

Fire involving Tanks; Cool containers with flooding quantities of water until well after fire is out

Fire involving Tanks; Always stay away from tanks engulfed in fire.

In case of fire: Use personal protective equipment as required

Spillage may cause pollution.

Do not dig and close trenches to dispose of digester water and do not scatter material.

Move containers from fire area if you can do it without risk

Extinguish the fire by leaving the area and maintaining a safe distance.

Fire involving Tanks; In case of large fires, use unmanned fire extinguishing equipment and, if this is not possible, try to evacuate and burn.

Fire involving Tanks; Withdraw immediately in case of rising sound from venting safety devices or discoloration of tank.

6. Accidental release measures

a) Personal precautions, protective equipment and emergency procedures

Wear protective gloves/protective clothing/eye protection/face protection.

Please note that materials and conditions to avoid.

Clean up spills immediately, observing precautions in Protective Equipment section.

Keep unnecessary and unprotected personnel from entering.

Restrict entry into contaminated areas.

b) Environmental precautions and protective procedures

Prevent entry to waterways.

spillage may cause pollution.

Dig a trench and cover it with wet sand or soil.

c) Methods and materials for containment and cleaning up

Absorb spills with inert material (e.g., dry sand or earth), then place in a chemical waste container.

Avoid release to the environment.

Collect spillage.

7. Handling and storage

a) Precautions for safe handling

Please work with reference to engineering controls and personal protective equipment.

Please note that materials and conditions to avoid.

Follow all MSDS/label precautions even after container is emptied because they may retain product residues.

Avoid release to the environment.

Wash the handling area thoroughly after handling.

Use with caution when handling/storing.

Obtain special instructions before use.

Keep away from heat, hot surfaces, sparks, flames, and other sources of ignition. no smoking

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

Do not handle until all safety precautions have been read and understood.

b) Conditions for safe storage (including any incompatibilities)

Store in cool and dry place

Empty drums should be completely drained, properly bunged, and promptly returned to a drum control, or properly placed.

Store locked up.

Store in a closed container.

Keep away from food and drinking water.

8. Exposure controls & personal protection

a) Control parameters (e.g. occupational exposure limit values, biological limit values)

Domestic regulations	Copper - TWA : 1 mg/m ³ , STEL : 2 mg/m ³
	Lead - TWA : 0.05 mg/m ³ , STEL : -
	Tin - TWA : 2 mg/m ³ , STEL : -
	Arsenic - TWA : 0.01 mg/m ³ , STEL : -
	Zinc - TWA : N/D , STEL : N/D
ACGIH regulations	Copper - TWA : N/D , STEL : N/D
	Lead - TWA : 0.05mg/m ³ , STEL : N/D
	Tin - TWA : N/D , STEL : N/D
	Arsenic - TWA : 0.01 mg/m ³ , STEL : N/D
	Zinc - TWA : N/D , STEL : N/D
Biological exposure standards	Copper - N/D
	Lead - 30ug/100mL Lead in blood(Sampling Time:Not critical)
	Tin - N/D
	Arsenic - Inorganic arsenic plus methylated metabolites in urine: 35 ug As/L, end of workweek (B)
	Zinc - N/D

a) Control parameters (e.g. occupational exposure limit values, biological limit values)

Other exposure criteria	Copper - N/D
	Lead - N/D
	Tin - N/D
	Arsenic - N/D
	Zinc - N/D

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 equipmen

Respiratory protection	Wear respiratory protection certified by the Korea Occupational Safety and Health Agency appropriate for the physical and chemical characteristics of the exposed substance.
eye protection	Use chemical protection glasses and safety glasses.
Hands protection	Wear suitable chemical resistant gloves.
Body protection	Wear suitable chemical-resistant protective clothing.

9. Physical and chemical properties

product properties

Division		information
a) Appearance	physical state	solid
	color	Yellow
b) Odour		odorless
c) Odour threshold		N/D
d) pH		N/D
e) Meting point/freezing point		N/D
f) Initial boiling point and boiling range		N/D
g) Flash point		N/D
h) Evaporation rate		N/D
i) Flammability (solid, gas)		N/D
j) Upper/lower flammability or explosive limits		N/D
k) Vapor pressure		N/D
l) Solubility		N/D
m) Vapor density		N/D
n) Relative density		N/D
o) Partition coefficient: n-octanol/water		N/D
p) Auto-ignition temperature		N/D
q) Decomposition temperature		N/D
r) Viscosity		N/D
s) Molecular mass		N/D

properties of each component

Ingredients	Division		information
Copper	a) Appearance	physical state	solid
		color	Red
	b) Odour		odorless
	c) Odour threshold		N/D
	d) pH		N/D
	e) Meting point/freezing point		about 1069 °C
	f) Initial boiling point and boiling range		2,595°C
	g) Flash point		N/D
	h) Evaporation rate		N/D
	i) Flammability (solid, gas))		N/D
	j) Upper/lower flammability or explosive limits		N/D

Copper	k) Vapor pressure		N/D
	l) Solubility		< 1 mg/l (30°C)
	m) Vapor density		N/D
	n) Relative density		8.78
	o) Partition coefficient: n-octanol/water		-0.57 (estimate)
	p) Auto-ignition temperature		N/D
	q) Decomposition temperature		N/D
	r) Viscosity		N/D
	s) Molecular mass		63.55
Lead	a) Appearance	physical state	solid
		color	Blue gray
	b) Odour		odorless
	c) Odour threshold		N/D
	d) pH		N/D
	e) Melting point/freezing point		about 326°C (1,013 hPa)
	f) Initial boiling point and boiling range		>600°C (1,013 hPa)
	g) Flash point		N/D
	h) Evaporation rate		N/D
	i) Flammability (solid, gas))		Not flammable
	j) Upper/lower flammability or explosive limits		N/D
	k) Vapor pressure		N/D
	l) Solubility		185mg/L(20°C, Ph)
	m) Vapor density		N/D
	n) Relative density		11.45
	o) Partition coefficient: n-octanol/water		N/D
	p) Auto-ignition temperature		N/D
	q) Decomposition temperature		N/D
	r) Viscosity		N/D
	s) Molecular mass		N/D
Tin	a) Appearance	physical state	solid
		color	White
	b) Odour		odorless
	c) Odour threshold		N/D
	d) pH		N/D
	e) Melting point/freezing point		231.9 °C
	f) Initial boiling point and boiling range		2260 °C
	g) Flash point		N/D

Ingredients	Division		information
Tin	h) Evaporation rate		N/D
	i) Flammability (solid, gas))		Combustibility (when exposed to heat in the form of dust or when spontaneously reacting with chemicals (Br2, BrF3, Cl2, ClF3, Cu(NO3), K2O2, S))
	j) Upper/lower flammability or explosive limits		N/D
	k) Vapor pressure		N/D
	l) Solubility		N/D
	m) Vapor density		N/D
	n) Relative density		7.2
	o) Partition coefficient: n-octanol/water		N/D
	p) Auto-ignition temperature		N/D
	q) Decomposition temperature		N/D
	r) Viscosity		1.85 (240°C)
	s) Molecular mass		118.71
Arsenic	a) Appearance	physical state	solid
		color	Three allotropes exist: yellow, black, and gray.
	b) Odour		odorless
	c) Odour threshold		N/D
	d) pH		N/D
	e) Melting point/freezing point		817 °C(28 atm)
	f) Initial boiling point and boiling range		1135 °F (760 mmHg, sublimated)
	g) Flash point		N/D
	h) Evaporation rate		N/D
	i) Flammability (solid, gas))		Not flammable
	j) Upper/lower flammability or explosive limits		N/D
	k) Vapor pressure		1 Pa(280°C)
	l) Solubility		10610 ug/L(20°C,pH:5.9~6.2)
	m) Vapor density		5.73 (gray arsenic)
	n) Relative density		5.6 (22.4°C, relative density)
	o) Partition coefficient: n-octanol/water		0.68 (estimate)(Log Kow)
	p) Auto-ignition temperature		> 430 °C (relative autoignition temperature)
	q) Decomposition temperature		N/D
	r) Viscosity		N/D
	s) Molecular mass		74.92

Ingredients	Division		information
Zinc	a) Appearance	physical state	solid
		color	gray
	b) Odour		odorless
	c) Odour threshold		N/D
	d) pH		N/D
	e) Meting point/freezing point		409°C (1,013hPa)
	f) Initial boiling point and boiling range		907 °C
	g) Flash point		N/D
	h) Evaporation rate		N/D
	i) Flammability (solid, gas))		Not flammable
	j) Upper/lower flammability or explosive limits		N/D
	k) Vapor pressure		N/D
	l) Solubility		N/D
	m) Vapor density		N/D
	n) Relative density		7.1
	o) Partition coefficient: n-octanol/water		N/D
	p) Auto-ignition temperature		460°C (equivalent to fine powder, etc.)
	q) Decomposition temperature		N/D
	r) Viscosity		N/D
	s) Molecular mass		N/D

10. Stability and reactivity

a) Chemical stability and possibility of hazardous reactions

May decompose at high temperatures into forming toxic gases

May decompose at high temperatures into forming toxic gases

In case of fire, irritating and toxic gas may be generated.

Inhalation of material may be harmfu

b) Conditions to avoid (e.g. static discharge, shock or vibration, etc)

Ignition sources (heat, sparks or flames)

c) Incompatible materials

Combustible substances, acids, oxidizing agents, alkalis

d) Hazardous decomposition products

Irritating, corrosive and/or toxic gases

11. Toxicological information

a) Information on the likely routes of exposure

product	N/D
Copper	N/D
Lead	N/D
Tin	N/D
Arsenic	N/D
Zinc	N/D

b) Health hazards information

Acute toxic	oral	product	N/D
		Copper	LD50 >2500mg/kg rat(male)(OECD Guideline 423)(analog: Copper oxide)(ECHA)
		Lead	LD50 >2000mg/kg rat (OECD Guideline 423)(ECHA)
		Tin	LD50 >2000 mg/kg Species : Rat (OECD TG 423, GLP)(ECHA)
		Arsenic	LD50 144 mg/kg Species : Mouse (LD50 (Rat) 15~293 mg/kg)(ECHA)
		Zinc	LD50 >2000 mg/kg bw rat (OECD Guideline 401)(ECHA)
	Percutaneous	product	N/D
		Copper	LD50 >2000mg/kg rat(OECD Guideline 402)(analog: Copper oxide)(ECHA)
		Lead	LD50 >2000mg/kg rat (OECD Guideline 402)(ECHA)
		Tin	LD50 >2000 mg/kg Species : Rat (OECD TG 402, GLP)(ECHA)
		Arsenic	N/D
		Zinc	N/D

b) Health hazards information

Acute toxic	Inhalation	product	N/D
		Copper	Dust/mist LC50 >5.11mg/L 4hr rat (OECD Guideline 436)(Coated copper flakes)(ECHA)
		Lead	Aerosol LC50 >5.05mg/L 4hr rat (OECD Guideline 403)(ECHA)
		Tin	Dust LC50 >4.75 mg/L 4 hr Species : Rat (OECD TG 403, GLP)(ECHA)
		Arsenic	Aerosol LC50 >5.05mg/L 4hr rat (OECD Guideline 403)(ECHA)
		Zinc	Dust LC50 >5.41mg/L 4hr rat (OECD Guideline 403)(ECHA)
Skin corrosive/irritant		product	N/D
		Copper	No irritation observed (Species: rabbit) (OECD Guideline 404)(read-across: Copper oxide)(ECHA)
		Lead	Except for mild erythema, no irritating symptoms were found (species: rabbit) (OECD Guideline 404) (ECHA)
		Tin	Skin corrosion/irritation test results using rabbits showed no irritation as the irritation index was 0 OECD TG 404, GLP (ECHA)

Skin corrosive/irritant	Arsenic		Result of skin corrosion/skin irritation test on human skin model, skin corrosion/irritation substance (OECD Guideline 439, GLP) (ECHA)
	Zinc		Not classified as an irritant (Species: rabbit) (ECHA)
Serious eye damage/eye irritation	product		N/D
	Copper		No irritation observed (Species: rabbit) (OECD Guideline 405) (read-across: Copper oxide) (ECHA)
	Lead		Not classified as an irritant (species: rabbit) (OECD Guideline 405) (ECHA)
	Tin		Eye damage/irritation test using rabbits showed no significant irritating effects, so no irritation OECD TG 405, GLP (ECHA)
	Arsenic		Results of a serious eye damage/eye irritation test conducted on rabbits, found to be an eye irritant (OECD Guideline 405, GLP) (ECHA)
	Zinc		Not classified as an irritant (species: rabbit) (OECD Guideline 405) (ECHA)
Respiratory sensitization	product		N/D
	Copper		N/D
	Lead		N/D
	Tin		N/D
	Arsenic		N/D
	Zinc		N/D

b) Health hazards information

Skin sensitization			product	N/D
			Copper	Not sensitizing (species: guinea pig) (OECD Guideline 406) (analog: Copper oxide) (ECHA)
			Lead	Not sensitizing (species: guinea pig)(OECD Guideline 406)(ECHA)
			Tin	Skin sensitization study, no sensitization (ECHA) based on review of human, guinea pig, rat and mouse data
			Arsenic	No sensitization, Guinea pig, Guinea pig maximization test (GMPT): Dose level: 0.01% (w/w) of NaAsO ₂ , Response: 0/20, OECD TG 406 (ECHA)
			Zinc	N/D
Carcinogenicity	IARC		product	N/D
			Copper	N/D
	IARC		Lead	2B
			Tin	N/D
			Arsenic	1
			Zinc	N/D
	NTP		product	N/D
			Copper	N/D
			Lead	R
			Tin	N/D
			Arsenic	K
			Zinc	N/D

Carcinogenicity	OSHA	product	N/D
		Copper	N/D
		Lead	N/D
		Tin	N/D
		Arsenic	N/D
		Zinc	N/D
	ACGIH	product	N/D
		Copper	N/D
		Lead	A3
		Tin	A4 (Tin and organic compounds, as Sn)
		Arsenic	A1
		Zinc	N/D
	Occupation Safety and Health Acts	product	N/D
		Copper	N/D
		Lead	Specially controlled substances
		Tin	N/D
		Arsenic	N/D
		Zinc	N/D

b) Health hazards information

Carcinogenicity	Ministry of Labor Notice	product	N/D
		Copper	N/D
		Lead	1B (Lead and its inorganic compounds) 2 (Lead metal)
		Tin	N/D
		Arsenic	1A
		Zinc	N/D
	EU CLP	product	N/D
		Copper	N/D
		Lead	N/D
		Tin	N/D
		Arsenic	N/D
		Zinc	N/D
Germ Cell Mutagenicity	product	N/D	
	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)	

Germ Cell Mutagenicity	Lead	N/D
	Tin	Results of genetic mutation test using mammalian cultured cells in vitro, negative regardless of presence or absence of metabolic activation system OECD TG 476, GLP Results of chromosomal abnormality test using mammalian cultured cells in vitro, negative regardless of presence or absence of metabolic activation system OECD TG 471, GLP Result of reverse mutation test using in vitro microorganisms, negative regardless of presence or absence of metabolic activation system OECD TG 473, GLP (ECHA)
	Arsenic	in vitro - reverse mutation test using bacteria: negative (WP2, WP6, WP10, WP44s-NF in spot test) in vivo test (dominant lethal test) positive (ECHA)
	Zinc	N/D
Reproductive toxicity	product	N/D
	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)

b) Health hazards information

Reproductive toxicity	Lead	Fertility test results showed that testosterone production could inhibit spermatogenesis in the pre-meiosis stage. At all test doses, ascorbic acid in the testes was significantly reduced, and seminiferous tubule diameter and sperm count were statistically significantly reduced (Species: rat) (ECHA) As a result of the developmental toxicity test, if metal ions are continuously present in early embryonic development, adaptation to the organizing effect may occur in sexual differentiation, which may include mechanisms similar to those in response to continuous lead exposure, delayed reproductive development, Continuous exposure to heavy metals is required for testosterone concentration to be suppressed (species: rat) (ECHA) EU CLP Category 1A
	Tin	Oral reproductive toxicity test results using rats, NOEL > 1,000 mg/kg/day (OECD TG 421) (ECHA)
	Arsenic	Inorganic arsenic does not cause malformations in humans, but urea arsenic has a teratogenic effect on human reproduction at recommended doses (NITE)
	Zinc	N/D
Specific Target Organ Toxicity (Single Exposure)	product	N/D
	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)
	Lead	No clinical observations related to acute toxicity test (ECHA)
	Tin	Classified as Category 3 (ICSC) as there are reports that it causes respiratory system irritation upon inhalation exposure.

Specific Target Organ Toxicity (Single Exposure)	Arsenic	Target organ systemic toxicity test results include conjunctivitis in the gastrointestinal tract, nasal mucosa, pharynx and bronchi, dermatitis, inflammation, thrombosis of hemoglobin, blockage of renal tubules, frequent urination or anuria, depression, and liver enlargement, irritation of nasal mucosa, larynx and bronchial tubes (toxic substance information) Summary) Not applicable to classification in this item due to acute toxic effects (NITE)
	Zinc	N/D
Specific Target Organ Toxicity (Repeated Exposure)	product	N/D
	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)
Specific Target Organ Toxicity (Repeated Exposure)	Lead	An aqueous concentration of 0.03 mg/l of oral (chronic)-lead may be considered safe for public health and may be recommended for inclusion in public health standards for drinking water (species: rat) (ECHA) Inhalation (Chronic) - A locally expressed immune response is essential for the host's defense against antigens and pathogens deposited in the lungs, and contaminants capable of inhibiting this effect can harm the health of the host. Air pollutants have been shown to reduce animal resistance to subsequent infection and pulmonary immunity (Species: mouse) (ECHA)
	Tin	There are epidemiological reports of lung damage (Stannosis) in workers handling metal tin, so it falls into Category 1. As a result of a 28-day repeated oral toxicity test using rats, no effects were observed even at the highest concentration. NOEL > 1,000 mg/kg bw/ dayOECD TG 407, GLP (NITE, ECHA)
	Arsenic	Arsenic and human gastrointestinal disorders, inorganic compounds upon repeated target organ exposure; Neurological disorders, abnormalities in the cardiovascular system, kidneys and liver observed. Not applicable for classification in this section due to carcinogenicity (NITE)
	Zinc	N/D
Aspiration hazard	product	N/D
	Copper	N/D
	Lead	N/D
	Tin	N/D
	Arsenic	N/D
	Zinc	N/D

12. Ecological information

a) Aquatic and terrestrial ecotoxicity

fish	product	N/D
	Copper	LC50 38.4~256.2µg/L 96hr Pimephales promelas (analog: copper sulfate CAS No.7758-98-7)(ECHA)
	Lead	LC50 1170µg/L 96hr Oncorhynchus mykiss (ECHA)
	Tin	LC50 > 0.0124 mg/ℓ 96 hr Pimephales promelas(OECD Guideline 203, GLP)(ECHA)
	Arsenic	LC50 10.3 mg/ℓ 4 day Morone saxatilis(ASTM, US EPA, 1975, GLP)(ECHA)
	Zinc	LC50 439µg/L 96hr (ECHA)
Crustacean	product	N/D
	Copper	48hr-EC50 7.7~430ug/L Daphnia magna (OECD202) (Copper(II)chloride dihydrate)
	Lead	48hr-EC50 26ug/L Ceriodaphnia dubia (Lead nitrate)(US EPA(1993))
	Tin	N/D
	Arsenic	LC50 0.426 mg/ℓ 7 day Hyalella azteca (ECHA)
	Zinc	48hr-LC50 0.413mg/L Daphnia magna (US EPA EPA 821-R-02-012)(ECHA)
Algae	product	N/D
	Copper	EC50 32~245µg/L 72hr Pseudokirchneriella subcapitata (analog: Copper sulphate pentahydrate CAS No. 7758-99-8)(ECHA)
Algae	Lead	EC50 123µg/L 72hr Pseudokirchneriella subcapitata (ECHA)
	Tin	EC50 > 0.0192 mg/ℓ 72 hr Other (Pseudokirchnerella subcapitata, OECD TG 201, GLP, poorly soluble substance, no significant effect observed) (ECHA)
	Arsenic	NOEC 0.04 mg/ℓ 42 hr Macrocystis pyrifera (ECHA)
	Zinc	N/D

b) Persistence and degradability

Persistence	product	N/D
	Copper	N/D
	Lead	N/D
	Tin	N/D
	Arsenic	0.68 log Kow (estimate)(EPISUITE)
	Zinc	N/D
degradability	product	N/D
	Copper	N/D
	Lead	N/D
	Tin	N/D
	Arsenic	(Recalcitrable substances) (NCIS)
	Zinc	N/D

c) Bioaccumulative potential

bioaccumulation	product	N/D
	Copper	N/D
	Lead	BCF 1553 (ECHA)
	Tin	N/D
	Arsenic	0.143 BSAF (dimensionless number) (ECHA)
	Zinc	N/D
biodegradability	product	N/D
	Copper	N/D
	Lead	N/D
	Tin	N/D
	Arsenic	N/D
	Zinc	N/D

d. Mobility in soil

product	N/D
Copper	N/D
Lead	N/D
Tin	N/D
Arsenic	N/D
Zinc	N/D

e) Other adverse effects

product	N/D
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)
Lead	N/D
Tin	CrustaceansCeriodaphnia dubia: LOEC = 200 µg/L 7d EPA 1002.0 (ECHA)
Arsenic	N/D
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)

13. Disposal considerations

a) Disposal method

Dispose of contents/container in accordance with waste regulations. In the case of workplace waste, it must be confirmed whether it falls under the category of designated waste according to Article 3 of the Waste Management Act Enforcement Order, and it must be disposed of in accordance with relevant laws and regulations.

b) Disposal precaution (including the disposal method of contaminated container and packaging)

Dispose of contents and container in accordance with relevant regulations. Recyclable waste must be recycled in accordance with Article 13-2 of the Act.

14. Transport information

a) UN number

N/D

b) UN proper shipping name

N/D

c) Transport hazard class

N/D

d) Packing group

e) Marine pollution

N/A

f) Special precaution which a user to be aware of or needs to comply with in connection with transport or conveyance either within or outside their premises

Emergency measures in case of fire

N/D

Emergency measures in case of spill

N/D

15. Regulatory information

a) Industrial Safety and Health Act

Hazardous substances subject to management (mixtures containing more than 1% of hazardous substances subject to management) (Copper,Tin ,Zinc)

Substances subject to work environment measurement (mixtures containing more than 1% of substances subject to work environment measurement) (Copper,Lead ,Tin ,Arsenic ,Zinc)

Harmful factors subject to special medical examination (mixture containing 1% or more of harmful factors subject to special medical examination) (Copper,Tin ,Arsenic ,Zinc)

Substances for which exposure standards are set (Copper,Lead ,Tin ,Arsenic ,Zinc)

Substances for which acceptance criteria are set (Lead)

b) Toxic Chemical Control Act

Restricted Substance (06-5-8: Lead and mixtures containing more than 0.06% of lead) Restricted Substance (06-5-8: Lead and mixtures containing more than 0.06% of lead) (Lead) Restricted Substance (06-5-8: Lead and mixtures containing more than 0.06% of lead) Restricted substances (06-5-8: Lead and mixtures containing more than 0.06% of lead) (Lead)

c) Dangerous Material Safety Control Act

Not applicable

d) Wastes Management Act

industrial waste

e) Other requirements in domestic and other countries

domestic regulation N/D

	- OSHA : N/A
	- CERCLA : Copper(2270 kg (5000 lb) Lead(4.54 kg (10 lb)) Arsenic(0.454 kg (1 lb))
	- EPCRA 302 : N/A
	- EPCRA 304 : N/A
foreign regulation	- EPCRA 313 : Copper(regulated),Lead(regulated),Zinc(regulated) Arsenic(regulated)
	- Rotterdam Convention : Arsenic(regulated)
	- Stockholm Convention : N/A
	- Montreal Protocol : N/A
	- EU Classification information : Copper(Aquatic Chronic 2(H411))

16. Other information

a) Information source and references

N/D

b) Issuing date

2013-04-12

c) Revision number and date

Revision			
number :	1	date :	2023-12-15

d) others

N/D