| POONGSAN | SDS<br>( SAFETY DATA SHEET ) | | |
|---|---|---|---|
| Product name | Cupro-Nickel 90/10 | Date of first creation | 2022. 03. 25 |
| | | Revision No. | 4 |
| Control No. | PS-SDS-19 | Date of last revision | 2026. 06. 25 |
| MSDS Submission No. | AA07087-0000000057 | Date of validation | 2026. 06. 25 |

## SECTION 1 Identification of the substance or mixture and of the supplier

A. product name: Cupro-Nickel 90/10
* Product Specification: C70600

B. Recommended use of the chemical and restrictions on use
* Recommended use: Heat exchanger, Constructions, Coins, Other Parts
* Restrictions on use: Not available

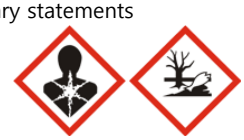
C. Manufacturer / Importer / Distributor Information
* Company name: Poongsan Ulsan Plant
* Address: 94 Sanam-ro Onsan-eup, Ulju-gun, Ulsan
* Emergency phone number: +82) 52 - 231 - 9114 (representative telephone), FAX: +82) 52 - 231 - 9400
* Department in charge: Quality Assurance Team

**※ This products are solid metallic products which do generally constitute a non hazardous materials in solid.**
**However some hazardous elements contained in these products can be emitted under ceratin processing conditions such as but not limited to: burning, melting, cutting, grinding, machining and welding.**
**The following information is for the hazardous elements which may be released during processing.**

## SECTION 2 Hazards identification

A. GHS classification of the substance/mixture
Carcinogenicity : Category 1A
Specific target organ toxicity(Repeated exposure) : Category 1
Acute aquatic toxicity : Category 1
Chronic aquatic toxicity : Category 1

B. GHS label elements, including precautionary statements
* Pictogram and symbol



* Signal word: Danger
* Hazard statements
H350 May cause cancer
H372 Causes damage to organs through prolonged or repeated exposure
H400 Very toxic to aquatic life
H410 Very toxic to aquatic life with long-lasting effects
* Precautionary statements
- Precaution
P201 Obtain special instructions before use.
P202 Do not handle until all safety precautions have been read and understood.
P260 Do not breathe dust/fume/gas/mist/vapours/spray.
P264 Wash thoroughly after handling.
P270 Do no eat, drink or smoke when using this product.
P273 Avoid release to the environment.
P280 Wear protective gloves/protective clothing/eye protection/face protection/hearing protection.
- Treatment
P314 Get medical advice/attention if you feel unwell.
P391 Collect spillage.
P308+P313 IF exposed or concerned: Get medical advice/attention.
- Storage
P405 Store locked up.
- Disposal
P501 Dispose of contents/container to an approved waste disposal plant.

C. GHS label elements, including precautionary statements In the case of dust, powder, and fine particles, there is a possibility of

an explosion when in contact with an ignition source

## SECTION 3 Composition/information on ingredients

| Alloy no. | Chemical Name | Common Name(Synonyms) | CAS number | Content (%) |
|---|---|---|---|---|
| C70600 | Copper | - | 7440-50-8 | 86.5~88.0 |
| | Nickel | - | 7440-02-0 | 10.2~10.8 |
| | Iron | - | 7439-89-6 | 1.2~1.7 |
| | Manganese | | 7439-96-5 | 0.6~1 |

※ In addition to the above ingredients, small amounts of other ingredients may be included as impurities.

## SECTION 4 First aid measures

A. Eye contact
Call emergency medical service.
In case of contact with substance, wipe from skin immediately; flush skin or eyes with 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 pearlite, 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 or 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 equipmen 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)<br>TWA 0.1mg/$m^3$ (fume) |
| Nickel | TWA 0.1mg/$m^3$ (soluble compounds)<br>TWA 0.2mg/$m^3$ (Insoluble inorganic compounds)<br>TWA 1mg/$m^3$ (metal) |
| Iron | TWA 1mg/$m^3$ |
| Manganese | TWA 1mg/$m^3$ (inorganic compounds)<br>TWA 1mg/$m^3$, STEL 3mg/m3 (fume) |

* ACGIH regulation

| | |
|---|---|
| Copper | TWA 0.2mg/$m^3$ (fume)<br>TWA 1mg/$m^3$ (metal dust) |
| Nickel | TWA insoluble inorganic compounds (NOS): 0.2 mg/$m^3$ (inhalable particulate matter)<br>TWA elemental: 1.5 mg/$m^3$ (inhalable particluate matter) |
| Manganese | TWA 0.1mg/$m^3$ (inhalable)<br>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-putifying 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

An eye wash unit and safety shower station should be available nearby work place.

| | |
|---|---|
| * Hand protection | 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 | Solid |
| * Color | White |
| B. Odor | Odorless |
| C. Odor threshold | Not available(No Data) |
| D. pH | Not available(No Data) |
| E. Melting point/freezing point | 1149℃ |
| 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) | Not available(No Data) |
| 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 | 8.94 (Water=1) |
| O. Partition coefficient n-octanol/water | Not available(No Data) |
| P. Auto ignition temperature | Not available(No Data) |
| 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

| | |
|---|---|
| A. Chemical stability and Possibility of hazardous reactions | May decompose at high temperatures into forming toxic gases.<br>Stable at room temperature, normal pressure and normal use.<br>Inhalation of material may be harmful.<br>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

A. Information of Health Hazardous

* Acute toxicity

- Oral **ATEmix >2000 (mg/kg) → Not classified**

| | |
|---|---|
| Copper | LD50 >2500mg/kg rat(male)(OECD Guideline 423)(read-aross: Copper oxide)(ECHA) |
| Nickel | LD50 > 9000 mg/kg bw rat(OECD Guideline 401)(ECHA) |
| Iron | LD50 98600 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-aross: Copper oxide)(ECHA) |
| Nickel | Not available(No Data) |
| Iron | 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) |
| Nickel | NOAEC >10.2mg/L 1hr rat(ECHA) |
| Iron | Not available(No Data) |
| Manganese | LC50 >5.14mg/L 4hr rat (ECHA) |

* Skin corrosion/ irritation **Not classified**

| | |
|---|---|
| Copper | No irritation observed (Species: rabbit) (OECD Guideline 404) (read-aross: Copper oxide) (ECHA) |
| Nickel | Not classified as an irritant (Species: rabbit)(OECD Guideline 404)(ECHA) |
| Iron | Not classified as an irritant (species : rabbit) (read-across: Bayferrox VP AC 5122 M) (OECD Guideline 404)(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-aross: Copper oxide) (ECHA) |
| Nickel | Not classified as an irritant (species: rabbit) (OECD Guideline 405) (ECHA) |
| Iron | Not classified as an irritant (species : rabbit) (read-across: Bayferrox VP AC 5122 M) (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) |
| Nickel | Not available(No Data) |
| Iron | Not available(No Data) |
| Manganese | Not sensitizing (species: guinea pig) (OECD Guideline 429,EU Method B.42)(ECHA) |

* Carcinogenicity **Category 1A**

- OCCUPATIONAL SAFETY AND HEALTH ACT: Nickel: (SMM; Special Management Materials)
- Notification of Ministry of Employment and Labor: Nickel: 1A
- IARC: Nickel: 2B
- OSHA: Not classified
- ACGIH: Nickel: A5<br>Manganese: A4
- NTP: Nickel: R
- EU CLP: 2

* Mutagenicity **Not classified**

| | |
|---|---|
| Copper | in vitro- gene mutation study in bacteria results :<br>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)<br>in vivo- mammalian somatic cell study: cytogenicity / erythrocyte micronucleus results<br>NEGATIVE(Species: mouse)(EU Method B.12)(read-across: Copper sulphate pentahydrate CAS No. 7758-99-8)(ECHA) |
| Nickel | in vitro- gene mutation study in mammalian cells results : NEGATIVE(Species : Chinese hamster lung fibroblasts)(OECD Guideline 476)(ECHA)<br>in vitro-cytogenicity / micronucleus study results : NEGATIVE(Species : Chinese hamster lung fibroblasts)(OECD Guideline 487)(ECHA) |
| Iron | in vitro- gene mutation study in bacteria : NEGATIVE(Species: S. typhimurium TA97a, TA98, TA 100, TA102, TA1535, TA1537 & TA1538)(read-across:carbonyl iron)(ECHA) |
| 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)<br>(read-across: Copper sulphate pentahydrate CAS No. 7758-99-8) (ECHA)<br>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)<br>(read-across: copper ( 1+) hydroxide CAS No. 1344-69-0) (ECHA) |
| Nickel | Embryotoxic / teratogenic effects:no effects (ECHA) |
| Iron | 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<br>(read-across: Copper sulphate pentahydrate) (ECHA) |
| Nickel | Not available(No Data) |
| Iron | Not available(No Data) |
| Manganese | Not available(No Data) |

* Specific target organ toxicity (repeat exposure) — **Category 1**

| | |
|---|---|
| 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)<br>(read-across: Copper sulphate pentahydrate CAS No. 7758-99-8) (ECHA)<br>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) |
| Nickel | Oral- LOAELs were 2.2 mg/kg bw/day and 6.7 mg/kg bw/day (species: rat)(ECHA)<br>Inhalation- Causes damage to organs through prolonged or repeated exposure |
| Iron | Inhalation- Not classified as no serious effects were observed as a result of the test<br>(Species: rat) (ECHA) |
| 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<br>(read-across: copper sulfate CAS No. 7758-98-7)(ECHA) |
| Nickel | LC50 > 15.3 mg/L 96hr Oncorhynchus mykiss (read-across: nickel dichloride CAS No. 7718-54-9)(ECHA) |
| Iron | Not available(No Data) |
| Manganese | LC50 > 3.6 mg/L 96hr Oncorhynchus mykiss (ECHA) |

* Crustacean

| | |
|---|---|
| Copper | EC50 31.8μg/L 48hr Ceriodaphnia dubia(ECHA) |
| Nickel | LC50 > 13 mg/L 48hr Ceriodaphnia dubia (read-across: nickel dichloride CAS No. 7718-54-9)(ECHA) |
| Iron | Not available(No Data) |
| Manganese | EC50 > 1.6 mg/L 48hr Daphnia magna(OECD Guideline 202)(ECHA) |

* Algae

| | |
|---|---|
| Copper | EC50 32~245μg/L 72hr Pseudokirchneriella subcapitata<br>(read-across: Copper sulphate pentahydrate CAS No. 7758-99-8)(ECHA) |
| Nickel | EC50 81.5~148μg/L 72hr Pseudokirchneriella subcapitata (read-across: Nickel chloride CAS No. 7718-54-9)(ECHA) |
| Iron | Not available(No Data) |
| Manganese | EC50 4.5 ㎎/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)<br>(read-across: Copper (II) chloride dihydrate CAS No. 10125-13-0)(ECHA)<br>Crustacean: NOEC 21.5~181μg/L 21day Daphnia magna (OECD Guideline 211)<br>(read-across: Copper sulphate CAS No. 7758-98-7)(ECHA)<br>Algae: NOEC 37.6~170.8μg/L 72hr Pseudokirchneriella subcapitata<br>(read-across: copper chloride)(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<br>* in case of fire<br>* in case of leakage | Not regulated |

## SECTION 15 Regulatory information

A. Korea Regulatory information

| | |
|---|---|
| - Regulations under the Occupational Safety and Health Act | Hazardous substances subject to management<br>(Mixtures containing 1% or more of hazardous substances subject to management)<br>Substances subject to work environment monitoring<br>(Mixtures containing 1% or more of substances subject to work environment monitoring)<br>Hazardous factors subject to special health examinations<br>(Mixtures containing 1% or more of hazardous factors subject to special health examinations)<br>Substances with established exposure limits<br>(Copper, Nickel, Manganese)<br>Substances with established permissible exposure limits<br>(Nickel) |
| - Regulations under the Chemicals Control Act | Not applicable |
| - Regulations under the Act on Registration and Evaluation of Chemicals | Not applicable |
| - Regulations under the Dangerous Substances Safety Management Act | Not applicable |
| - Regulations under the Waste Control Act | Industrial waste |

B. U.S.A Regulatory information & Other regulations
* U.S.A Regulatory information

| | |
|---|---|
| - U.S.A management information (CERCLA Regulation) | Copper(2270 kg (5000 lb))<br>Nickel(45.3599 kg (100 lb)) |
| - U.S.A management information (EPCRA 302 Regulation) | Not regulated |
| - U.S.A management information (EPCRA 304 Regulation) | Not regulated |
| - U.S.A management information (EPCRA 313 Regulation) | Copper(regulated)<br>Nickel(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) | Nickel(Carc. 2 STOT RE 1 Skin Sens. 1) |

| **SECTION 16** | **Other information** |
|---|---|
| A. Information source and references | CAMEO Chemicals (steam pressure)<br>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)<br>ECHA Registered substances(Weight, characteristics)<br>EPISUITE(Partition coefficient n-octanol / water (kow))<br>HSDB(Odor, color, initial boiling point and boiling point range))<br>ICSC(solubility)<br>pubchem(molecular weight)<br>Self test analysis data (Ulsan site Quality Assurance Team) |
| B. Issuing date | March 25, 2022 |
| C. Revision number and date | |
| * revision number | Ver. 4 |
| * date of the latest revision | June 25, 2026 |
| D. Others | This Material Safety Data Sheet (SDS) is prepared according to the GHS (Globally Harmonized System of Classification and Labeling of Chemicals) standards of Korea.<br>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.<br>In addition, this information may be revised without prior notice, and materials can be provided through our website (www.poongsan.co.kr).<br>For other details, please contact our Safety Environment Team or Quality Assurance Team. |