

COPPER METAL MATERIAL SAFETY DATA SHEET

SECTION 1. PRODUCT AND COMPANY IDENTIFICATION

Product Identity: Copper Metal

Manufacturer:

Teck Advanced Materials Inc.
13670 Danielson Street
Suite H & I
Poway, CA 92064
Emergency Telephone: 858-391-2935

Supplier:

Teck Advanced Materials Inc.
13670 Danielson Street
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Poway, CA 92064

MSDS Preparer:

Teck Metals Ltd.
3300 – 550 Burrard Street
Vancouver, British Columbia
V6C 0B3

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Product Use: Copper is used in the manufacture of bronzes, brass, other copper alloys, and electrical conductors.

SECTION 2. COMPOSITION / INFORMATION ON INGREDIENTS

Ingredient	Approximate Percent by Weight	CAS Number	Occupational Exposure Limits (OELs)	LD ₅₀ / LC ₅₀ Species and Route
Copper	>99.9%	7440-50-8	OSHA PEL 0.1 mg/m ³ fume 1.0 mg/m ³ dusts/mists ACGIH TLV 0.2 mg/m ³ fume 1.0 mg/m ³ dusts/mists NIOSH REL 0.1 mg/m ³ (Respirable) fume 1.0 mg/m ³ dusts/mists	LD ₅₀ , mouse, oral >5,000 mg/kg

NOTE: OELs for individual jurisdictions may differ from OSHA PELs. Check with local authorities for the applicable OELs in your jurisdiction. OSHA - Occupational Safety and Health Administration; ACGIH - American Conference of Governmental Industrial Hygienists; NIOSH - National Institute for Occupational Safety and Health. OEL - Occupational Exposure Limit, PEL - Permissible Exposure Limit, TLV - Threshold Limit Value, REL - Recommended Exposure Limit.

Trade Names and Synonyms: Cu-CATH-1; Copper Cathode (Higher Purity Grade).

SECTION 3. HAZARDS IDENTIFICATION

Emergency Overview: Reddish metal that does not burn in bulk. Copper dust clouds will not explode readily, if at all, in air. Due to its high melting point, molten copper metal is unlikely to be a risk in most fire situations. This metal is relatively non-toxic and poses little immediate hazard to personnel or the environment in an emergency situation.

Potential Health Effects: Inhalation of dust may result in irritation of the nasal mucous membranes. Inhalation of copper oxide fumes may cause irritation of the upper respiratory tract and may result in a form of metal fume fever, characterized by flu-like symptoms such as chills, fever, nausea, and vomiting. Ingestion of copper metal may cause nausea, vomiting, diarrhea, headaches, dizziness, and gastrointestinal irritation. Copper particles embedded in the eye may cause redness, pain and discoloration of ocular tissue. Direct skin contact may result in irritation in some workers. Discoloration of the skin has been observed from handling copper, but does not indicate any actual injury. Copper is not listed as a carcinogen by OSHA, the NTP, the ACGIH, IARC, or the EU (see Toxicological Information, Section 11).

Potential Environmental Effects: Copper is relatively insoluble in water and, therefore, likely has low bioavailability. However, long-term exposure in aquatic and terrestrial environments or processing of the product can lead to the release of the constituent copper compounds in more bioavailable forms. These bioavailable forms have the potential to yield toxic effects on aquatic organisms (see Ecological Information, Section 12).

EU GHS CLP Classification: Copper metal is not classified.

SECTION 4. FIRST AID MEASURES

Eye Contact: Do not allow victim to rub eye(s). Let the eye(s) water naturally for a few minutes. If particle/dust does not dislodge, flush with lukewarm, gently flowing water for five minutes or until particle/dust is removed, while holding eyelid(s) open. If irritation persists, immediately obtain medical attention. DO NOT attempt to manually remove anything stuck to the eye, but rather seek immediate medical attention in this case.

Skin Contact: *Dust:* No health effects expected. If irritation does occur, flush with lukewarm, gently flowing water for 5 minutes. If irritation persists, obtain medical advice. *Molten Metal:* Flush contact area to solidify and cool but do not attempt to remove encrusted material or clothing. Cover burns and seek medical attention immediately.

Inhalation: Remove source of contamination or move victim from exposure area to fresh air. Obtain medical advice. NOTE: Metal fume fever may develop 3-10 hours after exposure. If symptoms of metal fume fever (flu-like symptoms) develop, obtain medical attention.

Ingestion: Never give anything by mouth if victim is rapidly losing consciousness, or is unconscious or convulsing. Have victim rinse mouth thoroughly with water. DO NOT INDUCE VOMITING. Have victim drink 2 – 8 oz. (60 – 240 ml) of water. If vomiting occurs naturally, have victim rinse mouth with water again. Obtain medical advice and bring a copy of this MSDS.

SECTION 5. FIRE FIGHTING MEASURES

Fire and Explosion Hazards: Massive metal is not considered a fire or explosion hazard. Finely-divided copper metal dust or powder has also been demonstrated to be non-flammable in laboratory testing. Explosions may occur however upon contact with certain incompatible materials (see Stability and Reactivity, Section 10).

Extinguishing Media: Use any means of extinction appropriate for the surrounding fire conditions such as water spray, carbon dioxide, dry chemical, or foam.

Fire Fighting: If possible, move solid materials from fire area. Cool any materials that are exposed to heat or flames by the application of water streams until well after the fire has been extinguished. Copper metal has a high melting point, and is unlikely to melt except in the most extreme fire conditions. If molten metal is present, do not use direct water streams on fires, due to the risk of a steam explosion that could potentially eject molten metal uncontrollably. Use a fine water mist on the front-running edge of the spill and on the top of the molten metal to cool and solidify it. Fire fighters must be fully trained and wear full protective clothing including an approved, self-contained breathing apparatus which supplies a positive air pressure within a full face-piece mask.

Flashpoint and Method: Not Applicable.

Upper and Lower Flammable Limit: Not Applicable.

Autoignition Temperature: Not Applicable.

SECTION 6. ACCIDENTAL RELEASE MEASURES

Procedures for Cleanup: Control source of spillage if possible to do so safely. Clean up spilled material immediately, observing precautions in Section 8, Personal Protection. Molten metal should be allowed to cool and harden before cleanup. Once solidified wear gloves, pick up and return to process. Powder or dust should be cleaned up using methods which will minimize dust generation (e.g., vacuum solids, dampen material and shovel or wet sweep). Return uncontaminated spilled material to the process if possible. Place contaminated material in suitable labelled containers for later recovery in view of the commercial value of copper. Treat or dispose of waste material in accordance with all local, state/provincial, and national requirements.

Personal Precautions: Persons responding to an accidental release should wear protective clothing, gloves and a respirator in the event of a molten metal spill (see also Section 8). Close-fitting safety goggles may be necessary in some circumstances to prevent eye contact with dust and fume. Where molten metal is involved, wear heat-resistant gloves and suitable clothing for protection from hot-metal splash and radiant heat.

Environmental Precautions: Copper compounds, while not readily bioavailable in the environment, have the potential to pose ecological effects to aquatic life forms under certain chemical conditions. Releases of the product to water and soil should, therefore, be prevented.

SECTION 7. HANDLING AND STORAGE

Store copper in a dry, covered area. Copper cathodes suspected of containing moisture should be THOROUGHLY DRIED before being added to a molten bath. Cathodes may contain cavities that collect moisture. Entrained moisture will expand explosively when immersed in a molten bath and potentially spatter molten metal out of the bath. Always practice good personal hygiene. Refrain from eating, drinking, or smoking in work areas. Thoroughly wash hands before eating, drinking, or smoking in appropriate, designated areas.

EU GHS CLP Precautionary Statements: Copper metal is not classified.

SECTION 8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Protective Clothing: Gloves and coveralls or other work clothing are recommended to prevent prolonged or repeated direct skin contact when copper is processed. Appropriate eye protection should be worn where fume or dust is generated. Where hot or molten metal is handled, heat resistant gloves, goggles or faceshield, and clothing to protect from hot metal splash and radiant heat should be worn. Safety type boots are recommended.

Ventilation: Use adequate local or general ventilation to maintain the concentration of copper (as either dust or fumes) in the working environment well below recommended occupational exposure limits. Supply sufficient replacement air to make up for air removed by the exhaust system.

Respirators: Where copper dust or fumes are generated and cannot be controlled to within acceptable levels by engineering means, use appropriate NIOSH-approved respiratory protection equipment (a 42CFR84 Class N, R or P-95 particulate filter cartridge or better).

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance: Reddish metal	Odour: None	Physical State: Solid	pH: Not Applicable
Vapour Pressure: 1 mm at 1083°C Negligible @ 20°C	Vapour Density: Not Applicable	Boiling Point/Range: 2595° C	Melting Point/Range: 1083° C
Specific Gravity: 8.94	Evaporation Rate: Not Applicable	Coefficient of Water/Oil Distribution: Not Applicable	Odour Threshold: None
Solubility: Insoluble in water			

SECTION 10. STABILITY AND REACTIVITY

Stability & Reactivity: Copper is stable and not considered reactive under normal temperatures and pressures. Hazardous polymerization or runaway reactions will not occur.

Incompatibilities: Copper is incompatible with nitric acid, acetylene, chlorine, fluorine, chlorine trifluoride, and peroxides. Shock-sensitive compounds are formed with acetylenic compounds, ethylene oxide or azide compounds. Copper in finely-divided powder or granular form reacts with strong oxidants like chlorates, bromates, iodates and ammonium nitrate, causing a potential explosion hazard.

Hazardous Decomposition Products: High temperature operations such as oxy-acetylene cutting, electric arc welding, arc-air gouging or overheating a molten metal bath may generate fumes. The fumes will contain copper oxides, which, on inhalation in sufficient quantity, can produce metal fume fever.

SECTION 11. TOXICOLOGICAL INFORMATION

General: Copper is an essential element, but can become toxic when inhaled or ingested in large doses. Most reports of acute toxicity are from suicidal attempts involving ingestion of copper sulphate. Individuals with a rare disorder called "Wilson's Disease" (estimated prevalence 0.003% of the population) are predisposed to accumulate copper and should not be occupationally exposed. However, in the form in which this product is sold it is relatively non-toxic. The major route of exposure would be through the generation and inhalation of copper oxide fume.

Acute:

Skin: Copper metal is not irritating to skin other than by direct abrasive action of metal particles on skin tissue.

Eye: Contact with dust or fume may cause local irritation. Embedded copper particles in the eye result in a brownish or green-brown discoloration of the cornea, lens and iris (chalcosis) which may progress to serious ocular complications.

Inhalation: An intense, short-term exposure to fumes from cutting or welding, etc. could result in the condition called metal fume fever. The symptoms of metal fume fever generally occur within 3 to 10 hours. They may include immediate dryness and irritation of the throat, metallic taste, tightness of the chest, and coughing that may later be followed by flu-like symptoms of fever, malaise, perspiration, frontal headache, muscle cramps, low back pain, occasionally blurred vision, nausea, and vomiting. Those experiencing a single acute episode of metal fume fever generally recover slowly but without apparent residual effects. Copper dust may be irritating to the nasal passages and the throat with a sweetish, metallic taste and excessive salivation.

Ingestion: Individuals reported to have ingested large quantities of copper salts have reported gastrointestinal effects including vomiting, diarrhea, nausea, malaise, anorexia, abdominal pain and a metallic taste in the mouth. Effects on the kidneys and liver, and even death have also been reported in severe cases of copper poisoning. However, copper is a strong emetic and spontaneous vomiting following ingestion usually limits uptake of copper.

Chronic:

Prolonged exposure to copper dust or fume can cause irritation to the eye and skin. A green discoloration of the skin has been reported similar to that sometimes experienced from copper jewelry. This green discoloration may occasionally also be seen in hair (particularly noticeable in blonde hair), nails and teeth. A few instances of allergic contact dermatitis have been reported. Copper is not listed as a human carcinogen by the Occupational Safety and Health Administration (OSHA), the National Toxicology Program (NTP), the International Agency for Research on Cancer (IARC), the American Conference of Governmental Industrial Hygienists (ACGIH) or the European Union (EU).

SECTION 12. ECOLOGICAL INFORMATION

Copper metal is relatively insoluble in water and, therefore, generally has low bioavailability. However, long-term exposure in aquatic and terrestrial environments or processing of the product can lead to the release of the constituent copper compounds in more bioavailable forms. These more bioavailable forms have the potential to yield toxic effects under specific chemical conditions (e.g., low pH). The mobility of the copper compounds in soluble forms is also media-dependent. They can bind with inorganic and organic ligands, reducing their mobility and bioavailability in both soil and water. Bioavailability is also regulated by other factors in the aquatic environment, such as hardness and dissolved organic carbon content.

SECTION 13. DISPOSAL CONSIDERATIONS

If material cannot be returned to process or salvage, dispose of in accordance with applicable regulations.

SECTION 14. TRANSPORT INFORMATION

No special shipping or transportation requirements in ingot form.

SECTION 15. REGULATORY INFORMATION

U.S.

Ingredient Listed on TSCA Inventory Yes

Hazardous Under Hazard Communication Standard..... Yes

CERCLA Section 103 Hazardous Substances Yes..... RQ: 5,000 lbs. (2270 kg.)*

*reporting not required when diameter of the pieces of solid metal released is equal to or exceeds 100 micrometers (0.004 inches).

EPCRA Section 302 Extremely Hazardous Substance No

EPCRA Section 311/312 Hazard Categories..... No Hazard Categories Apply

EPCRA Section 313 Toxic Release Inventory Copper CAS No. 7440-50-8
Percent by Weight - At least 99%

CANADIAN:

WHMIS Classification Not applicable. Copper is not a controlled product under WHMIS. This Material Safety Data Sheet is provided for information purposes only.

EUROPEAN UNION:

Listed on the European Inventory of Existing
Commercial Chemical Substances (EINECS): Yes

EU GHS CLP CLASSIFICATION:..... Not classified.

SECTION 16. OTHER INFORMATION

The information in this Material Safety Data Sheet is based on the following references:

- American Conference of Governmental Industrial Hygienists, 2004, Documentation of the Threshold Limit Values and Biological Exposure Indices, 7th Edition plus updates.
- American Conference of Governmental Industrial Hygienists, 2012, Guide to Occupational Exposure Values.
- BIA Report 13/97 – Combustion and Explosion Characteristics of Dusts – Table 2 Product Group: Metals and Alloys.
- Bretherick's Handbook of Reactive Chemical Hazards, 20th Anniversary Edition (P. G. Urben, Ed.) 1995.
- Canadian Centre for Occupational Health and Safety CHEMINFO Record No: 2073, Copper - *Last Revised 2005-03*.
- Commission de la santé et la sécurité du travail, Service du répertoire toxicologique, Cuivre , 2010-07.
- European Regulation (EC) No 1272/2008 on classification, labelling and packaging of substances and mixtures, amending and repealing directives 67/548/EEC and 1999/45/EC, and amending Regulation (EC) No 1907/2006 (REACH).
- Explosion Temperatures of Metals and Other Elemental Dust Clouds, Kenneth L. Cashdollar & Isaac A. Zlochower, J. of Loss Control In the Process Industries, 20, (2007) 337 – 348.
- Industry Canada, Controlled Products Regulations SOR/88-66, as amended.
- Industrial Toxicology 3rd Edition: Alice Hamilton & Harriet L Hardy, Publishing Sciences Group, Inc. (1974).
- International Chemical Safety Cards (WHO/IPCS/ILO) ICSC:0240 – Copper (Revised Sept 1993).
- International Labour Office (WHO/ILO) Encyclopedia of Occupational Health & Safety 4th Ed. CD-ROM Version (1998).
- Merck & Co., Inc., 2001, The Merck Index, An Encyclopedia of Chemicals, Drugs, and Biologicals, Thirteenth Edition.
- National Library of Medicine, Hazardous Substance Data Bank (*last accessed 2010 -02-03*).
- National Oceanic and Atmospheric Administration, Office of Response and Restoration, CAMEO Chemicals – Database of Hazardous Materials [<http://www.cameochemicals.noaa.gov/>] *last accessed 2010-02-03*.
- Patty's Toxicology, 5th Edition, (E Bingham, B Cohnssen & C H Powell, Ed.) 2001.
- The Chemistry of Industrial Toxicology: Hervey B Elkins, John Wiley & Sons, New York (1959).
- Toxicology of the Eye, 2nd Ed. W. Morton Grant, MD, Charles C. Thomas , Publishers; Springfield. IL (1974).
- University of Pittsburgh Safety Manual, EHS Policy # 02-005 – Combustible Metals – 01 Jan 2007.
- U.S. Dept. of Health and Human Services, Public Health Service, Agency for Toxic Substances and Disease Registry, Toxicological Profile for Copper (Sept 2004).
- U.S. Dept. of Health and Human Services, National Institute for Occupational Safety and Health, NIOSH Pocket Guide to Chemical Hazards. CD-ROM Edition September 2005.
- U.S. Dept. of Health and Human Services, National Institute for Occupational Safety and Health, Registry of Toxic Effects of Chemical Substances (RTECS) CCOHS Web Access subscription. Accessed 8 Mar 2013.
- U.S. Occupational Safety and Health Administration, 1989, Code of Federal Regulations, Title 29, Part 1910.

Notice to Reader

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