

# COPPER CATHODE MATERIAL SAFETY DATA SHEET

## SECTION 1. PRODUCT AND COMPANY IDENTIFICATION

**Product Identity:** Copper Cathode

**Manufacturer:**

Compañía Minera Teck Carmen de Andacollo  
Camino a Chepiquilla s/n  
Andacollo  
Región de Coquimbo, Chile  
Emergency Phone Number 56.51.431.589

**Supplier:**

Compañía Minera Teck Carmen de Andacollo  
Camino a Chepiquilla s/n  
Andacollo  
Región de Coquimbo, Chile

**MSDS Preparer:**

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

**Date of MSDS Preparation:** April 8, 2010.

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

## SECTION 2. COMPOSITION / INFORMATION ON INGREDIENTS

Ingredient	Approximate Percent by Weight	CAS Number	Occupational Exposure Limits (OELs)		LD <sub>50</sub> /LC <sub>50</sub> Species and Route
Copper	99.99+%	7440-50-8	OSHA PEL	0.1 mg/m <sup>3</sup> fume 1.0 mg/m <sup>3</sup> dusts/mists	No Data
			ACGIH TLV*	0.2 mg/m <sup>3</sup> fume 1.0 mg/m <sup>3</sup> dusts/mists	
			NIOSH REL	0.1 mg/m <sup>3</sup> (Respirable) fume 1.0 mg/m <sup>3</sup> dusts/mists	

Typical composition of a copper cathode (ppm):

Se < 0.1	Pb < 3.0
Bi < 0.1	Sn < 0.1
Mn < 1.0	Fe < 1.0
Cd < 1.0	Zn < 1.0
Ag < 1.0	P < 1.0
Te < 0.1	Co < 1.0
Cr < 1.0	S < 5.0
Sb < 0.1	Ni < 1.0
As < 0.1	Si < 1.0

NOTE: OELs for individual jurisdictions may differ from OSHA PELs. Check with local authorities for the applicable OELs in your jurisdiction. OSHA – (U.S) 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.

\*In 2005 the ACGIH published a Notice of Intended Changes for Copper, Elemental Metal and Copper Oxides to introduce a TLV of 0.1 mg/m<sup>3</sup> (as Cu) as a time-weighted average for inhalable dust/fume.

**Trade Names and Synonyms:** Copper Metal, Copper Laminate, EW Processed Copper

## SECTION 3. HAZARDS IDENTIFICATION

**Emergency Overview:** Copper cathode is a reddish metal that does not burn in bulk but may form explosive mixtures if dispersed in air as a fine powder and exposed to heat or flames. 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 fumes or dust may result in irritation of the nasal mucous membranes. Inhalation of copper oxide 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, headaches, dizziness, and gastrointestinal irritation. Direct eye contact may cause redness or pain. Direct skin contact may result in irritation. Discoloration of the skin often occurs 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.

**Potential Environmental Effects:** Copper can be toxic to aquatic and terrestrial organisms. However, in metal form it is not readily bio-available in the environment. (see Ecological Information, Section 12)

**EU Risk Phrase(s):** Not applicable – copper is not a dangerous substance.

## 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.

**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 victim from exposure area to fresh air immediately. If breathing has stopped, give artificial respiration. Keep affected person warm and at rest. Administer oxygen, if required. Seek medical attention immediately. 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 may be flammable or explosive when dispersed in the air at high concentrations and exposed to heat, flame, or other ignition sources. Explosions may also occur upon contact with certain incompatible materials (see Stability and Reactivity, Section 10).

**Extinguishing Media:** In the event copper cathode is on fire, do NOT use water, carbon dioxide, foam, or halons. Apply dry sand, dolomite, graphite, powdered sodium chloride, soda ash, or other suitable dry powders.

**Fire Fighting:** Fire fighters must be fully-trained and wear full protective clothing including gloves and 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.

**Personal Precautions:** Persons responding to an accidental release should wear protective clothing, gloves and a respirator (see also Section 8). Avoid contact with the corners of the cathode and its peripheral ridge. 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.

**Environmental Precautions:** Copper compounds can pose a significant threat to aquatic life forms. However, in metal form it is not readily bio-available in the environment. Nevertheless, contamination of water and soil should 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.

**EU Safety Phrase(s):** Not applicable - copper is not a dangerous substance.

## SECTION 8. EXPOSURE CONTROLS / PERSONAL PROTECTION

**Protective Clothing:** Protective clothing, close-fitting safety goggles, gloves, and respiratory equipment are recommended when copper is handled at potentially hazardous levels. Where hot or molten metal is handled, heat resistant gloves, goggles or faceshield, and clothing to protect from hot metal splash should be worn. Safety type boots are recommended.

**Ventilation:** Use adequate local or general ventilation to maintain the concentration of copper 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

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

### Other Physical Characteristics of Copper Cathode as Sold:

Weight and Dimensions	Cathode	Bundle/Package
Length (mm)	1,000	1,000
Width (mm)	1,000	1,000
Thickness (mm)	4	
Weight (kg)	45-48	2,046 – 2,140
Units per Bundle/Package		44-46
Strap		3
Seals		1

## 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 acetylene, ammonium nitrate, bromates, chlorates, iodates, chlorine fluorine, chlorine trifluoride, and peroxides. Shock-sensitive compounds are formed with acetylenic compounds, ethylene oxide or azide compounds. Copper 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. 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.

**Acute:**

**Skin/Eye:** Contact with dust or fume may cause local irritation but would not cause tissue damage.

**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, 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. Severe cases could cause pulmonary congestion and edema as well as acute encephalopathy with possible seizures, coma, and death. However, short-term exposures of this magnitude are unlikely in industry today. Those experiencing a single acute episode of metal fume fever generally recover slowly but without apparent residual effects.

**Ingestion:** Individuals reported to have ingested large quantities of copper salts have reported gastrointestinal effects including vomiting, diarrhea, nausea, 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 caused by wearing jewelry made of copper. 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 insoluble in water and generally has essentially no direct bioavailability. However, its processing or extended exposure in the aquatic and terrestrial environments can lead to the release of copper in bioavailable forms. These can cause detrimental environmental effects. The mobility of copper in soluble forms is media dependent. These can bind with inorganic and organic ligands and particulates, reducing mobility and bioavailability in soil and water. Bioavailability is also controlled by other factors such as pH and hardness in the aquatic environment.

## SECTION 13. DISPOSAL CONSIDERATIONS

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

## SECTION 14. TRANSPORT INFORMATION

No special shipping or transportation requirements in cathode form.

## SECTION 15. REGULATORY INFORMATION

**CHILEAN:**

Mine Safety Rules: Supreme Decree 72

Main Environment Act 19300

**U.S.**

Ingredient Listed on TSCA Inventory..... Yes

Hazardous Under Hazard Communication Standard..... Yes

CERCLA Section 103 Hazardous Substances .....Yes.....Copper..... 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 Classification: ..... Not applicable. Copper is not a dangerous substance.

**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, 2006, Guide to Occupational Exposure Values.
- American Conference of Governmental Industrial Hygienists, 2006, Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices.
- Bretherick's Handbook of Reactive Chemical Hazards, 20th Anniversary Edition. (P. G. Urban, Ed.) 1995.
- Canadian Centre for Occupational Health and Safety (CCOHS) CHEMINFO Record No: 2073, Copper - Last Revised 2005-03-24.
- Commission de la santé et la sécurité du travail, Service du répertoire toxicologique, Cuivre, 2001-07.
- Industry Canada, Controlled Products Regulations SOR/88-66, as amended.
- 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.
- Patty's Toxicology, 5th Edition, (E Bingham, B Cohnsen & C H Powell, Ed.) 2001.
- U.S. Department of Health and Human Services, Public Health Service, Agency for Toxic Substances and Disease Registry, Toxicological Profile for Copper (Sept 2004).
- U.S. Department 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. Occupational Safety and Health Administration, 1989, Code of Federal Regulations, Title 29, Part 1910.

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