

## COPPER ARSENATE MATERIAL SAFETY DATA SHEET

### SECTION 1. PRODUCT AND COMPANY IDENTIFICATION

**Product Identity:** Copper Arsenate

**Manufacturer:**

Teck Metals Ltd.  
Trail Operations  
Trail, British Columbia  
V1R 4L8  
Emergency Telephone: 250-364-4214

**Supplier:**

Teck Metals Ltd.  
#1700 – 11 King Street West  
Toronto, Ontario  
M5H 4C7

**MSDS Preparer:**

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

**Date of Last Review:** June 6, 2012.

**Date of last Edit:** September 15, 2014.

**Product Use:** This material is a feed stock for the production of wood treatment chemicals.

### SECTION 2. COMPOSITION / INFORMATION ON INGREDIENTS

Hazardous Ingredient	Approximate Percent by Weight	CAS Number	Occupational Exposure Limits (OELs)		LD <sub>50</sub> / LC <sub>50</sub> Species and Route
Copper Arsenate	98.7 – 99.7%	146504-31-6	OSHA PEL	see note below	LD <sub>50</sub> , rat, oral 2147 mg/kg for the product as a whole**
			ACGIH TLV	see note below	
			NIOSH REL	see note below	
Cadmium Compounds	0.3 – 1.3%	N/A	OSHA PEL	0.005 mg/m <sup>3</sup>	
			OSHA SECAL*	0.015 or 0.05 mg/m <sup>3</sup>	
			ACGIH TLV	0.01 mg/m <sup>3</sup> Total 0.002 mg/m <sup>3</sup> Respirable	
			NIOSH REL	Lowest feasible level	

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; SECAL – Separate Engineering Control Airborne Limit.

The OSHA PEL and ACGIH TLV for inorganic arsenic compounds are both 0.01 mg/m<sup>3</sup>. The NIOSH REL is 0.002 mg/m<sup>3</sup> as a 15 minute ceiling limit. The OSHA PEL, the ACGIH TLV and NIOSH REL for copper dust and mist are 1.0 mg/m<sup>3</sup>. For copper fume the OSHA TLV and NIOSH REL are 0.1 mg/m<sup>3</sup> and the ACGIH TLV is 0.2 mg/m<sup>3</sup>. Based on the composition of this product, the airborne arsenic concentration would be the controlling factor in maintaining copper, arsenic and cadmium concentrations below their respective OELs.

\*Separate Engineering Control Airborne Limits: to be achieved in specified processes and workplaces where it is not possible to achieve the PEL through engineering and work practices alone. The OSHA SECAL for cadmium is 0.015 or 0.050 mg/m<sup>3</sup>, depending on the processes involved. See Table 1 of 29 CFR § 1910.1027.

\*\*Acute oral toxicity determined using an actual sample of this specific product.

**Trade Names and Synonyms:** Copper orthoarsenate, Copper arsenate hydrate, Sodium copper arsenate, Arsenic acid copper sodium salt.

### SECTION 3. HAZARDS IDENTIFICATION

**Emergency Overview:** A turquoise blue powder that does not burn or readily decompose in a fire situation. Copper arsenate dust particles may cause eye, skin and respiratory irritation. Inhalation or ingestion of dust or fumes may produce both acute and chronic health effects. In a fire situation freshly-formed fume may be an intense pulmonary irritant and may result in development of pulmonary edema several hours after exposure. Arsenic and cadmium compounds are a cancer hazard. Contact with acid or alkaline solutions under reducing conditions (e.g. in the presence of zinc or galvanized steel) may generate highly toxic arsine gas.

**Such circumstances should be regarded as being immediately life threatening.** SCBA and full protective clothing are required for fire emergency response personnel.

**Potential Health Effects:** Copper arsenate dust is irritating to the eyes, skin and respiratory passages. Inhalation or ingestion of dust may result in dryness and irritation of the nose and throat, metallic taste, headache, nausea, vomiting, diarrhea, abdominal pain, muscle spasms, weight loss and anemia. Prolonged exposure may also cause central and peripheral nervous system damage, kidney dysfunction, cardiovascular and gastrointestinal disturbances, skin rashes and dermatitis. Due to the presence of arsenic and cadmium, which are classified as known human carcinogens by various regulatory and advisory bodies, this product is considered carcinogenic (see Toxicological Information, Section 11).

**Potential Environmental Effects:** This product is known to have low water solubility and, therefore, its constituents have limited bioavailability. However, it can be hazardous in aquatic and terrestrial environments; low concentrations of copper and cadmium can be potentially toxic to fish, and elevated concentrations of the arsenic from the product in soils can lead to increased bioaccumulation and can therefore be detrimental to terrestrial plants and invertebrates (see Ecological Information, Section 12).

## SECTION 4. FIRST AID MEASURES

**Eye Contact:** Quickly and gently blot or brush chemical off face. Immediately flush the contaminated eye(s) with lukewarm, gently flowing water for 15 – 20 minutes, while holding the eyelid(s) open. If a contact lens is present, DO NOT delay irrigation or attempt to remove the lens. Take care not to rinse contaminated water into the unaffected eye or onto the face. Immediately obtain medical attention.

**Skin Contact:** Remove contaminated clothing, shoes and leather goods (e.g., watchbands, belts). Quickly and gently blot or brush away excess chemical. Wash gently and thoroughly with lukewarm gently flowing water and non-abrasive soap for 5 minutes. If irritation persists, repeat flushing. Obtain medical advice. Completely decontaminate clothing, shoes and leather goods before reuse or else discard.

**Inhalation:** Remove source of contamination or move victim from exposure area to fresh air immediately. If breathing has stopped, trained personnel should begin artificial respiration. If the heart has stopped, immediately start cardiopulmonary resuscitation (CPR), or automated external defibrillation (AED). Quickly transport victim to an emergency care facility.

**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:** This product is not considered a fire or explosion hazard.

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

**Fire Fighting:** Highly toxic cadmium oxide fumes may evolve in fires. 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 facepiece mask. If possible, move material from fire area and cool material exposed to flame. Do not allow run-off to enter sewers or watercourses.

**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. Restrict access to the area until completion of clean up. Clean up spilled material immediately, observing precautions in Section 8, Personal Protection and 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 labeled containers for recovery or disposal. Treat or dispose of waste material in accordance with all local, regional, and national requirements.

**Personal Precautions:** Persons responding to an accidental release should wear protective clothing, gloves and a respirator (see also Section 8). Close-fitting safety goggles may be necessary in some circumstances to prevent eye contact with dust. Workers should wash and change clothing following cleanup of a spill to prevent personal contamination with copper arsenate dust.

**Environmental Precautions:** This product can pose a threat to the environment. Contamination of soil and water should be prevented. Do not allow spillage or run-off to enter storm drains, sewers or watercourses.

## SECTION 7. HANDLING AND STORAGE

Store containers in a dry, cool, well-ventilated area, separate from strong acids, other incompatible materials, active metals and foods or feedstuffs. Avoid exposure to incompatible materials such as acids or alkalis and galvanized (zinc) surfaces. Keep container tightly closed. Minimize dust generation and accumulation. Avoid breathing dust. 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 as well as at the end of the workday.

## SECTION 8. EXPOSURE CONTROLS / PERSONAL PROTECTION

**Protective Clothing:** Coveralls or other work clothing and gloves are recommended to prevent prolonged or repeated direct skin contact. Close-fitting safety goggles should be worn to prevent eye contact if excessive dust is generated or where any possibility exists that eye contact may occur. Workers should wash immediately when skin becomes contaminated and at the end of each work shift. Work clothing should be removed immediately if it becomes heavily contaminated and should be changed daily if there is reasonable probability that the clothing may be contaminated. Inform laundry personnel of contaminant's hazards.

**Ventilation:** Use adequate local or general ventilation to maintain the concentration of copper arsenate in the working environment well below recommended occupational exposure limits, especially when fumes are generated. Supply sufficient replacement air to make up for air removed by the exhaust system. Use process enclosure, local exhaust ventilation, moist rather than dry handling techniques or other engineering controls to minimize airborne dust generation.

**Respiratory Protection:** Where copper arsenate dust is 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-100 particulate filter cartridge). All cutting and burning of copper arsenate contaminated surfaces should be done under local exhaust ventilation or else with appropriate respiratory protection (an assigned protection factor of at least 1,000 recommended). When exposure levels are unknown, a self-contained breathing apparatus which supplies a positive air pressure within a full face piece mask should be worn.

## SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

<b>Appearance:</b> Turquoise blue powder	<b>Odour:</b> None	<b>Physical State:</b> Solid	<b>pH:</b> 6.4 (saturated solution)
<b>Vapour Pressure:</b> <10 <sup>-5</sup> Pa @ 50 °C	<b>Vapour Density:</b> Not Applicable	<b>Boiling Point/Range:</b> No Data	<b>Melting Point/Range:</b> >300°C
<b>Specific Gravity:</b> 3.1	<b>Evaporation Rate:</b> Not Applicable	<b>Coefficient of Water/Oil Distribution:</b> No Data	<b>Odour Threshold:</b> None
<b>Solubility in Water:</b> Very slightly soluble	<b>Molecular Formula:</b> Cu <sub>5</sub> NaH(AsO <sub>4</sub> ) <sub>4</sub> •5H <sub>2</sub> O	<b>Molecular Weight:</b> 987.5	<b>Particle Size:</b> 24 µm

## SECTION 10. STABILITY AND REACTIVITY

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

**Incompatibilities:** Contact with acids in the presence of active metals such as zinc or galvanized steel may form nascent hydrogen and possibly result in the generation of highly toxic arsine gas.

**Hazardous Decomposition Products:** High temperature operations such as oxy-acetylene cutting or electric arc welding on dust contaminated surfaces will generate highly toxic arsenic and cadmium oxide fumes. Freshly formed cadmium fume is an intense pulmonary irritant and may result in development of pulmonary edema several hours after exposure.

## SECTION 11. TOXICOLOGICAL INFORMATION

**General:** NOTE: There is very limited available data on the health effects of this product. Therefore, much of the information provided in this MSDS is based on analogy with other copper, arsenic and cadmium compounds for which more extensive health hazard data and industrial experience is available. The primary routes of exposure to copper arsenate are by inhalation or ingestion of dust. Individuals with "Wilson's Disease" are predisposed to accumulate copper in their body and should not be occupationally exposed. Individuals with pre-existing lung, liver, kidney, and blood ailments should be precluded from exposure until approved by a physician.

### **Acute:**

**Skin/Eye:** Contact with copper arsenate may cause local irritation of skin and eyes, including redness and pain in the eyes. Dermatitis may also be experienced by some individuals.

**Inhalation:** Copper arsenate dust may be irritating to the nose, throat and upper respiratory tract with symptoms of sneezing, cough, dryness of the mouth and throat, metallic taste and headache. Severe over-exposure may cause shortness of breath, stomach pains, muscle spasms, vertigo, delirium and coma. **Arsine gas may be generated when arsenic-containing compounds are in contact with acid solutions and an active metal such as zinc or galvanized steel. Exposure to arsine gas should be regarded as potentially life threatening.** Fumes from cutting or burning of copper arsenate contaminated surfaces will contain oxides of copper, arsenic and cadmium. They may be highly toxic by inhalation, causing serious systemic poisoning and possible permanent damage to the lungs. Early symptoms of excessive exposure include dryness of the throat; irritation of the nose, throat, and respiratory tract; headache; coughing; and a metallic taste. After a delay of several hours (up to 10), a person may develop constriction of the chest, persistent cough, and progressive shortness of breath. There may be headache, chills, diarrhea, muscle aches, nausea, vomiting, irritability, and restlessness. Pulmonary congestion may progress rapidly causing wheezing and symptoms of oxygen deficiency. Death may follow. Recovery from an acute exposure episode is slow but generally without ongoing or lingering effects. Milder cases of acute exposure have produced symptoms resembling metal fume fever with some symptoms and signs of acute gastroenteritis as well.

**Ingestion:** Ingestion of arsenic compounds can cause nausea and gastrointestinal upset, abdominal pain, vomiting, diarrhea, muscle spasms and, in severe cases, can cause delirium, vertigo, acute kidney failure, cardiopulmonary depression and coma.

### **Chronic:**

Prolonged exposure to copper arsenate dust may produce many of the symptoms of short term exposure and may also cause anemia, weight loss, central and peripheral nervous system damage, gastrointestinal and cardiovascular disturbances, skin rashes and dermatitis. Inhalation of copper and arsenic compounds has occasionally caused ulceration and perforation of the nasal septum. The primary target organ for chronic cadmium effects is the kidney with increased excretion of a specific low molecular weight protein (beta-2-microglobulin). Damage to the lungs (of the emphysematous type) has been reported in some studies of cadmium-exposed workers but not found in other studies. Cigarette tobacco contains cadmium and smoking adds to the daily intake of cadmium that may increase the risk of cumulative toxic effects. Clinical evidence of the cumulative effects of cadmium may appear after exposure has ceased. Disease may then be progressive. Arsenic and inorganic arsenic compounds are listed as an *A1 Carcinogen (Confirmed Human Carcinogen)* by the ACGIH and as a *Group 1 Carcinogen (Carcinogenic to Humans)* by IARC. The NTP and OSHA also identify arsenic and inorganic arsenic compounds as *Known Human Carcinogens*. The IARC has classified cadmium and certain cadmium compounds as *Group 1, Carcinogenic to Humans*. The ACGIH classifies cadmium as a *Suspected Human Carcinogen (A2)*. The NTP classifies cadmium as a *Known Human Carcinogen* and OSHA lists cadmium as a *Carcinogen*. Copper is not identified as having carcinogenic potential by any of these regulatory or advisory bodies.

## SECTION 12. ECOLOGICAL INFORMATION

This product is known to have low water solubility and, therefore, its constituents have limited bioavailability. However, when present in their soluble forms, copper and cadmium, at relatively low concentrations, can be acutely toxic to fish and other aquatic life forms. In addition, arsenic is known to bioconcentrate in plants and aquatic organisms, which may lead to ecotoxicity to higher life forms. Copper in soil can also be toxic to plants and soil invertebrates at elevated concentrations.

High soil acidity (pH) favors the release of cadmium ions and, as a result, the uptake of cadmium by plants. Cadmium is strongly accumulated by most organisms through food and water. Cadmium bioaccumulation in aquatic organisms is greatest in invertebrates, followed by fish and then by aquatic plants. Bioaccumulation in terrestrial plants can, in turn, lead to elevated concentrations of cadmium in animals that feed on these plants.

## SECTION 13. DISPOSAL CONSIDERATIONS

Do not wash down drain or allow material to reach natural watercourses. If material cannot be returned to process or salvage, dispose of only in accordance with applicable regulations.

## SECTION 14. TRANSPORT INFORMATION

PROPER SHIPPING NAME ..... Environmentally Hazardous Substance, Solid, n.o.s.  
(Copper Arsenate)  
HAZARD CLASSIFICATION ..... Class 9, Packing Group III  
PRODUCT IDENTIFICATION NUMBER ..... UN3077  
MARINE POLLUTANT ..... Yes  
IMO CLASSIFICATION ..... Class 9, Packing Group III

## SECTION 15. REGULATORY INFORMATION

### U.S.

INGREDIENT LISTED ON TSCA INVENTORY ..... Yes  
HAZARDOUS UNDER HAZARD COMMUNICATION STANDARD ..... Yes  
CERCLA SECTION 103 HAZARDOUS SUBSTANCES  
Arsenic Compounds ..... Yes ..... Reportable Quantity: None Assigned  
Arsenic RQ: 1lb.  
Copper Compounds ..... Yes ..... Reportable Quantity: None Assigned  
Copper RQ: 5,000lb.  
Cadmium Compounds ..... Yes ..... Reportable Quantity: None Assigned  
Cadmium RQ: 10lb.  
EPCRA SECTION 302 EXTREMELY HAZARDOUS SUBSTANCE ..... No  
EPCRA SECTION 311/312 HAZARD CATEGORIES ..... Delayed (Chronic) Health Hazard - Carcinogen  
Delayed (Chronic) Health Hazard – Target Organ Effects  
(Kidney)  
EPCRA SECTION 313 Toxic Release Inventory  
Arsenic Compounds (Copper Arsenate) CAS No. 146504-31-6  
Percent by Weight ..... 98.7 - 99.7  
Cadmium Compounds CAS No. N/A  
Percent by Weight ..... 0.3 – 1.3

### CANADIAN:

INGREDIENTS LISTED ON DOMESTIC SUBSTANCES LIST ..... No. However, Teck Metals Ltd. is in compliance with the  
New Substances Notification Regulations under the  
Canadian Environmental Protection Act, 1999.  
WHMIS CLASSIFICATION: ..... D2A (Very Toxic Material)

## 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, 7<sup>th</sup> Edition, plus updates.
- American Conference of Governmental Industrial Hygienists, 2012, Guide to Occupational Exposure Values.
- American Conference of Governmental Industrial Hygienists, 2012, Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices.
- Bretherick's Handbook of Reactive Chemical Hazards, 20<sup>th</sup> Anniversary Edition (P. G. Urben, Ed.) 1995.
- Canadian Centre for Occupational Health and Safety (CCOHS), Hamilton, ON, CHEMINFO Record No. 3454 Cadmium.
- European Economic Community, Commission Directives 91/155/EEC, 93/21/EEC, and 67/548/EEC.
- International Chemical Safety Cards (WHO/IPCS/ILO), ICSC:0020 – Cadmium.
- International Chemical Safety Cards (WHO/IPCS/ILO), ICSC:0648 – Copper (II) Orthoarsenate.
- Industry Canada, Controlled Products Regulations SOR/88-66, as amended.
- Merck & Co., Inc., 2001, The Merck Index, An Encyclopedia of Chemicals, Drugs, and Biologicals, Thirteenth Edition.
- National Library of Medicine, National Toxicology Information Program, 1997, Hazardous Substance Data Bank.
- Patty's Toxicology, 5th Edition, (E Bingham, B Cohnsen & C H Powell, Ed.) 2001.
- 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, Public Health Service, Agency for Toxic Substances and Disease Registry, Toxicological Profile for Cadmium (Draft) Sept 2008.
- U.S. Occupational Safety and Health Administration, 1989, Code of Federal Regulations, Title 29, Part 1910.

**Notice to Reader**

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