

**CADMIUM METAL  
MATERIAL SAFETY DATA SHEET**

**SECTION 1. PRODUCT AND COMPANY IDENTIFICATION**

**Product Identity:** Cadmium Metal

**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/Edit:** August 18, 2010.

**Product Use:** Cadmium metal is used as a constituent in easily fusible alloys, in soft solder and solder for aluminum, in electroplating, as a deoxidizer in nickel plating, in process engraving, in electrodes for cadmium vapour lamps, in photoelectric cells, in nickel-cadmium storage batteries, and in pigment manufacture.

**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
Cadmium	99.97+ %	7440-43-9	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 dust) 0.002mg/m <sup>3</sup> (respirable) NIOSH REL Lowest feasible level	LD <sub>50</sub> , rat, oral 225 mg/kg LD <sub>50</sub> , mouse, oral 636 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, SECAL – Separate Engineering Control Airborne Limit.

\*Separate Engineering Control Airborne Limits: To be achieved in specified processes and work places 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.

**Trade Names and Synonyms:** Tadanac Cadmium; Cadmium Balls; Cadmium Sticks; Cd; ASTM B440

**SECTION 3. HAZARDS IDENTIFICATION**

**Emergency Overview:** A bluish-silver lustrous metal that does not burn in bulk. Clouds of finely-divided dust are a fire and explosion hazard, however. When heated strongly in air cadmium oxide fumes will be generated. Freshly formed cadmium fume is an intense pulmonary irritant and may result in development of pulmonary edema several hours after exposure. Inhalation or ingestion of dust or fumes may produce both acute and chronic health effects. Probable cancer hazard. A self-contained breathing apparatus (SCBA) and full protective clothing are required for all emergency response personnel when cadmium is involved in a fire situation. Do NOT use water or foam. Apply dry chemical, dry sand, or special powder extinguishing media.

**Potential Health Effects:** Cadmium dust and fume have both acute and chronic health effects. Cadmium dust is a pulmonary irritant. Freshly formed cadmium fume is an intense pulmonary irritant, resulting in respiratory distress and possible pulmonary edema that may develop 4 to 10 hours after exposure. In severe cases death may result. Long term exposures may cause kidney dysfunction and lung injury (emphysema) as well as other symptoms. Cadmium is classified as a carcinogen or probable carcinogen by IARC, ACGIH, NTP, OSHA and the EU. (See Toxicological Information, Section 11)

**Potential Environmental Effects:** While cadmium metal has relatively low bioavailability, compounds which it forms with other elements can be potentially toxic to biota at low concentrations. Bioaccumulation of cadmium occurs readily in aquatic and terrestrial food chains, specifically in plants and aquatic organisms. (See Ecological Information, Section 12).

**EU Risk Phrase(s):** R45 – May cause cancer; R26 – Very toxic by inhalation; R48/23/25 – Toxic: danger of serious damage to health by prolonged exposure through inhalation and if swallowed ; R62 – Possible risk of impaired fertility; R63 – Possible risk of harm to the unborn child; R68 – Possible risk of irreversible effects; R50/53 – Very toxic to aquatic organisms - may cause long-term adverse effects in the environment.

#### 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 5 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:* 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. *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:** Take proper precautions to ensure your own safety before attempting rescue (e.g. wear appropriate protective equipment). Remove source of contamination or move victim from exposure area to fresh air immediately. If breathing is difficult, trained personnel should administer medical oxygen. DO NOT allow victim to move around unnecessarily. Treat pulmonary edema as a priority, even if no symptoms (i.e. wheezing, coughing, shortness of breath, etc) are apparent. Symptoms of pulmonary edema can be delayed up to 48 hours after exposure. 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. The irritant and emetic action of swallowed cadmium usually leads to spontaneous vomiting. If vomiting occurs naturally, have victim rinse mouth with water again. Immediately obtain medical attention and bring a copy of this MSDS.

#### SECTION 5. FIRE FIGHTING MEASURES

**Fire and Explosion Hazards:** Massive metal is not flammable or combustible. Finely-divided metallic dust or powder is a moderate fire hazard and moderate explosion hazard when dispersed in air at high concentrations and exposed to heat, flame or other ignition sources. Freshly oxidized cadmium powder, in contact with limited amounts of water, may heat spontaneously and may ignite combustible materials in contact with the powder. Fires and explosions may also occur upon contact with certain incompatible materials (see Stability and Reactivity, Section 10).

**Extinguishing Media:** Do NOT use water or foam. Molten metal reacts violently with extinguishing agents such as water, foam, carbon dioxide, and Halons. Apply dry chemical, dry sand, or special powder extinguishing media.

**Fire Fighting:** If possible, move material from fire area and cool material exposed to flame. Apply dry chemical, sand or special powder extinguishing media to burning cadmium. Highly toxic cadmium oxide fumes 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 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. Restrict access to the area until completion of clean-up. Clean up spilled material immediately, observing precautions in Section 8, Personal Protection. Molten metal should be allowed to solidify prior to clean-up. If solid metal, wear gloves, pick up and return to process. If dust, wear recommended personal protective equipment (see Section 8) and use methods that will minimize dust generation (e.g. vacuum solids). Return uncontaminated spilled material to the process if possible. Place contaminated and non-recyclable material in suitable labelled containers for later disposal. Treat or dispose of waste material in accordance with all local, regional and national requirements, as applicable.

**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 and fume. Where molten metal is involved, wear heat-resistant gloves and suitable clothing for protection from hot-metal splash as well as a respirator to protect against inhalation of cadmium fume. Workers should wash and change clothing following cleanup of a cadmium spill to prevent personal contamination with cadmium dust.

**Environmental Precautions:** Cadmium metal has relatively low bioavailability; however, compounds which it forms with other elements can be toxic to aquatic and terrestrial biota. Releases of the product to water and soil should be prevented.

## SECTION 7. HANDLING AND STORAGE

Store cadmium in a DRY, covered area, away from incompatible materials and food or feedstuffs. Cadmium ingots suspected of containing moisture should be THOROUGHLY DRIED before being added to a molten bath. Otherwise, entrained moisture could expand explosively and 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, as well as at the end of the workday. No special packaging materials are required.

**EU Safety Phrase(s):** S45 – In case of accident or if you feel unwell, seek medical advice immediately (show label where possible); S53 – Avoid exposure – obtain special instructions before use; S60 – This material and its container must be disposed of as hazardous waste; S61 – Avoid release to the environment. Refer to special instructions/Safety Data Sheets

## 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 cadmium 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 face shield, respirator and clothing to protect from hot metal splash should be worn. Safety type boots are recommended.

Do not eat, drink or smoke in work areas. Thoroughly wash hands before eating, drinking, or smoking in appropriate, designated areas only. Work clothing should be removed immediately and laundered before reuse if it becomes heavily contaminated. Work clothing should be removed before leaving the plant site and should be changed daily if there is a reasonable probability that the clothing may be contaminated. If using a commercial or industrial laundry service, inform laundry personnel of contaminants' hazards. Workers should shower at the end of each work shift. A double locker-shower system with separate clean and dirty sides is usually required for cadmium handling operations to avoid cross-contamination of street clothes. Workers should not take dirty work clothes home and launder them with other personal clothing.

**Ventilation:** Use adequate local or general ventilation to maintain the concentration of cadmium 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. Local exhaust is strongly recommended for melting, casting, grinding and welding or flame cutting of cadmium.

**Respirators:** Where cadmium 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-100 particulate filter cartridge). When exposure levels are obviously high but the actual concentration is 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

**Appearance:**  
Bluish-silver lustrous metal

**Odour:**  
None

**Physical State:**  
Solid

**pH:**  
Not Applicable

**Vapour Pressure:**  
1 mm at 394°C  
negligible @ 20°C

**Vapour Density:**  
Not Applicable

**Boiling Point/Range:**  
765°C

**Melting Point/Range:**  
321°C

**Specific Gravity:**  
8.65

**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:** Massive metal is stable under normal temperatures and pressures. Hazardous polymerization or runaway reactions will not occur. Metal surfaces tarnish on exposure to moist air. Finely powdered metal or dust can be ignited from a dust cloud in air. Freshly oxidized cadmium powder, in contact with limited amounts of water, may heat spontaneously and may ignite combustible materials in contact with the powder.

**Incompatibilities:** Cadmium reacts vigorously with oxidizing agents such as peroxides, chlorates, nitrates, and halogens or interhalogen compounds such as chlorine trifluoride as well as with elemental sulphur, zinc, selenium, or tellurium. Mixtures with nitric acid liberate toxic fumes of nitrogen oxides. Violent explosions can occur when the metal is in contact with fused ammonium nitrate or immersed in hydrazoic acid. Burning metal reacts violently with fire extinguishing agents such as water, foam, carbon dioxide or Halons. Cadmium metal reacts with strong acids giving off flammable hydrogen gas.

**Hazardous Decomposition Products:** High temperature operations such as oxy-acetylene cutting or burning, electric arc welding or overheating a molten bath will generate highly toxic cadmium oxide fumes. These brownish fumes are highly soluble in body fluids and the particle size of the metal fumes is largely within the respirable size range, which increases the likelihood of inhalation and deposition of the fume within the body.

## SECTION 11. TOXICOLOGICAL INFORMATION

**General:** Cadmium dust and fume are both pulmonary irritants, but freshly generated cadmium fume is an intense irritant and its small particle size allows it to reach into the lung more readily. The onset of symptoms is frequently delayed by 4 to 10 hours after exposure. Pulmonary edema may then develop rapidly. The mortality rate from acute pulmonary disease is about 20% according to the ACGIH. Those surviving an episode of acute poisoning generally recover slowly but without apparent residual effects.

Chronic exposure to cadmium has been associated with a wide variety of gastrointestinal symptoms, pulmonary edema, and kidney malfunction with increased excretion of a specific low molecular weight protein (beta-2-microglobulin). The body to a large extent retains absorbed cadmium, and excretion is very slow. Cadmium has been linked to both prostate cancer and lung cancer, though several researchers have questioned the association with prostate cancer recently.

Individuals with pre-existing lung, liver, kidney, and blood ailments should be precluded from exposure until approved by a physician. Initial and periodic medical examinations are recommended for persons exposed to levels above the exposure limits of cadmium.

### **Acute:**

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

**Inhalation:** Fumes of cadmium (i.e. cadmium oxide) are highly toxic by inhalation. They may cause 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 excessive quantities of cadmium dust may cause salivation, choking, nausea, vomiting, diarrhea, abdominal pain, tenseness, blurred vision, dizziness, vertigo, and headache. Convulsions, exhaustion, collapse, shock, and unconsciousness may occur. Death has followed within 24 hours from shock or after 7 to 14 days from acute kidney failure or cardiopulmonary depression.

### **Chronic:**

Prolonged exposure to cadmium dust and/or fume may cause loss of sense of smell, occasional ulcerations of the nasal passages, rhinolaryngitis, cough, shortness of breath, mild anemia, sleeplessness, irritability, loss of appetite, and cadmium-yellow fringe on teeth. 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 which 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.

The International Agency for Research on Cancer (IARC) has classified cadmium and certain cadmium compounds as Group 1 Carcinogens (carcinogenic to humans). The American Conference of Governmental Industrial Hygienists (ACGIH) classifies cadmium as a Suspected Human Carcinogen (A2). The National Toxicology Program (NTP) classifies cadmium as a Known

Human Carcinogen and OSHA lists cadmium as a Carcinogen. The European Union (EU) classifies cadmium as a Category 2 (Probable) Carcinogen.

## SECTION 12. ECOLOGICAL INFORMATION

While cadmium metal is relatively insoluble, its processing or extended exposure in aquatic and terrestrial environments may lead to the release of cadmium in bioavailable forms. Compared to most other metals, cadmium is relatively mobile and toxic in the aquatic environment. Water hardness, pH and dissolved organic carbon are three major factors which regulate the degree of cadmium toxicity. In soils, higher acidity (lower pH) results in the release of cadmium ions, which may, in turn, yield higher toxicity to soil organisms and uptake of cadmium by plants.

Cadmium is strongly accumulated by all organisms through the food chain. Bioaccumulation in aquatic organisms is greatest in invertebrates, followed by fish and aquatic plants. Bioaccumulation of cadmium into terrestrial plants can result in higher cadmium concentrations in terrestrial animals that feed on the plants.

## SECTION 13. DISPOSAL CONSIDERATIONS

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

## SECTION 14. TRANSPORT INFORMATION

PROPER SHIPPING NAME ..... Not a regulated product in ingot form  
TRANSPORT CANADA AND U.S. DOT HAZARD CLASSIFICATION .... Not applicable  
TRANSPORT CANADA AND U.S. DOT PIN ..... Not applicable  
MARINE POLLUTANT ..... No  
IMO CLASSIFICATION ..... Not regulated

## SECTION 15. REGULATORY INFORMATION

### U.S.

INGREDIENT LISTED ON TSCA INVENTORY ..... Yes

HAZARDOUS UNDER HAZARD COMMUNICATION STANDARD..... Yes

CERCLA SECTION 103 HAZARDOUS SUBSTANCES ..... Cadmium ..... Yes.....RQ: 10lbs. (4.54 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 ..... Immediate (Acute) Health Hazard – Toxic  
Delayed (Chronic) Health Hazard – Target Organ Effects (Kidney)  
Delayed (Chronic) Health Hazard - Carcinogen

EPCRA SECTION 313 Toxic Release Inventory ..... Cadmium  
CAS NO. 7440-43-9 Percent by Weight: 99.97+

### CANADIAN:

LISTED ON THE DOMESTIC SUBSTANCES LIST..... Yes

WHMIS CLASSIFICATION: ..... D1B Materials Causing Immediate & Serious Toxic Effects

D2A Materials Causing Other Toxic Effects - Carcinogen

### EUROPEAN UNION:

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

EU Classification ..... Very Toxic, Carc. Cat. 2, Muta Cat. 3, Repr. Cat. 3, Dangerous for the Environment.

## 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, Seventh Edition plus updates.
- American Conference of Governmental Industrial Hygienists, 2009, Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices.
- American Conference of Governmental Industrial Hygienists, 2009, Guide to Occupational Exposure Values.
- Bretherick's Handbook of Reactive Chemical Hazards, 20th Anniversary Edition. (P. G. Urban Ed.) 1995.
- Canadian Centre for Occupational Health and Safety, Hamilton, ON, CHEMINFO Record No. 3454 Cadmium (Rev. 2009-04).
- European Economic Community, Commission Directives 91/155/EEC and 67/548/EEC.
- Industry Canada, SOR/88-66 Controlled Products Regulations, as amended.
- International Chemical Safety Cards (WHO/IPCS/ILO), ICSC:0020 – Cadmium (April 2005).
- International Labour Office (WHO/ILO) Encyclopedia of Occupational Health & Safety 4<sup>th</sup> 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, National Toxicology Information Program, Hazardous Substance Data Bank. (On line version).
- Oak Ridge National Laboratory, Health Sciences Research Division, Toxicity Summary for Cadmium. - November 1991.
- Patty's Toxicology, 5th Edition, (E Bingham, B Cohnsen & C H Powell, Ed.) 2001:
- U.S. Department of Health and Human Services, National Institute for Occupational Safety and Health, NIOSH Pocket Guide to Chemical Hazards. CD-ROM Edition DHHS September 2005.
- U.S. Department of Health and Human Services, Public Health Service, Agency for Toxic Substances and Disease Registry, Draft Toxicological Profile for Cadmium (September 2008).

### **Notice to Reader**

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