

ZINC CALCINE MATERIAL SAFETY DATA SHEET

SECTION 1. PRODUCT AND COMPANY IDENTIFICATION

Product Identity: Zinc Calcine

Manufacturer:

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

Supplier:

Teck Metals Ltd.
Trail Operations
Trail, British Columbia
V1R 4L8

MSDS Preparer:

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

Date of MSDS Preparation: June 1, 2009.

Product Use: Intermediate feed material for zinc metal production.

SECTION 2. COMPOSITION / INFORMATION ON INGREDIENTS

Hazardous Ingredient	Approximate Percent by Weight	CAS Number	Occupational Exposure Limits (OELs)		LD ₅₀ /LC ₅₀ Species and Route
Zinc Calcine		69012-79-9			
<u>Comprised of:</u>					
Zinc (primarily as zinc oxide, but also as zinc sulphate and zinc silicate)	55 – 65%	1314-13-2	OSHA PEL ACGIH TLV NIOSH REL	15 mg/m ³ (total) 5 mg/m ³ (respirable) 2 mg/m ³ (respirable) 5 mg/m ³ (see note)	LD ₅₀ Rat-oral = >8,437 mg/kg
Lead (as lead sulphate)	2 - 3%	7446-14-2	OSHA PEL ACGIH TLV NIOSH REL	0.05 mg/m ³ 0.05 mg/m ³ <0.10 mg/m ³	LD ₅₀ G Pig-oral >30,000 mg/kg
Iron (as iron oxide)	6 – 7%	1309-37-1	OSHA PEL ACGIH TLV NIOSH REL	10 mg/m ³ 5 mg/m ³ (respirable) 5 mg/m ³	No Data
Sulphur (as zinc sulphate and lead sulphate)	2 – 4%	7704-34-9	OSHA PEL ACGIH TLV NIOSH REL	None Established None Established None Established	LD ₅₀ Rat-oral = >5,000 mg/kg
Cadmium Oxide	0.2 - 0.3%	1306-19-0	OSHA PEL OSHA SECAL ACGIH TLV NIOSH REL	0.005 mg/m ³ 0.015 / 0.05 mg/m ³ 0.01 mg/m ³ (Inhalable) 0.002 mg/m ³ (Respirable) Lowest feasible level	LD ₅₀ Rat-oral = 72 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.

The OSHA PEL for zinc oxide dust is 15 mg/m³ (total) and 5 mg/m³ (respirable); the OSHA PEL for zinc oxide fume is 5 mg/m³. The ACGIH TLV for zinc oxide is 2 mg/m³ (respirable fraction) with a Short Term Exposure Limit (STEL) of 10 mg/m³ (respirable fraction). The NIOSH REL for zinc oxide (dust or fume) is 5 mg/m³ 10 hr TWA with a 15 mg/m³ ceiling for zinc oxide dust and a 10 mg/m³ STEL for zinc oxide fume (15 min. sample). 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 0.05 mg/m³, depending on the processes involved. See Table 1 of 29 CFR § 1910.1017.

Trade Names and Synonyms: None.

SECTION 3. HAZARDS IDENTIFICATION

Emergency Overview: A red-brown soil-like material that consists principally of zinc oxide with small amounts of zinc sulphate, zinc silicate, lead sulphate, iron oxide and traces of cadmium oxide. It is not flammable or combustible under normal conditions of transport and storage and is insoluble in water. Inhalation or ingestion of zinc calcine dust may produce both acute and chronic health effects. Possible cancer and reproductive hazard due to lead and cadmium content. SCBA and full protective clothing required for fire emergency response personnel.

Potential Health Effects: *Caution: The toxicological properties of this material have not been fully investigated. The information contained in this MSDS is therefore based on information in the technical and scientific literature about the material's constituent compounds.*

Zinc calcine dust is irritating to the nose, throat and respiratory tract. Inhalation or ingestion of very high concentrations of dust may result in cadmium and/or lead absorption and possible lead intoxication. Symptoms include headache, nausea, vomiting, diarrhea, abdominal spasms, fatigue, sleep disturbances, weight loss, anemia and leg, arm, and joint pain. Prolonged exposure may also cause central nervous system damage, possible kidney dysfunction and reproductive effects. Pregnant women should especially be protected from excessive exposure. Lead and lead compounds are listed as an *A3 Carcinogen (Confirmed Animal Carcinogen with Unknown Relevance to Humans)* by the ACGIH. IARC has listed lead compounds as *Group 2A Carcinogens (Probably Carcinogenic to Humans)*. The NTP has recently listed lead and lead compounds as *Reasonably Anticipated to be a Human Carcinogen*. OSHA and the EU do not currently list lead as a human carcinogen. Cadmium is classified as an *A2 Carcinogen* by the ACGIH and as a *Group 1 Carcinogen* by IARC. (see Toxicological Information, Section 11)

Potential Environmental Effects: Zinc calcine has very low solubility in water and its metals contents have low direct bioavailability. However, its processing or extended exposure in the aquatic and terrestrial environments can lead to the release of contained metals in bioavailable forms. These can cause toxic impacts in organisms (see Ecological Information, Section 12).

EU Risk Phrase(s): R61 - May cause harm to the unborn child; R36/37/38 – Irritating to eyes, respiratory system and skin; R33 - Danger of cumulative effects; R49 – May cause cancer by inhalation.

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 5 minutes, while holding the eyelid(s) open. Obtain medical advice.

Skin Contact: Remove contaminated clothing, shoes and leather goods (e.g. watchbands, belts). Flush with lukewarm gently flowing water 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. Obtain medical advice.

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 material is not flammable or combustible.

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

Fire Fighting: 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.

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 the Protective Equipment Section 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 containers for recovery or disposal. 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 (see also Section 8). Close-fitting safety goggles may be necessary in some circumstances to prevent eye contact with dust.

Environmental Precautions: Zinc calcine may be toxic in the aquatic and terrestrial environments. It is also prone to dusting which can lead to wind-borne contamination. Prevent spills from entering watercourses.

SECTION 7. HANDLING AND STORAGE

Store in a cool dry area away from incompatible materials. Generation of zinc calcine dust should be avoided. Transport on roadways should be in covered containers and storage piles should be protected. Storm water runoff in contact with zinc calcine should be managed in accordance with local water quality protection requirements. Always practice good personal hygiene. Refrain from eating, drinking, or smoking in work areas. Thoroughly wash hands before eating, drinking, or smoking in appropriately designated areas.

EU Safety Phrases(s): S53 - Avoid exposure - obtain special instructions before use; S36/37/39 – Wear suitable protective clothing, gloves and eye/face protection; S24/25 – Avoid contact with skin and eyes; S22 – Do not breathe dust.

SECTION 8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Protective Clothing: Coveralls or other work clothing, safety glasses and gloves are recommended to prevent prolonged or repeated direct skin contact. Close-fitting safety goggles may be required to prevent eye contact if excessive dust is generated. 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 and laundered before reuse if there is reasonable probability that the clothing may be contaminated.

Ventilation: Use adequate local or general ventilation to maintain the concentration of zinc calcine dust 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 zinc calcine 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).

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance: Red-brown powder	Odour: None	Physical State: Solid	pH: Not Applicable
Vapour Pressure: Negligible	Vapour Density: Not Applicable	Boiling Point/Range: No Data	Freezing/Melting Point/Range: No Data
Specific Gravity: Approx. 5 to 6	Evaporation Rate: Not Applicable	Coefficient of Water/Oil Distribution: No Data	Odour Threshold: Not Applicable
Solubility in Water: Minimal			

SECTION 10. STABILITY AND REACTIVITY

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

Incompatibilities: Intimate mixtures of chlorinated rubber and zinc oxide in the presence or absence of hydrocarbon or halocarbon solvents react violently or explosively at about 216 °C. Zinc oxide and magnesium metal filings or powder can react violently when heated.

Hazardous Decomposition Products: High temperature operations such as oxy-acetylene cutting or electric arc welding on surfaces contaminated with zinc calcine will generate metal oxide fumes that, on inhalation in sufficient quantity, can produce metal fume fever. Some sulphur dioxide gas may also be generated.

SECTION 11. TOXICOLOGICAL INFORMATION

General: The toxicological properties of this material have not been fully investigated. The information contained in this MSDS is therefore based on information in the technical and scientific literature about the material's constituent compounds. The primary route of exposure would be through inhalation of dust.

Acute:

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

Inhalation: Exposure to zinc calcine dust is irritating to the nose, throat and respiratory tract with dryness and irritation of the nose and throat, possible tightness of the chest, coughing and metallic taste. It may cause headache, as well as gastrointestinal disturbances with nausea, vomiting, diarrhea, abdominal spasms, fatigue, sleep disturbances, weight loss, anemia, and pain in legs, arms, and joints. An intense, short-term exposure to welding/burning fumes could cause congestion and pulmonary edema. However, short-term exposures of this magnitude are unlikely in industry today. Less intense short term exposure could result in the condition called metal fume fever. The symptoms of metal fume fever will occur within 3 to 10 hours of exposure, and include immediate dryness and irritation of the throat, tightness of the chest, and coughing which 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. The symptoms are temporary and generally disappear, without medical intervention, within 24 to 48 hours of onset. There are no recognized complications, after effects, or chronic effects that result from zinc metal fume fever. An acute, short-term exposure to high levels of fumes could also result in the absorption of lead and possibly cadmium in the body. Kidney damage, as well as anemia, could potentially result from continued, intense dust/fume exposures.

Ingestion: Symptoms due to ingestion of dust or fume would be similar to those from inhalation. Other health effects such as constipation or bloody diarrhea might also occur.

Chronic: The chronic health effects of zinc calcine have not been fully investigated. Prolonged exposure may be expected to produce many of the symptoms of short-term exposure and may also cause mild skin rashes or dermatitis in a few individuals. Inhalation of very high dust concentrations may result in lead absorption with elevated blood lead concentrations and symptoms of fatigue, anemia, gastrointestinal disturbances, and possible central nervous system and kidney damage. Effects on male and female reproductive capacity are cited for lead. Pregnant women should be protected from excessive exposure as lead can cross the placental barrier and unborn children may suffer neurological damage or developmental problems. Teratogenic and mutagenic effects from exposure to lead have been reported in some studies but not in others. The literature is inconsistent and no firm conclusions can be drawn at this time. Lead and lead compounds are listed as an *A3 Carcinogen (Confirmed Animal Carcinogen with Unknown Relevance to Humans)* by the ACGIH. IARC has listed lead compounds as *Group 2A Carcinogens (Probably Carcinogenic to Humans)*. The NTP has recently listed lead and lead compounds as *Reasonably Anticipated to be a Human Carcinogen*. OSHA and the EU do not currently list lead as a human carcinogen. IARC has classified cadmium and certain cadmium compounds as a *Group 1 Carcinogen (Carcinogenic to Humans)* while ACGIH classify cadmium as a *Suspected Human Carcinogen (A2)*. The NTP classifies cadmium as a *Known Human Carcinogen* and OSHA lists cadmium as a *Carcinogen*. The EU classifies cadmium oxide as a *Category 2 (Probable) Carcinogen*.

SECTION 12. ECOLOGICAL INFORMATION

While this product has very low solubility, its processing or extended exposure in the aquatic and terrestrial environments may lead to the release of zinc, lead and cadmium compounds in bioavailable forms. Compounds of these metals can be toxic to aquatic organisms, especially fish, with lead and cadmium being so at low concentrations. Water hardness, pH and dissolved organic carbon content are factors which regulate the degree of toxicity by both metals. Lead compounds are not particularly mobile in surface water or groundwater but zinc and cadmium compounds are quite mobile in both media.

In soil, lead tends to become highly sorbed on soil particles in accordance with soil properties but zinc and cadmium are more mobile and bioavailable, especially in acidic soils. Zinc, lead and cadmium bioaccumulate in plants and animals in aquatic and terrestrial environments.

SECTION 13. DISPOSAL CONSIDERATIONS

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

SECTION 14. TRANSPORT INFORMATION

TRANSPORT CANADA CLASSIFICATION..... Not regulated
PROPER SHIPPING NAME (U.S.) Environmentally Hazardous Substance, Solid, n.o.s.
(contains lead sulphate)
HAZARD CLASSIFICATION (U.S.) Class 9, Packing Group III
U.S. RQ..... Lead sulphate (10 lbs./4.54 kg.)
PRODUCT IDENTIFICATION NUMBER (U.S.) UN3077
MARINE POLLUTANT No
IMO CLASSIFICATION Materials Hazardous Only in Bulk

SECTION 15. REGULATORY INFORMATION

U.S.

INGREDIENTS LISTED ON TSCA INVENTORY Yes

HAZARDOUS UNDER HAZARD COMMUNICATION STANDARD..... Yes

CERCLA SECTION 103 HAZARDOUS SUBSTANCES Lead Sulphate..... RQ:10 lbs. (4.54 kg.)
Zinc Compounds (see below)
Zinc Oxide RQ:None assigned
Zinc Sulphate..... RQ:1000 lbs. (454 kg.)
Zinc Silicate RQ:None assigned
Cadmium Compounds RQ:None assigned

EPCRA SECTION 302 EXTREMELY HAZARDOUS SUBSTANCE Cadmium Oxide RQ:100 lbs. (45.4 kg.)
Threshold Planning Quantity:100/10,000 lbs.*

*The lower quantity applies only if the solid exists in powdered form and has a particle size less than 100 microns, or is handled in solution or in molten form, or meets the criteria for a National Fire Protection Association (NFPA) rating of 2, 3 or 4 for reactivity. If the solid does not meet any of these criteria, it is subject to the upper (10,000 pound) threshold planning quantity.

EPCRA SECTION 311/312 HAZARD CATEGORIES..... Delayed (Chronic) Health Hazard - Carcinogen
Delayed (Chronic) Health Hazard – Reproductive Toxin

EPCRA SECTION 313 TOXIC RELEASE INVENTORY..... Zinc Compounds (primarily Zinc Oxide, some Zinc
Sulphate and Zinc Silicate)
CAS No 1314-13-2 (Zinc Oxide)
Percent by Weight:..... 55 to 65%

Lead Compounds (Lead Sulphate)
CAS No 7446-14-2
Percent by Weight:..... 2 to 3%

Cadmium Compounds (Cadmium Oxide)
CAS No. 1306-19-0
Percent by Weight..... 0.2 to 0.3%

CANADIAN:

INGREDIENTS LISTED ON DOMESTIC SUBSTANCES LIST Yes

WHMIS CLASSIFICATION: D2A, Material Causing Other Toxic Effects – Very Toxic

EUROPEAN UNION:

INGREDIENTS LISTED ON THE EUROPEAN INVENTORY OF
EXISTING COMMERCIAL CHEMICAL SUBSTANCES (EINECS)..... Yes

EU CLASSIFICATION: Irritant, Repr. Cat. 1, Toxic, Carc. 2

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.
- American Conference of Governmental Industrial Hygienists, 2006, Guide to Occupational Exposure Values.
- American Conference of Governmental Industrial Hygienists, Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices - 2006.
- Bretherick's Handbook of Reactive Chemical Hazards, 20th Anniversary Edition. (P. G. Urben ed.) 1995.
- Canadian Centre for Occupational Health and Safety (CCOHS), Hamilton, Ont., CHEMpendium Chemical Information Data Base On-line version 2006.
- European Economic Community, Commission Directives 91/155/EEC and 67/548/EEC.
- Industry Canada, Controlled Products Regulations, SOR/88-66, as amended.
- International Agency for Research on Cancer (IARC), Monographs on the Evaluation of the Carcinogenic Risk of Chemicals to Man, 1972 – 2006, (multi-volume work), World Health Organization, Geneva.
- International Chemical Safety Cards (WHO/IPCS/ILO), ICSC:0052 – Lead, ICSC 0208 – Zinc Oxide, ICSC 0117 – Cadmium Oxide.
- Merck & Co., Inc., 2001, The Merck Index, An Encyclopedia of Chemicals, Drugs, and Biologicals, 13th Edition.
- National Library of Medicine, National Toxicology Information Program, 2006, Hazardous Substance Data Bank. On-line version.
- Patty's Toxicology, 5th Edition, (E Bingham, B Cohrssen & C H Powell, ed.) 2001:
- Sax, N. Irving, 1989, Dangerous Properties of Industrial Materials, Seventh Edition.
- U.S. Department of Health and Human Services, National Institute for Occupational Safety and Health, 2001, NIOSH Pocket Guide to Chemical Hazards. CD-ROM Edition, September 2005.
- U.S. Department of Health and Human Services, Public Health Service National Institute for Occupational Safety and Health, Registry of Toxic Effects of Chemical Substances (RTECS) on line version.
- U.S. Department of Health and Human Services, National Institute of Environmental Health Sciences, National Toxicology Program (NTP), 11th Report on Carcinogens, January 2005.
- U.S. Department of Health and Human Services, Public Health Service, Agency for Toxic Substances and Disease Registry, Update Toxicological Profile for Lead September 2005.
- U.S. Department of Health and Human Services, Public Health Service, Agency for Toxic Substances and Disease Registry, Update Toxicological Profile for Zinc August 2005.
- U.S. Occupational Safety and Health Administration, 1989, Code of Federal Regulations, Title 29, Part 1910.

Notice to Reader

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