

INDIUM METAL MATERIAL SAFETY DATA SHEET

SECTION 1. PRODUCT AND COMPANY IDENTIFICATION

Product Identity: Indium Metal

NOTE: in the form in which this product is sold it is not regulated. This Material Safety Data Sheet is provided for information only.

Manufacturer:

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

Supplier:

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Product Use: Indium metal is used in the production of indium tin oxide (ITO) as the coating in flat panel display devices: liquid crystal displays, plasma display devices and field emission devices. It is also used in making coatings in architectural glass, low pressure sodium lamps, solar collectors, and windshield glass. Indium is used in plating for bearings, alloys for solders, fusible alloys, nuclear control rods and dental alloys. Indium is used in compounds for phosphors and semiconductors. Other uses include batteries and radioisotopes.

SECTION 2. COMPOSITION / INFORMATION ON INGREDIENTS

Ingredient	Approximate Percent by Weight	CAS Number	Occupational Exposure Limits (OELs)	LD ₅₀ / LC ₅₀ Species and Route
Indium	99.9%	7440-74-6	OSHA PEL None Established* ACGIH TLV 0.1 mg/m ³ NIOSH REL 0.1 mg/m ³	LD ₅₀ , rat, oral 4,200 mg/kg

*NOTE: In 1989 OSHA proposed a PEL of 0.1 mg/m³ for indium and indium compounds in its Final Rule on occupational exposure limits. However, this Final Rule PEL was vacated by a court decision and is currently not enforceable. 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: None.

SECTION 3. HAZARDS IDENTIFICATION

Emergency Overview: A soft, silvery-white metal that does not burn in bulk but may form explosive mixtures if dispersed in air as a fine powder. Indium is relatively non-toxic and poses little immediate hazard to the health of emergency response personnel or the environment in an emergency situation.

Potential Health Effects: Relatively non-toxic to humans by inhalation or ingestion. Chronic exposure may cause irritation to the lungs and gastrointestinal disorders. It is not considered a human carcinogen by the OSHA, NTP, ACGIH, IARC or the EU. (See Toxicological Information, Section 11).

Potential Environmental Effects: In the form in which this product is sold, it has low bioavailability and does not pose any significant environmental risks. Releases of the product to water and soil should, nevertheless, be prevented. (See Ecological Information, Section 12.)

EU GHS CLP Classification: Indium 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 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: No health effects expected. If irritation does occur, flush with lukewarm, gently flowing water for 5 minutes. If irritation persists, obtain medical advice. If splashed by 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: If symptoms are experienced remove source of contamination or move victim from exposure area to fresh air immediately. Obtain medical advice.

Ingestion: If swallowed, no specific intervention is indicated as this material is not likely to be hazardous by ingestion. However, if irritation or discomfort occurs, obtain medical advice.

SECTION 5. FIRE FIGHTING MEASURES

Fire and Explosion Hazards: Massive metal is not considered a fire or explosion hazard. Finely-divided indium 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: Use any means of extinction appropriate for surrounding fire conditions such as water spray, carbon dioxide, dry chemical, or foam. Do not use direct water streams on fires where molten metal is present.

Fire Fighting: Indium metal has a low melting point. Therefore, if possible move this material from the fire area and/or cool material exposed to flame in order to prevent molten pools of indium. Do not use direct water streams on fires where molten metal is present, 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 should 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 outlined below. 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 or dampen material and shovel/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 economic value of indium. Treat or dispose of waste material in accordance with all local, regional, and national requirements.

Personal Precautions: Protective clothing, gloves, and a respirator are recommended for persons responding to an accidental release (see also Section 8). Close-fitting safety goggles may be necessary in some circumstances to prevent eye contact with indium metal dust or fume.

Environmental Precautions: Indium metal has low bioavailability and poses no immediate ecological risks. However, good management practices should always be applied in the storage and use of indium and its compounds. Any releases of the product to water and soil should be prevented.

SECTION 7. HANDLING AND STORAGE

Store in a cool, dry, covered area away from incompatible materials. Solid metal 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. No special packaging materials are required.

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

SECTION 8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Protective Clothing: Work clothes and gloves are recommended to prevent prolonged or repeated direct skin contact. 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, 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 indium 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. Where indium metal dust or filings are being collected and transported by a ventilation system, use a non-sparking, grounded ventilation system separate from other exhaust ventilation systems. Locate dust collectors and fans outdoors if possible and provide dust collectors with explosion vents or blow out panels. Refer to appropriate NFPA Standards 484, 654, and/or 68 for specific guidance.

Respirators: Where indium dust or fumes are generated and cannot be controlled in the working environment 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: Soft, silvery-white metal	Odour: None	Physical State: Solid	pH: Not Applicable
Vapour Pressure: Negligible @ 20°C	Vapour Density: Not Applicable	Boiling Point/Range: 2072°C	Melting Point/Range: 156.6°C
Specific Gravity: 7.31	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: Indium is stable and not considered reactive under normal temperatures and pressures. Hazardous polymerization or runaway reactions will not occur.

Incompatibilities: An explosive reaction may occur on contact with dinitrogen tetraoxide dissolved in acetonitrile. Indium reacts vigorously with mercury (II) bromide at high temperatures (350° C). Mixtures with sulphur ignite when heated. Reacts with halogens, selenium, tellurium, arsenic or phosphorus on heating. Avoid oxidizing agents and acids.

Hazardous Decomposition Products: High temperature operations such as oxy-acetylene cutting, electric arc welding or arc-air gouging will generate indium oxide fumes. The particle size of 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: The information available on the toxic properties of indium in humans is limited. It is known that soluble indium salts are extremely toxic when injected into laboratory animals with a direct effect on the heart, liver, kidneys and blood. However, indium salts are far less toxic when administered orally or by inhalation. Teratogenic effects have been reported in laboratory animals injected with indium but it is considered that the risk of developmental toxicity in humans is low. The inhalation route is by far the most significant route in the occupational setting.

Acute:

Skin/Eyes: Indium metal is not irritating to the eyes or skin other than by direct abrasive action of metal particles on eye or skin tissue. Soluble indium salts are very irritating to the eyes.

Inhalation/Ingestion: Inhalation of indium fume or dust may cause irritation and damage to the respiratory tract. It may also irritate the gastrointestinal tract if ingested.

Chronic: Prolonged exposure to indium fume or dust may cause irritation and damage to the lung. Russian workers exposed to indium compounds during the production of indium complained of tooth decay, pain in joints and bones, nervous and gastrointestinal disorders, heart pains, and general debility. Indium and indium oxide are not listed as human carcinogens 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

Indium metal is highly insoluble, and therefore presents minimal ecological risk. However, its processing or extended exposure in the environment may lead to the release of indium in more bioavailable compound forms. As there is limited information on the fate and effects of indium compounds, care should be taken to prevent releases to the environment.

SECTION 13. DISPOSAL CONSIDERATIONS

In view of the economic value of indium metal, every effort should be made to recover and reuse any spilled material. 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.

SECTION 15. REGULATORY INFORMATION

U.S.:

Listed On TSCA Inventory: Yes

Hazardous Under Hazard Communication Standard:..... Yes

CERCLA Section 103 Hazardous Substance: No

EPCRA Section 302 Extremely Hazardous Substance: No

EPCRA Section 311/312 Hazard Categories:..... No hazard categories apply.

EPCRA Section 313 Toxic Release Inventory: This product does not contain any toxic chemicals subject to the Toxic Release reporting requirements.

CANADIAN:

Listed on the Domestic Substances List: Yes

WHMIS Classification:..... Not applicable. Indium 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:..... Indium metal is 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 Indices, Seventh Edition, plus updates.
- American Conference of Governmental Industrial Hygienists, Guide to Occupation Exposure Values - 2012.
- 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, 20th Anniversary Edition. (P. G. Urban Ed.) 1995.
- Canadian Centre for Occupational Health and Safety (CCOHS) CHEMINFO Record 3500 (last updated 2006-05).
- Commission de la santé et la sécurité du travail, Service du Répertoire toxicologique – Indium. (last updated Jan 2000).

- Developmental toxicity of indium: embryotoxicity and teratogenicity in experimental animals. M. Nakajima, M. Usami, K. Nakazawa *et al*, *Conjenit. Anom.* (Kyoto) 2008, Dec. 48(4), 145 – 150 (Nat'l Library of Medicine PubMed ID 18983530).
- European Economic Community, Commission Directives 91/155/EEC and 67/548/EEC.
- Industry Canada, SOR/88-66, Controlled Products Regulations, as amended.
- International Labour Office (WHO/ILO) Encyclopaedia of Occupational Health & Safety 4th Ed.
- 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).
- Patty's Toxicology, Fifth Edition, 2001. E. Bingham, B. Cohnsen & C.H. Powell, Ed.
- Preliminary Investigation of Effects on the Environment of Boron, Indium, Nickel, Selenium, Tin, Vanadium, and Their Compounds – Volume II, Indium (August 1975) EPA Document EPA 560/2-75-005B.
- 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. Occupational Safety and Health Administration, 1989, Code of Federal Regulations, Title 29, Part 1910.

Notice to Reader

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