

**GERMANIUM DIOXIDE
SAFETY DATA SHEET**

SECTION 1. IDENTIFICATION

Product Identity: Germanium Dioxide

Trade Names and Synonyms: Germanic acid; germanium oxide; germania; G-15; ACC10380.

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

Supplier:
In U.S.:
Teck American Metal Sales
Incorporated
501 North Riverpoint Blvd, Suite 300
Spokane, WA
USA, 99202

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

Other than U.S.:
Teck Metals Ltd.
#1700 – 11 King Street West
Toronto, Ontario
M5H 4C7

Date of Last Review: June 12, 2015.

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Product Use: Germanium dioxide is used in the production of phosphors, transistors and diodes, infrared-transmitting glass, and as a catalyst in the manufacture of PET resin. It is often converted to other germanium compounds for use in applications such as fibre optics and chemotherapy.

SECTION 2. HAZARDS IDENTIFICATION

CLASSIFICATION:

NOTE: In the form in which it is sold, this product is not regulated as a Hazardous Product in the US or Canada. This Safety Data Sheet is provided for information purposes only.

Health		Physical	Environmental
Acute Toxicity (Oral, Inhalation)	- Does not meet criteria	Does not meet criteria for any Physical Hazard	Aquatic Toxicity – Short Term/Long Term Does not meet criteria
Skin Corrosion/Irritation	- Does not meet criteria		
Eye Damage/Eye Irritation	- Does not meet criteria		
Respiratory or Skin Sensitization	- Does not meet criteria		
Mutagenicity	- Does not meet criteria		
Carcinogenicity	- Does not meet criteria		
Reproductive Toxicity	- Does not meet criteria		
Specific Target Organ Toxicity	- Does not meet criteria		
Acute Exposure	- Does not meet criteria		
Chronic Exposure	- Does not meet criteria		

LABEL:

Symbols: None required	Signal Word: None required
Hazard Statements None Required	Precautionary Statements: None required

Emergency Overview: An odourless white powder which is non-combustible. Germanium dioxide is relatively non-toxic and poses little immediate hazard to personnel or the environment in an emergency situation. However, acrid and irritating smoke can

form at very high temperatures. Contact with hydrochloric acid will emit volatile germanium tetrachloride, which is corrosive and irritating.

Potential Health Effects: Inhalation or ingestion of germanium dioxide dust may cause localized irritation. Direct contact of germanium dioxide with eyes or skin may cause local irritation. It is not considered a human carcinogen by OSHA, NTP, ACGIH, IARC or the EU (see Toxicological Information, Section 11).

Potential Environmental Effects: Germanium dioxide is considered to have low bioavailability and toxicity when released into the environment; therefore, it poses no immediate ecological risk (see Ecological Information, Section 12).

SECTION 3. COMPOSITION / INFORMATION ON INGREDIENTS

HAZARDOUS COMPONENTS	CAS Registry No.	CONCENTRATION (% wgt/wgt)
Germanium Dioxide	1310-53-8	100%

Note: See Section 8 for Occupational Exposure Guidelines.

SECTION 4. FIRST AID MEASURES

Eye Contact: *Symptoms:* Mild irritation. If irritation occurs, cautiously rinse eye(s) with lukewarm, gently flowing water for 5 minutes, while holding the eyelids open. If eye irritation persists, get medical advice/attention.

Skin Contact: *Symptoms:* No health effects expected. If irritation does occur, flush with lukewarm, gently flowing water for 5 minutes. If irritation occurs, obtain medical advice.

Inhalation: *Symptoms:* Possible respiratory irritation. If symptoms are experienced remove source of contamination or move victim from exposure area to fresh air immediately. Get medical advice/attention if you feel unwell or are concerned.

Ingestion: *Symptoms:* If swallowed, no specific intervention is indicated as this material is not likely to be hazardous by ingestion. However, if you feel unwell or are concerned, get medical advice/attention.

SECTION 5. FIRE FIGHTING MEASURES

Fire and Explosion Hazards: Germanium dioxide is non-combustible and is a negligible fire or explosion hazard when exposed to heat or flame. However, acrid and irritating smoke can form at very high temperatures.

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 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.

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 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 labelled containers for later recovery in view of the economic value of germanium dioxide. 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 the dust.

Environmental Precautions: Germanium dioxide is considered to have low bioavailability and toxicity when released into the environment; therefore, it poses no immediate ecological risk. Releases of the product to water and soil should be prevented.

SECTION 7. HANDLING AND STORAGE

Store germanium dioxide in a tightly closed container in a cool, dry, covered area away from incompatible materials. No special packaging materials are required.

SECTION 8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Occupational Exposure Guidelines:

<u>Component</u>	<u>ACGIH TLV</u>	<u>OSHA PEL</u>	<u>NIOSH REL</u>
Germanium Dioxide	None established	None established	None established

NOTE: OEGs for individual jurisdictions may differ from those given above. Check with local authorities for the applicable OEGs in your jurisdiction.

ACGIH - American Conference of Governmental Industrial Hygienists; OSHA - Occupational Safety and Health Administration; NIOSH - National Institute for Occupational Safety and Health. TLV – Threshold Limit Value, PEL – Permissible Exposure Limit, REL – Recommended Exposure Limit.

NOTE: The selection of the necessary level of engineering controls and personal protective equipment will vary depending upon the conditions of use and the potential for exposure. The following are therefore only general guidelines that may not fit all circumstances. Control measures to consider include:

Ventilation: Use adequate local or general ventilation to maintain the concentration of germanium dioxide dust in the working environment as low as practicable. Supply sufficient replacement air to make up for air removed by the exhaust system.

Protective Clothing: Gloves and coveralls or other work clothing are recommended to prevent prolonged or repeated direct skin contact when germanium dioxide is processed. Eye protection should be worn where dust is generated.

Respirators: Where germanium dioxide 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).

General Hygiene Considerations: 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.

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance: Colourless crystals or white powder	Odour: None	Odour Threshold: Not Applicable	pH: Not Applicable
Vapour Pressure: . <9.25 Pa @ 25°C	Vapour Density: Not Applicable	Melting Point/Range: 1115°C	Boiling Point/Range: No Data
Relative Density: 4.23 (Water = 1) Bulk Density: 1614 Kg/m ³	Evaporation Rate: Not Applicable	Coefficient of Water/Oil Distribution: log Pow = 2.21	Solubility: 4.14 g/L @ 20 °C, 4.5 g/L @ 25°C, 10.7 g/L @ 100°C
Flash Point: None	Flammable Limits (LEL/UEL): Not Flammable	Auto-ignition Temperature: None	Decomposition Temperature: None

SECTION 10. STABILITY AND REACTIVITY

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

Incompatibilities: Germanium dioxide is incompatible with strong oxidizing agents and concentrated hydrochloric acid.

Hazardous Decomposition Products: Acrid and irritating smoke will form at very high temperatures. Contact between germanium dioxide and hydrochloric acid emits volatile germanium tetrachloride, which is corrosive and irritating.

SECTION 11. TOXICOLOGICAL INFORMATION

General: On the basis of both animal experiments and industrial experience it is believed that elemental germanium and germanium dioxide are of low toxicity both acutely and chronically by all routes of administration including inhalation.

Acute:

Skin/Eye: Direct contact with skin or eyes may cause local irritation due to the reaction between germanium dioxide and moisture on the skin or eye to form germanic acid, which is an irritant.

Inhalation: Inhalation of germanium dioxide dust may be irritating to the respiratory system. Symptoms may include coughing, sneezing and/or shortness of breath.

Ingestion: A few cases of kidney damage, liver damage, anemia, peripheral neuropathy and even death have been reported in individuals who have taken large doses of germanium products as food supplements or health-promoting elixirs.

Chronic: Prolonged exposure in a few patients ingesting germanium medications has been shown to affect the kidneys (renal dysfunction) and the liver (hepatotoxicity) as well as occasionally affecting the nervous system (peripheral neuropathy). Similar effects have not been reported in workers occupationally exposed to germanium or germanium dioxide. Germanium dioxide is not mutagenic in bacterial testing (OECD 471) and 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).

Animal Toxicity:

<u>Hazardous Ingredient:</u>	<u>Acute Oral Toxicity:</u>	<u>Acute Dermal Toxicity:</u>	<u>Acute Inhalation Toxicity:</u>
Germanium Dioxide	>2,000 mg/kg †	No data	>1,420 mg/m ³ /4hr [‡]

† LD₅₀, Rat, Oral, determined on a sample of Trail's production ‡ LC₅₀, Rat, Inhalation, 4 hour – RTECS report

SECTION 12. ECOLOGICAL INFORMATION

Germanium dioxide has low bioavailability in water and is believed to present no immediate ecological risk. Little is known about the toxicity of germanium compounds; therefore, care should be taken to prevent any releases to the environment.

SECTION 13. DISPOSAL CONSIDERATIONS

In view of the economic value of germanium dioxide, every effort should be made to recover and reuse any spilled materials. 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.

INGREDIENTS LISTED ON TSCA INVENTORY..... Yes
HAZARDOUS UNDER HAZARD COMMUNICATION STANDARD..... No
CERCLA SECTION 103 HAZARDOUS SUBSTANCES 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.

SECTION 16. OTHER INFORMATION

Date of Original Issue: December 3, 1998 **Version:** 01 (*First edition*)
Date of Latest Revision: June 12, 2015 **Version:** 13

The information in this 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, 2015, Guide to Occupation Exposure Values.
- American Conference of Governmental Industrial Hygienists, 2015, 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.
- European Economic Community, European Regulation (EC) No 1272/2008 (Classification, Labelling and packaging of substances and mixtures).

- Handbook on the Toxicology of Metals, 3rd Ed., Gunnar F. Nordberg, Bruce A. Fowler, Monica Nordberg and Lars Friberg, Editors, Academic Press, New York, NY (2007).
- Health Canada, SOR/2015-17, Hazardous Products Regulations, 30 January 2015.
- 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.
- U.S. Dept. of Health and Human Services, National Institute for Occupational Safety and Health. NIOSH Pocket Guide to Chemical Hazards, CD-ROM Edition DHHS (NIOSH) Publication September 2005.

Notice to Reader

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