

**GERMANIUM DIOXIDE SOLUTION TGO
SAFETY DATA SHEET**

SECTION 1. IDENTIFICATION

Product Identity: Germanium Dioxide Solution TGO

Trade Names and Synonyms: TGO

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 23, 2015.

Date of Last Edit: June 23, 2015.


Product Use: Catalyst Solution.

SECTION 2. HAZARDS IDENTIFICATION

CLASSIFICATION:

Health		Physical	Environmental
Acute Toxicity (Oral)	- Category 4	Does not meet criteria for any Physical Hazard	Aquatic Toxicity – Short Term Category 1
Skin Corrosion/Irritation	- Category 1		
Eye Damage/Eye Irritation	- Category 2B		
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:			
Acute Exposure	- Category 3		
Chronic Exposure	- Category 1		

LABEL:

Symbols:		Signal Word:
		DANGER
Hazard Statements		Precautionary Statements:
DANGER! Causes severe skin burns and eye damage. Harmful if swallowed. May cause respiratory irritation. May cause damage to kidneys through prolonged or repeated inhalation of mists. Very toxic to aquatic life.		Do not breathe mists or vapours. Wear protective gloves, protective clothing and eye/face protection. Wash thoroughly after handling. Do not eat, drink or smoke when using this product. Collect spillage. Avoid release to the environment. Store locked up. Dispose of containers/contents according to local hazardous waste regulations. IF ON SKIN or HAIR: Take off immediately all contaminated clothing. Rinse skin with water or shower. Immediately call for medical assistance. Wash contaminated clothing before reuse. IF IN EYES: Rinse cautiously with water for several minutes. Do not delay irrigation in order to attempt to remove contact lenses. If eye irritation persists, get medical advice/attention. IF INHALED: Remove person to fresh air and keep comfortable for breathing. Get medical advice/attention if you feel unwell. IF SWALLOWED: Rinse mouth. DO NOT induce vomiting. Immediately call for medical assistance.

Emergency Overview: A colourless, odourless liquid which is non-combustible but, in a fire, may decompose with the possible production of irritating and potentially toxic fumes. Skin or eye contact will cause irritation of tissues.

Potential Health Effects: Skin or eye contact will cause corrosion and/or irritation of tissue, which may be severe in the case of eye contact. Vapours or mist may be irritating to the upper respiratory system. Moderately toxic by ingestion. Reproductive effects have also been demonstrated in experimental animals for one of the major components. None of the components is listed as a human carcinogen by OSHA, the NTP, IARC, the ACGIH or the European Union (EU) (see Toxicological Information, Section 11).

Potential Environmental Effects: Germanium compounds are believed to pose a low level of environmental hazard but there is little documentation on this subject. Ethylene glycol is known to have a relatively low level of toxicity to organisms. However, the product is hazardous because of its substantial acid content and low pH (see Ecological Information, Section 12).

SECTION 3. COMPOSITION / INFORMATION ON INGREDIENTS

HAZARDOUS COMPONENTS	CAS Registry No.	CONCENTRATION (% wgt/wgt)
Germanium Dioxide	1310-53-8	11%
Ethylene Glycol	107-21-1	32%
Organic Acid	Proprietary †	29%
Water	--- --	28%

Note: See Section 8 for Occupational Exposure Guidelines.

† HMIRC Exemption: An exemption was granted on December 22, 2004 by the Hazardous Materials Information Review Commission to withhold the chemical identity of one ingredient of this product under HMIRC Registry No. 5099.

SECTION 4. FIRST AID MEASURES

Eye Contact: *Symptoms:* Pain, redness, irritation. Rinse the eye(s) cautiously with lukewarm gently flowing water for several minutes, while holding the eyelid(s) open. Remove contact lens if present and easy to do but do not delay irrigation in order to attempt to remove the lens. Continue rinsing for 15 – 20 minutes. Take care not to rinse contaminated water into the unaffected eye or onto the face. If eye irritation persists, get medical advice/attention.

Skin Contact: *Symptoms:* Stinging, irritation, redness. Immediately take off contaminated clothing, shoes and leather goods (e.g., watchbands, belts). Gently blot away excess product. Shower if contamination is extensive. Otherwise, wash with plenty of lukewarm gently flowing water and mild soap for 15 – 20 minutes. If skin irritation occurs or you feel unwell, get medical advice/attention. Wash contaminated clothing before reuse or else discard.

Inhalation: *Symptoms:* Irritation of nose, throat and upper airways. Remove source of exposure or move person to fresh air and keep comfortable for breathing. Get medical advice/attention if you feel unwell.

Ingestion: *Symptoms:* Irritation/burning of the mouth, throat and GI tract. Rinse mouth. Do NOT induce vomiting. Immediately call for medical assistance. If vomiting occurs naturally, lie affected person on their side, in the recovery position.

SECTION 5. FIRE FIGHTING MEASURES

Fire and Explosion Hazards: This product is not considered a fire or explosion hazard. However, if involved in a fire it will decompose with the possible production of irritating and potentially toxic fumes.

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 face piece mask.

SECTION 6. ACCIDENTAL RELEASE MEASURES

Procedures for Cleanup: Control source of release if possible to do so safely. Contain spill, isolate hazard area, and deny entry to unauthorized personnel. Dike area around spill, pump uncontaminated material back to process if possible, and then absorb any remaining liquid in solid absorbent such as vermiculite or clay absorbents. Place irreclaimable material and used absorbents in suitable labelled containers for final disposal. Wash site of spillage with large amounts of water. Do not let wash water enter natural watercourses. Treat or dispose of waste spilled material and contaminated wash water in accordance with all local, regional and national regulations.

Personal Precautions: Protective clothing, chemical resistant gloves, and eye protection are recommended for persons responding to an accidental release (see also Section 8). Close-fitting safety goggles or a face mask should be worn to prevent eye contact when splashing is a possibility. Workers should wash and also consider the need to change clothing following cleanup of a spill to minimize personal contamination.

Environmental Precautions: Components of this product can pose a threat to the environment. Contamination of watercourses should be prevented. Do not allow spills of this solution to enter sewers or watercourses.

SECTION 7. HANDLING AND STORAGE

Store in its original container in a dry, cool, well-ventilated area away from potentially incompatible materials. Keep container tightly closed in storage. Protect from physical damage. It is good practice to keep containers closed when not in use.

SECTION 8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Occupational Exposure Guidelines: *(Time-Weighted Average (TWA) concentration over 8 hr unless otherwise indicated)*

Component	ACGIH TLV	OSHA PEL	NIOSH REL
Germanium Dioxide	None established	None established	None established
Ethylene Glycol	100 mg/m ³ (Ceiling)	None established	None established
Organic Acid	1 mg/m ³	1 mg/m ³	1 mg/m ³

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 aerosol mist well below recommended occupational exposure limits.

Protective Clothing: Gloves and coveralls, shop coat or other work clothing with long sleeves are recommended to prevent prolonged or repeated direct skin contact when handling bulk solution. Eye protection should be worn where mist is generated and where any possibility exists that eye contact may occur. An eyewash and quick drench shower should be provided near the work area. 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 contaminated and should be laundered before reuse.

Respirators: Where mist or aerosol 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-95 particulate filter cartridge). A full face respirator may be necessary to provide sufficient eye protection against aerosol mists.

General Hygiene Considerations: Always practice good personal hygiene. Refrain from eating, drinking, or smoking in work areas. Thoroughly wash hands after handling and before eating, drinking, or smoking in appropriate, designated areas.

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance: Clear, colourless solution	Odour: Odourless	Odour Threshold: Not Applicable	pH: <1
Vapour Pressure: 0.05 mm Hg @ 20°C (Ethylene Glycol)	Vapour Density: 2.14 (Ethylene Glycol)	Freezing Point/Range: Approx. -20 °C	Boiling Point/Range: >100 °C
Relative Density (Water = 1): 1.3	Evaporation Rate: No Data	Coefficient of Water/Oil Distribution: No Data	Solubility: Complete (aqueous solution)
Flash Point: None	Flammable Limits (LEL/UEL): Not Flammable	Auto-ignition Temperature: None	Decomposition Temperature: None

SECTION 10. STABILITY AND REACTIVITY

Stability & Reactivity: This solution is stable and not considered reactive under normal temperatures and pressures. Hazardous polymerization or runaway reactions will not occur. No specific reaction hazards are known. The components are reported as presenting the following hazards: vigorous reactions with strong oxidizing agents such as chlorosulphonic acid or oleum, formation of explosive products after mixing with perchloric acid, and violent reaction with phosphorus pentasulphide. The organic acid is reported as forming explosive compounds with silver and undergoing a violent reaction with sodium chlorite, urea and/or sodium hypochlorite.

Incompatibilities: Strong oxidizing agents such as nitric, perchloric and chlorosulphonic acid, alkaline substances, urea, sodium chlorite/hypochlorite, phosphorus pentasulphide etc.

Hazardous Decomposition Products: Oxides of carbon.

SECTION 11. TOXICOLOGICAL INFORMATION

General: *CAUTION:* The toxicological properties of this material have not been fully investigated. The information contained in this SDS is therefore based on information in the technical and scientific literature about the material's constituent components.

This material is likely to be corrosive and/or irritating to tissue, particularly so to the eyes, and moderately toxic by ingestion. Hazards are largely those from acute inhalation of mists or overheated vapours or direct contact with the skin and eyes rather than through chronic or repeated low level exposure.

Acute:

Skin/Eye: Direct liquid contact with the eye will cause severe irritation and possible eye tissue damage. Skin contact may also cause stinging, irritation, redness. If not washed off promptly, it may result in corrosive tissue damage.

Inhalation: Vapour concentrations at room temperature are normally too low to cause health effects, but aerosol spray or mist would be irritating. Upon heating, vapour and mist can cause irritation of the nose, throat and upper respiratory passages.

Ingestion: May cause nausea, vomiting, abdominal pain, and weakness, as well as symptoms of central nervous system depression (dizziness, stupor, lack of co-ordination, drunkenness). Probably irritating to the mouth, throat and gastrointestinal passages. Ethylene glycol has produced cardiopulmonary effects, kidney damage and neurological impairment in humans after ingestion of large amounts.

Chronic: Prolonged exposure to germanium dioxide solution can irritate the upper respiratory passages, and occasionally the skin or eyes. A few cases of health effects have been reported in humans taking large amounts of germanium dioxide medicinally. They have generally resulted in renal dysfunction and failure. Chronic ingestion of ethylene glycol has resulted in effects in the kidneys, bone marrow, liver and sperm of animals. Reproductive effects have also been demonstrated in experimental animals at doses that were not toxic to the mothers. None of the components is 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 Ingredients:</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 Φ
Ethylene Glycol	4,000 mg/kg †	9,530 mg/kg*	2,725 mg/m ³ Φ
Organic Acid	≥375 mg/kg †	≥20,000 mg/kg*	No Data
Water	>90,000 mg/kg †	No Data	No Data

† LD₅₀, Rat, Oral, * LD₅₀, Rat, Dermal Φ LC₅₀, Rat, Inhalation, 4 hour
‡ — Actual test result on sample of Trail's germanium dioxide according to OECD 425 procedures – May 2012.
NOTE: The calculated Rat, Oral LD₅₀ for the complete mixture is greater than or equal to 1095 mg/kg

SECTION 12. ECOLOGICAL INFORMATION

The low pH of this solution will result in acidic toxicity effects to aquatic and terrestrial organisms if present in high concentrations. Little is known about the toxicity of germanium compounds but it is believed to be relatively low. The ethylene glycol content of this product has generally low toxicity to organisms in all environmental media.

SECTION 13. DISPOSAL CONSIDERATIONS

Do not wash down drain or allow to reach natural watercourses. If material cannot be returned to process or salvage, dispose of in accordance with applicable regulations. Empty and thoroughly clean all residues from containers before reuse or disposal.

SECTION 14. TRANSPORT INFORMATION

UN (ICAO, IMO) PROPER SHIPPING NAME Corrosive Liquid, Acidic, Organic, n.o.s. (ethanedioic acid solution)
UN CLASSIFICATION Class 8, Packing Group III
UN PRODUCT IDENTIFICATION NUMBER..... UN3265
MARINE POLLUTANT No

SECTION 15. REGULATORY INFORMATION

U.S.
INGREDIENTS LISTED ON TSCA INVENTORY Yes
HAZARDOUS UNDER HAZARD COMMUNICATION STANDARD..... Yes
CERCLA SECTION 103 HAZARDOUS SUBSTANCES Ethylene Glycol – Yes
RQ: 5,000 lbs (2270 kg.)
EPCRA SECTION 302 EXTREMELY HAZARDOUS SUBSTANCE No ingredients qualify.
EPCRA SECTION 311/312 HAZARD CATEGORIES Immediate (Acute) Health Hazard – Corrosive
Immediate (Acute) Health Hazard – Effects on gastrointestinal tract, nervous system, cardiovascular system and kidneys.
Chronic (Delayed) Health Hazard – Effects on kidneys, liver and bone marrow. Teratogen and Fetotoxin
EPCRA SECTION 313 TOXIC RELEASE INVENTORY:..... Ethylene Glycol

SECTION 16. OTHER INFORMATION

Date of Original Issue:	March 7, 2012	Version:	01 (<i>First edition</i>)
Date of Latest Revision:	June 23, 2015	Version:	03

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 Exposure Indices, Seventh Edition plus updates.
- American Conference of Governmental Industrial Hygienists, 2015, Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices.
- American Conference of Governmental Industrial Hygienists, 2015, Guide to Occupational Exposure Values.
- Analysis of Ethylene Glycol-Based Engine Coolant as a Vehicle Fire Fuel – Wendell C. Hull, Cale Robertson *et al*; International Symposium on Fire Investigation Science and Technology (ISFI); 2008.
- Bretherick's Handbook of Reactive Chemical Hazards, 20th Anniversary Edition. (P.G. Urben Ed.) 1995.
- Canadian Centre for Occupational Health and Safety (CCOHS) CHEMpendium Chemical Information Data Base.
- European Regulation (EC) No 1272/2008 on classification, labelling and packaging of substances and mixtures, amending and repealing directives 67/548/EEC and 1999/45/EC, and amending Regulation (EC) No 1907/2006 (REACH).
- Health Canada, SOR/2015-17, Hazardous Products Regulations, 30 January 2015.
- International Agency for Research on Cancer (IARC), Monographs on the Evaluation of the Carcinogenic Risk of Chemicals to Man, 1972 – present, (multi-volume work), World Health Organization, Geneva.
- International Chemical Safety Cards (WHO/IPCS/ILO), ICSC:0270 – Ethylene Glycol.
- Merck & Co., Inc., 2001, The Merck Index, An Encyclopedia of Chemicals, Drugs, and Biologicals, Thirteenth Edition.
- Patty's Toxicology, Fifth Edition, 2001: E. Bingham, B. Cohrssen & C.H. Powell, Ed.
- U.S. Department 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. Department of Health and Human Services, National Institute for Occupational Safety and Health, Registry of Toxic Effects of Chemical Substances (RTECS).
- U.S. Department of Health and Human Services, National Institute for Occupational Safety and Health, National Toxicology Program (NTP), 13th Report on Carcinogens, October 2014.
- U.S. Occupational Safety and Health Administration, 1989, Code of Federal Regulations, Title 29, Part 1910.

Notice to Reader

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