

SULPHURIC ACID MATERIAL SAFETY DATA SHEET

SECTION 1. PRODUCT AND COMPANY IDENTIFICATION

Product Identity: Sulphuric Acid (93 percent)

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

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Product Use: Used in the manufacture of chlorine dioxide (a pulp and paper bleaching chemical), in the manufacture of phosphate and sulphate fertilizers, in the manufacturing of metal sulfates, as a metal pickling chemical and as a component of lead storage batteries.

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
Sulphuric Acid	93%	7664-93-9	OSHA PEL 1 mg/m ³ ACGIH TLV 0.2 mg/m ³ Thoracic NIOSH REL 1 mg/m ³	LD ₅₀ , rat, oral 2140 mg/kg LC ₅₀ , rat, inhal 255 mg/m ³ /4Hr

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.

Trade Names and Synonyms: Oil of vitriol, electrolyte acid, battery acid, matting acid, H₂SO₄.

SECTION 3. HAZARDS IDENTIFICATION

Emergency Overview: A strong mineral acid present as a colourless and odourless oily liquid when pure but may appear yellow to dark brown when impure. Extremely corrosive to all body tissues, causing rapid tissue destruction and serious chemical burns. Skin or eye contact requires immediate first aid. Can decompose at high temperatures, forming toxic gases such as sulphur oxides. Non-flammable but reacts violently with water, generating large amounts of heat with potential for spattering of the acid. Can react with combustible materials to generate heat and ignition. Reacts with most metals, particularly when diluted with water, to form flammable hydrogen gas which may create an explosion hazard. It is highly toxic to aquatic organisms and plant life.

Potential Health Effects: Sulphuric acid is not very volatile and workplace exposures are therefore primarily due to accidental splashes or to processes or actions that generate an acid mist. It is extremely corrosive to all body tissues, causing rapid tissue destruction and serious chemical burns on contact with the skin or eyes. Skin or eye contact requires immediate first aid. Inhalation of sulphuric acid mist or fumes may produce irritation of the nose, throat and respiratory tract. High levels of acid mist are also irritating to the skin and eyes. Chronic inhalation of acid mist may cause pitting and erosion of tooth enamel. Sulphuric acid, per se, is not listed as a carcinogen by OSHA, NTP, IARC, or the ACGIH. However, IARC, the ACGIH and the NTP have concluded there is sufficient evidence that occupational exposure to strong inorganic acid mists containing sulphuric acid is carcinogenic or potentially carcinogenic to humans. (See Toxicological Information, Section 11)

Potential Ecological Effects: Sulphuric acid is highly toxic to aquatic organisms and terrestrial plant life; however, it does not bioaccumulate or bioconcentrate through the food chain. (See Ecological Information, Section 12)

SECTION 4. FIRST AID MEASURES

Eye Contact: Avoid direct contact. Wear chemical protective gloves if necessary. Quickly and gently blot excess acid off face. Immediately flush the contaminated eye(s) with lukewarm, gently flowing water, for at least 30 minutes, while holding the eyelid(s) open. If a contact lens is present, DO NOT delay irrigation or attempt to remove the lens. Neutral saline solution may be used as soon as it is available. DO NOT INTERRUPT FLUSHING. If necessary, continue flushing during transport to emergency care facility. Take care not to rinse contaminated water into the unaffected eye or onto the face. Quickly transport victim to an emergency care facility.

Skin Contact: Avoid direct contact. Wear chemical protective clothing if necessary. As quickly as possible, remove contaminated clothing, shoes and leather goods (e.g. watchbands, belts) under shower. Flush with lukewarm, gently flowing water for at least 30 minutes. DO NOT INTERRUPT FLUSHING. If necessary, and if it can be done safely, continue flushing during transport to emergency care facility. Completely decontaminate clothing, shoes and leather goods before reuse or discard.

Inhalation: Take proper precautions to ensure your own safety before attempting rescue (e.g. wear appropriate protective equipment, use the buddy system). Remove source of contamination or move victim from exposure area to fresh air immediately. If breathing has stopped, trained personnel should begin artificial respiration. If the heart has stopped, immediately start cardiopulmonary resuscitation (CPR), or automated external defibrillation (AED). Avoid mouth-to-mouth contact by using mouth guard or shields. 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. If vomiting occurs naturally, have victim lean forward to reduce risk of aspiration. Have victim rinse mouth with water again. Quickly transport victim to an emergency care facility and bring a copy of this MSDS.

SECTION 5. FIRE FIGHTING MEASURES

Fire and Explosion Hazards: Sulphuric acid is not flammable or combustible. However, fires may result from the heat generated by contact of concentrated sulphuric acid with combustible materials. Sulphuric acid reacts with most metals, especially when diluted with water, to produce hydrogen gas which can accumulate to explosive concentrations inside confined spaces. It reacts violently with water and organic materials evolving a considerable amount of heat and is very hazardous when in contact with carbides, cyanides, and sulfides.

Extinguishing Media: Use dry chemical or carbon dioxide extinguishers to extinguish small fires in surrounding combustible materials. Use water spray or fog to cool fire-exposed containers and to knock down large fires. Use water streams only if absolutely necessary and DO NOT USE WATER DIRECTLY ON ACID as a violent reaction may occur resulting in spattering of the acid. Do not release runoff from fire control methods to sewers or waterways.

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. For fires close to a spill or where vapours are present, use acid-resistant personal protective equipment.

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 release if possible to do so safely. Contain spill, isolate hazard area, and deny entry to unauthorized personnel. Prevent from entering sewage or drainage systems and bodies of water. Dike area around spill and pump uncontaminated acid back to process if possible. Neutralize spilled material with alkali such as sodium carbonate or sodium bicarbonate, soda ash, lime or limestone granules. If neutralized with lime rock or soda ash, good ventilation is required during neutralization because of the release of carbon dioxide gas. Allow to stand for 1-2 hours to complete neutralization, then absorb any liquid in solid absorbent such as vermiculite or clay absorbents. Place spilled material in suitable (corrosion resistant) labeled containers for final disposal. Treat or dispose of waste spilled material and/or contaminated absorbent material in accordance with all local, regional and national regulations.

Personal Precautions: Acid resistant protective clothing and gloves. Sleeves and pant legs should be worn outside, not tucked into gloves and rubber boots. Use close-fitting safety goggles or a combination of safety goggles and a face shield where

splashing is a possibility. Respiratory protection equipment should be worn where exposure to hazardous levels of mist or fume is possible.

Environmental Precautions: This product has the potential to pose ecological risks to organisms in both aquatic and terrestrial environments. Discharge of the product to soil and water should be prevented. Prevent spillage from entering sewers or natural watercourses.

SECTION 7. HANDLING AND STORAGE

Store in a dry, cool, well-ventilated area away from incompatible substances. Keep in tightly closed containers which are appropriately labeled. Do not allow contact with water. Do not store near alkaline substances. Always practice good personal hygiene. Refrain from eating, drinking, or smoking in work areas. Thoroughly wash hands before eating, drinking, or smoking.

SECTION 8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Protective Clothing: Protective clothing and gloves as well as glasses, goggles or face shield. Appropriate protective clothing should be worn where any possibility exists that skin contact can occur. Use close-fitting safety goggles or a combination of safety goggles and a face shield where any possibility exists that eye contact can occur. An eyewash and quick drench shower should be provided near the work area. Workers should wash immediately whenever skin becomes contaminated.

Ventilation: Use adequate local or general ventilation to maintain the concentration of sulphuric acid aerosol mists below recommended occupational exposure limits.

Respiratory Protection: Where sulphuric acid mists are generated and cannot be controlled to within acceptable levels, use appropriate NIOSH-approved respiratory protection equipment (a combination of a 42CFR84 Class N, R or P-100 particulate filter and an acid gas cartridge). Note: sulphuric acid mist also causes eye irritation at high concentrations and a full face respirator or supplied air respirator may be necessary in some cases.

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance: Clear, colourless, oily liquid (may turn yellowish to amber upon aging)	Odour: Odourless when cold, acrid odour upon heating	Physical State: Liquid	pH: Concentration dependant <0.1 (93% Sol'n), 0.3 (5% or 1N Sol'n)
Vapour Pressure: <0.04 kPa (<0.3 mm Hg) @ 25°C	Vapour Density: 3.4 (air = 1)	Boiling Point/Range: 280°C	Freezing Point/Range: -35°C
Specific Gravity: 1.84	Evaporation Rate: Not Applicable	Coefficient of Water/Oil Distribution: No Data Available	Odour Threshold: > 1 mg/m ³ (Acid mist will irritate the nose and may be sensed as a pungent odour)
Solubility in Water: Completely soluble with generation of significant heat.			

SECTION 10. STABILITY AND REACTIVITY

Stability & Reactivity: Sulphuric acid is stable and not considered reactive under normal temperatures and pressures. Hazardous polymerization or runaway reactions will not occur. Decomposes at 340°C into sulphur trioxide and water. Extremely reactive with metals, alkalis, reducing agents and many other organic and inorganic chemicals. Hazardous gases such as hydrogen cyanide, hydrogen sulfide and acetylene are evolved on contact with chemicals such as cyanides, sulfides and carbides respectively. Contact with combustible organic matter may cause fire or explosion. Dilution with water generates excessive heat and spattering or boiling may occur. Always add acid to water, NEVER ADD WATER TO ACID. Corrosive to most metals including mild steel, copper, aluminum, zinc, etc., especially when diluted to below 90%.

Incompatibilities: Combustible materials, organic materials, reducing agents, amines, bases, water, excess heat, and metals.

Hazardous Decomposition Products: Sulphur dioxide, sulphur trioxide and sulphuric acid fumes.

SECTION 11. TOXICOLOGICAL INFORMATION

General: Concentrated sulphuric acid is a direct acting toxicant, producing local effects at the site(s) of contact but no systemic effect. It exerts a strong corrosive action on all tissues due to its severe dehydration action (removing water from tissues). The severity of the chemical burn produced by the concentrated acid is proportional to the strength of the acid and the duration of contact. Burns are deep but typically not severely painful.

Acute:

Skin/Eye: Splashes can cause severe eye burns and may cause irreversible eye injury and possible blindness. Skin contact results in severe burns and may result in permanent scarring. High levels of sulphuric acid mists and aerosols are also irritating to the eyes and skin.

Inhalation: Inhalation may cause severe irritation of the respiratory tract with sore throat, coughing, shortness of breath, laryngeal spasm and delayed lung edema. These symptoms may be aggravated by physical exertion. Asthmatics may be more sensitive to inhaling sulphuric acid mists and asthma may be aggravated by exposure to sulphuric acid.

Ingestion: Ingestion is unlikely in industrial use but would result in severe burns to the mouth, throat, esophagus and stomach which could lead to permanent damage to the digestive tract. Small amounts of acid can also enter the lungs during ingestion or subsequent vomiting and cause serious lung injury.

Chronic: Prolonged exposure to dilute solutions or mists may result in eye irritation (chronic conjunctivitis) and produce skin dermatitis. Exposure to high concentrations of acid mist has caused erosion and discolouration of the anterior teeth. Inhalation of sulphuric acid mist may decrease the ability of the respiratory tract to remove other small particles which may be inhaled. Sulphuric acid, per se, is not listed as a carcinogen by OSHA, the National Toxicology Program (NTP), the International Agency for Research on Cancer (IARC), or the ACGIH. IARC has concluded that there is sufficient evidence that occupational exposure to strong inorganic acid mists containing sulphuric acid is carcinogenic to humans, resulting in an increased incidence of primarily laryngeal cancers. The ACGIH lists strong inorganic acid mists containing sulphuric acid as a suspect human carcinogen (A2) and the NTP have classified strong inorganic acid mists containing sulphuric acid as a known human carcinogen. OSHA does not list sulphuric acid mist as a carcinogen.

SECTION 12. ECOLOGICAL INFORMATION

Sulphuric acid is highly toxic to aquatic organisms and terrestrial plant life; however, it does not bioaccumulate or bioconcentrate through the food chain.

SECTION 13. DISPOSAL CONSIDERATIONS

Do not wash down drain or allow to reach natural watercourses. Dispose of neutralized waste consistent with regulatory requirements. If neutralized with lime rock or soda ash, good ventilation is required during neutralization because of the release of carbon dioxide gas.

SECTION 14. TRANSPORT INFORMATION

Proper Shipping Name Transport Canada and U.S. DOT	Sulphuric Acid
Transport Canada and U.S. DOT Hazard Classification	Class 8 Packing Group II (RQ)
U.S. RQ for Sulfuric Acid	1,000 lbs.
Transport Canada and U.S. DOT Product Identification Number	UN1830
Marine Pollutant	No
IMO Classification	Class 8

SECTION 15. REGULATORY INFORMATION

U.S.

Listed on TSCA Inventory Yes

Hazardous Under Hazard Communication Standard Yes

CERCLA Section 103 Hazardous Substances Sulfuric Acid..... Yes.....RQ: 1000 lbs. (454 kg.)

EPCRA Section 302 Extremely Hazardous Substance YesRQ: 1000 lbs. (454 kg.)
Threshold Planning Quantity: 1000 lbs.

EPCRA Section 311/312 Hazard Categories	Immediate (Acute) Health Hazard - Corrosive Immediate (Acute) Health Hazard - Highly Toxic
EPCRA Section 313 Toxic Release Inventory	Sulfuric Acid CAS NO. 7664-93-9 Percent by Weight: 93%

CANADIAN:

Listed on Domestic Substances List:.....	Yes
WHMIS Classification	Controlled Product, Classification D1A (Immediate & Serious Toxic Effects), E (Corrosive Material)

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, 2012, Guide to Occupational Exposure Values.
- 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 & Safety CHEMINFO Record No. 122 - Sulphuric Acid, 2009-04.
- Commission de la santé et la sécurité du travail, Service du Répertoire toxicologique, Acide Sulfurique, 2006-02-08.
- 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 – present, (multi-volume work), World Health Organization, Geneva.
- International Chemical Safety Cards (WHO/IPCS/ILO), ICSC:0362 – Sulphuric Acid (Revised Oct 2008).
- Merck & Co., Inc., 2001, The Merck Index, An Encyclopedia of Chemicals, Drugs, and Biologicals, Thirteenth Edition.
- National Industrial Chemicals Notification and Assessment Scheme (NICNAS), Sydney, Australia – Existing Chemicals Information Sheet – Sulphuric Acid, 30 June 2003.
- OECD Screening Information Data Base (SIDS) Initial Assessment Report – Sulphuric Acid, January 2001.
- Patty's Toxicology, Fifth Edition, 2001: E. Bingham, B. Cohnsen & C.H. Powell, Ed.
- Toxicology of the Eye, 2nd Ed. W. Morton Grant, MD, Charles C. Thomas, Publishers; Springfield. IL (1974).
- 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. Dept. of Health and Human Services, National Institute for Occupational Safety and Health, Registry of Toxic Effects of Chemical Substances (RTECS) CCOHS Web Access subscription.
- U.S. Dept. of Health and Human Services, Public Health Service, Agency for Toxic Substances and Disease Registry, Toxicological Profile for Sulfur Trioxide and Sulfuric Acid, December 1998.
- U.S. Occupational Safety and Health Administration, 1989, Code of Federal Regulations, Title 29, Part 1910.

Notice to Reader

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