MATERIAL SAFETY DATA SHEET SULPHURIC ACID

1: Chemical Product Identification

Product Name:	Sulphuric acid
Catalogue Codes:	SLS2539, SLS1741, SLS3166, SLS2371, SLS3793
CAS#:	7664-93-9
RTECS:	WS5600000
TSCA: TSCA 8(b) inventory:	Sulphuric acid
CI#:	Not applicable.
Synonym:	Oil of Vitriol; Sulphuric Acid
Chemical Name:	Hydrogen sulphate
Chemical Formula:	H_2SO_4

2. Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Sulphuric acid	7664-93-9	95–98

Toxicological Data on Ingredients: Sulphuric acid: ORAL (LD50): Acute: 2140 mg/kg [Rat.]. VAPOR (LC50): Acute: 510 mg/m 2 hours [Rat]. 320 mg/m 2 hours [Mouse].

3: Hazards Identification

Potential Acute Health Effects: Very hazardous in case of skin contact (corrosive, irritant, permeator), of eye contact (irritant, corrosive), of ingestion, of inhalation. Liquid or spray mist may produce tissue damage particularly on mucous membranes of eyes, mouth and respiratory tract. Skin contact may produce burns. Inhalation of the spray mist may produce severe irritation of respiratory tract, characterized by coughing, choking, or shortness of breath. Severe overexposure can result in death. Inflammation of the eye is characterized by redness, watering, and itching. Skin inflammation is characterized by itching, scaling, reddening, or, occasionally, blistering.

Potential Chronic Health Effects:

CARCINOGENIC EFFECTS: Classified 1 (Proven for human.) by IARC, + (Proven.) by OSHA. Classified A2 (Suspected for human.) by ACGIH.

MUTAGENIC EFFECTS:	Not available.
TERATOGENIC EFFECTS:	Not available.
DEVELOPMENTAL TOXICITY:	Not available. The substance may be toxic to kidneys, lungs, heart, cardiovascular system, upper respiratory tract, eyes, teeth. Repeated or prolonged exposure to the substance can produce target organs damage. Repeated or prolonged contact with spray mist may produce chronic eye irritation and severe skin irritation. Repeated or prolonged exposure to spray mist may produce respiratory tract irritation leading to frequent attacks of bronchial infection. Repeated exposure to a highly toxic material may produce general deterioration of health by an accumulation in one or many human organs.

4: First Aid Measures

Eye Contact: Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Cold water may be used. Get medical attention immediately.

Skin Contact: In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Cover the irritated skin with an emollient. Cold water may be used. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention immediately.

Serious Skin Contact: Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek immediate medical attention.

Inhalation: If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention immediately.

Serious Inhalation: Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. WARNING: It may be hazardous to the person providing aid to give mouth-to-mouth resuscitation when the inhaled material is toxic, infectious or corrosive. Seek immediate medical attention.

Ingestion: Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention if symptoms appear.

Serious Ingestion:	Not available.

5: Fire and Explosion Data

Flammability of the Product:	Non-flammable.
Auto-Ignition Temperature:	Not applicable.
Flash Points:	Not applicable.
Flammable Limits:	Not applicable.

Products of Combustion: Products of combustion are not available since material is non-flammable. However, products of decomposition include fumes of oxides of sulphur. Will react with water or steam to produce toxic and corrosive fumes. Reacts with carbonates to generate carbon dioxide gas. Reacts with cyanides and sulphides to form poisonous hydrogen cyanide and hydrogen sulphide respectively.

Fire Hazards in Presence of Various Substances:

Combustible materials Explosion Hazards in Presence of Various Substances:

Risks of explosion of the product in presence of mechanical impact:	Not available.
Risks of explosion of the product in presence of static discharge:	Not available. Slightly explosive in presence of oxidizing materials.
Fire Fighting Media and Instructions:	Not Applicable.

Special Remarks on Fire Hazards: Metal acetylides (Monoecism and Monorubidium), and carbides ignite with concentrated sulphuric acid. White Phosphorous + boiling Sulphuric acid or its vapor ignites on contact. May ignite other combustible materials. May cause fire when sulphuric acid is mixed with Cyclopentadiene, cyclopentanone oxime, nitroaryl amines, hexalithium disilicate, phosphorus (III) oxide, and oxidizing agents such as chlorates, halogens, permanganates.

Special Remarks on Explosion Hazards: Mixtures of Sulphuric acid and any of the following can explode: p-nItrotoluene, pentasIlver trihydroxy diamino phosphate, perchlorates, alcohols with strong hydrogen peroxide, ammonium tetraperoxychromate, mercuric nitrite, potassium chlorate, potassium permanganate with potassium chloride, carbides, nitro compounds, nitrates, carbides, phosphorous, iodides, picratres, fulminats, dienes, alcohols (when heated) Nitroamide decomposes explosively on contact with concentrated sulphuric acid. 1,3,5- Trinitrosohexahydro-1,3,5-triazine + sulphuric acid causes explosive decomposition.

6: Accidental Release Measures

Small Spill: Dilute with water and mop up or absorb with an inert dry material and place in an appropriate waste disposal container. If necessary: Neutralize the residue with a dilute solution of sodium carbonate. Large Spill: Corrosive liquid. Poisonous liquid. Stop leak if without risk. Absorb with DRY earth, sand or other non-combustible material. Do not get water inside container. Do not touch spilled material. Use water spray curtain to divert vapor drift. Use water spray to reduce vapours. Prevent entry into sewers, basements or confined areas; dike if needed. Call for assistance on disposal. Neutralize the residue with a dilute solution of sodium carbonate. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

7: Handling and Storage

Precautions: Keep locked up. Keep container dry. Do not ingest. Do not breathe gas/fumes/vapor/spray. Never add water to this product. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes. Keep away from incompatibles such as oxidizing agents, reducing agents, combustible materials, organic materials, metals, acids, alkalis, moisture. May corrode metallic surfaces. Store in a metallic or coated fibreboard drum using a strong polyethylene inner package. Storage: Hygroscopic. Reacts. violently with water. Keep container tightly closed. Keep container in a cool, well-ventilated area. Do not store above 23°C (73.4°F).

8: Exposure Controls/Personal Protection

Engineering Controls: Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapours below their respective threshold limit value. Ensure that eyewash stations and safety showers are proximal to the work-station location.
Personal Protection: Face shield. Full suit. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Gloves. Boots.
Personal Protection in Case of a Large Spill: Splash goggles. Full suit. Vapor respirator. Boots. Gloves. A self-contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.
Exposure Limits:

TWA:	1 STEL: 3 (mg/m3) [Australia] Inhalation
TWA:	1 (mg/m3) from OSHA (PEL) [United States] Inhalation
TWA:	1 STEL: 3 (mg/m3) from ACGIH (TLV) [United States] [1999] Inhalation
TWA:	1 (mg/m3) from NIOSH [United States] Inhalation
TWA:	1 (mg/m3) [United Kingdom (UK)] Consult local authorities for acceptable exposure limits.

9: Physical and Chemical Properties

Physical state and appearance:	Liquid. (Thick oily liquid.)
odour:	Odourless but has a choking odour when hot.
Taste:	Marked acid taste. (Strong.)
Molecular Weight:	98.08 g/mole
Colour:	Colourless.
pH (1% soln/water):	Acidic.
Boiling Point:	270°C (518°F) – 340°C Decomposes at 340°C
Melting Point:	-35°C (-31°F) to 10.36^{o}C (93% to 100% purity)
Critical Temperature:	Not available.

Specific Gravity:	1.84 (Water = 1)
Vapor Pressure:	Not available.
Vapor Density:	3.4 (Air = 1)
Volatility:	Not available.
odour Threshold:	Not available.
Water/Oil Dist. Coeff.:	Not available.
Iconicity (in Water):	Not available.
Dispersion Properties:	See solubility in water.
Solubility:	Easily soluble in cold water. Sulphuric is soluble in water with liberation of much heat. Soluble in ethyl alcohol.

10: Stability and Reactivity Data

Stability:	The product is stable.
Instability Temperature:	Not available.

Conditions of Instability:

Conditions to Avoid:	Incompatible materials, excess heat, combustible material materials, organic materials, exposure to moist air or water, oxidizers, amines, bases. Always add the acid to water, never the reverse.
Incompatibility with various substances:	Reactive with oxidizing agents, reducing agents, combustible materials, organic materials, metals, acids, alkalis, moisture.
Corrosivity:	Extremely corrosive in presence of aluminium, of copper, of stainless steel (316). Highly corrosive in presence of stainless steel (304). Non- corrosive in presence of glass.

Special Remarks on Reactivity:

Hygroscopic. Strong oxidizer. Reacts violently with water and alcohol especially when water is added to the product. Incompatible (can react explosively or dangerously) with the following: ACETIC ACID, ACRYLIC ACID, AMMONIUM HYDROXIDE, CRESOL, CUMENE, DICHLOROETHYL ETHER, ETHYLENE CYANOHYDRIN, ETHYLENEIMINE, NITRIC ACID, 2-NITROPROPANE, PROPYLENE OXIDE, SULFOLANE, VINYLIDENE CHLORIDE, DIETHYLENE GLYCOL MONOMETHYL ETHER, ETHYL ACETATE, ETHYLENE CYANOHYDRIN, ETHYLENE GLYCOL MONOETHYL ETHER ACETATE, GLYOXAL, METHYL ETHYL KETONE, dehydrating agents, organic materials, moisture (water), Acetic anhydride, Acetone, cyanohydrin, Acetone nitric acid, Acetone + potassium dichromate, Acetonitrile, Acrolein, Acrylonitrile, Acrylonitrile +water, Alcohols + hydrogen peroxide, ally compounds such as Allyl alcohol, and Allyl Chloride, 2-Aminoethanol, Ammonium hydroxide, Ammonium triperchromate, Aniline, Bromate + metals, Bromine pentafluoride, n-Butyraldehyde, Carbides, Caesium acetylene carbide, Chlorates, Cyclopentanone oxime, chlorinates, Chlorates + metals, Chlorine trifluoride, Chlorosulfonic acid, 2-cyano-4-nitrobenzenediazonium hydrogen sulphate, Cuprous nitride, p-chloronitrobenzene, 1,5-Dinitronaphthlene + sulphur, Isobutylene, p-dimethylaminobenzaldehyde, 1,3-Diazidobenzene, Dimethylbenzylcarbinol + hydrogen peroxide, Epichlorohydrin, Ethyl alcohol + hydrogen peroxide, Ethylene diamine, Ethylene glycol and other glycols, Ethylenimine, Fulminates, hydrogen peroxide, Hydrochloric acid, Hydrofluoric acid, Iodine heptafluoride, Indene + nitric acid, Iron, Isoprene, Lithium silicide, Mercuric nitride, Mistily oxide, Mercury nitride, Metals (powdered), Nitromethane, Nitric acid + glycerides, p-Nitrotoluene, Pentasilver trihydroxydiaminophosphate, Perchlorates, Perchloric acid, Permanganates + benzene, 1- Phenyl-2-methylpropyl alcohol + hydrogen peroxide, Phosphorus, Phosphorus isocyanate, Picrates, Potassium tert-butoxide, Potassium chlorate, Potassium Permanganate and other permanganates, halogens, amines, Potassium Permanganate + Potassium chloride, Potassium Permanganate + water, Propiolactone (beta)-, Pyridine, Rubidium acetylene carbide, Silver permanganate, Sodium, Sodium carbonate,

sodium hydroxide, Steel, styrene monomer, toluene + nitric acid, Vinyl acetate, Thallium (I) azido dithiocarbonate, Zinc chlorate, Zinc Iodide, azides, carbonates, cyanides, sulphides, sulphites, alkali hydrides, carboxylic acid anhydrides, nitriles, olefinic organics, aqueous acids, cyclopentadiene, cyano-alcohols, metal acetylides, Hydrogen gas is generated by the action of the acid on most metals (i.e. lead, copper, tin, zinc, aluminium, etc.). Concentrated sulphuric acid oxidizes, dehydrates, or sulfonates most organic compounds.

Special Remarks on Corrosivity:	Non-corrosive to lead and mild steel, but dilute acid attacks most metals. Attacks many metals releasing hydrogen. Minor corrosive effect on bronze. No corrosion data on brass or zinc.
Polymerization:	Will not occur.

11: Toxicological Information

Routes of Entry: Absorbed through skin. Dermal contact. Eye contact. Inhalation. Ingestion. Toxicity to Animals: WARNING: THE LC50 VALUES HEREUNDER ARE ESTIMATED ON THE BASIS OF A 4-HOUR EXPOSURE. Acute oral toxicity (LD50): 2140 mg/kg [Rat.]. Acute toxicity of the vapor (LC50): 320 mg/m3 2 hours [Mouse]. Chronic Effects on Humans: CARCINOGENIC EFFECTS: Classified 1 (Proven for human.) by IARC, + (Proven.) by OSHA. Classified A2 (Suspected for human.) by ACGIH. May cause damage to the following organs: kidneys, lungs, heart, cardiovascular system, upper respiratory tract, eyes, teeth. Other Toxic Effects on Humans: Extremely hazardous in case of inhalation (lung corrosive). Very hazardous in case of skin contact (corrosive, irritant, permeator), of eye contact (corrosive), of ingestion, Special Remarks on Toxicity to Animals: Not available. Special Remarks on Chronic Effects on Humans: Mutagenicity: Cytogenetic Analysis: Hamster, ovary = 4mmol/L Reproductive effects: May cause adverse reproductive effects based on animal data. Developmental abnormalities

(musculoskeletal) in rabbits at a dose of 20 mg/m3 for 7 hrs.(RTECS) Teratogenicity: neither embryotoxic, fetoxic, nor teratogenetic in mice or rabbits at inhaled doses producing some maternal toxicity Special Remarks on other Toxic Effects on Humans: Acute Potential Health Effects: Skin: Causes severe skin irritation and burns. Continued contact can cause tissue necrosis. Eye: Causes severe eye irritation and burns. May cause irreversible eye injury. Ingestion: Harmful if swallowed. May cause permanent damage to the digestive tract. Causes gastrointestinal tract burns. May cause perforation of the stomach, GI bleeding, enema of the glottis, necrosis and scarring, and sudden circulatory collapse (similar to acute inhalation). It may also cause systemic toxicity with acidosis. Inhalation: May cause severe irritation of the respiratory tract and mucous membranes with sore throat, coughing, shortness of breath, and delayed lung enema. Causes chemical burns to the respiratory tract. Inhalation may be fatal as a result of spasm, inflammation, enema of the larynx and bronchi, chemical pneumonitis, and pulmonary enema. Cause corrosive action on mucous membranes. May affect cardiovascular system (hypotension, depressed cardiac output, bradycardia). Circulatory collapse with clammy skin, weak and rapid pulse, shallow respiration, and scanty urine may follow. Circulatory shock is often the immediate cause of death. May also affect teeth (changes in teeth and supporting structures – erosion, discoloration). Chronic Potential Health Effects: Inhalation: Prolonged or repeated inhalation may affect behaviour (muscle contraction or spasticity), urinary system (kidney damage), and cardiovascular system, heart (ischemic heart lesions), and respiratory system/lungs (pulmonary enema, lung damage), teeth (dental discoloration, erosion). Skin: Prolonged or repeated skin contact may cause dermatitis, an allergic skin reaction.

12: Ecological Information

Ecotoxicity:	Ecotoxicity in water (LC50): 49 mg/l 48 hours [bluegill/sunfish].
BOD5 and COD:	Not available.

Products of Biodegradation:	Possibly hazardous short-term degradation products are not likely. However, long term degradation products may arise. Toxicity of the Products of Biodegradation: The products of degradation are less toxic than the product itself. Special Remarks on the Products of Biodegradation: Not available.

13: Disposal Considerations

Waste Disposal: Sulphuric acid may be placed in sealed container or absorbed in vermiculite, dry sand, earth, or a similar material. It may also be diluted and neutralized. Be sure to consult with local or regional authorities (waste regulators) prior to any disposal. Waste must be disposed of in accordance with federal, state and local environmental control regulations.

14: Transport Information

DOT Classification:	Class 8 Corrosive material
Identification:	Sulphuric acid UNNA: 1830 PG: II
Special Provisions for Transport:	Not available.

15: Other Regulatory Information

Other Regulations:
OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200).
EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

Protective Equipment:	Gloves. Full suit. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Face shield.

16: Other Information

References:	Not Available
Other Special Considerations:	Not available

EXCLUSION OF LIABILITY All information and instructions provided in this Material Safety Data Sheet in respect of the substance is given solely in terms of the provisions of the Occupational Health and Safety Act No 85 of 1993 and Regulations (“the Act”), is based on scientific and technical knowledge as at the date indicated on this MS Material Safety Data Sheet and is presented in good faith to be correct. The information and instructions provided in this MSDS apply only to the substance in its present form and not to any formulation or mix, in which event it is the sole responsibility of the user of the substance as formulated and/or mixed to investigate and establish any danger which may arise out of its use, wherever such user may be situated.

It is the sole responsibility of the person in receipt of this Material Safety Data Sheet wherever such recipient may be situated, to ensure that the information provided is communicated to and understood by any person who may come in contact with the substance in any place and in any manner whatsoever. If such recipient produces formulations or mixes using the substance, then it is such recipient’s sole responsibility to comply with the provisions of the Act in respect of the provision of the necessary Material Safety Data Sheet, or to comply with any other applicable legislation.