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Section 1: Product Identification

Synonyms:	Sulphuric Acid, Hydrogen Sulphate, Oil of Vitriol, Battery Acid
Chemical Name:	Sulfuric Acid
Chemical Family:	Inorganic Acid
Chemical Formula:	H2SO4
CAS Reg. No.:	7664-93-9

Martin can not guarantee the technical analysis and exact chemical composition as it may vary depending on the chemical components of the raw material and are not reflected in this document. Consult analysis sheets for exact chemical composition.

Section 2: Hazard Identification

PHYSICAL STATE AND APPEARANCE: Odorless, clear to amber, heavy, oily liquid. A pungent odor may exist if certain impurities are present in the acid.

EMERGENCY OVERVIEW: Danger! Extremely corrosive. Causes severe burns and / or eye damage. Mist: Causes respiratory irritation. Harmful if inhaled. Harmful or fatal if swallowed. Reacts violently with water. Concentrated Sulfuric Acid will react with many organic materials and may cause fire due to the heat of the reaction. Not flammable, but reacts with most metals to form explosive/flammable hydrogen gas.

This product contains ingredients that are considered to be hazardous as defined by the OSHA Hazard Communication Standard 29 CFR 1910.1200, and is listed in the Toxic Substances Control Act (TSCA).

Routes of entry: Skin contact. Eye contact. Ingestion. Inhalation.

Potential acute health effects
EYE CONTACT: Immediate pain, severe burns and corneal damage, which may result in permanent blindness.

SKIN CONTACT: Causes burns, and brownish or yellow stains. Concentrated solutions may cause second or third degree burns with severe necrosis. Prolonged and repeated exposure to dilute solutions may cause irritation, redness, pain and drying and cracking of the skin.

INHALATION: Causes respiratory irritation and at high concentrations may cause severe injury, burns, or death. Effects of exposure may be delayed.

INGESTION: Causes severe irritation or burns of the mouth, throat, and esophagus.

EXISTING MEDICAL CONDITIONS POSSIBLY AGGRAVATED BY EXPOSURE: Skin irritation may be aggravated in individuals with existing skin lesions. Breathing of vapors or sprays (mists) may aggravate acute or chronic asthma and chronic pulmonary disease such as emphysema and bronchitis.

See Section 11 for Toxicological Data

Section 3: Composition / Information on Ingredients

Name	CAS #	% by weight
Sulfuric Acid	7664-93-9	70 – 100%
Water	7732-18-5	0-30%

Section 4: First Aid Measures

Corrosive effects on the skin and eyes may be delayed, and damage may occur without the sensation or onset of pain.

SPEED IS ESSENTIAL. OBTAIN IMMEDIATE MEDICAL ATTENTION.
Have emergency eyewash station / safety shower available in work area.

SKIN CONTACT**:** Immediately flush skin with running water for a **minimum** of 20 minutes. Start flushing while removing contaminated clothing. If irritation persists, repeat flushing. Obtain medical attention immediately. Do not transport victim unless the recommended flushing period is completed or flushing can be continued during transport.

Discard heavily contaminated clothing and shoes in a manner that limits further exposure.

EYE CONTACT**:** Immediately flush eyes with running water for a **minimum** of 20 minutes. Hold eyelids open during flushing. If irritation persists, repeat flushing. Obtain medical attention IMMEDIATELY. Do not transport victim until the recommended flushing period is completed unless flushing can be continued during transport.

INHALATION**:** Move victim to fresh air. Give artificial respiration ONLY if breathing has stopped. Do not use mouth-to-mouth method if victim ingested or inhaled the substance: induce artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device. Give Cardiopulmonary Resuscitation (CPR) if there is no pulse AND no breathing. Obtain medical attention IMMEDIATELY.

INGESTION**:** DO NOT INDUCE VOMITING. If victim is alert and not convulsing, rinse mouth and give ½ to 1 glass of water to dilute material. If spontaneous vomiting occurs, have victim lean forward with head down to avoid breathing in of vomitus, rinse mouth and administer more water. IMMEDIATELY contact local poison control center. Vomiting may need to be induced but should be directed by a physician or a poison control centre. IMMEDIATELY transport victim to an emergency facility.

While the patient is being transported to a medical facility apply compresses of iced water. If medical treatment must be delayed, immerse the affected area in iced water or apply compresses of iced water to affected areas. Do not freeze tissue.

Continued washing of the affected area with cold or iced water will be helpful in removing the last traces of sulfuric acid. Creams or ointments should not be applied before or during the washing phase of treatment.

NOTE TO PHYSICIANS: This product contains materials that may cause severe pneumonitis if aspirated. If ingestion has occurred less than 2 hours earlier, carry out careful gastric lavage; use endotracheal cuff if available, to prevent aspiration. Observe patient for respiratory difficulty from aspiration pneumonitis. Give artificial resuscitation and appropriate chemotherapy if respiration is depressed. Following exposure the patient should be kept under medical review for at least 48 hours as delayed pneumonitis may occur. DO NOT attempt to neutralize the acid with weak bases since the reaction will produce heat that may extend the corrosive injury

Section 5: Fire Fighting Measures

Flammability of the product:	Non-flammable
Flash points:	Not applicable
Auto-ignition temperature:	Not applicable
Flammable limits:	Not applicable
Products of thermal decomposition:	Oxides of Sulfur

EXPLOSION HAZARDS:

Not flammable but highly reactive. Reacts violently with water with evolution of heat can react with organic materials explosively (See Section 10). Reacts with many metals to liberate hydrogen gas which can form explosive mixtures with air. Hydrogen can accumulate to explosive concentrations. May ignite other combustible materials.

HAZARDOUS REACTIVITY
Instability: Stable, but reacts violently with water and organic materials with evolution of heat.

Decomposition: Releases sulfur dioxide at extremely high temperatures.

Polymerization: Polymerization will not occur.

Materials to Avoid: Vigorous reactions with water; alkaline solutions; metals, metal powder; carbides; chlorates; fuminates; nitrates; picrates; strong oxidizing, reducing, or combustible organic materials. Hazardous gases are evolved on contact with chemicals such as cyanides, sulfides, and carbides.

FIRE-FIGHTING MEDIA AND INSTRUCTIONS:
Wear a NIOSH/MSHA approved self-contained breathing apparatus if vapors or mists are present and full protective clothing. For fighting fires in close proximity to spill or vapors, use acid-resistant personal protective equipment. Evacuate personnel to a safe area. Prevent unauthorized entry to fire area. Dike area to contain runoff and prevent contamination of water sources. Neutralize runoff with lime, soda ash or other suitable neutralizing agents (see Deactivating Chemicals, Section 6). Cool containers that are exposed to flame with streams of water until fire is out.

Section 6: Accidental Release Measures

Small Spill:
Cover with DRY earth, sand or other non-combustible material or absorb with an inert dry material and place in a loosely covered plastic or other appropriate waste disposal container. If necessary: Neutralize the residue with a dilute solution of sodium carbonate, lime, or other suitable neutralizing agent.

Large Spill:
Stop leak if possible without risk. Dike with DRY earth, sand or other non-combustible inert material. Prevent entry into sewers or waterways. Consider neutralizing the residue with sodium carbonate, lime, or other suitable neutralizing agent. Ensure adequate decontamination of tools and equipment following clean up. Comply with Federal, Provincial/State and local regulations on reporting releases. Dispose of waste material at an approved waste treatment/disposal facility, in accordance with applicable regulations. Do not dispose of waste with normal garbage or to sewer systems.

Section 7: Handling and Storage

Good general ventilation should be provided to keep vapor and mist concentrations below the exposure limits. Have available and wear as appropriate: Chemical splash goggles; full-length faceshield/chemical splash goggle combination; acid-proof gauntlet gloves, apron, and boots; acid proof suit and hood; and appropriate NIOSH/MSHA respiratory protection. In case of emergency or where there is a strong possibility of considerable exposure, wear a complete acid suit with hood, boots and gloves. If acid vapor or mist are present and exposure limits may be exceeded, wear appropriate NOISH/MSHA respiratory protection.

HANDLING: Wear appropriate Personal Protection Equipment. Do not breathe sprays or mists. Do not ingest. Do not get in eyes, on skin or on clothing. Keep ignition sources away from sulfuric acid storage, handling and transportation equipment. Locate safety shower and eyewash station close to chemical handling area. Use EXTREME care when diluting with water. **Always add acid to water never the reverse**. CAUTION: Hydrogen, a highly flammable gas, can accumulate to explosive concentrations inside drums, or any types of steel containers or tanks upon storage. Carbon steel storage tanks must be vented**.** People working with this chemical should be properly trained regarding its hazards and its safe use.

STORAGE: If stored in non-reactive container, keep container tightly closed. Metal and, specifically carbon steel, storage tanks must be vented due to hydrogen release as noted above.

Section 8: Exposure Control / Personal Protection

Engineering controls

Use process enclosures, local exhaust ventilation or other engineering controls to keep airborne levels below recommended exposure limits. The most effective measures are the total enclosure of processes and the mechanization of handling procedures to prevent all personal contact with sulfuric acid. Safety showers and eyewash stations should be installed in storage and handling areas.

Personal protection

Eyes: Chemical goggles and face shield.

Skin: Where there is a danger of spilling or splashing, acid resistant aprons or suits should be worn. Trouser legs should be worn outside (not tucked in) rubber boots.

Hands: Chemical-resistant, impervious gloves (i.e. neoprene) should be worn when handling sulfuric acid.

Respiratory: Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator. A NIOSH/MSHA approved air-purifying respirator equipped with acid gas/fume, dust, mist cartridges for concentrations up to 10 mg/m^3. An air-supplied respirator if concentrations are higher or unknown.

NOTE: Personal protection information shown in Section 8 is based upon general information as to normal uses and conditions. Where special or unusual uses or conditions exist, it is suggested that the expert assistance of an industrial hygienist or other qualified professional be sought.

Component	**Exposure limits**
Sulfuric Acid:	ACGIH TLV 1 mg/m^3 (TWA) 8 hours
	ACGIH STEL 3 mg/m^3 15 minutes
	OSHA PEL 1 mg/m^3 (TWA) 8 hours
	NIOSH REL 1 mg/m^3 (TWA) 10 hours

Section 9: Physical and Chemical Properties

Appearance and Odor: Odorless, clear to amber, heavy, oily liquid. A pungent odor may exist if certain impurities are present in the acid.

Physical State: Liquid

Molecular Weight: 98.08

Odor Threshold: Not applicable

Boiling Point:	78%: 193°C (380°F)	93%: 276°C (529°F)	98%:330°C (626°F)
Melting/Freezing Point:	78%: -11.2°C (+11.6°F)	93%: -29.5°C (-21.1°F)	98%: -1.1°C (30°F)
Vapor Pressure at 40°C (102°F):	78%: 1.2 mmHg	93%: 0.0016 mmHg	98%: 0.002 mmHg
Specific Gravity at 15°C (60°F):	78%: 1.7059	93%: 1.8354	98%: 1.8437

Vapor Density: (Air=1): 3.4

Evaporation Rate: Not applicable

Solubility: Easily soluble in cold water (with liberation of much heat.)
Soluble in ethyl alcohol.

pH: 0.3 (1N solution at 25°C/78°F)

Section 10: Stability and Reactivity

Stability: Stable

Conditions to Avoid: Keep away from heat and sources of ignition. Avoid temperatures, which may have a negative effect on the materials of construction used in equipment.

Materials to Avoid: Contact with organic materials (such as alcohol, acrylonitrile, chlorates, carbides, epichlorohydrin, fulminates, isoprene, nitrates and picrates) may cause fire and explosions. Contact with metals may produce flammable hydrogen gas. When diluting, add acid to water. Do NOT add water to the acid.

Hazardous Decomposition or Combustion Products: Toxic gases and vapors (e.g. sulfur dioxide, sulfuric acid vapors/mists and sulfur trioxide) may be released when sulfuric acid decomposes.

Hazardous Polymerization: Will Not Occur.

Corrosivity: Extremely corrosive in presence of aluminum, copper, and stainless steel. Highly corrosive in presence of stainless steel (304). Non-corrosive in presence of glass.

Section 11: Toxicological Information

Toxicity Data

LD_{50} (oral, rat) = 2140 mg/kg LC_{50} (inhalation, rat) = 510 mg/m^3 for 2 hrs

Carcinogenicity Data: The IARC has concluded that occupational exposure to strong inorganic acid mists containing sulfuric acid is carcinogenic to man, causing cancer of the larynx (the voice box). Although no direct link has been established between exposure to sulfuric acid and cancer in man, exposure to any mist or aerosol during the use of this product should be avoided.

Reproductive Effects: Slightly embryotoxic in rabbits (a minor, rare skeletal variation). The animals were exposed to 5 and 20 mg/m^3 for 7 hrs/day throughout pregnancy. Slight maternal toxicity was present at the highest dose in both species.

Mutagenicity Data: Cytogenic analysis (hamster) ovaries 4 mmol/L

Teratogenicity Data: Not teratogenic in mice and rabbits.

Synergistic Materials: None known

Special Remarks on other Toxic Effects on Humans:
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, edema 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 edema. Causes chemical burns to the respiratory tract. Inhalation may be fatal as a result of spasm, inflammation, edema of the larynx and bronchi, chemical pneumonitis, and pulmonary edema. May also affect teeth (changes in teeth and supporting structures - erosion, discoloration).

Chronic Potential Health Effects:

Inhalation: Prolonged or repeated inhalation may affect behavior (muscle contraction or spasticity), urinary system (kidney damage), and cardiovascular system, heart (ischemic heart lesions), and respiratory system/lungs (pulmonary edema, lung damage), teeth (dental discoloration, erosion).

Skin: Prolonged or repeated skin contact may cause dermatitis, an allergic skin reaction.

Section 12: Ecological Information

Ecotoxic Effects: Harmful to aquatic life in very low concentrations. May be dangerous if it enters water intake; Fish toxicity; 2.8 µg/L 96 hrs LC50 Rainbow trout.

Products of Degradation: Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise. These products are sulphur oxides (SO2, SO3)

Toxicity of the Products of Degradation: The products of degradation are more toxic than the original product.

Section 13: Disposal Considerations

Waste disposal: The generation of waste should be avoided or minimized wherever possible. Cleaned up material may be a hazardous waste as defined by Resource Conservation and Recovery Act (RCRA) on disposal due to the corrosivity characteristic. Disposal of this product and any by-products must comply with all local, state, and federal requirements. Consult your local and/or regional authorities.

Section 14: Transport Information

Shipping Description:	Sulfuric Acid
Shipping Description:	UN 1830, Sulfuric Acid, 8, PG II
Packaging References:	49CFR, Sections 172.504, 173.213, 173.247, 172.325 / SP 30

Section 15: Regulatory Information

U.S. Federal regulations:

TSCA 8(b) inventory: Sulfuric acid
SARA 302/304/311/312 extremely hazardous substances: Sulfuric acid
SARA 313 toxic chemical notification and release reporting: Sulfuric acid
CERCLA: Hazardous Substances: Sulfuric acid: 1000 lbs. (453.6 kg)

Reportable Quantity (RQ) under U.S. EPA CERCLA: RQ=1000 lb / 454 kg
TSCA Inventory Status: Reported/Included

Other Regulations/Legislation which apply to this product: New Jersey Special Health Hazard Substance List and Environmental Hazardous Substance; Minnesota, Florida, Rhode Island Hazardous Substance ; California Director's List of Hazardous Substances; Massachusetts Extraordinarily Hazardous Substance List

Section 16: Other Information

Hazardous Material Information System (HMIS)

Health	3
Fire hazard	0
Physical Hazard	2
Personal protection	C

National Fire Protection Association (NFPA)

References:

29 CFR Part 1910.1200 OSHA MSDS Requirements.
49 CFR 172.101 Table of Hazardous Materials
ANSI Z400.1, MSDS Standard, 2004.
Hawley's Condensed Chemical Dictionary, 14th Edition
The Merck Index, 12th Edition
Supplier Material Safety Data Sheets

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