

53108



Sulfuric Acid UN 1830

1. PRODUCT AND COMPANY IDENTIFICATION

Product Name: Sulfuric Acid **Formula:** H₂SO₄ **Molecular Weight:** 98.08
Chemical Name: Sulfuric Acid **Chemical Family:** Inorganic Acid **CAS#** 7664-93-9
Synonyms: Sulphuric Acid, Hydrogen Sulphate, Oil of Vitriol, Battery Acid
Product Use: Used in manufacture of fertilizers, explosives, other acids, metal pickling and petroleum processing.

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2. COMPOSITION/INFORMATION ON INGREDIENTS

| <u>Hazardous Ingredients</u> | <u>% by Wt.</u> | <u>CAS Number</u> |
|----------------------------------|-----------------|-------------------|
| Sulfuric Acid | 70-100% | 7664-93-9 |
| <u>Non-Hazardous Ingredients</u> | | |
| Water | 0-30% | 7732-18-5 |

3. HAZARD INFORMATION

EMERGENCY OVERVIEW:

Δ **Danger!** Extremely corrosive. Causes severe burns and 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. Read the entire MSDS for a more thorough evaluation of the hazards.

National Fire Protection Association (NFPA) Rating
Hazardous Materials Identification System (HMIS) Rating

| | NFPA | HMIS |
|------------|------|------|
| HEALTH | 3 | 3 |
| FIRE | 0 | 0 |
| REACTIVITY | 2 | 2 |
| SPECIAL | W | |

4 = Extreme/Severe
 3 = High/Serious
 2 = Moderate
 1 = Slight
 0 = Minimum
 W = Water Reactive



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3. HAZARD INFORMATION (continued)

Exposure Limits:

| | ACGIH (TLV) | OSHA (PEL) |
|---------------|----------------------------|---------------------------|
| Sulfuric Acid | 1 mg/m ³ (TWA) | 1 mg/m ³ (TWA) |
| | 3 mg/m ³ (STEL) | |

- Δ A2 (Notations) refers to sulfuric acid contained in strong inorganic acid mists; suspected human carcinogen

POTENTIAL HEALTH EFFECTS:

Eye Contact: Immediate pain, severe burns and corneal damage, which may result in permanent blindness.

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

- Δ **Chronic Effects:** Repeated exposure may produce erosion and discoloration of teeth.

Carcinogenicity: The International Agency for Research on Cancer (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) and, to a lesser extent, the lung. Although no direct link has been established between exposure to sulfuric acid itself, and cancer in man, exposure to any mist or aerosol during the use of this product should be avoided and, in any case, keep exposures below the occupational exposure limit for sulfuric acid.

The National Toxicology Program (NTP) does not classify sulfuric acid or strong inorganic acid mists as known (or reasonably anticipated to be) human carcinogens.



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4. FIRST AID MEASURES

Δ **General:** Corrosive effects on the skin and eyes may be delayed, and damage may occur without the sensation or onset of pain. Strict adherence to first aid measures following any exposure is essential. **SPEED IS ESSENTIAL. OBTAIN IMMEDIATE MEDICAL ATTENTION.**

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.

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. If immersion is not practical, compresses of iced water can be applied. Avoid freezing tissues.

Discard heavily contaminated clothing and shoes in a manner that limits further exposure. Otherwise, wash clothing separately before reuse.

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.

Δ **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



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5. FIRE FIGHTING MEASURES

Flash Point (method): Not applicable. Not combustible

Flammable Limits (Lower): Not applicable.

Flammable Limits (Upper): Not applicable.

Auto Ignition Temperature: Not applicable.

Combustion and Thermal Decomposition Products: Oxides of Sulfur

- Δ **Fire and Explosion Hazards:** Not flammable but highly reactive. Strong dehydrating agent, which may cause ignition of finely divided combustible materials on contact. 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, a highly flammable gas, can accumulate to explosive concentrations inside drums, or any types of steel containers or tanks upon storage. Oxides of sulfur may be produced in fire.
- Δ **Extinguishing Media:** For large fires use an all purpose type AFFF foam according to foam manufacturer's recommended techniques. The foam supplier should be consulted for recommendations regarding foam types and delivery rates for specific applications. Use carbon dioxide or dry chemical media for small fires. If only water is available, use it in the form of a fog.

Special Fire Fighting Procedures: 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 residents who are downwind of fire. 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 (Deactivating Chemicals, Section 6). Cool containers that are exposed to flame with streams of water until fire is out.

NOTE: Also see "Section 10 - Stability and Reactivity"

6. ACCIDENTAL RELEASE MEASURES

Steps to be taken in the event of a spill or leak: Remove all ignition sources (no smoking, flares, sparks or flames). All equipment should be grounded. Ventilate area. Use appropriate Personal Protection Equipment. Prevent liquid from entering sewers or waterways. Stop or reduce leak if safe to do so.

- Δ **Small Spills:** Cover with DRY earth, sand or other non-combustible material. Use clean non-sparking tools to collect material and place it into loosely covered plastic containers for later disposal.
- Δ **Large Spills:** Prevent liquid from entering sewers or waterways. Dike with inert material (sand, earth, etc.). Collect into plastic containers for disposal. Consider insitu neutralization and disposal. Ensure adequate decontamination of tools and equipment following clean up. Comply with Federal, Provincial/State and local regulations on reporting releases.

Deactivating Chemicals: Lime, limestone, sodium carbonate (soda ash), sodium bicarbonate, dilute sodium hydroxide, dilute aqua ammonia.

Waste Disposal Methods: 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.

Note - Clean-up material may be a RCRA Hazardous Waste on disposal.

- Spills are subject to CERCLA reporting requirements: RQ = 1000 lbs.



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7. HANDLING AND STORAGE

Δ **Precautions:** 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.** 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.

Δ **Handling Procedures and Equipment:** Carbon steel, Cast Iron, as well as certain alloys or stainless steels are suitable for use for acid concentrations equal to or greater than 93%. However, the effect of lower concentrations on materials of construction can be very complex. Contact product supplier for specific recommendations when handling sulfuric acid at strengths less than 71%.

Inspect containers for leaks before handling. Secondary protective containers must be used when this material is being carried. Keep containers tightly closed when not in use. Assume that empty containers contain residues, which are hazardous. Use corrosion-resistant transfer equipment when transferring acid.

Storage Temperature: Store above freezing point (Section 9). Elevated temperatures will increase the corrosion rate of most metals.

Storage Requirements: Store packaged acid in a dry, well, ventilated location preferably in the supplier's container. Protect the label and keep it visible. Keep away from combustibles, oxidizers, bases, or metallic powders. Storage tanks should be protected from water ingress, be well ventilated, and maintained structurally in a safe and reliable condition.

Other Precautions: Sulfuric acid will attack some forms of plastics and coatings. Always add acid to water - not water to acid. If kept in upper floors of building, floors should be acid proof with drains to a recovery tank.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Recommendations listed in this section indicate the type of equipment that will provide protection against over exposure to this product. Conditions of use, adequacy of engineering or other control measures, and actual exposures will dictate the need for specific protective devices at your workplace.

Δ **Engineering Controls:** Local exhaust ventilation should be applied wherever there is an incidence of point source emissions or dispersion of regulated contaminants in the work area. Ventilation control of the contaminant as close to its point of generation is both the most economical and safest method to minimize personnel exposure to airborne contaminants. The most effective measures are the total enclosure of processes and the mechanization of handling procedures to prevent all personal contact with sulfuric acid. Electrical installations should be protected against the corrosive action of acid vapors. Smoking should be prohibited in areas in which sulfuric acid is stored or handled.

Respiratory Protection: A NIOSH/MSHA approved air-purifying respirator equipped with acid gas/fume, dust, mist cartridges for concentrations up to 10 mg/m³. An air-supplied respirator if concentrations are higher or unknown.

Skin Protection: RECOMMENDED: Impervious (i.e., neoprene, PVC) gloves, coveralls, boots and/or other acid resistant protective clothing.



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8. EXPOSURE CONTROLS/PERSONAL PROTECTION (continued)

Recommended Materials: Guidelines for sulfuric acid concentrations above 70%:

- (Resistance to breakthrough longer than 8 hours): Butyl rubber, polyethylene, Teflon (TM), Saranex (TM), 4H (TM), Barricade (TM), CPF 3 (TM), Responder (TM), Trelchem HSP (TM), Tychem 10000 (TM).
- (Resistance to breakthrough longer than 4 hours): Viton (TM).
- (Resistance to breakthrough within 1 to 4 hours): CAUTION; use for short periods only. Neoprene, polyvinyl chloride, Viton (TM).

NOT RECOMMENDED for use (resistance to breakthrough less than 1 hour): Natural rubber, nitrile rubber, polyvinyl alcohol.

Eye Protection: Tight-fitting chemical goggles and face shield.

Other Personal Protective Equipment: 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. Safety showers and eyewash fountains should be installed in storage and handling areas.

Δ EXPOSURE GUIDELINES:

HAZARDOUS INGREDIENT(S):

Sulfuric Acid:

| | |
|---|-----------------------------|
| ACGIH TLV | 1 mg/m ³ (TWA) |
| ACGIH STEL | 3 mg/m ³ |
| OSHA PEL | 1 mg/m ³ (TWA) |
| NIOSH Immediately Dangerous to Life and Health Level (IDLH) | 15 mg/m ³ (IDLH) |

9. PHYSICAL AND CHEMICAL PROPERTIES

Molecular Weight: 98.08

Physical State: Liquid

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

Odor Threshold: Not applicable

Boiling Point: 77.67%: 193°C (380°F); 93.19%: 276°C (529°F); 98%: 330°C (626°F)

Melting/Freezing Point: 77.67%: -11.2°C (+11.6°F); 93.19%: -29.5°C (-21.1°F); 98%: -1.1°C (30°F)

Vapor Pressure at 40°C (102°F): 77.67%: 1.2 mmHg; 93.19%: 0.0016 mmHg; 98%: 0.002 mmHg

Specific Gravity at 15°C (60°F): 77.67%: 1.7059; 93.19%: 1.8354; 98%: 1.8437

Vapor Density: (Air=1): 3.4 sulfuric acid component

Bulk Density: Not applicable (see specific gravity)

Evaporation Rate: Not applicable

Solubility: Miscible in all proportions in water.

pH: 0.3 (1N solution at 25°C/78°F)



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10. STABILITY AND REACTIVITY

Δ **Stability:**

Under Normal Conditions: Stable, but reacts violently with water and organic materials with evolution of heat.

Under Fire Conditions: Decomposes to form sulphur dioxide, sulphur trioxide, sulphuric acid vapours and hydrogen gas.

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.

Δ **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.

Δ **Corrosivity to Metals:**

Sulfuric acid can be corrosive to most metals, depending on such factors as acid concentration, temperature and impurities. Concentrated sulfuric acid (containing more than 90 wt-% H₂SO₄) can be safely handled using carbon steel, cast iron, and certain stainless steel alloys. The resistance of alloys to sulfuric acid corrosion generally increases with increasing chromium, molybdenum, copper and silicon content. Corrosion Tables and/or the supplier should be consulted for further information on the corrosiveness of sulfuric acid towards metals.

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

11. TOXICOLOGICAL INFORMATION

Toxicological Data: LD₅₀ (oral, rat) = 2140 mg/kg
LC₅₀ (inhalation, rat) = 510 mg/m³ for 2 hrs
Skin effects (rabbit): Severe irritation
Eye effects (rabbit): Severe irritation

Δ **Carcinogenicity Data:** The International Agency for Research on Cancer (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) and, to a lesser extent, the lung. Although no direct link has been established between exposure to sulfuric acid, itself, and cancer in man, exposure to any mist or aerosol during the use of this product should be avoided. See Section 3. Hazard Information, regarding Potential Health Effects (Long Term Exposure) for further discussion.

The National Toxicology Program (NTP) does not classify sulfuric acid or strong inorganic acid mists as known (or reasonably anticipated to be) human carcinogens.

Δ **Reproductive Effects:** Slightly embryotoxic in rabbits (a minor, rare skeletal variation). The animals were exposed to 5 and 20 mg/m³ for 7 hrs/day throughout pregnancy. Slight maternal toxicity was present at the highest dose in both species.

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



MATERIAL SAFETY DATA SHEET

Sulfuric Acid

11. TOXICOLOGICAL INFORMATION (continued)

Δ **Teratogenicity Data:** Not teratogenic in mice and rabbits.

Synergistic Materials: None known

12. ECOLOGICAL INFORMATION

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

13. DISPOSAL CONSIDERATIONS

Δ Do not dispose of waste with normal garbage, or to sewer systems.

- Responsibility for proper waste disposal is with the owner of the waste. Work with the appropriate regulatory bodies to ensure compliance with regulations.
- Consider the collection of residual sulfuric acid into containers for reclamation or disposal only if the container is suitable to withstand the material.
- Consider insitu neutralization and disposal.
- Clean-up material may be a RCRA Hazardous Waste on disposal.
- Provincial/State or local regulations or restrictions are complex and may differ from Federal regulations.
- The information applies to the material as manufactured; processing, neutralizing, use or contamination may make the information inappropriate, inaccurate or incomplete.

14. TRANSPORT INFORMATION

U.S. (Under DOT)

Δ **Shipping Name:** Sulfuric acid
Hazard Class or Division: 8
Identification No.: UN1830
Packing Group: II
 RQ = 1000 pounds (454 kg)

Δ **IMO:** 8
IATA/CAO Class: 8

Canada (Under TDG)

Shipping Name: Sulphuric acid
Classification(s): Class 8, (9.2)
Product Identification No. (PIN): UN1830
Packing Group: II
Regulated Limit: 50 kg



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15. REGULATORY INFORMATION

U.S.A.

SARA Title III HAZARD CATEGORIES AND LISTS

| <u>Product Hazard Categories</u> | | <u>Lists</u> | |
|----------------------------------|-----|---|-----|
| Acute (Immediate) Health: | Yes | Extremely Hazardous Substance | Yes |
| Chronic (Delayed) Health: | Yes | (40 CFR 355, SARA Title III Section 302) | |
| Fire: | No | CERCLA Hazardous Substance | Yes |
| Reactivity: | Yes | (40 CFR 302.4) | |
| Sudden Release of Pressure: | No | Toxic Chemical | Yes |
| | | (40 CFR 372.65, SARA Title III Section 313) | |

Reportable Quantity (RQ) under U.S. EPA CERCLA: RQ=1000 lb / 454 kg

TSCA Inventory Status: Reported/Included

Δ **Right-To-Know:** Illinois, Massachusetts, New Jersey, Pennsylvania

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

CANADA

Workplace Hazardous Materials Information System (WHMIS)

Δ **WHMIS Classification(s):** Class D1A - Very Toxic
 Class D2B - Suspected Human Carcinogen
 Class E - Corrosive

WHMIS Health Effects Index: Acute Lethality - very toxic - immediate
 Materials Causing Other Toxic Effects - Chronic
 Corrosive to animal skin

WHMIS Ingredient Disclosure List: Confirmed A; Meets criteria for disclosure at 1% or greater.

National Pollutant Release Inventory (NPRI): Included

Δ **European:**

EEC CLASSIFICATION: C, R 35

EINECS: 231-639-5

**Sulfuric Acid****16. OTHER INFORMATION****Revision Indicators:**

Δ In the left margin indicates a revision or addition of information since the previous issue.

Δ REFERENCES:

1. **RTECS-Registry of Toxic Effects of Chemical Substances**, On-line search, Canadian Centre for Occupational Health and Safety RTECS database, Doris V. Sweet, Ed., National Institute for Occupational Safety and Health, U.S. Dept. of Health and Human Services, Cincinnati, Entry Update/Dec1997.
2. **ChemAdvisor**, Canadian Centre for Occupational Health and Safety, October 1998.
3. **CHEMINFO**, through "CCINFOdisc", Canadian Centre for Occupational Health and Safety, Hamilton, Ontario, Canada, (August, 1998).
4. **Hazardous Substances Data Bank**, through "CCINFO disc", Canadian Centre for Occupational Health and Safety, Hamilton, Ontario, Canada, (August, 1998).
5. **NIOSH POCKET GUIDE TO CHEMICAL HAZARDS**, U.S. Department of Health and Human Services, National Institute for Occupational Safety and Health, June 1997.
6. **"8th Report on Carcinogens – 1998 Summary"**, National Toxicology Program.
7. **Sax, N.I.**, "Dangerous Properties of Industrial Materials", 7th Edition, 1989.
8. **"1998 Threshold Limit Values and Biological Exposure Indices"**, American Conference of Government Industrial Hygienists, 1998.
9. **Merck**, 11th Edition, 1989.
10. **Supplier's Material Safety Data Sheets.**



Sulfuric Acid

16. OTHER INFORMATION (continued)

Legend:

| | |
|------------------|--|
| AFFF | - Aqueous Film Forming Foam |
| CAS # | - Chemical Abstracts Service Registry Number |
| CERCLA | - Comprehensive Environmental Response, Compensation, and Liability Act |
| CFR | - Code of Federal Regulations |
| DOT | - Department of Transportation |
| EPA | - Environmental Protection Agency |
| LC ₅₀ | - The concentration of material in air expected to kill 50% of a group of test animals |
| LD ₅₀ | - Lethal Dose expected to kill 50% of a group of test animals |
| LEL | - Lower Explosive Limit |
| MSHA | - Mine Safety and Health Administration |
| NIOSH | - National Institute for Occupational Safety and Health |
| PEL | - Permissible Exposure Limit |
| PVC | - Polyvinyl chloride |
| RCRA | - Resource Conservation and Recovery Act |
| SARA | - Superfund Amendments and Reauthorization Act of the U.S. EPA |
| STEL | - Short Term Exposure Limit |
| TC | - Transport Canada |
| TDG | - Transportation of Dangerous Goods Act/Regulations |
| TLV | - Threshold Limit Value |
| TSCA | - Toxic Substances Control Act |
| TWA | - Time-Weighted Average |
| UEL | - Upper Explosive Limit |

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