

Product Name: Sulfuric Acid
Revision Date: 05/11/2010 Revision No.: 8

OCEAN NETWORK EMERGENCY PHONE 1-888-2891-911

THIS MATERIAL SAFETY DATA SHEET (MSDS) HAS BEEN PREPARED IN COMPLIANCE WITH THE FEDERAL OSHA HAZARD COMMUNICATION STANDARD, 29 CFR 1910.1200. THIS PRODUCT MAY BE CONSIDERED TO BE A HAZARDOUS CHEMICAL UNDER THAT STANDARD. (REFER TO THE OSHA CLASSIFICATION IN SEC.I.) THIS INFORMATION IS REQUIRED TO BE DISCLOSED FOR SAFETY IN THE WORKPLACE. THE EXPOSURE TO THE COMMUNITY, IF ANY, IS QUITE DIFFERENT.

I - PRODUCT IDENTIFICATION

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| Product Name: | Sulfuric Acid |
| Synonyms: | Drying acid |
| Chemical Family: | Inorganic acid |
| Formula: | H ₂ SO ₄ |
| Use Description: | Chemical manufacturing, neutralization |
| Hazard Classification: | Corrosive, skin and eye hazard, lung toxin; water reactive |
| Product Code: | 105002 |
| File No.: | MSDS0350 |

II - COMPONENT DATA

THIS PRODUCT COMPOSITION INFORMATION PRESENTED HERE DESCRIBES THE MAJOR COMPONENTS AND THEIR CONCENTRATIONS FOUND IN THIS PRODUCT AND OTHER INFORMATION AS REQUIRED BY OSHA. THIS IS NOT, AND SHOULD NOT BE INTERPRETED, OR USED AS, A PRODUCT SPECIFICATION OR A DETAILED CHEMICAL ANALYSIS.

Established Federal OSHA PEL is provided. OSHA Agreement State PEL may be different.

Product Composition

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|---------------------------------|---------------|-----|-------------------|-----|-------------------|
| CAS or Chemical Name: | Sulfuric acid | | | | |
| CAS Number: | 7664-93-9 | | | | |
| Percentage Range: | > 51-75% | | | | |
| Hazardous Per 29 CFR 1910.1200: | Yes | | | | |
| Exposure Standards: | OSHA (PEL) | | ACGIH (TLV) | | |
| | | ppm | mg/M ³ | ppm | mg/M ³ |
| | TWA: | N/A | 1.0 | N/A | 1.0 |
| | CEILING: | N/A | None | N/A | None |
| | STEL: | N/A | None | N/A | None |

| | | | | |
|---------------------------------|-----------|--|--|--|
| CAS or Chemical Name: | Water | | | |
| CAS Number: | 7732-18-5 | | | |
| Percentage Range: | 25- > 49% | | | |
| Hazardous Per 29 CFR 1910.1200: | No | | | |

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| Exposure Standards: | None Established |
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III - PRECAUTIONS FOR SAFE HANDLING AND STORAGE

DO NOT TAKE INTERNALLY. AVOID CONTACT WITH SKIN, EYES AND CLOTHING. UPON CONTACT WITH SKIN OR EYES, WASH OFF WITH WATER. AVOID BREATHING MIST OR VAPOR.

INCOMPATIBLE MATERIALS FOR STORAGE OR TRANSPORT:

STORAGE CONDITIONS:

Store in a cool, dry, well ventilated place. Avoid breathing mist or vapors. Use caution when mixing with water. Can react violently with water.

DO NOT STORE AT TEMPERATURES ABOVE: 53 Deg.C (125 Deg.F)

PRODUCT STABILITY AND COMPATIBILITY:

| | |
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| SHELF LIFE LIMITATIONS: | 2 years |
| MATERIALS FOR PACKAGING: | Glass, steel, polyethylene |
| INCOMPATIBLE MATERIALS FOR PACKAGING: | |
| INCOMPATIBLE MATERIALS FOR STORAGE OR TRANSPORT: | organic materials, nitrates, carbides, chlorates, metallic powders. |

IV - PHYSICAL DATA

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| Appearance: | Turbid liquid |
| Freezing Point: | -42 Deg.C (-44 Deg.F), 70% -26 Deg.C (-15 Deg.F), 75% |
| Boiling Point: | 123 Deg.C (255 Deg.F), 70% 177 Deg.C (350 Deg.F), 75% |
| Decomposition Temperature: | 340 Deg.C (644 Deg.F), 100% |
| Specific Gravity: | 1.67 (75%), 1.40 (50%) |
| Bulk Density: | 11.66 (50%), 13.4 (75%) lbs./gal. |
| pH @ 25° C: | <1 |
| Vapor Pressure @ 25° C: | < 1 mm Hg (75%), 8 mm Hg (50%) |
| Solubility in Water: | Miscible |
| Volatiles, Percent by Volume: | 25-50 |
| Evaporation Rate: | No Data |
| Vapor Density: | No Data |
| Molecular Weight: | 98.08 (active ingredient) |
| Odor: | None |
| Coefficient of Oil/Water | No Data |

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| Distribution: | |
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V – PERSONAL PROTECTIVE EQUIPMENT REQUIREMENTS

Personal Protection for Routine Use of Product:

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| Respiratory Protection: | Wear a NIOSH approved respirator if any exposure occurs above the TLV, if unable to maintain levels with ventilation. |
| Ventilation: | Use local exhaust ventilation to maintain levels to below the TLV. |
| Skin and Eye Protection: | Wear gloves, boots, apron and a face shield with safety goggles. A full impermeable suit is recommended if exposure is possible to large portion of body. |
| Other: | Emergency eye wash and safety showers must be provided in the immediate work area. |

Equipment Specifications (When Applicable):

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| Respirator Type: | Wear a NIOSH approved full-face respirator with an acid gas cartridge and a dust/mist pre-filter. |
| Protective Clothing Type: (This includes: gloves, boots, apron, protective suit.) | GLOVE TYPE: Butyl rubber, or polyethylene, or Teflon. BOOT TYPE: Butyl rubber, or polyethylene, or Teflon. APRON TYPE: Butyl rubber, or polyethylene, or Teflon. PROTECTIVE SUIT: Impervious. See section XI for more information. |

VI – FIRE AND EXPLOSION HAZARD INFORMATION

Flammability Data:

| | |
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| Explosive: | N/A |
| Flammable: | No |
| Combustible: | No |
| Pyrophoric: | No |
| Flash Point: | None |
| Autoignition Temperature: | Not Applicable |
| Flammable Limits at Normal Atmospheric Temperature and Pressure (Percent Volume in Air): | LEL - Not Applicable UEL - Not Applicable |

NFPA Ratings:

| | |
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| Health: | 3 |
| Flammability: | 0 |
| Reactivity: | 2 |
| Special Hazard Warning: | (WATER REACTIVE) |

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HMIS Ratings:

| | |
|---------------|---|
| Health: | 3 |
| Flammability: | 0 |
| Reactivity: | 2 |
| | |

Extinguishing Media:

Not Applicable

Fire Fighting Techniques and Comments:

Use water to cool containers exposed to fire. Use extreme caution, see below. Water reactive material; do not spray with water. Contact with reactive metals, e.g., aluminum may result in the generation of flammable hydrogen gas. See Section XI for protective equipment for fire fighting. Reacts violently with water and organic materials with evolution of heat. See Section VII. Fires involving small amounts of combustibles may be smother with suitable dry chemical. Use water on combustibles burning in the vicinity of this material, but use extreme caution when applying water to cool containers. DO NOT LET WATER COME IN CONTACT WITH THIS ACID, EVOLUTION OF HEAT AND SPLATTERING WILL RESULT.

VII - REACTIVITY INFORMATION

Conditions Under Which This Product May Be Unstable:

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| Temperatures Above: | 250 Deg. C (482 Deg.F) |
| Mechanical Shock or Impact: | No |
| Electrical (Static) Discharge: | No |
| Other: | Water, heat |
| Hazardous Polymerization: | No |
| Incompatible Materials: | Alkalis, amines, anhydrides, combustibles, organics, oxidizers, powdered metals |
| Hazardous Decomposition: | hydrogen gas by reaction with metals, sulfur trioxide |

Summary of Reactivity:

| | |
|-------------------|-----|
| Explosive: | N/A |
| Oxidizer: | No |
| Pyrophoric: | No |
| Organic Peroxide: | No |
| Water Reactive: | Yes |
| Corrosive: | N/A |

VIII - FIRST AID

Eyes

Immediately flush with large amounts of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Seek medical attention at once.

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Skin

Immediately flush with water for at least 15 minutes. Seek medical attention. If clothing, shoes and/or jewelry come in contact with the product, they should be removed immediately and laundered before re-use.

Ingestion

Immediately drink large quantities of water. DO NOT induce vomiting. Seek medical attention at once. DO NOT give anything by mouth if the person is unconscious or if having convulsions.

Inhalation

If person experiences nausea, headache or dizziness, person should stop work immediately and move to fresh air until these symptoms disappear. If breathing is difficult, administer oxygen, keep the person warm and at rest. Seek medical attention. In the event that an individual inhales enough vapor to lose consciousness, person should be moved to fresh air at once and seek medical attention immediately. If breathing has stopped, artificial respiration should be given immediately. In all cases, ensure adequate ventilation and provide respiratory protection before the person returns to work.

IX – TOXICOLOGY AND HEALTH INFORMATION

Routes of Absorption

Inhalation, skin and eye contact, ingestion

Warning Statements and Warning Properties

HARMFUL IF INHALED. CAUSES SKIN AND EYE BURNS. MAY CAUSE DIGESTIVE TRACT AND RESPIRATORY TRACT BURNS. CAN CAUSE LUNG DAMAGE.

Human Threshold Response Data

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| Odor Threshold: | No Data |
| Irritation Threshold: | No Data |
| Immediately Dangerous to Life or Health: | 15.0 mg/M ³ . |

Signs, Symptoms and Effects of Exposure

Inhalation

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| Acute: | Inhalation of this material is irritating to the nose, mouth, throat, and lungs. It may also cause burns to the respiratory tract with the production of lung edema, which can result in shortness of breath, wheezing, choking, chest pain, and impairment of lung function. Inhalation of high concentrations may result in permanent lung damage. |
| Chronic: | Repeated inhalation exposure may cause bronchitis, impairment of lung function and permanent lung damage with epithelial hyperplasia and thickening of the bronchiolar walls. Inhalation of mist may also produce |

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| | etching of the dental enamel followed by erosion of the enamel and dentine with loss of tooth substance. |
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| Acute: | Dermal exposure can cause severe irritation and/or burns characterized by redness, swelling, and scab formation. Repeated or prolonged skin exposure may cause permanent damage. |
| Chronic: | Effects from chronic skin exposure would be similar to those from simple exposure except for effects secondary to tissue destruction. |

Eye

Severe irritation and/or burns can occur following eye exposure. Contact may cause impairment of vision and corneal damage.

Ingestion

| | |
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| Acute: | Irritation and/or burns can occur to the entire gastrointestinal tract, including the stomach and intestines, characterized by nausea, vomiting, diarrhea, abdominal pain, bleeding, and/or tissue ulceration. Ingestion causes severe damage to the gastrointestinal tract with the potential to cause perforation. |
| Chronic: | There are no know or reported effects form chronic exposure. Chronic ingestion of significant amounts of this product is unlikely because of its acute corrosive action. |

Medical Conditions Aggravated by Exposure

Asthma, respiratory and cardiovascular disease.

Interactions With Other Chemicals Which Enhance Toxicity

None known or reported.

Animal Toxicology

Acute Target Organ Toxicity

INHALATION LC 50: 510 mg/cubic meter (2 hrs., rat), as concentrated sulfuric acid
ORAL LD 50: 2.14 g/kg(rat) as concentrated sulfuric acid
DERMAL LD 50:Believed to be > 2.0 g/kg (rabbit)
IRRITATION: Causes burns to eyes and skin.

This product is corrosive to all tissues contacted and upon inhalation may cause irritation to mucous membranes and respiratory tract.

Chronic Target Organ Toxicity

Alteration of lung structure and deterioration of lung function has been observed in primates exposed to concentrations 4 to 5 times the TLV. The damage was characterized by hyperplasia and thickening of the bronchiolar walls due to repeated irritation and inflammation.

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Reproductive and Developmental Toxicity

Sulfuric acid aerosol (95.7% purity) was tested in pregnant mice and rabbits exposed to concentrations of 0, 5 and 20 mg/cubic meter by inhalation on gestational days 6-15 and 6-1,8 respectively. No reproductive or developmental effects were seen in either species at any of the exposure concentrations utilized.

Carcinogenicity

Sulfuric acid is not known or reported to be carcinogenic by any reference source including: IARC, OSHA, NTP, or EPA. IARC evaluated several epidemiology studies where individuals in a variety of industries had been exposed to a mixture of strong-inorganic-acid mists and concluded that there is sufficient evidence that occupational exposure to a mixture of strong-inorganic-acid mists in combination with sulfuric acid is carcinogenic to humans (Group I carcinogen). Cancer has not been observed in animals when they are exposed only to sulfuric acid mist. ACGIH lists sulfuric acid (strong mist) as category A2 - Suspected Human Carcinogen, human data conflicting or insufficient.

Mutagenicity

The genotoxicity of sulfuric acid has been reviewed. It has shown positive results in some studies, and negative results in other. The overall conclusion is equivocal.

Aquatic Toxicity

The toxicity of sulfuric acid to aquatic life is a function of the resulting pH. Sulfuric acid can be directly lethal to fully developed fish in most natural waters only when the pH is reduced to 5.09 or lower. A pH of 3.9 has been reported to cause the death of trout. A pH of 4.0 has been reported to cause pronounced gill irritation and 3.5 caused death to sunfish, bass and carp.

96-hour LC50, Bluegill sunfish: 10.5 ppm
48-hour TLm, flounder: 100-300 ppm

X - TRANSPORTATION INFORMATION

THIS MATERIAL IS REGULATED AS A DOT HAZARDOUS MATERIAL.

DOT Description from the Hazardous Materials Table 49 CFR 172.101:

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| Land (U.S. DOT): | Sulfuric Acid, 8, UN 1830, PG II |
| Water (IMO): | Sulfuric Acid, 8, UN 1830, PG II |
| Air (IATA/ICAO): | Sulfuric Acid, 8, UN 1830, PG II |
| Hazard Label/Placard: | CORROSIVE |
| Reportable Quantity: | 1000 lbs. (Per 49 CFR 172.101, Appendix) |
| Emergency Guide: | 137 |
| | |

XI - SPILL AND LEAKAGE PROCEDURES

FOR ALL TRANSPORTATION ACCIDENTS, CALL CHEMTREC AT 800-424-9300.

Reportable Quantity: 1000 lbs. as 100% Sulfuric acid (Per 40 CFR 302.4)

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Spill Mitigation Procedures:

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| Hazardous concentrations in air may be found in local spill area and immediately downwind. DO NOT PUT WATER DIRECTLY ON THIS PRODUCT as heat evolution may occur causing a violent reaction. Stop source of leak if safe to do so and if proper safety equipment is available. Evacuate immediate area of spill and if necessary, down-wind as required. | |
| Air Release: | Vapors may be suppressed by the use of a water fog. Contain water in a diked area for treatment and disposal. |
| Water Release: | This material is heavier than water. This material is soluble in water. Divert all water flow to a containment area for treatment. Notify other water users of possible contamination and proceed to clean up via vacuuming liquid or neutralizing as necessary. |
| Land Spill: | Contain by creating a trench or dike made of soil, sand or other compatible materials. Accumulated liquid may be recovered via use of a vacuum truck or by pumping into compatible and approved storage containers. |

Spill Residues:

Dispose of per guidelines under Section XII, WASTE DISPOSAL.

This material may be neutralized for disposal; you are requested to contact OCEAN at 800-OLIN-911 before beginning any such operation.

Personal Protection for Emergency Spill and Firefighting Situations:

Response to a spill of this material may require the use of a full-encapsulated suit and self-contained breathing apparatus (SCBA). In all cases protective clothing must be worn to prevent personal contact with this material.

Those items include but are not limited to: boots, gloves, hard hat, splash-proof goggles, full-face shield and impervious clothing, i.e., chemically impermeable suit.

Compatible materials for response to this material are: Butyl rubber, or polyethylene, or Teflon.

Protection concerns must also address the potential of this product to react with various metals to form hydrogen gas creating a potential fire or explosion hazard.

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XII - WASTE DISPOSAL

If this product becomes a waste, it meets the criteria of a hazardous waste as defined under 40 CFR 261 and would have the following EPA hazardous waste number: D002, D003.

If this product becomes a waste, it will be a hazardous waste, which is subject to the Land Disposal Restrictions under 40 CFR 268 and must be managed accordingly.

As a hazardous liquid waste, it must be disposed of in accordance with local, state and federal regulations in a permitted hazardous waste treatment, storage and disposal facility by treatment.

CARE MUST BE TAKEN TO PREVENT ENVIRONMENTAL CONTAMINATION FROM THE USE OF THIS MATERIAL. THE USER OF THIS MATERIAL HAS THE RESPONSIBILITY TO DISPOSE OF UNUSED MATERIAL, RESIDUES AND CONTAINERS IN COMPLIANCE WITH ALL RELEVANT LOCAL, STATE AND FEDERAL LAWS AND REGULATIONS REGARDING TREATMENT, STORAGE AND DISPOSAL FOR HAZARDOUS AND NONHAZARDOUS WASTES.

XIII - ADDITIONAL REGULATORY STATUS INFORMATION

TOXIC SUBSTANCES CONTROL ACT:

This substance is listed on the Toxic Substances Control Act inventory.

NSF LIMITS: NSF Maximum Drinking Water Use Concentration - 50 mg/l as sulfuric acid.

SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT TITLE III:

HAZARD CATEGORIES, PER 40 CFR 370.2:

HEALTH:

Immediate (Acute)

Delayed (Chronic)

PHYSICAL:

Reactivity

EMERGENCY PLANNING AND COMMUNITY RIGHT TO KNOW, PER 40 CFR 355, APP.A:

EXTREMELY HAZARDOUS SUBSTANCE - THRESHOLD PLANNING QUANTITY:

1,000 lbs.

SUPPLIER NOTIFICATION REQUIREMENTS, PER 40 CFR 372.45:

This mixture or tradename product contains a toxic chemical or chemicals subject to the reporting requirements of Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 and 40 CFR 372.

CHEMICALS LISTED ARE: Sulfuric Acid (If in aerosol or mist form)

California Prop 65 Components - This product is not listed, but it may contain elements known to the State of California to cause cancer or reproductive toxicity as listed under Proposition 65 State Drinking Water and Toxic Enforcement Act. For additional information, contact Olin Technical Services (800-299-6546)

XIV - ADDITIONAL INFORMATION

MSDS REVISION STATUS: Changes from Rev 6 (03/10/04) have been made to Section X

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XV – MAJOR REFERENCES

1. Murray, F.J. et al. Embryotoxicity of Inhaled Sulfuric Acid Aerosol in Mice and Rabbits. J. Environ. Sci. Health, C13(3), 251-266 (1979).
2. Soskolne, C.L. et al. Laryngeal Cancer and Occupational Exposure to Sulfuric Acid, American Journal of Epidemiology, Vol. 120, No. 3 (1984).
3. Alarie, Y. et al. Long-Term Continuous Exposure to Sulfuric Acid Mist in Cynomolgus Monkeys and Guinea Pigs, Arch. Environ. Health, Vol. 27, July 1973.
4. Sittig, M. Handbook of Toxic and Hazardous Chemicals and Carcinogens. Noyes Press, 2nd Edition. (1985).
5. McKee, Jack E. and Harold W. Wolf, Eds., Water Quality Criteria, NTIS PB Report; (PB-82-188244), 2nd Ed., Springfield, VA: National Technical Information Services, 1963.
6. Shepard, Thomas H., Catalog of Teratogenic Agents, 6th Edition, The John Hopkins University press, Baltimore, MD, 1989.

Other Reference area available upon request.

THE INFORMATION IN THIS MATERIAL SAFETY DATA SHEET SHOULD BE PROVIDED TO ALL WHO WILL USE, HANDLE, STORE, TRANSPORT, OR OTHERWISE BE EXPOSED TO THIS PRODUCT. THIS INFORMATION HAS BEEN PREPARED FOR THE GUIDANCE OF PLANT ENGINEERING, OPERATIONS AND MANAGEMENT AND FOR PERSONS WORKING WITH OR HANDLING THIS PRODUCT. OLIN BELIEVES THIS INFORMATION TO BE RELIABLE AND UP TO DATE AS OF THE DATE OF PUBLICATION, BUT MAKES NO WARRANTY THAT IT IS. ADDITIONALLY, IF THIS MATERIAL SAFETY DATA SHEET IS MORE THAN THREE YEARS OLD, YOU SHOULD CONTACT OLIN AT THE PHONE NUMBER LISTED BELOW TO MAKE CERTAIN THAT THIS SHEET IS CURRENT.

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