SULFURIC ACID	ICSC: 0362

Date of Peer Review:
February 2000

Sulfuric acid 100%
Oil of vitriol

CAS #	**7664-93-9**	**H_2SO_4**
RTECS #	**WS5600000**	**Molecular mass: 98.1**
UN #	**1830**	
EC Annex 1 Index #	**016-020-00-8**	
EC/EINECS #	**231-639-5**	

TYPES OF HAZARD / EXPOSURE	ACUTE HAZARDS / SYMPTOMS	PREVENTION	FIRST AID / FIRE FIGHTING
FIRE	Not combustible. Many reactions may cause fire or explosion. Gives off irritating or toxic fumes (or gases) in a fire.	NO contact with flammable substances. NO contact with combustibles.	NO water. In case of fire in the surroundings: powder, foam, carbon dioxide
EXPLOSION	Risk of fire and explosion on contact with base(s), combustible substances, oxidants, reducing agents or water.		In case of fire: keep drums, etc., cool by spraying with water but NO direct contact with water.

EXPOSURE		**PREVENT GENERATION OF MISTS! AVOID ALL CONTACT!**	**IN ALL CASES CONSULT A DOCTOR!**
Inhalation	Corrosive. Burning sensation. Sore throat. Cough. Laboured breathing. Shortness of breath. Symptoms may be delayed (see Notes).	Ventilation, local exhaust, or breathing protection.	Fresh air, rest. Half-upright position. Artificial respiration may be needed. Refer for medical attention.
Skin	Corrosive. Redness. Pain. Blisters. Serious skin burns.	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse skin with plenty of water or shower. Refer for medical attention.
Eyes	Corrosive. Redness. Pain. Severe deep burns.	Face shield or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
Ingestion	Corrosive. Abdominal pain. Burning sensation. Shock or collapse.	Do not eat, drink, or smoke during work.	Rinse mouth. Do NOT induce vomiting. Refer for medical attention.

SPILLAGE DISPOSAL	PACKAGING & LABELLING
Consult an expert! Evacuate danger area! Do NOT absorb in saw-dust or other combustible absorbents. Personal protection: complete protective clothing including self-contained breathing apparatus. Do NOT let this chemical enter the environment.	Unbreakable packaging; put breakable packaging into closed unbreakable container. Do not transport with food and feedstuffs. Note: B **EU Classification** Symbol: C R: 35 S: (1/2-)26-30-45 **UN Classification** UN Hazard Class: 8 UN Pack Group: II
EMERGENCY RESPONSE	**STORAGE**
Transport Emergency Card: TEC (R)-80S1830 or 80GC1-II+III NFPA Code: H 3; F 0; R 2; W	Separated from combustible and reducing substances, strong oxidants, strong bases, food and feedstuffs, incompatible materials. See Chemical Dangers. May be stored in stainless steel containers. Store in an area having corrosion resistant concrete floor.

IPCS
International Programme on Chemical Safety

SEE IMPORTANT INFORMATION ON BACK

SULFURIC ACID — ICSC: 0362

IMPORTANT DATA

PHYSICAL STATE; APPEARANCE:
COLOURLESS, OILY, HYGROSCOPIC LIQUID , WITH NO ODOUR.

CHEMICAL DANGERS:
The substance is a strong oxidant and reacts violently with combustible and reducing materials. The substance is a strong acid, it reacts violently with bases and is corrosive to most common metals forming a flammable/explosive gas (hydrogen - see ICSC 0001). Reacts violently with water and organic materials with evolution of heat (see Notes). Upon heating, irritating or toxic fumes (or gases) (sulfur oxides) are formed.

OCCUPATIONAL EXPOSURE LIMITS:
TLV: 0.2 mg/m³ Thoracic fraction A2 (suspected human carcinogen); (sulfuric acid contained in strong inorganic acid mists) (ACGIH 2005).
MAK: (Inhalable fraction) 0.1 mg/m³; Peak limitation category: I(1); Carcinogen category: 4; Pregnancy risk group: C; (DFG 2004).

ROUTES OF EXPOSURE:
The substance can be absorbed into the body by inhalation of its aerosol and by ingestion.

INHALATION RISK:
Evaporation at 20℃ is negligible; a harmful concentration of airborne particles can, however, be reached quickly on spraying.

EFFECTS OF SHORT-TERM EXPOSURE:
Corrosive. The substance is very corrosive to the eyes, the skin and the respiratory tract. Corrosive on ingestion. Inhalation of an aerosol of this substance may cause lung oedema (see Notes).

EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:
Lungs may be affected by repeated or prolonged exposure to an aerosol of this substance. Risk of tooth erosion upon repeated or prolonged exposure to an aerosol of this substance. Strong inorganic acid mists containing this substance are carcinogenic to humans.

PHYSICAL PROPERTIES

Boiling point (decomposes): 340℃ Melting point: 10℃ Relative density (water = 1): 1.8 Solubility in water: miscible Vapour pressure, kPa at 146℃: 0.13 Relative vapour density (air = 1): 3.4	

ENVIRONMENTAL DATA

The substance is harmful to aquatic organisms.

NOTES

The symptoms of lung oedema often do not become manifest until a few hours have passed and they are aggravated by physical effort. Rest and medical observation are therefore essential. NEVER pour water into this substance; when dissolving or diluting always add it slowly to the water. Other UN numbers: UN1831 Sulfuric acid, fuming, hazard class 8, subsidiary hazard 6.1, pack group I; UN1832 Sulfuric acid, spent, Hazard class 8, Pack group II. Card has been partly updated in October 2005. See sections Occupational Exposure Limits, Emergency Response. Card has been partially updated in January 2008: see Fire fighting.

ADDITIONAL INFORMATION

OCCUPATIONAL EXPOSURES TO MISTS AND VAPOURS FROM SULFURIC ACID AND OTHER STRONG INORGANIC ACIDS (Group 1)

For definition of Groups, see Preamble Evaluation.

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Sulfuric acid
CAS No.: 7664-93-9

Sulfur trioxide
CAS No.: 7446-11-9

Oleum
CAS No.: 8014-95-7

5. Summary of Data Reported and Evaluation

5.1 Exposure data

Strong inorganic acids may be present in the work environment as mists, vapours or gases. The most prevalent acids are sulfuric, hydrochloric, nitric and phosphoric acids, which may be present in a wide variety of industries, including the extraction, fabrication and finishing of metal, fertilizer production, battery manufacture and various segments of the petroleum, chemical and petrochemical industries. Millions of workers worldwide are estimated to be potentially exposed to these acids.

Sulfuric acid is the most widely used of the strong inorganic acids. Average exposures to sulfuric acid mists in pickling, electroplating and other acid treatment of metals are frequently above 0.5 mg/m^3, while lower levels are usually found in the manufacture of lead-acid batteries and in phosphate fertilizer production. Exposure to sulfuric acid also occurs during its manufacture and during the production of isopropanol, synthetic ethanol and detergents. Hydrochloric acid is used in industries that involve acid treatment of metals, where occupational exposure levels to hydrochloric acid mists and gas are frequently above 1 mg/m^3. Exposures to hydrochloric acid may also occur during its synthesis and use in various industrial processes. Pickling and other acid treatments of metal may entail occupational exposures to nitric and phosphoric acids, but these occur less frequently than exposures to sulfuric and hydrochloric acids. Exposure to nitric acid also occurs during its manufacture and exposure to phosphoric acid in phosphate fertilizer production.

5.2 Human carcinogenicity data

An early study of isopropanol manufacture in the USA using the strong-acid process demonstrated an excess of nasal sinus cancer. Studies of one US cohort of workers in pickling operations within the steel industry showed excesses of laryngeal and lung cancer after smoking and other potentialconfounding variables had been controlled for. A Swedish study of a cohort of workers in steel pickling also showed an excess risk for laryngeal cancer. A nested case-control study of workers in a US petrochemical plant showed an elevated risk for laryngeal cancer among workers exposed to sulfuric acid. Of two population-based case-

control studies in Canada, one of laryngeal cancer showed an increased risk for exposure to sulfuric acid, and one of lung cancer suggested an excess risk; the latter also suggested a risk associated with exposure to mixed inorganic acids. In all these studies, sulfuric acid mists were the commonest exposure, and positive exposure-response relationships were seen in two of the studies.

Additional supporting evidence was provided by one cohort study in the soap manufacturing industry in Italy, which showed an increased risk for laryngeal cancer. Studies of three US cohorts and one Swedish cohort in the phosphate fertilizer manufacturing industry showed excess lung cancer, but there was potential confounding from exposure to radon decay products in some cohorts.

5.3 Animal carcinogenicity data

No data were available to the Working Group.

5.4 Other relevant data

Acid mists containing particles with a diameter of up to a few micrometers will be deposited in both the upper and lower airways. They are irritating to mucous epithelia, they cause dental erosion, and they produce acute effects in the lungs (symptoms and changes in pulmonary function). Asthmatics appear to be at particular risk for pulmonary effects.

Significant increases in the incidences of sister chromatid exchange, micronucleus formation and chromosomal aberrations in peripheral lymphocytes were observed in a single study of workers engaged in the manufacture of sulfuric acid.

The studies reviewed examined the effects of pH values < 7 specifically. In cultured mammalian cells at pH 6.7 or below, cell transformation, gene mutation and chromosomal aberrations were induced. Mitotic abnormalities were induced in sea urchins and clastogenic effects in plants. Gene conversion was induced in yeast cells. No point mutation was observed in fungi, yeast or bacteria. Acid pH caused depurination of isolated DNA.

5.5 Evaluation

There is *sufficient evidence* that occupational exposure to strong-inorganic-acid mists containing sulfuric acid is carcinogenic.

Overall evaluation

Occupational exposure to strong-inorganic-acid mists containing sulfuric acid is *carcinogenic to humans (Group 1)*.

Synonyms for sulfuric acid

- Battery acid
- BOV
- Dihydrogen sulfate
- Dipping acid
- Electrolyte acid

- Hydrogen sulfate
- Matting acid
- Mattling acid
- Nordhausen acid
- Oil of vitriol
- Sulphuric acid
- Vitriol brown oil

Synonyms for sulfur trioxide

- Sulfan
- Sulfuric anhydride
- Sulfuric oxide
- Sulfur oxide (SO_3)
- Sulphur trioxide

Synonyms for oleum

- Fuming sulfuric acid
- Sulfuric acid fuming
- Sulfuric acid mixture with sulfur trioxide