Section 1 - Product and Company Identification

Product name: Sulfuric acid
Other names: --
Product use: In the manufacture of fertilizer, chemicals, dyestuff, purification of petroleum, pickling agent, alkylation catalyst, electroplating, iron and steel, rayon and membrance, industrial explosives, laboratory reagents, nonferruos metallurgy.
Supplier's name：San Fu Chemical Co., Ltd., Shan Hua Plant
Supplier's address：340 Hsiao Hsin Li, Shan-Hua District, Tainan City, Taiwan, R.O.C.
Supplier's phone：886-6-5837608 Emergency phone：886-6-5837608
FAX.：886-6-5839498

Section 2 - Hazards Identification

Classification:

1.	Acute Toxicity (Ingestion)	Category 5
2.	Acute Toxicity (Inhalation)	Category 2
3.	Metal Corrosion	Category 1
4.	Skin Corrosion/Irritation	Category 1
5.	Serious Eye Damage/Eye Irritation	Category 1

The Most Important Hazards and effect

Label element:

- Hazard symbol: Skull and Crossbones, Corrosion

- Signal word: Danger

Hazard statement:

1. Harmful or fatal if swallowed
2. Harmful if inhaled
3. May cause metal corrosion
4. Cause severe skin burns and eye damage
5. Cause serious eye injury

Precautionary statement：

1. Set the container in the shade
2. In case of contact with eyes, flush with plenty of water, and seek medical attention immediately
3. Wear goggles/masks
4. Place the containers in well ventilated area

Others Hazard: --

Section 3 - Composition/Information On Ingredients

Pure Substance:

Chemical name: Sulfuric acid
Synonyms: Sulfuric acid, fertilizer acid, battery acid, hydrogen sulfate, dihydrogen sulfate,

electrolyte acid, spirit of sulfur, sulphuric acid
CAS No.: 7664-93-9
Ingredient contributing to the hazard (%): 15%~25%

Section 4 - First Aid Measures

The First-aid Information:

- Inhalation:
  1. Remove from exposure to fresh air immediately.
  2. If breathing is difficult, give oxygen.
  3. If not necessary, do not move victim.
  4. Get medical aid immediately.
  5. The symptoms of lung injury will show after 48 hours of exposed to the hazard.
- Skin Contact:
  1. Avoid direct contact; wear chemical protective clothing if necessary.
  2. Remove contaminated clothing, shoes, and leather goods (e.g. watchbands, belts) under shower.
  3. Flush with lukewarm, gently flowing water for at least 20-30 minutes.
  4. If irritation continues, flush repeatedly and get medical attention immediately.
  5. DO NOT INTERUPT FLUSHING.
  6. Get medical attention immediately.
  7. Completely decontaminate clothing, shoes, and leather goods before reuse or discard.
- Eye Contact:
  1. Avoid direct contact, wearing chemical protective gloves if necessary.
  2. Immediately flush the contaminated eyes with lukewarm, gently flowing water, for at least 20 minutes, while holding the eyelids open.
  3. Neutral saline solution may be used as soon as it is available. DO NOT INTERUPT FLUSHING.
  4. Take care not to rinse contaminated water into the unaffected eye or onto the face.
  5. If irritation continues, flush repeatedly and get medical attention immediately.
- Ingestion:
  1. Never give anything by mouth if victim is rapidly losing consciousness, or is unconscious or convulsing.
  2. Have victim rinse mouth thoroughly with water.
  3. DO NOT INDUCE VOMITING.
  4. Have victim drink 240-300ml of water, and milk (if available) later.
  5. If vomiting occurs naturally, have victim lean forward to reduce risk of aspiration. Have victim rinse mouth with water again.
  6. Quickly transport victim to an emergency care facility and bring a copy of this MSDS.

The Most Important Symptoms and Hazardous Effects: corrosive burn, sight losing, pulmonary edema

Protection of First-aiders:

1. Staff without full body chemical-protective suit and mask should not enter the disaster area to carry the injured person.
2. Wear class C equipment to do first aid in a safety zone.

Notes to a Physician: avoid gastric lavage and lead to vomiting.

Section 5 - Fire Fighting Measures

Extinguishing Media: 1. This is non-inflammable chemical, select appropriate fire extinguishing media to the surround fire. 2. Use dry chemical or carbon dioxide extinguishers to extinguish small fires in surrounding combustible materials.
Specific Hazards when Fire-fight: 1. Sulfuric acid is not flammable or combustible. However, fires may result from the heat generated by contact of concentrated sulfuric acid with combustible materials. 2. Sulfuric acid reacts with most metals, especially when diluted with water, to produce hydrogen gas which can accumulate to explosive concentrations inside confined spaces. 3. It reacts violently with water and organic materials.
Specific Fire-fighting Procedure: 1. Can decompose at high temperatures, forming toxic and irritating gases such as sulfur oxides. Avoid inhalation of decomposition. 2. Fight fire from safe distance and upwind. 3. Move the undamaged containers from fire area if safe to do so. 4. Use water spray or fog to cool fire-exposed containers and to knock down large fires. 5. Use water streams only if absolutely necessary and DO NOT USE WATER DIRECTLY ON ACID as a violent reaction may occur resulting in spattering of the acid. 6. Do not entry unless wear specific protective gears.
Specific Protection of Firefighters: 1. Fire fighters must be fully-trained and wear full protective clothing including an approved, self-contained breathing apparatus which supplies a positive air pressure within a full face-piece mask. 2. For fires close to a spill or where vapors are present, use acid-resistant personal protective equipment.

Section 6 - Accidental Release Measures

Personal Precautions: 1. Restrict access the area until completion of clean up. 2. Ensure clean up is conducted by trained personnel only. 3. Wear proper personal protective equipments.
Environmental Precautions: 1. Ventilate area of leak or spill. 2. Remove all sources of ignition 3. Inform Government Safety and environmental protection-related units.
Methods for Cleaning up: 1. Avoid contact with spills. 2. Prevent from entering sewers or confined space. 3. If safe to do so, stop or reduce spills. 4. Absorb or dike spill with sand or other inert, stable, and non-flammable materials. 5. Small spills: Absorb with non-combustible material. The contaminated absorber is as dangerous as the leakage. Collect the contaminated absorber and leakage into the proper covered container with labels. Wash the spilled area with water. Small leakage could be diluted

with large amount of water.
6. Large Spill: Contact the fire fighting unit, emergency control unit and supplier for help.

Section 7 - Handling and Storage

Handling:
1. While processing, the engineering control should be operated and make good use of personal protective equipments.
2. The staff should receive proper training and inform the risk and safety handling method.
3. People who don't wear proper protective gears shall not operate this chemical, including the contaminated equipments.
4. Report immediately if there is leak or adverse ventilation.
5. Avoid producing vapor and mist, operating in well-ventilated area only.
6. Handling amount of usage should be kept to a minimum.
7. Separate the working area and storage place.
8. Operate with large amount in the confined area.
9. Do not allow contact with water.
10. Do not use with incompatible material.
11. Do not pour the contaminated chemicals to the original storage tank.
12. Dilution with water generates excessive heat and spattering or boiling may occur. Always add acid to water; never add water to acid. Do it slowly and stir it well.
13. Pre-operation check if container has leakage.
14. Should have second protective container while moving the chemical.
15. Labeled the container. Secure and cover the container when not in use to prevent damage.
16. Use anti-corrosive transfer equipment, use light weight containers and small amount of the chemicals as much as possible per container.
17. Do not use air or inert gas to pressure the liquid out of the container.
18. Empty containers maybe still have harmful substance.
19. Exhaust of the container should follow Chemical manufacturer/supplier's proposal. If the storage container is bloated, contact the manufacturer/supplier immediately for advice and seek proper procedure to deal with the container.
20. Operate in the vicinity should be conducive to a fire, spills and other emergency equipment to deal with.

Storage:
1. Stored in cool, dried and well ventilated area. Avoid direct contact with the sun light and other heat source
2. A small amount of storage as much as possible. Avoid storage of large volume of the chemical.
3. Check all new containers; check if properly labeled and if damaged.
4. Stored in the original labeled containers or manufacturer / supplier recommended storage containers
5. Marked to avoid damage and visible place, when not in use to keep containers closed.
6. Containers should be at the appropriate height in order for easier operation.
7. Maintain chemical manufacturer / supplier recommended storage temperature.
8. Empty container should be separated from the storage area.
9. Empty container may still have hazardous substance, keep it sealed.
10. Periodically check the storage area or whether the corrosion or leak.
11. Storage area should be properly labeled, with no obstruction and only allow the appointed or trained people to enter.

12. Separate operation area from storage area.
13. Post warning signs appropriately.
14. Use compatible material made plate to store leaked substance.
15. Must have attract leak agent.
16. Entrance system should be the threshold, drains slope or building, or into the containment to a safe place.
17. Impervious flooring to prevent self-absorption.
18. Exhaust of the container should follow Chemical manufacturer/supplier's proposal. If the storage container is bloated, contact the manufacturer/supplier immediately for advice and seek proper procedure to deal with the container.
19. Storage area walls, floors, scaffolding and accessories should be used sulfuric acid corrosion resistant material.
20. Storage equipment should be made of fire resistance materials.
21. Storage areas should have fire-fighting equipment and spill clean-up
22. Storage tanks should be on the ground, bottom part should be sealed to prevent leak.

Section 8 - Exposure Controls & Personal Protection

Engineering measures:

1. Use ventilation sufficient to reduce vapor and acid mists to permissible levels.
2. Packaging and unloading areas and open processing equipment may require mechanical exhaust systems.
3. Corrosion-proof construction recommended.
4. Closed ventilation systems (e.g. vapor hoods) are frequently used in the electronics industry.
5. Provide the adequate fresh air to supply amount the air exhausted. .

Control parameters			
TWA	STEL	Ceiling	Biological standards
1mg/m^3	2mg/m^3	--	--

Personal protective equipment: Choose the right protective equipment in accordance with the working environment and the concentration of the hazardous substances. Obtain the anti-chemical-table from the supplier.

- Respiratory Protection:
  - Up to 15 mg/m^3: Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back- mounted acid gas canister having a HEPA filter; any self-contained breathing apparatus (SCBA) with a full facepiece; or any SAR with a full facepiece.
  - Emergency or Planned Entry into unknown concentrations or IDLH conditions: any SCBA that has a full face piece and is operated in a pressured-demand or other positive-pressure mode or any SAR that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary SCBA operated in pressure-demand or other positive-pressure mode.
  - Escape: any air purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back- mounted acid gas canister having a HEPA filter or any appropriate escape-type, SCBA.
- Hand Protection: Wear impervious gloves made of butyl rubber, natural rubber, caoutchoid, polyethylene, polyvinyl chloride, Teflon, barricade, 4H, CPF3, Viton, Tellchem HPS, Tychem 10000, Saranex, Responder, and etc.
- Eye Protection: Wear chemical splash goggles and face shield.
- Skin and Body Protection: Wear impervious boots, apron, or coveralls, as need.

Hygiene measures: 1. Remove contaminated clothing immediately, clean thoroughly before reuse or disposal. Must advise the danger to the laundry workers. 2. Eating, drinking, or smoking is prohibited. 3. Wash hands thoroughly after handling this material. 4. Maintain good housekeeping.

Section 9 - Physical & Chemical Properties

Appearance: clear, oily liquid	Odor: pungent
Color: colorless	Melting Point: 11℃
pH value: 0.3 (1N solution)	Boiling point/boiling range: 274℃
Flammability: --	Flash point: --
Decomposition temp: 340℃	Test method: --
Auto ignition temp: --	Explosion properties: --
Vapor pressure: < 0.3 mmHg@25℃	Vapor density: 3.4 (air=1)
Density: 1.1020(15%) 1.1783(20%~25%)	Solubility: very soluble in water
log Kow: --	Evaporation Rate: very low

Section 10 - Stability & Reactivity Data

Stability: stable at standard temperature and pressures
Possible hazardous reactions under specific conditions: 1. Vigorous reactions with incompatible materials listed below. 2. Possibly violent polymerization with acetaldehyde or chloropropylene. 3. Corrosive with most of metal (include stainless steel, aluminum, nickel and alloys). General corrosion of sulfuric acid depending on acid temperature, concentration and purity.
Conditions to avoid: WATER, incompatible materials, ignition sources, metals, excess heat, combustible materials, organic materials, reducing agents, exposure to moist air, oxidizers, amines, bases.
Materials to avoid: carbide, chlorate, fulminates, nitrate, perchlorate, permanganate, picrate, active metals, metal acetylides, metal carbide, epichlorohydrin, aniline, diethylamine, alcohol, hydrogen peroxide, chlorosulfonic acid, cyclopentene, hydrofluoric acid, nitromethane, 4-nitrotoluene, phosphorus oxide, potassium, sodium, ethylene glycol, isoprene, styrene, chloropropvlene, water, propylene, alkaline solutions.
Hazardous decomposition products: thermal decomposition of sulfuric acid can generate sulfur oxides, irritating and toxic fumes and gases. (over 340℃)

Section 11 - Toxicological Information

Route of exposure: Skin, inhalation, ingestion, eyes
Symptoms: eye corrosion; coughing, difficulty in breathing, nausea, vomiting, erosion or discoloration of teeth.

Immediate Toxicity:

1. Skin: cause burns, and brownish or yellow stains. Concentrated solutions may cause second or third degree burns with severe necrosis. Prolonged or repeated exposure to dilute solutions may cause irritation, redness, pain, and drying and cracking of the skin.
2. Inhalation: Cause respiratory irritation and at high concentrations may cause severe injury, burns, or death. Effects of exposure may be delayed.
3. Eye: immediate pain, severe burns, and corneal damages, which may resuli in permanent blindness.
4. Ingestion: cuase severe irritation or burns of the mouth, throat, and esophagus.
   - LD_{50}: 2140 mg/kg (rat, oral)
   - LC_{50}: 510 mg/m^3/2H (rat, inhalation)

Specific effects：

1. Prolonged exposure to dilute solutions or mists may result in eye irritation (chronic conjunctivitis) and produce skin dermatitis.
2. Exposure to high concentrations of acid mist has caused erosion and discoloration of the anterior teeth.
3. Inhalation of sulfuric acid mist may decrease the ability of the respiratory tract to remove other small particles which may be inhaled.
4. 20 ppm/m^3/7H (pregnant 6-18 days, rodent, inhalation) causes embryo developmental retardation.

Section 12 - Ecological Information

Ecotoxicology:

- LC_{50}(Fish): 0.282 mg /1/ 96 H
- EC_{50}(Aquatic Invertebrates) : --
- Bioconcentration factor (BCF) : --

Persistence and degradability:

1. If released to bodies of water, sulfuric acid will ultimately react with calcium and magnesium to form sulfate salts.

- Half-Life (Air): --
- Half-Life (Water surface): --
- Half-Life (Groundwater): --
- Half-Life (Soil): --

Bioaccumulative potential: The toxic chemical may be discharged. Not highly bioaccumulative.

Mobility in soil: If released to soil, the acid will migrate downward to the water table. Upon reaching the groundwater table, the acid will continue to move in the direction of the groundwater flow and downward since its mass density exceeds that of water.

Other adverse effects: --

Section 13 - Disposal Considerations

Methods of disposal:

1. Neutralize with alkaline material (soda ash, lime), and then flush with large amount of water drained in the sewer or drainage.
2. Disposal management from this products and emission standard should follow the environmental laws and regulations.

Section 14 - SDS Transport Information

UN classification number: 1830
Proper D.O.T Shipping Name: Dilute sulfuric acid
Hazard Class: Corrosion Category 8
Packing Group: II
Marine pollution: none
Specific precautionary transport measures and conditions: --

Section 15 - Regulatory Information

Regulations:

1. Occupational Safety and Health Act
2. Regulations for the Labelling and Hazard Communication of Hazardous Chemicals
3. Hazard prevention standards for specific chemicals
4. Road Traffic Safety Regulations
5. Industrial Waste Storage and Disposal Regulations
6. Assessment and Classification Administration of Hazardous Chemicals
7. Permissible Exposure Limits of Hazardous Substances in the Work Environment

Section 16 - Other Information

Literature references	1. CHEMINFO Database, CCINFO Disc, 2005-3 2. HAZARDTEXT Database, TOMES PLUS Disc, Vol. 65, 2005 3. RTECS Database, TOMES PLUS Disc, Vol. 65, 2005 4. HSDB Database, TOMES PLUS Disc, Vol. 65, 2005 5. Hazardous Substances Data Bank , EPA(Taiwan) 6. ChemWatch Database, 2005-1	
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