

# Standard Operating Procedure

## Sulfuric Acid

*This SOP is not complete until it has been signed and dated by the PI and relevant lab personnel.*

Print a copy and insert into your  
*Laboratory Safety Manual and Chemical Hygiene Plan.*  
Refer to instructions for assistance.

<b>Department:</b>	Chemistry & Biochemistry – Chemical Engineering
<b>Date SOP was written:</b>	December 14, 2012
<b>Date SOP was approved by PI/lab supervisor:</b>	January 18, 2013
<b>Principal Investigator:</b>	Prof. Susannah Scott
<b>Internal Lab Safety Coordinator/Lab Manager:</b>	Stephanie Goubert-Renaudin
<b>Lab Phone:</b>	805-893-8149
<b>Office Phone:</b>	805-893-7403
<b>Emergency Contact:</b>	EH&S 24 hour line: 805-893-3194
<b>Location(s) covered by this SOP:</b>	ESB 33 24 and 3328

**Type of SOP:**     Process             Hazardous Chemical             Hazardous Class

### Purpose

Sulfuric acid, also spelled sulphuric acid, is a highly corrosive mineral acid. Its corrosiveness on metals, stones, skin, eyes and flesh and other materials can be mainly ascribed to its strong acidic nature and if concentrated strong dehydrating property and strong oxidizing property. The historical name of this acid is oil of vitriol. It is a central substance in the chemical industry. Principal uses include mineral processing, fertilizer manufacturing, oil refining, wastewater processing, and chemical synthesis. So, safety precautions should be done when using it.

### Physical & Chemical Properties/Definition of Chemical Group

CAS#: 7664-93-9

Class: **Strong Corrosive**

Molecular Formula: H<sub>2</sub>SO<sub>4</sub>

Form (physical state): Liquid

Color: Clear, colorless to slightly yellow

Boiling point: 290 °C

### **Potential Hazards/Toxicity**

Highly corrosive chemical. Inhalation may cause irritation to the respiratory tract with burning pain in the nose and throat, coughing, wheezing, shortness of breath and pulmonary edema. Contact with skin causes burns and irritation. Eye contact causes burns, irritation, and may cause blindness. Ingestion may cause permanent damage to the digestive tract

Acute toxicity: Oral LD50 [rat] – 2140 mg/kg

CalOSHA Permissible Exposure Limit (PEL) - 0.1 mg/m<sup>3</sup>, 3 mg/m<sup>3</sup> STEL

California Proposition 65: Strong inorganic acid mists containing sulfuric acid are listed as carcinogenic.

### **Personal Protective Equipment (PPE)**

#### **Respiratory protection**

Where risk assessment shows air-purifying respirators are appropriate use a full-face respirator with multi-purpose combination (US) or type AXBEK (EN 14387) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU). Refer to 8 CCR 5144 for selection of respirators. A respiratory protection program that meets 8 CCR 5144 must be followed whenever workplace conditions warrant use of a respirator.

Respirators should be used only under any of the following circumstances:

- As a last line of defense (i.e., after engineering and administrative controls have been exhausted).
- When Permissible Exposure Limit (PEL) has exceeded or when there is a possibility that PEL will be exceeded.
- Regulations require the use of a respirator.
- An employer requires the use of a respirator.
- There is potential for harmful exposure due to an atmospheric contaminant (in the absence of PEL)
- As PPE in the event of a chemical spill clean-up process

**NOTE:** Lab personnel intending to use/wear a respirator mask must be trained and fit-tested by EH&S. This is a regulatory requirement.

### **Hand Protection**

Handle with gloves. [Butyl and butyl/Viton gloves](#) must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

**NOTE:** Specific information on glove selection is to be added to the Protocol/Procedure section.

Refer to glove selection chart from the links below:

[http://www.ansellpro.com/download/Ansell\\_8thEditionChemicalResistanceGuide.pdf](http://www.ansellpro.com/download/Ansell_8thEditionChemicalResistanceGuide.pdf)

OR

<http://www.allsafetyproducts.biz/page/74172>

OR

<http://www.showabestglove.com/site/default.aspx>

OR

<http://www.mapaglove.com/>

### **Eye Protection**

Safety glasses with side shields or tightly fitting safety goggles.

### **Skin and Body Protection**

Long pants, closed-toed and closed-heeled shoes, and lab coat must be worn for protecting against chemical hazards.

### **Hygiene Measures**

Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

### **Engineering Controls**

Work with concentrated sulfuric acid should be conducted in a fume hood. Sash height should be kept low to avoid escaping fumes and provide a physical barrier.

### **First Aid Procedures**

#### **If inhaled**

Move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

#### **In case of skin contact**

Take off contaminated clothing immediately. Wash off with soap and plenty of water for 15 minutes. Take victim immediately to hospital. Consult a physician.

#### **In case of eye contact**

Rinse thoroughly with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical aid immediately.

### **If swallowed**

Do not induce vomiting. Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

### **Special Handling and Storage Requirements.**

**Working alone** Certain extremely hazardous operations should not be performed if the PI or Lab Safety Contact(s) are not present. Never work alone with extremely hazardous materials/operations. See the Protocol/Procedure section below for specific prohibitions (if any) on working alone.

#### **Precautions for safe handling**

Do not allow water to get into the container because of violent reaction. Do not get in eyes, on skin, or on clothing. Keep container tightly closed. Use only with adequate ventilation. Do not breathe spray or mist. Do not use with metal spatula or other metal items..

#### **Conditions for safe storage**

Do not store near combustible materials. Keep container closed when not in use. Store in a cool, dry, well-ventilated area away from incompatible substances. Do not store near alkaline substances. Store protected from moisture. Sulfuric acid is incompatible with metals, oxidizing agents, reducing agents, bases, acrylonitrile, chlorates, finely powdered metals, nitrates, perchlorates, permanganates, epichlorohydrin, aniline, carbides, fulminates, picrates, organic materials, flammable liquids.

### **Spill and Accident Procedure**

#### **Chemical Spill Dial 9-911 and EH&S (805-893-3194)**

**Spill** – Assess the extent of danger. Help contaminated or injured persons. Evacuate the spill area. Avoid breathing vapors. If possible, confine the spill to a small area using a spill kit or absorbent material. Keep others from entering contaminated area (e.g., use caution tape, barriers, etc.).

**Small (<1 L)** – If you have training, you may assist in the clean-up effort. Use appropriate personal protective equipment and clean-up material for chemical spilled. Double bag spill waste in clear plastic bags, label and take to the next chemical waste pick-up.

**Large (>1 L)** – Dial **9-911 from campus phones (and 805-893-3446 from a cell phone)** and EH&S (893-3194) for assistance.

**Chemical Spill on Body or Clothes** – Remove clothing and rinse body thoroughly in emergency shower for at least 15 minutes. Seek medical attention. *Notify supervisor and EH&S immediately.*

**Chemical Splash Into Eyes** – Immediately rinse eyeball and inner surface of eyelid with water from the emergency eyewash station for 15 minutes by forcibly holding the eye open. Seek medical attention. *Notify supervisor and EH&S immediately.*

#### **Medical Emergency Dial 9-911**

**Life Threatening Emergency, After Hours, Weekends and Holidays** – Dial **9-911** (or 805-893-3446 from a cell phone) or go to the Emergency Room of Goleta Valley Cottage Hospital at 351 South Patterson Avenue, Goleta (Phone number: 805-967-3411) Note: All Serious injuries *must* be reported to EH&S within 8 hours.

**Non-Life Threatening Emergency** – Go to the Student Health Building, Building 588 (phone number: 893-5361, hours: M, T, R, F 8am-4.30pm, W 9am - 4.30pm, R 5pm to 7pm by appointment). After hours go to the Emergency Room of Goleta Valley Cottage Hospital at 351 South Patterson Avenue, Goleta (Phone number: 805-967-3411) *Note: All serious injuries must be reported to EH&S within 8 hours.*

**Needle stick/puncture exposure** (as applicable to chemical handling procedure) – Wash the affected area with antiseptic soap and warm water for 15 minutes. For mucous membrane exposure, flush the affected area for 15 minutes using an eyewash station. Page the needle stick nurse \ and then enter your extension. After hours go to the nearest emergency room: the Emergency Room of Goleta Valley Cottage Hospital at 351 South Patterson Avenue, Goleta (Phone number: 805-967-3411). *Note: All needle stick/puncture exposures must be reported to EH&S within 8 hours.*

## Decontamination/Waste Disposal Procedure

Wearing proper PPE, please decontaminate equipment and bench tops. Call EH&S if assistance is needed. Please dispose of the spent sulfuric acid and disposables contaminated with sulfuric acid as hazardous waste.

*General hazardous waste disposal guidelines:*

### Label Waste

- Affix an online hazardous waste tag on all waste containers using the UCB Hazardous Waste Program as soon as the first drop of waste is added to the container.

### Store Waste

- Store hazardous waste in closed containers, in secondary containment and in a designated location
- Waste must be under the control of the person generating & disposing of it

### Dispose of Waste

- Dispose of regularly generated chemical waste within 6 months
- Call EH&S for questions
- Empty Containers
  - Dispose as hazardous waste if it once held extremely hazardous waste (irrespective of the container size)
  - Consult waste pick-up schedule

Prepare for transport to pick-up location

- Check on-line waste tag
- Write date of pick-up on the waste tag
- Use secondary containment

## Safety Data Sheet (SDS) Location

SDS can be found online: <http://ehs.ucsb.edu/units/labsfty/labrsc/chemistry/lchemmsdsacc.htm>

## Protocol/Procedure

In our laboratory, concentrated sulfuric acid (98%) is stored in the designated 'Acid' ventilated storage cabinet and is used to prepare diluted solutions.

Concentrated sulfuric acid cannot be handled out of the ventilated fume hood, and has to be used on a

cleared space away from any strong base, reducing agent and metals.

Due to the corrosive properties of sulfuric acid, Butyl and butyl/Viton gloves have to be worn at all times, as well as safety goggles and a lab coat.

Due to the exothermic nature of the reaction, dilution of sulfuric acid has to be done by slowly adding the acid to water to limit the risk of splashing concentrated acid out. Concentrated sulfuric acid is also a strong oxidizing agent incompatible with flammable organic chemicals.

Diluted solutions of sulfuric acid can be handled out of the ventilated fume hood.

Sulfuric acid has to be disposed as a hazardous waste in the appropriate acidic waste container, kept closed at all times.

### **Documentation of Training** (signature of all users is required)

- Prior to conducting any work with sulfuric acid, designated personnel, i.e. approved users listed below, must provide training to his/her laboratory personnel specific to the hazards involved in working with this substance, work area decontamination, and emergency procedures.
- The Principal Investigator must provide his/her laboratory personnel with a copy of this SOP and a copy of the SDS provided by the manufacturer.
- The Principal Investigator must ensure that his/her laboratory personnel have attended appropriate laboratory safety training or refresher training as required by EH&S.

I have read and understand the content of this SOP:

<b>Name</b>	<b>Signature</b>	<b>Trainer</b>	<b>Date</b>
<b>Prof. Susannah Scott</b>			
Stephanie Goubert-Renaudin			
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