Standard Operating Procedure

for work with

Chemical name/class:	**Sulfuric Acid**	**CAS #:**	**7664-93-9**
PI:	**Ken Henderson**	**Date:**	**2/4/2013**
Building:	**Stepan**	**Room #:**	**Laboratory Stepan 386**
	Designated Work Area:	**Fume hood**	

1. **Circumstances of Use:**

Various.

2. **Potential Hazards:**

- Explosions may occur if sulfuric acid comes in contact with many metals, carbides, chlorates, perchlorates, permanganates, bases, and reducing agents.
- Concentrated sulfuric acid is stable, but may violently react with water, inorganic substances, and many organic compounds due to its powerful dehydrating, oxidizing, and sulfonating properties.
- Sulfuric acid is noncombustible, but can cause finely divided combustible substances to ignite.
- Sulfuric acid (especially dilute) reacts with most metals to produce hydrogen gas which is flammable and potentially explosive.
- Concentrated sulfuric acid is highly corrosive and can cause severe burns upon skin contact or permanent loss of vision upon eye contact. Dilute sulfuric acid is still a skin and eye irritant, but health effects are usually not as severe. For more in depth health hazard and safety information, refer to Prudent Practice's Laboratory Chemical Safety Summary for Sulfuric Acid.
- Sulfuric acid mist severely irritates the eyes, skin, and respiratory tract. Higher inhalation exposures may lead to temporary lung irritation with breathing difficulty.
- Sulfuric acid reacts with many substances to generate highly toxic products, so be aware of any toxic products produced by your reaction. Examples include carbon monoxide formation from reaction with formic or oxalic acid, HCN formation with cyanide salts, and SO_2 and Br_2 formation with sodium bromide.
- Chronic exposure to sulfuric acid mist may lead to bronchitis, skin lesions, conjunctivitis, and erosion of teeth.
- The OSHA Permissible Exposure Limit (PEL) and ACGIH Threshold Limit Value (TLV) are both 1 mg/m^3 as an 8-hour time-weighted average.

3. **Engineering Controls:**

- An eyewash/drench hose combination unit must be available in the immediate work area for any work with corrosive materials.
- Sulfuric acid must be handled in a chemical fume hood if there is any potential for inhalation exposure (including if mists are generated either mechanically or from vapor).

4. **Work Practice Controls:**

- When diluting, the acid should always be added to water slowly, in small amounts.
- Purchase sulfuric acid in the smallest containers that are practical for lab use.
- Purchase in shatter-resistant containers if available (such as PVC-coated glass).
- Work with the smallest practicable amount and lowest practicable concentration.
- Once work with sulfuric acid is complete, decontaminate the area by wiping it down with a soap and water solution.

5. **Personal protective equipment (PPE):**

Wear a buttoned lab coat, safety goggles, and chemical-resistant gloves (e.g. neoprene over natural rubber such as ChemMaster or thick nitrile such as Nitri-Solve) for any work with sulfuric acid. Sulfuric acid penetrates standard nitrile laboratory gloves in 5 minutes or less. If chemical-resistant gloves are not available, wear double nitrile laboratory gloves and change gloves immediately after a splash occurs. Depending on the quantities and concentrations used, a face shield, impenetrable apron and sleeves (or coverall), and special gloves may be recommended.

6. **Transportation and Storage:**

- Transport corrosives in secondary containment, preferably a polyethylene or other non-reactive acid/solvent bottle carrier.
- Store away from incompatibles, including organic materials, reducing agents, combustibles, metals, acids, carbides, chlorates, perchlorates, permanganates, bases, and moisture.
- Store in well-ventilated areas with secondary containment, such as a non-reactive plastic bin.
- Store below eye level.
- Store away from metal (unless the metal has a corrosion-proof coating), and do not store under the sink.
- Avoid storing on the floor. If storing on the floor is necessary, use secondary containment.

7. **Waste Disposal:**

Handle and store corrosive wastes following the guidelines above while accumulating wastes and awaiting chemical waste pickup. Waste must be disposed of following the chemical hygiene plan.

8. **Exposures/Unintended contact:**

- For eye or skin contact, flush exposed eyes or skin with water for at least 15 minutes (lifting upper and lower lids occasionally) and remove contaminated clothing. Seek medical attention if needed.
- If ingested, seek medical attention immediately.
- If large amounts of sulfuric acid mists are inhaled, move the person to fresh air and seek medical attention immediately.
- Call **911** from a campus phone or 574-631-5555 from a cell phone to request assistance if needed.

Contact RM&S for medical advice on occupational chemical exposures, **1-5037**. For an

actual chemical exposure or injury, complete the work-related injury or illness report found at: http://chemistry.nd.edu/safety/supervisors-report-of-injury-to-the-health-center.pdf. If medical attention is needed, see http://chemistry.nd.edu/safety/procedures-for-injury-illness-or-incident.pdf.

9. **Spill Procedure:**

- In the case of a small spill (<200 ml) contained in the fume hood, neutralize the spill by gradually adding alkaline material (sodium carbonate, lime) from the edges of the spill towards the center. Test the pH of the spilled material and continue neutralizing until the pH reaches the 6-9 range. Absorb with an inert material (vermiculite, dry sand). Do NOT use combustible materials, such as saw dust, to absorb sulfuric acid spills! Place materials in a chemical waste container and dispose of appropriately. Appropriate chemical resistant gloves should be used when cleaning up a spill due to possible prolonged glove contact with sulfuric acid. After spill has been completely absorbed, wipe contaminated area down with a soap and water solution.
- Large" spills must be referred to RMS by calling 1-5037 during working hours or 911 from a campus phone (574-631-5555 from a cell phone) after hours

10. **Training of personnel:**

All personnel are required to complete the General Lab Safety session thru RM&S. This session includes an introduction to general chemical safety. Furthermore, all personnel shall read and fully adhere to this SOP when handling sulfuric acid.