


ACIDS (Non-oxidizing)
STANDARD OPERATING PROCEDURE TEMPLATE

Type of SOP: Process Hazardous Chemical Hazard Class

1. HAZARD OVERVIEW

Acids are corrosive to eyes, skin, and mucous membrane and are generally immediately painful. Corrosive effects can occur not only on the skin and eyes, but also in the respiratory tract and, in the case of ingestion, in the gastrointestinal tract as well. The international symbol (GHS system) for a corrosive to skin/eyes (ac ) is:

The pH range of acids is 0 to 6.9 (water = 7.0 = neutral). A pH of approximately 0 to 3 represents a **strong acid**. Some inorganic acids fall within this range. Weak acids (pH of 3 to 7) include diluted acetic acid solutions and boric acid. **Weak acids** irritate the skin with short contact and can cause burns with prolonged contact.

Heat is released when strong acids are mixed with water. When water is added to acid, an extremely concentrated solution of acid is initially formed and the solution may boil very violently, splashing concentrated acid. When acid is added to water, the solution formed is dilute and the small amount of heat released is not significant to vaporize and spatter it. **Always add acid to water, and never the reverse.** Aqueous solutions of inorganic acids are not in themselves flammable. Acids also react with many metals, resulting in the liberation of hydrogen, a highly flammable gas.

Some acids like nitric and perchloric are strong **oxidizing agents** and can react destructively and violently when in contact with organic solvents and organic acids like acetic. Due to the unique and highly reactive nature of oxidizing acids, there are *separate* UCSB SOP templates for nitric and perchloric acids that labs should adopt. Numerous accidents have occurred on campus via the mishandling of nitric acid. There is also a separate SOP for **hydrofluoric acid** given its unique hazards

2. HAZARDOUS NON-OXIDIZING ACIDS

All acid solutions are considered hazardous. The following is a list of the common non-oxidizing acids used: *hydrobromic acid; hydrochloric; hydrofluoric; acetic; benzoic; chloroacetic; formic; phosphoric; sulfuric; trifluoroacetic*

3. PERSONAL PROTECTIVE EQUIPMENT (PPE)

Given the severe and immediate effects of acids on the eyes and skin, it is essential that proper PPE always be employed. This is the law and UC policy.

Nitrile or Latex gloves may be used for short term exposure to HCl, butyl rubber gloves should be used for longer exposure.

See the PPE information under Sec. II of the *UCSB Chemical Hygiene Plan* regarding:

- the UC PPE Policy and policy summary (what a PPE is needed and when/where to use)
- obtaining your PPE via use of the *Laboratory Hazard Assessment Tool*
- glove selection criteria
- respirator use, etc.

4. ENGINEERING/VENTILATION CONTROLS

In general, acids should always be used in a properly functioning fume hood.

For further information see these pages in Sec. II of the UCSB Chemical Hygiene Plan:

- Fume Hood Usage Guide
- Criteria for Implementing Engineering Controls

5. SPECIAL HANDLING PROCEDURES AND STORAGE REQUIREMENTS

Acids can be only used in areas properly equipped with a certified eye wash/safety shower that can be reached within ten seconds. It is essential that all strong corrosives be stored separately from other laboratory chemicals with which they may react. Ensure secondary containment and segregation of incompatible chemicals. Also, follow any substance-specific storage guidance provided in Safety Data Sheet (SDS) documentation.

The corrosive properties of these materials and their ability to produce fires or explosions by combination with combustible materials make the following considerations mandatory in the selection of a storage site:

- A relatively cool, dry environment free from extremes of temperature--humidity should be maintained.
- Acids must be stored in a manner that separates them from other materials
- Stored acids in material that is acid-resistant; this facilitates flushing and other cleanup procedures in the event of leaks or spills.
- Store on low shelves or in acid/base storage cabinets.
- **Segregate oxidizing acids from organic acids, and flammable and combustible liquids. This is crucial to avoid fires/explosions!**
- Segregate acids from active metals such as sodium, potassium, magnesium, etc.
- Use bottle carriers for transporting materials when possible.
- When mixing acids and water, always add acid to water. **NEVER add water to acid!**

- Store mineral acids together, separate from oxidizing agents and organic materials.
- Store acetic acid and other organic acids with the combustible organic liquids.



6. SPILL AND INCIDENT PROCEDURES

See directions under the “Chemical Incident” and “Medical Emergency” tabs of the *UCSB Emergency Information Flipchart* – should already be posted in all labs. Spill cleanup supplies are stored in the two tan cabinets in the corridor outside the Microfluidics Lab towards the mountains from the lab entrance.



7. DECONTAMINATION

Wear proper PPE, decontaminate equipment and bench tops using sodium bicarbonate and water. Dispose of all used contaminated disposables as hazardous waste following the Waste Disposal Section.

8. WASTE DISPOSAL

See “Chemical Waste Disposal” in Sec. II of the *UCSB Chemical Hygiene Plan*.

9. PRIOR APPROVAL/REVIEW

Use of acids in the Microfluidics Lab may only be done in accordance with an approved SOP after review by the lab manager.

10. DESIGNATED USE AREA

Acids may only be used in lab fume hoods, preferably the white polypropylene hood on the south wall of the lab.

11. SAFETY DATA SHEETS

Found online at: <http://ehs.ucsb.edu/labsafety/msds>

12. LAB-SPECIFIC INFORMATION (required) (*Examples of appropriate content*)

HCl is used in low concentrations as described in the Solder Dip Coating Process as described in the SOP with that name. Gloves, face shield and an apron must be worn when working with concentrated acid. A lab coat, gloves and safety glasses are required when working with the dilute acid.