UIC UNIVERSITY OF ILLINOIS AT CHICAGO ENVIRONMENTAL HEALTH AND SAFETY OFFICE

Standard Operating Procedure (SOP)

Working with Corrosives: Acids and Bases

BUILDING: **ROOM:**

PREPARED BY: **REVISION DATE:**

Experimental Process – Brief Description of the Operation/Experiment:

Specialized Training Instructions:

See UIC Hydroflouric Acid (HF) Fact Sheet before working with HF

Chemical and Physical Hazards Associate with the Experiment – Before completing this section, please review the UIC Chemicals of Concern form to identify significant chemical hazards involved in this experiment.

Corrosive Materials: Below are common examples of strong acids and bases that may be present in your laboratory.

Strong Inorganic Acids

Hydrochloric Acid
Nitric Acid
Sulfuric Acid
Hydrobromic Acid
Perchloric Acid
Hydroiodic Acid
Chloric Acid

Strong Inorganic Bases

Sodium Hydroxide
Potassium Hydroxide
Calcium Hydroxide
Lithium Hydroxide
Barium Hydroxide
Rubidium Hydroxide
Strontium Hydroxide
Cesium Hydroxide

Common Weak Acids

Hydrofluoric Acid
Hydrogen Sulfide
Hydrocyanic Acid

Common Weak Bases

Ammonia
Pyridine
Zinc Hydroxide

Phyical and Health Hazards:

Skin contact: Most concentrated acids and bases are corrosive and must immediately be flushed with water if skin contact occurs. Eyes are especially susceptible to liquids, vapors, dusts, or mists and must be immediately flushed with water if exposure occurs.

Inhalation: Vapors, mists, and dusts act on the body in two ways: irritation of the air passages of the nose, throat, and lungs and absorption of the substance from the lungs into the blood stream. The seriousness of injury will depend on the concentration in air and on the duration of exposure.

Ingestion: Ingestion causes severe burns of the mucous membranes of the mouth, throat, esophagus, and stomach.

Important Information on Corrosives

• Most acids are liquids, and most bases are solids. Acids, especially when in concentrated form, are most likely to cause immediate pain when they come in contact with the body. Contact with strong bases, on the other hand, usually goes unnoticed since immediate pain does not occur. This allows the base time to react with the body part and a serious injury may result.

• Solid bases, when dissolved in water, can cause serious damage to eyes and skin by their corrosive action. Fine dust from almost any solid base can cause severe damage to the eyes, upper respiratory tract, and lungs. Fine dust can also cause skin irritation, particularly to persons who have become wet or perspire freely.

• All of these materials are corrosive and will destroy body tissue. The seriousness of the injury depends on such factors as the type and concentration of the chemical, the body parts contacted, and the speed used in applying emergency measures.

• Concentrated aqueous solutions of inorganic acids are not in themselves flammable. Combustion can occur when an acid is mixed with other chemicals or with combustible materials. Acids also react with many metals, resulting in the liberation of hydrogen, a highly flammable gas. Some acids are strong oxidizing agents and can react destructively and violently when in contact with other materials. For this reason, it is essential to read warning labels indicating physical hazards.

Chemical Storage

Remember to store all corrosive materials in an appropriately designed corrosive storage area. Regular metal flammable cabinets will corrod over time due to inproper corrosive storage. All inorganic corrosive materials must separated into two storage areas marked, “Corrosive-Acid,” and “Corrosive- Base.” If you have quantities exceeding 10 gallons or 9 four liter containers, all corrosives must still be segregated and stored in appropriately manufactured corrosive cabinets. In addition, most organic acids and bases, such as acetic acid and the amines group (bases), have multiple hazard classes, and should be stored separately away from inorganic acids and bases through secondary containment or in a different cabinet.

ENGINEERING CONTROLS – The following safety equipment or device features must be available.

Fume Hood ☒

Biological Safety Cabinet ☐

Glove Box ☐

Clean Bench ☐

Toxic Gas Cabinet ☐

Other (Please Explain below) ☐

Autoclave ☐

Shielding ☐

Laminar Flow Hood ☐

Further Instructions:

Before filling in this section, the UIC Laboratory Hazard Assessment Tool must be completed. Please refer to this document to select appropriate PPE for the experiment.

PROTECTIVE EQUIPMENT – The minimum required PPE for working with Corrosive Liquids is as follows:

Safety Glasses ☐

Flammable Resistant Lab Coat ☐

Lab Coat ☒

Safety Goggles ☒

Face Shield ☐

Nitrile Glove ☒

Butyl Gloves ☒

Chemical Apron ☒

Disposable Gowns ☐

Respirator ☐

Cryogenic Gloves ☐

Autoclave Gloves ☐

Wire Mesh Gloves ☐

Boot Covers ☐

Further Instructions:
Butyl Gloves that cover the forearm should be used for all acid washing glassware protocols.

EMERGENCY EQUIPMENT – Required for handling these hazardous substances

Safety Shower ☒ **Chemical Antidote** ☐

Eyewash ☒ **Emergency Shut-off Switch/Valve** ☐

Fire Extinguisher ☐ **Oxygen Sensors/Alarms** ☐

FIRST AID PROCEDURES:

Personnel:

It is essential to prevent skin and eye contact, but shall it occur, it is necessary to immediately flush the affected area with large amounts of clean water for at least fifteen minutes to prevent injury. The sooner the area is flushed the better the chance of preventing damage. After the area is flushed, medical attention is required.

Eye
Immediately flush the eye with clean tap water (flush the eye before other parts of the body). Spread the eyelids with fingers, and allow water to flood the eye. Roll the eye about so that the water may contact all surfaces. Continue washing the eye with clean tap water until medical aid can be obtained.

Skin
Flush the exposed area thoroughly with plenty of clean water; remove contaminated clothing, and then gently flush the area again with water. Report to the Employee Health Services for treatment as soon as possible.

Ingestion
Immediately call UIC police 5-5555 and report to the UIC Emergency Room.

Medical Center Information

Non Life Threatening Emergencies
Report to University Health Services (MC 684)
835 South Wolcott Avenue, Room E-144
Chicago, Illinois 60612-7338
T 312-996-7420
F 312-413-8485

Life Threatening Emergencies:

Report to University of Illinois Hospital & Health Sciences System
Emergency Room
1740 W Taylor Street
Chicago, IL 60612
T: 312-996-8177

WASTE DISPOSAL – Please follow EHSO Waste Disposal Guidelines to remove unwanted chemicals after the experiment: Unwanted Chemical Removal Form

SPECIAL EMERGENCY PROCEDURES – Outline any special emergency procedures unique to this experiment.

GENERAL EMERGENCY PROCEDURES

FIRE/EXPLOSION:

Use R.A.C.E. Rescue, Alarm, Contain, and Evacuate for all building fires.

CHEMICAL SPILL:

Large Spills (Greater than 1 L)
The contaminated area should be blocked off from other researchers and if necessary, the affected area should be evacuated as soon as an emergency is determined.

Call 5-5555 for UIC Police on a campus phone OR (312) 355-5555 from a cell phone as needed.

Report the spill to EHSO 6-SAFE (6-7233) or 312-996-7233 and complete an incident report.

Small Spills (Less than 1 L) EB: acid or caustic neutralizer from spill kit should be used to neutralize small acid or base spills

Employees in the area should be prepared to clean up minor spills, including most spills confined to the chemical fume hood. Wearing double nitrile gloves, splash goggles, face shield and lab coat (and impermeable apron, if available); use absorbent pads to absorb spilled material. Wipe down the contaminated area with soap and water solution. Lab personnel should avoid direct contact with any particulary hazardous chemical. If glove contact does occur, remove gloves and wash hands immediately. Contaminated PPE and clean-up materials must be polaced in a compatible container.

Note: If there is respiratory irritation associated with the exposure, remove all persons from the contaminated area and contact 6-SAFE (6-7233) or 312-996-7233.

Approval and Certification – I approve the use of this SOP for my lab group. I agree to modify this SOP to meet the safety needs of my researchers working in my lab.

PI Signature **Name (Print)** **Date**

CERTIFICATION – I have read and understand the above SOP. I agree to contact my PI or Lab Manager if I plan to modify this procedure.

Signature	Name (Print)	Date
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References

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2. OSHA Safety and Health Standards (29CFR1910) - United States Department of Labor, OSHA, Government Printing Office: Washington, DC., (latest edition)

3. Prudent Practices in the Laboratory: Handling and Management of Chemical Hazards, National Research Council, National Academy Press: Washington, D.C., 2011

4. Safety in Academic Chemistry Laboratories- 3rd ed., Committee on Chemical Safety, American Chemical Society: Washington, D.C., 2003

5. Brent, Lynnette. *Acids and Bases*. New York, NY: Crabtree Pub., 2009. Print.

6. Oxlade, Chris. *Acids & Bases*. Chicago, IL: Heinemann Library, 2002. Print.