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 Hydrofluoric 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.

<table>
<thead>
<tr>
<th>Strong Inorganic Acids</th>
<th>Strong Inorganic Bases</th>
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</thead>
<tbody>
<tr>
<td>Hydrochloric Acid</td>
<td>Sodium Hydroxide</td>
</tr>
<tr>
<td>Nitric Acid</td>
<td>Potassium Hydroxide</td>
</tr>
<tr>
<td>Sulfuric Acid</td>
<td>Calcium Hydroxide</td>
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<tr>
<td>Hydrobromic Acid</td>
<td>Lithium Hydroxide</td>
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<tr>
<td>Perchloric Acid</td>
<td>Barium Hydroxide</td>
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<tr>
<td>Hydroiodic Acid</td>
<td>Rubidium Hydroxide</td>
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<tr>
<td>Chloric Acid</td>
<td>Strontium Hydroxide</td>
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<tr>
<td></td>
<td>Cesium Hydroxide</td>
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<table>
<thead>
<tr>
<th>Common Weak Acids</th>
<th>Common Weak Bases</th>
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<tbody>
<tr>
<td>Hydrofluoric Acid</td>
<td>Ammonia</td>
</tr>
<tr>
<td>Hydrogen Sulfide</td>
<td>Pyridine</td>
</tr>
<tr>
<td>Hydrocyanic Acid</td>
<td>Zinc Hydroxide</td>
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</table>
**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 corrode over time due to improper 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) ☐

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 ☐
- Chemical Apron ✗
- Flammable Resistant Lab Coat ☐
- Disposable Gowns ☐
- Lab Coat ✗
- Respirator ☐
- Safety Goggles ✗
- Cryogenic Gloves ☐
- Face Shield ☐
- Autoclave Gloves ☐
- Nitrile Glove ✗
- Wire Mesh Gloves ☐
- Butyl 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 particularly hazardous chemical. If glove contact does occur, remove gloves and wash hands immediately. Contaminated PPE and clean-up materials must be placed 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.

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<tr>
<th>PI Signature</th>
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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.
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References

1. Approaches to Safe Nanotechnology: Managing the Health and Safety Concerns associated with engineered nanomaterials, Center for Disease Control, Washington D.C., 2009


