NJIT New Jersey Institute of Technology

ACIDS (NON-OXIDIZING)

STANDARD OPERATING PROCEDURE

Type of SOP: ☐ Process ☐ Hazardous Chemical ☐ Hazard Class

Department: _____ **Building:** _____ **Room #:**_____

Principal Investigator: _____ **Phone #:**_____

Prepared By: _____ **Email:** _____ **Date:** _____

1. HAZARD OVERVIEW

Acids are corrosive to eyes, skin, and mucous membrane. They can cause tissue damage and burns to the affected the area. Corrosive effects can also occur in the respiratory tract via inhalation and in the gastrointestinal tract via ingestion. In addition, acids react with many metals resulting in the release of hydrogen gas *(a highly flammable gas)*, and causing metal corrosion in some cases.

All acid solutions are considered hazardous.

Strong Acids: The pH range of acids is 0 to 6.9 *(water = 7.0 = neutral)*. A pH of less than 3.0 represents a strong acid. Some examples are hydrochloric acid, sulfuric acid, nitric acid, and perchloric acid.

Weak Acids: Unlike strong acids, weak acids partially ionizes in an aqueous solution or water, and has a pH of greater than or equal to 3.0 and less than 7.0. Some examples are diluted acetic acid solutions, phosphoric acid, hydrofluoric acid, and boric acid. Weak acids can irritate the skin with short contact and can cause burns with prolonged contact.

Acid + Water Mixture: 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.

Oxidizing Acids: 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 acid. Due to the unique and highly reactive nature of oxidizing acids, the lab should have a separate SOP for nitric and perchloric acids.

Non-Oxidizing Acids: The following is a list of the common non-oxidizing acids used in the lab. Hydrobromic Acid • Hydrochloric Acid • Hydrofluoric Acid • Acetic Acid • Benzoic Acid • Chloroacetic Acid • Formic Acid • Phosphoric Acid • Sulfuric Acid • Trifluroacetic Acid

Other Acids with Unique Hazards: Hydrofluoric acid readily penetrates the skin and dissociates into fluoride ions, causing destruction of deep tissue layers, including bone without any associated pain or other signs of exposure occurring until 1 to 24 hours later. Therefore, hydrofluoric acid should have a separate SOP.

Reference: University of California, Santa Barbara - Environmental Health & Safety

2. PERSONAL PROTECTIVE EQUIPMENT (PPE)

Given the severe and immediate effects of acids on the eyes and skin, and because PPE is required per OSHA regulation and New Jersey Institute of Technology (NJIT) policy, it is essential that proper PPE is always worn when handling acid materials. At minimum, safety glasses, lab coats, and gloves are required. Additional or more protective PPE may be required pending the volume, corrosivity, and unique hazards. Please refer to the NJIT Chemical Hygiene Guide and Hazard Assessment Form to determine the proper PPE for handling corrosive materials.

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3. ENGINEERING/VENTILATION CONTROLS

In general, acids should always be used in a properly functioning chemical fume hood. Please review the NJIT Chemical Hygiene Guide and the Safe Chemical Fume Hood Use Guide for information on the proper use of a chemical fume hood and criteria for implementing engineering controls.

☐ Chemical Fume Hood ☐ Glovebox ☐ Biological Safety Cabinet ☐ Other _____

Room Location of Unit(s): _____

4. 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 proper segregation of incompatible chemicals. Follow any substance-specific storage guidance provided in Safety Data Sheet (SDS).

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 temperature extremes--humidity should be maintained.
- Acids must be stored in a manner that separates them from other materials
- Store acids in a container/tray/cabinet 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 cabinet.
- 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!

Reference: University of California, Santa Barbara - Environmental Health & Safety

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

5. INCIDENTS AND ACCIDENTS

Laboratory personnel are to report all occupational injuries or illnesses to Faculty/PI as soon as practical. The Faculty/PI and laboratory personnel must submit the required paperwork to NJIT EHS Department. See the the Emergency Response Guidelines posted in the laboratory or Emergency Procedures section of the NJIT CHG for proper procedures involving an injury, exposure, fire, or release/spill of a hazardous material.

In the event of an emergency, DIAL 9-1-1 to activate emergency response personnel.

6. SPILL AND DECONTAMINATION

Wear proper PPE. Decontaminate equipment and work surfaces using sodium bicarbonate and water, or other appropriate decontamination/cleaning solution. Dispose of all used contaminated disposables in the appropriate waste stream following the Waste Disposal Section of the NJIT CHG.

Decontamination Solution(s): _____

Additional Spill / Decontamination Requirements:

7. WASTE DISPOSAL

Follow the practices and procedures in accordance with the NJIT Laboratory Waste Management Program to properly dispose of waste.

Additional Waste Disposal Requirements:

8. PRIOR APPROVAL/REVIEW

9. DESIGNATED USE AREA

Designated Use Area Location(s): _____

10. SAFETY DATA SHEETS

Location of SDS: _____

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

Reference: University of California, Santa Barbara - Environmental Health & Safety