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**STANDARD OPERATING PROCEDURE FOR ACIDS**

I. POTENTIAL HAZARDS:

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 (acid or base) 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 acid 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 Columbia State SOP templates for nitric acid that labs should adopt.

II. ENGINEERING CONTROLS:

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

III. WORK PRACTICE CONTROLS:

- 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.

IV. PERSONAL PROTECTIVE EQUIPMENT (PPE):

- Chemical splash goggles (over prescription glasses)
- Apron
- Pants or skirts that extend to below the knee

- Shoes that completely cover the feet,
- Clothing made of natural fibers.

V. 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.

VI. 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 Columbia State's Hazardous Waste Policy 06-04-00. Contact the director of Facility Services and Safety for assistance for determining appropriate methods for disposal.