

Standard Operating Procedures for

working with organic and inorganic acids

Dr. Ragauskas Group
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Process and Hazardous Chemicals

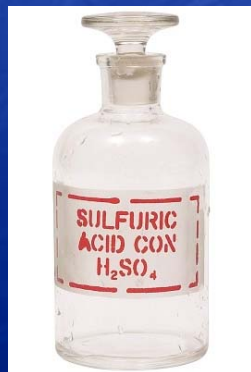
- ❖ Proper **handling** (carrying, disposal) of concentrated acids.
- ❖ **Mixing** various concentrations of aqueous acid solutions.
- ❖ A **mineral acid** is defined as a water-soluble acid derived from inorganic minerals by chemical reaction as opposed to **organic acids** (e.g. acetic acid, formic acid). Chemicals that fall under, but are not limited to, this SOP include:
 - Hydrochloric acid (CAS No. 7647-01-0)**
 - Nitric acid (CAS No. 7697-37-2)**
 - Phosphoric acid (CAS No. 7664-38-2)**
 - Sulfuric acid (CAS No. 7664-93-9)**
 - Hydrofluoric acid (CAS No. 7664-39-3)**
 - Boric acid (CAS No. 10043-35-3)**
 - Chromic acid (CAS No. 1333-82-0)**

Process, Hazardous Chemical, or Hazard Class Description

- ❖ Concentrated acids are very corrosive and dangerous chemicals encountered in the laboratory. Some acids are also shock sensitive which given the right conditions can explode. Concentrated acids may be fatal if inhaled; and can cause severe eye and skin burns, severe respiratory and digestive tract burns. Contact with other material may cause a fire. Whenever working with concentrated acids it **MUST** be done in the fume hood.
- ❖ Some Common Acids used frequently are:
 - (~65%) **Nitric acid (HNO_3)**
 - (~32%) **Hydrochloric Acid (HCl)**
 - (~96%) **Sulfuric Acid (H_2SO_4)**
 - (~97%) **Acetic Acid (CH_3COOH)**
- ❖ These are not the only acids used just some of the more common.
- ❖ **NOTE!** This SOP does not apply to hydrofluoric acid (HF). Please use special directions if working with it.

Potential Hazards

- ❖ **Corrosive** – causes severe eye and skin burns; can cause digestive and respiratory tract burns;
- ❖ **Irritant** – eye, skin, respiratory tract, digestive tract;
- ❖ Avoid **skin contact**, serious burns may result.
- ❖ Before proceeding, you must have read and are familiar with the **MSDS** for each of the hazardous materials you will be using.



Personal Protective Equipment

- ❖ Safety glasses / chemical splash goggles
- ❖ Only applicable if not working in a fume hood or if hood's sash is not down.
- ❖ Immediately replace gloves with new ones when splash occurs.
- ❖ Chemical resistant apron/smock/lab coat (rubber, neoprene or PVC), reusable or disposable.
- ❖ Always wear lab coat.
- ❖ Protective clothing (e.g. impervious sleeves, closed-toed impervious footwear)

Engineering/Ventilating Controls

- ❖ All work with concentrated acids **must** be done in the fume hood, with no other persons working close enough to interfere or come into contact with the acid; someone must be in the immediate area in case of an emergency, the protective shield on the fume hood drawn down as much as possible, but allowing to work comfortable.
- ❖ Make sure when you are **dispensing the acids** that the bottle being dispensed in is far enough in the fume hood so that fumes will not come back to the users face.
- ❖ A safety shower and eyewash must be available and accessible when working with corrosive liquids.

Storage Requirements

- ❖ All chemicals must be stored in cabinets, according to NFPA ratings
- ❖ Nitric acid can not be stored with organic acids; as a strong oxidizer it should be stored separately in a chemically resistant secondary container within an acid cabinet.
- ❖ Per-acids must be stored in the correct fridge (Refrigerator #1 next to the Instrument lab).



Storage Requirements

- ❖ Containers of hydrochloric acid and sulfuric acid should be stored in secondary plastic trays to avoid corrosion of metal storage shelves due to drips or spills; nitric acid should also be stored in a double container.
- ❖ Bottles of mineral acids should be stored together in an acid (corrosives) cabinet.
- ❖ Nitric acid and other mineral acids should be stored separately from oxidizing agents, organic materials, and combustible materials.
- ❖ Avoid storing ammonium hydroxide and strong acids in the same cabinet.

Special Handling Requirements

- ❖ Add **acid to water** and *never* water to the acid, *never* use hot water. Water added to acid can cause uncontrolled boiling and splashing.
- ❖ When diluting, the acid should *always* be added slowly to water and in small amounts. When transporting any acids you **MUST** place the acid bottle into a plastic transport container.
- ❖ Reaction with certain metals generates flammable and potentially explosive hydrogen gas.
- ❖ Avoid mixing nitric acid with organics. This can result in an explosion or fire.
- ❖ Stock fresh calcium gluconate, in a tube, to counter immediate effects of hydrofluoric acid on skin, tissue, then seek immediate medical attention

Spill and Accident Procedures

- ❖ **Skin exposure:** Rinse affected skin with plenty of water while removing contaminated clothing and shoes. Rinse for at least 15 minutes. Seek medical attention.
- ❖ **Eye exposure:** Splashes may cause tissue destruction. Wash eyes for at least 15 minutes, lifting the upper and lower eyelids. Seek medical attention immediately.
- ❖ **Small spills:** Do not attempt cleanup if you feel unsure of your ability to do so or if you perceive the risk to be greater than normal laboratory operations. Clean up using the spill kit, follow the directions for use.
- ❖ **Large spills:** Notify others in area of spill. Turn off ignition sources in area. Evacuate area and post entrance ways to spill area. Call the Buildings Operations Division immediately:

Jerry Nunn 404-894-5332(O), 404-276-0834(C) and inform the supervisor Dr. Art. Ragauskas 404-894-9701(O), 404-894-4778(F) or after hours call GA Tech Police 894-2500 for first response. Restrict persons from area of spill or leak until cleanup is complete. Remain in area in safe location to assist the team with response.

Decontamination Procedures

- ❖ For small spills, follow chemical spill response guidelines above (use spill kits). Don protective clothing and carefully apply acid-neutralization powder or liquid, whichever is most appropriate, to the spill. Allow time to neutralize, and then apply liquid absorbent pellets or powder.



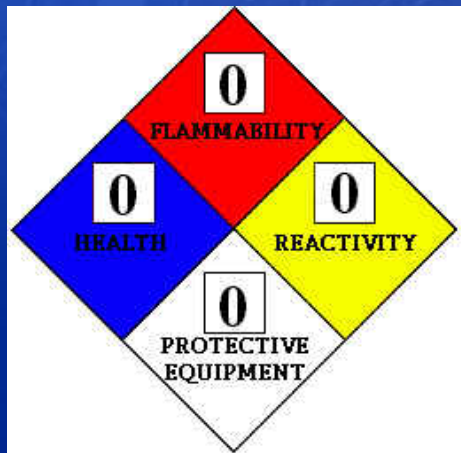
Waste Disposal Procedures

- ❖ Any waste acids will require disposal as hazardous waste. Each container of hazardous waste must have a completed **Hazardous Waste** label attached.



Material Safety Data Sheet Location

- ❖ They should be obtained through the vendor or on the vendor's website. MSDS's are also available online:
www.msds.com
- ❖ For emergency situations, MSDS's can be obtained through 3E Company (a 24/7 emergency MSDS company): www.3ecompany.com
or by phone: 1-800-360-3220



Additional Notes

ALSO REMEMBER THE FOLLOWING POINTS ABOUT WORKING AND STORING ACIDS IN THE LAB!

- ❖ All **purchases** of reactive acids or concentrated acid solutions are to be purchased in the smallest practical volume and in plastic coated bottles.
- ❖ Spills of fuming nitric acid, sulfuric acid, hydrofluoric acid or peroxy-organic acids can NOT be cleaned with the regular acid spill kits. For these situations please use **TEAM LIQUID NEUTRALIZER** – located in the storage room and adjacent to fume hood 475 B.

