

Syracuse University

Laboratory Guidance Document

Hydrofluoric Acid



This Laboratory Guidance Document was created by Syracuse University Environmental Health & Safety Services (EHSS) to assist researchers in developing laboratory specific standard operating procedures for the handling, storage, and disposal of hydrofluoric acid.

Potential Hazards:

Hydrofluoric acid (HF) is a clear, colorless, fuming, corrosive liquid that can cause severe burns to skin and other tissues, and can decalcify bone. HF has a number of chemical, physical, and toxicological properties that make handling this material particularly hazardous:

- HF penetrates tissues on contact. Health hazards can occur when absorbed through skin, tissues, or eyes, and/or when inhaled or swallowed.
- HF seeks calcium; systemic exposures may decalcify bone and cause hypocalcemia due to fixation of blood calcium.
- Symptoms of HF exposure include eye and skin burns, irritation of the eyes, skin, nose and throat, rhinitis, bronchitis, pulmonary edema, and bone damage.
- HF interferes with nerve function and skin contact with HF may not initially be painful. Symptoms of exposure to HF may not be immediately evident and accidental exposures can go unnoticed due to nerve function interference. Delayed treatment of HF exposures may increase the extent and severity of the injury.

Physical & Chemical Properties:

Hydrofluoric acid reacts with glass, concrete, many metals, organic materials, leather, natural rubber, and wood. Chemically compatible containers, such as those made from polyethylene and Teflon should be used. Compatible secondary containment should always be provided for HF when in use, storage, and during transport.

General Precautions:

The use of HF requires extreme care; if not stored, handled, and disposed of properly, this material poses a serious threat to the health and safety of laboratory personnel, emergency responders, and waste handlers.

1. Training.

The Principal Investigator (PI) is responsible for ensuring all personnel under their supervision are aware of the hazards of HF, have received appropriate hands-on training, adhere to the laboratory standard operating procedures, and are provided with the appropriate personal protective equipment.

2. Work under the buddy system.

Hydrofluoric acid should never be handled while working alone. At least one additional person trained in the safe handling of HF should be present in the general vicinity of the work area while HF is used.

Personal Protective Equipment (PPE):

In addition to the standard laboratory attire (i.e., long pants and closed toe shoes), the following PPE is recommended for all protocols involving HF:

- ANSI certified (Z87) chemical splash goggles
- Full face shield
- Knee-length lab coat
- Chemical resistant apron
- Butyl rubber, neoprene rubber, or other HF resistant gloves that cover the hands, wrists, and forearms as an outer layer, with nitrile gloves as the inner layer.

Best Practices for the Safe Handling of Hydrofluoric Acid:

1. Review the Safety Data Sheet (SDS), laboratory standard operating procedure (SOP), and emergency procedures before starting any work requiring HF.
2. Post a hazard warning sign (*Appendix I*) and emergency response procedure in all storage and use areas.
3. Spill response and first aid supplies should be readily available near the HF work area.
4. All protocols involving HF should be performed inside a fume hood. Keep the chemical container deep inside the fume hood and as far away from the user as practical.
5. Place plastic trays or bench paper on the work surface before starting procedures to prevent contamination of the work surfaces.
6. Use only polyethylene or Teflon containers for HF protocols. Inspect all containers for cracks and brittleness prior to use.
7. Keep HF containers securely supported to avoid tip overs and spills.
8. If necessary, transport HF between work areas in a labeled, sealed, and non-breakable secondary container. Always remove HF from the secondary container inside a chemical fume hood to vent any accumulated vapor.
9. Decontaminate all work surfaces with a 10% calcium carbonate solution at the end of the procedure.



Commercially available HF spill response materials: **(A)** HF spill kit containing neutralization compounds, PPE, disposable brooms & scoops, and a topical first aid gel. **(B)** 2.5% gel preparation of calcium gluconate used to treat HF burns. Calcium gluconate reacts with HF to form calcium fluoride, a non-toxic compound.

Storage Considerations:

- Procure and store only the smallest practical quantities for the experiment performed.
- Store in a dry area away from ignition and combustion sources.
- Store below eye level in a corrosive/acid cabinet within chemically compatible secondary containment.
- HF should not be stored with oxides, organic chemicals, bases, or metals.

Disposal and Waste Management:

HF waste must be stored in a compatible container such as those made of polyethylene or Teflon, and labeled with a hazardous waste tag provided by EHSS. *HF waste should never be stored in glass containers.*

- Ensure the waste container is fitted with a proper screw cap.
- Place the waste container in the satellite accumulation area in secondary containment and notify the EHSS Hazardous Waste Group at 315.443.9132 for disposal.

Spill Response & Clean Up:

EHSS will oversee and direct an HF spill cleanup. Depending on the location and/or severity of the spill, EHSS may seek assistance from an outside emergency response services provider.

- Small spills of dilute HF can be absorbed and neutralized by covering the spill with powdered calcium carbonate or a neutralizer from a commercial HF spill kit.

NOTE: HF should not be neutralized with:

1. Potassium carbonate, sodium carbonate, potassium hydroxide or sodium hydroxide. HF contact with these compounds may yield gaseous HF.
2. Silicon-based absorbent materials (common in solvent spill kits). HF contact with these materials may yield silicon tetrafluoride, a toxic and corrosive gas.

First Aid:

All exposures to HF must receive immediate first aid and medical evaluation even if the injury appears minor or there is no sense of pain. Contact DPS immediately (315.443.2224 or 711 from campus landline or #78 from mobile phone) in the event of an exposure.

The following information provides typical first aid measures recommended for HF exposures. The chemical's SDS should be readily available and used as a reference for determining appropriate first aid measures.

1. Inhalation:

Move to fresh air and seek medical attention immediately.

2. Skin Contact:

Remove all contaminated clothing and rinse affected area with water for at least 15 minutes. Any contaminated clothing that has to be pulled over the head should be cut off the body. After rinsing affected area(s), apply generous amounts of 2.5% calcium gluconate gel. White specks appearing around the burned region indicates the formation of calcium fluoride and that the gel is working. Seek medical attention immediately. Re-apply calcium gluconate every 15 minutes until medical help arrives.

NOTE: HF is readily absorbed through the skin. Medical treatment is still necessary after rinsing with water and applying 2.5% calcium gluconate.

First Aid (cont'd):**3. Eye Contact:**

Flush with water at an emergency eyewash station for at least 15 minutes. Seek medical attention immediately.

4. Ingestion:

Do not induce vomiting. Seek medical attention immediately.

Additional Resources:

1. PubChem: [Hydrofluoric Acid Compound Summary](#)
2. Centers for Disease Control: [Facts About Hydrofluoric Acid](#)

Appendix I. Laboratory Signage.
Post this warning sign at all storage and use areas.

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|  DANGER | <p>HYDROFLUORIC ACID</p> <p>Hydrofluoric acid (HF) is used and/or stored in this area.</p> <p>Causes severe burns.</p> <p>Avoid contact with skin and eyes.</p>  |
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