

Standard Operating Procedure

Hydrofluoric Acid

Type of SOP: Process/Equipment Hazardous Chemical Hazardous Class

This SOP has been written and/or reviewed and approved by a laboratory supervisor or principal investigator. Any edits or revisions to this SOP must be approved by a laboratory supervisor or PI. All personnel subject to this SOP must review the completed SOP and sign below in Section 11: Documentation of Training. This SOP must be readily available in your lab.

Department:	Click here to enter text.		
Location:	Click here to enter text.		
Principal Investigator (PI):	Click here to enter text.		
PI Office Phone:	Click here to enter text.	PI Home Phone:	Click here to enter text.
Emergency Contact Name:	Click here to enter text.	Emergency Contact Phone:	Click here to enter text.
Safety Office Phone:	701-231-7759	University Police Phone:	701-231-8998

1. PROCESS OVERVIEW

[Insert a brief description of the laboratory process/equipment involving hazardous chemicals, a single hazardous chemical, or class of hazardous chemicals covered by this SOP. A detailed step-by-step procedure will be included in Section 10.]


2. HAZARDOUS CHEMICAL(S)

Chemical Name	CAS Number	Quantity Stored
Hydrofluoric Acid	7664-39=-3	Enter quantity and units

Chemical and Physical Properties	
Molecular Formula	HF
Hazard Class	Acid / Toxic
Form/Physical State	Liquid, colorless
Boiling Point	105C
pH	<1

Odor	Pungent
Vapor Density	2.21

3. HAZARDS IDENTIFICATION

	Signal Word: Danger
	GHS Hazard Statements: <ul style="list-style-type: none"> • May be corrosive to metals • Causes Severe skin burns and eye damage • May cause respiratory irritation • Fatal if swallowed, in contact with skin or if inhaled.

Other Potential Hazards

- HF reacts with glass, glazes, enamels, ceramics, concrete, rubber, leather, many metals, and organic compounds. Upon reaction with metals, explosive hydrogen gas may be formed.
- HF is a corrosive acid causing burns to skin, eyes, mucous membranes, and respiratory tract.
- Hydrofluoric acid readily penetrates skin to destroy tissues, decalcify bone and interfere with nerve function. Exposure to high concentrations of HF can cause hypocalcemia and cardiac arrest.
- Exposure to dilute HF solutions may cause serious injury, but the appearance of symptoms can be delayed for up to 24 hours. Any potential exposure to HF requires medical attention, even if there are no immediate symptoms.

4. DESIGNATED LOCATION AND STORAGE

Designated Work and Storage Locations	Enter building, room number, & specific areas
Storage Conditions	<p>Store in designated acid cabinet. Label storage cabinet with HF Warning signage. Do not store with incompatible materials, including organic acids, ammonia, or other bases. Keep away from light, heat, flames and sources of ignition. Store HF in labeled, closed plastic or Teflon containers. Do not store in glass, metal, or ceramic containers. Use secondary containment at all times.</p>

5. ENGINEERING CONTROLS

Engineering Controls

- All handling of hydrofluoric acid must be performed in a designated chemical fume hood with the sash in the lowest possible height for safe use of the chemical.
- Chemical fume hood must be working, and labeled "DANGER, Hydrofluoric Acid"

6. WORK PRACTICE CONTROLS & TRAINING

Precautions for Safe Handling:

- Never use hydrofluoric acid when working alone or after hours, and inform others in the immediate area when you are working with HF.
- Post signage on exterior laboratory door to alert others that HF is stored in your lab, and when work is in progress.
- Ensure all users are trained.
- Ensure the designated HF chemical fume hood is operational.
- Maintain a physical copy of an SDS for Hydrofluoric acid and this SOP in your lab.
- Ensure that you have all the PPE required for handling HF.
- Do not leave any skin exposed when handling HF.
- Practice good hygiene. Wash hands immediately after handling hazardous materials. Wash hands before exiting the lab.
- Purchase the smallest feasible quantities of HF and conduct small-scale experiments.
- Use the lowest concentration of HF possible.
- Always use secondary containment when pouring or transferring HF.
- Lab emergency contact information must be readily available.

Training Requirements:

- Laboratory Safety Training*
- Laboratory Specific HF Safety Training (Provided by PI or Lab Supervisor)
- Hazardous Waste Handling Training*
- Hydrofluoric Acid Safety Training*

*Training is provided by the Safety Office: https://www.ndsu.edu/police_safety/training/

7. PERSONAL PROTECTIVE EQUIPMENT

Long pants, closed toe shoes, and safety glasses are required upon entry into an area where hazardous materials are used or stored. Additional PPE requirements are listed below.

Eye Protection

Fully enclosed splash-goggles and a face shield are required for HF work, as they offer greater facial protection than safety glasses.

Hand Protection

Thick neoprene or nitrile gloves must be always worn when handling HF. It is recommended to double glove when working with HF (i.e., regular thickness nitrile gloves with heavy neoprene or nitrile over the top of those). In case of spill, a user can strip the outer layer of contaminated gloves and still be protected.

Skin and Body Protection

Lab coat is required. Lab coats should be easily removable in case of emergency (i.e., lab coats should close with snaps, not with zippers or buttons). Full-length pants, closed toe shoes must be worn. Chemical resistant apron, booties, and gauntlets are all recommended.

Respiratory Protection

Additional respiratory protection is not required, if all work is performed in a working chemical fume hood.

8. EMERGENCY RESPONSE

Emergency Safety Equipment

Emergency Equipment	Location
Emergency Eyewash Station(s)	Click here to enter text.
Safety Shower	Click here to enter text.
First Aid Kit	Click here to enter text.
Fire extinguisher	Click here to enter text.
Fire Alarm Pull Station	Click here to enter text.
Telephone	Click here to enter text.
HF Exposure Kit*	Click here to enter text.

*HF Exposure Kit:

In case of emergency, an HF Exposure Kit must be available in the laboratory.

The HF Exposure kit must include:

1. Container of calcium gluconate gel.
 - a. Gel must be inspected before each use of HF and at least monthly to ensure the gel has not been removed or expired. If the gel has been opened or expired, it must be replaced before working with HF.
2. Two pairs of thick (22mm) neoprene or nitrile gloves.
3. Calcium carbonate (antacid tablets).
4. A copy of this SOP, Safety Data Sheet, and a medical fact sheet kept in a envelope for medical personnel in case of potential exposure.
 - a. Example Fact Sheet:
<https://emergency.cdc.gov/agent/hydrofluoricacid/basics/facts.asp>
[Recommended Medical Treatment for HF Exposure](#)

Chemical Exposure

Symptoms of acute exposure:

- Immediate pain and surface burns on affected areas.
- Difficulty breathing.
- Inhalation may cause coughing, choking, chest tightness, chills, fever and cyanosis.

- Dilute exposure to HF may cause no pain or discomfort initially but may cause serious delayed reactions.

IMPORTANT: All exposures or chemical exposures with HF must receive immediate first aid and medical evaluation even if there are no exposure symptoms. Immediately upon exposure call 9-1-1. A copy of this SOP, HF Safety Data Sheet, and a medical fact sheet must be available to give to medical responders in case of exposure.

If Inhaled:

1. Immediately move to fresh air and call 9-1-1.
2. Take 6 calcium carbonate (Tums) if conscious.
3. Inform medical personnel that calcium carbonate has been administered.

In Case of Skin Contact:

1. Call 9-1-1 for medical assistance.
2. Rinse affected areas in the sink or emergency safety shower for 5 minutes.
 - a. Remove all contaminated clothing and PPE.
3. Apply calcium gluconate immediately to all potentially contaminated skin.
4. Take 6 calcium carbonate (Tums) if conscious.
5. Inform medical personnel that calcium carbonate and calcium gluconate have been administered.

In Case of Eye Contact:

1. Call 9-1-1 for medical assistance.
2. Rinse eyes in the emergency eyewash for 15 minutes – holding eyelids open for irrigation and wait for emergency medical personnel to arrive.
3. Take 6 calcium carbonate (Tums) if conscious.
4. Inform medical personnel that calcium carbonate has been administered.

If Ingested:

1. Call 9-1-1 for medical assistance.
2. Drink large amounts of water quickly to dilute the acid. Do not induce vomiting. Do not give emetics or baking soda. Do not give anything by mouth to an unconscious person.
3. Take 6 calcium carbonate (Tums) if conscious.
4. Inform medical personnel that calcium carbonate has been administered.

Chemical Spills

NDSU Safety Office is available for spill clean-up 24/7. Call 701-231-7759 for assistance in cleaning up ALL HF spills.

In Case of Chemical Spill:

1. Alert others in the area.
2. Contain the spill, if safe to do so.

3. Cordon off area.
4. Evacuate the area, and immediately call the Safety Office (701-231-7759) for assistance.
5. The Safety Office will clean up all HF spills.

Life Threatening Emergencies

Fire, explosion, life-threatening hazardous material spill/leak, compressed gas leak, etc.:

1. Call 9-1-1 or University Police 701-231-8998
2. Alert others in the area and activate local alarm systems (e.g., fire alarm pull stations)
3. Evacuate building to designated assembly point: [Enter Designated Assembly Point](#)
4. Remain at the designated assembly point to advise emergency responders.
5. Call the Safety Office at 701-231-7759, when it is safe to do so.

Injuries:

1. Call 9-1-1 or University Police 701-231-8998.
2. Administer first aid as appropriate.
3. Call the Safety Office at 701-231-7759, when it is safe to do so.

9. WASTE DISPOSAL

Hazardous wastes must be stored and labeled properly and disposed of by the NDSU Safety Office within 9 months of accumulation start date.

- Do not dispose of HF down the drain, or in the garbage.
- Do not dilute or neutralize HF hazardous waste.
- Collect HF waste in compatible containers provided by the Safety Office.
- Do not mix incompatibles or other acids in the HF waste container.
- Any solid material contaminated with HF (e.g., gloves, wipes, plasticware, ...) should be collected in solid waste buckets.
- When the waste container is full, or the HF waste container will no longer be used. Coordinate a waste pick-up immediately.

10. LAB SPECIFIC PROCEDURES

Laboratory Specific Procedures:

[List your detailed laboratory specific procedures in this section. Remember, any changes to these procedures require advance PI approval]

11. APPROVAL & DOCUMENTATION

SOP Approval	
Date SOP was approved by PI:	Click here to enter text.
Date of Last SOP Revision by PI:	Click here to enter text.
Click here to enter text.	Click here to enter text.

DOCUMENTATION OF TRAINING	
All laboratory personnel must read and understand this SOP, and sign/date below.	
NAME	DATE