

Hydrofluoric Acid – Operating Procedure

Updated on 03/01/2019 by IC

A. Warnings and Notes

- Hydrofluoric Acid (HF) has a number of chemical, physical and toxicological properties, which make handling this material especially hazardous. Hydrofluoric Acid is a clear, colorless, fuming, corrosive liquid. Hydrofluoric Acid is also available in the gaseous state. All forms including the solution or the vapor can cause severe burns to tissue and cause serious toxic systemic effects.
- Fluoride ions are both acutely and chronically toxic. Acute effects of Hydrofluoric Acid exposure include extreme respiratory irritation, immediate and severe eye damage and pulmonary edema. Skin, eye, or lung exposure to concentrated (>50%) Hydrofluoric Acid solutions will cause immediate, severe, penetrating burns. Exposure to less concentrated solutions may have equally serious effects, but the appearance of symptoms can be delayed for up to 24 hours.
- If you are exposed to hydrofluoric acid you must seek medical attention immediately, even if you do not feel pain.
- You must read its SDS before you use it the SDSs are available in the yellow binders located in the cleanroom, on the UNDF-Tools shared drive, and in the "Current Users" section of the website (udnf.udel.edu).
- Never use glass beakers with HF as HF will etch them away.
- HF may only be used in the dedicated wet bench in Bay 2 of the UNDF cleanroom.
- Only one person may use the HF hood at any given time.
- You must have a safety buddy to use HF; only HF trained and qualified users may be HF safety buddies. The safety buddy: (1) must wear the PPE listed in the next section and (2) must stand by you while you use HF

and while you clean up.

- You must log into the “Chem – Hydrofluoric Acid” tool in FOM before you start work and log out once you are done using the chemical. You must make reservations in advance in FOM.
- Identify the closest eye wash and safety shower before you start work.
- You must report all chemical spills and exposures to UDNF staff or EHS if UDNF staff cannot be located immediately. Please refer to the Emergency Procedures section below for HF exposures.
- You may not clean HF spills; no matter how small. Only EHS personnel is authorized to clean HF spills.
- HF may be used only during staffed hours (typically 08:30-17:00, M-F while the University is open). Unstaffed hours will be announced via email and will be posted on the UDNF Calendar in FOM.
- You should expect to find the working area clean and dry and are expected to leave the working area clean and dry. Please ask for staff assistance as needed.

B. Emergency Procedures

1. General Procedures for All Exposures

- a. **Activate buddy system response Immediately**
- b. The buddy should grab the Hydrofluoric Acid Spill/ Exposure Kit and don the clean 22 mil neoprene gloves.
- c. The buddy should help the injured person to the safety eyewash or sink, as appropriate. The buddy must not expose him/herself.
- d. The buddy contacts **911**
- e. Let Public Safety know you have a Hydrofluoric Acid exposure and give the exact location. Instruct them send an ambulance and notify the hospital of person in transport

- f. The buddy gets the Hydrofluoric Acid Spill/Exposure Kit and provides the calcium gluconate gel and calcium carbonate tablets when appropriate.
- g. The buddy accompanies the injured person to the emergency room and brings along the HF response kit. Transportation must be provided by ambulance.

2. Small Skin Exposures

- a. The buddy locates and helps the exposed person the nearest clean laboratory sink
- b. Turn on the water and rinse the area
- c. Rinse area while removing all contaminated clothing for up to 5 minutes
- d. Victim should remove all contaminated items (i.e. clothing, shoes and jewelry while under the water)
- e. Victim should self-administer calcium gluconate, apply the gel onto the affected area and thoroughly rub the gel into the skin:
 - i. if the victim is unable to administer, the buddy can assist using the neoprene gloves
 - ii. **NOTE THE TIME OF INITIAL APPLICATION** (may need to apply every 20 minutes until pain subsides or reach medical facility)
- f. Take 6 Calcium Carbonate tablets (TUMS) if conscious
- g. Inform Emergency Medical Personnel that calcium carbonate and calcium gluconate have been administered
- h. Buddy should bag all contaminated clothing and supplies (USE PPE)
- i. Notify EHS

3. Eye Exposure

- a. The buddy locates and helps the exposed person the eyewash station
- b. Activate the eyewash. Rinse the eyes and face under the eyewash for 15 minutes – holding lids open (both lower and upper) for irrigation. Conduct this process for both liquid or vapor contamination
- c. Victim should self-administer calcium gluconate, apply the gel to any effected skin areas and thoroughly rub the gel into the skin.
Do not apply the gel to the eyes:
 - i. if the victim is unable to administer, the buddy can assist using the neoprene gloves
 - ii. **NOTE THE TIME OF INITIAL APPLICATION** (may need to apply every 20 minutes until pain subsides or reach medical facility)
- d. Take 6 Calcium Carbonate tablets (TUMS) if conscious
- e. Inform Emergency Medical Personnel that calcium carbonate and calcium gluconate have been administered
- f. Buddy should bag all contaminated clothing and supplies (USE PPE)
- g. Notify EHS

4. Large Body Area Exposure

- a. The buddy locates and helps the exposed person the emergency safety shower
- b. Stand under shower and turn it on
- c. Rinse whole body while removing all contaminated clothing for up to 5 minutes. Victim should remove all contaminated items (i.e. clothing, shoes and jewelry while under the shower)
- d. Remove safety glasses last, face water and pull over head

- e. Victim should self-administer calcium gluconate, apply the gel onto the effect area and thoroughly rub the gel into the skin:
 - i. if the victim is unable to administer, the buddy can assist using the neoprene gloves
 - ii. **NOTE THE TIME OF INITIAL APPLICATION** (may need to apply every 20 minutes until pain subsides or reach medical facility)
- f. Take 6 Calcium Carbonate tablets (TUMS) if conscious
- g. Inform Emergency Medical Personnel that calcium carbonate and calcium gluconate have been administered
- h. Buddy should bag all contaminated clothing and supplies (USE PPE)
- i. Notify EHS

5. Inhalation Exposure

- a. Immediately remove the victim to clean air if it is safe to do so
- b. The procedures for large skin or eye exposure must then be followed based on the exposure circumstances. If a vapor exposure occurs to the face, follow the procedures for an eye exposure. If a vapor exposure occurs to the chest of body, follow the procedures for a large skin exposure.

C. Personal Protective Equipment and Tools

- In addition to the normal UDNF cleanroom suit, the following safety PPE must be worn when handling HF.
 - Chemical apron
 - Face shield
 - Chemical resistant gloves
- The PPE must be inspected before you start any work:

- If the gloves have any cracks, tears, holes, etc. please do not use them; ask staff for a new pair of gloves.
- If the apron is not completely dry, please do not use it; please notify staff.
- Only use TEFLON tweezers or the blue locking forceps when working with HF.

D. Use Procedure

- Identify your safety buddy.
- Inspect HF kit; if anything is missing, please **STOP** and notify UDNF staff.
- Inspect PPE; if anything is not right with the PPE, please **STOP** and notify UDNF staff.
- Log into “Chem – Hydrofluoric Acid” tool in FOM. Enter the name of your safety buddy in the “Comment” section on the pop up window.
- All beakers containing HF must be placed in the white secondary containment tray located in the HF fume hood.
- Use one of the pre-formatted labels available in the file folder in Bay 2 to write the name of the chemical(s), date and time, your name, and contact info. Place the note under the beaker that will contain HF.
- Bring a number of cleanroom wipers into the hood and separate them; you will need them to dry the chemically resistant gloves if they get wet and to clean up when you are done using the chemicals.
- Attach your sample(s) to the blue locking forceps and place them in the fume hood.
- The person using HF and the safety buddy put on the additional PPE in the following order:
 - Apron
 - Face shield
 - Chemical resistant gloves
- Fill a plastic beaker with DI water for rinsing your sample(s).
- Move the bottle with fresh chemicals from the HF chemical cabinet into

the wet bench. Use both hands to carry the bottle.

- Pour the HF solution into the clean, dry plastic beaker that was placed onto the label you filled out previously.
- Place the bottle with the fresh chemical into the HF chemical cabinet. Use both hands to carry the bottle.
- Place the sample into the beaker containing HF.
- Start the timer.
- Remove the sample from the HF beaker and place into the DI water beaker for rinsing.
- Dry the sample with nitrogen.

E. Waste Disposal

- Remove the cap from the waste bottle.
- Rinse the funnel with water over the sink.
- Pour HF into the appropriate waste bottle using the funnel; do not overfill.
- **Note:** If you start a new waste bottle make sure it is dry on the inside and outside.
- Place the cap on the waste bottle.
- Rinse the funnel with water over the sink.

F. Cleanup and Final Steps

- Wash both beakers with DI water three times over the sink.
- Place the beakers in the designated location.
- Remove the label and dispose of it into the white “acid” trash can located in front of the wet bench.
- Wipe off any liquids from the bench and white tray, and dispose of the wipers into the white trash can located in front of the wet bench.
- Wash chemical resistant gloves with DI water over the sink.
- Dry the chemical resistant gloves with wipers, and dispose of the wipers into the white “acid” trash can located in front of the wet bench.
- Wipe off any liquids from the apron, and dispose of the wipers into the

white trash can located in front of the wet bench.

- Dry the chemical resistant gloves with wipers, and dispose of the wipers into the white “acid” trash can located in front of the wet bench.
- Remove PPE in the following order:
 - Remove gloves and place them in the fume hood.
 - Remove face shield.
 - Remove apron.
- Log out of “Chem – Hydrofluoric Acid” tool in FOM.