Standard Operating Procedure

Hydrofluoric Acid (HF) use in SC 1110

|  |  |
| --- | --- |
| **Department:** | Earth and Environmental Sciences |
| **Date SOP was written:** | 2/27/2018 |
| **Date SOP was approved by PI/lab supervisor:** | 2/27/2018 |
| **Principal Investigator:** | Daniel Morgan |
| **Internal Lab Safety Coordinator/Lab Manager:** | Richard Bradshaw |
| **Lab Phone:** | Located in SC 1110 (615) 322-2171 |
| **Office Phone:** | D. Morgan (615) 343-3154 (campus: 3-3154)R. Bradshaw (615) 343-0839 (campus: 3-0839) |
| **Emergency Contact:** | D. Morgan (615) 934-4146 (cell)R. Bradshaw (208) 260-2792 (cell) |
|  |
| **Location(s) covered by this SOP:** | *SC 1110* |
|  |

**Type of SOP:** ☐ Process ☒ Hazardous Chemical ☐ Hazardous Class

**Personal Protective Equipment (PPE)**

**Eye/Hearing Protection:**

Required: General lab attire: Long pants, closed toed shoes, lab coat, and ANSI approved, tight-fitting safety glasses/goggles (personal eye glasses are okay).

Additional Required Personal Protective Equipment for work with Hydrofluoric Acid: thick nitrile gloves (Atlas brand), face shield, PVC apron, and PVC sleeves.

# **Other Protection:**

Pull long hair back and tuck into back of shirt or under lab coat.
Remove any loose jewelry.

# **Medical Emergency Dial (615) 322-2222 for Vanderbilt Police**

**Life Threatening Emergency, After Hours, Weekends and Holidays** – Dial **(615) 322-2222 for Vanderbilt Police** or go to the nearest emergency room. *Note: All serious injuries must be reported to Environmental Health and Safety (EH&S) within 8 hours.*

**Non-Life Threatening Emergency** – Go to the Occupational Health Facility (OHF). After hours, go to the nearest emergency room. *Note: All serious injuries must be reported to EH&S within 8 hours.*

**Risks of working with Hydrofluoric Acid**

Hydrofluoric acid (HF) is very dangerous. It is highly corrosive and capable of dissolving most materials, including glass and many metals. HF fumes are also very dangerous. The fumes are corrosive and can easily damage the lungs and eyes. Extreme caution and care must be exercised when working with HF.

HF burns can cause permanent damage to the skin and tissue, and are potentially fatal. HF has a high ability to penetrate the skin, and it interferes with nerve function, so burns may not be initially painful. HF interferes with the body’s ability to metabolize calcium, so if it is absorbed into your bloodstream, it can cause systemic toxicity leading to cardiac arrest and potentially death. Thus, extra precautions must be taken to ensure that drips and spills are avoided, or at the very least, minimized.

Because hydrofluoric acid is incredibly dangerous, only perform the steps and procedures that you are comfortable doing. Dan Morgan, the lab PI, will assist with any procedures that you are not comfortable with.

**Protocol/Procedure**

1. Any work with hydrofluoric acid (HF) must be done with another trained person in the lab with you. Never work with HF alone.
2. Before beginning any work with HF, put on the entire suite of PPE for HF. You should be wearing long pants, closed-toed shoes, a lab coat, and safety goggles. The HF safety gear includes an orange PVC apron, orange PVC sleeves, thick blue nitrile gloves (Atlas Brand), and a full face shield. These are found in the drawer marked “HF Safety Gear” and the face shields are stored on the shelf above this drawer.
3. Remove the calcium gluconate gel from the “HF Safety Gear” drawer and leave it on the counter next to the fume hood while working with HF.
4. Open bottles of HF are stored in the “Acid Storage” cabinet under the fume hood. Extra bottles of acid are stored in the cabinet by the sink marked “Extra Acid Storage.” Because HF can react and potentially combust with organic acids (like Acetic acid), HF should never be stored with them. For this reason, Acetic acid is stored in another cabinet in the lab.
5. Before handling the HF bottles, ensure that your gloves, sleeves, and apron are dry. Monitor your PPE for droplets of liquid that may be acid throughout any procedure that uses HF. All materials used during a procedure that uses HF should be dry to be aware of any HF spills that may occur.
6. Always work with HF in the fume hood. HF fumes are highly corrosive and can easily damage the lungs, eyes, or any exposed surfaces. Work at least 6 inches into the fume hood to ensure that fumes are pulled up the hood. The maximum working sash height is 18 inches.
7. To pour HF, remove the cap and place the cap on the fume hood with the inside of the cap facing upwards. This ensures that any drips on the inside of the cap stay in the cap. This also ensures that any HF fumes do not etch the surface of the fume hood. 🡪 Maintain awareness that there may be HF drips inside this cap and be sure not to brush your hand or sleeve against it. To help with this, place the cap away from your working area.
8. When pouring HF, hold the bottle firmly, and pour slowly and consistently.
9. After pouring the HF acid, check the rim and sides of the bottle for drips. Check your gloves and sleeves for drips too.
10. When you have finished using the HF, put the cap back on the bottle and store it in the acid storage cabinet. Rinse all equipment that was used to pour HF in the fume hood to clean the equipment.
11. Drips on the bottle should be wiped up quickly to avoid having the drip spread to more surfaces. To wipe up the drip, use a kim wipe or paper towel. Blot the drip with the wipe, but do not press into the drip to avoid having the drip soak through the wipe and onto your gloves. When the drip has been absorbed, take the wipe to the sink and rinse the wipe with water. Let the water run for 30-60 seconds to fully rinse the wipe and dilute the acid.
12. Drips on your gloves and or sleeves should also be dealt with quickly to ensure that the acid does not spread to more surfaces. When you observe a drip on your glove or sleeve, go to the nearest sink and rinse the drip off of your glove or sleeve with water. Flush the drip for at least 30 seconds and make sure that it does not spread to other areas of your body.
13. If necessary, change your gloves and/or sleeves after rinsing them.
14. For larger spills, try to contain the spill with supplies from the spill kit. Do not risk getting the acid onto you while wiping up or containing the spill. If necessary, close down and evacuate the lab and notify EHS, the LM, and the PI immediately.
15. If you do get HF acid on your body and are experiencing an acid burn, first rinse the acid from your skin and ensure that you are not getting any more acid onto your body. You may need to leave the lab area to ensure this. Remove any clothing that may have HF on it. Then take the calcium gluconate gel and liberally apply it to the site of the acid burn. Continue re-applying and rubbing the gel into the burn site and go to the Vanderbilt University Medical Center Emergency Room as soon as possible. If it is possible to move on your own, going to the emergency room is faster than calling 911 and waiting for an ambulance to pick you up and take you to the emergency room.
16. Be sure to cap and adequately store HF bottles when finished. Be sure to store HF separately from any organic acids, like Acetic acid.
17. When you are finished working with HF, and all samples and HF bottles are put away, remove the PPE and store it in the proper place. Be sure to leave the face shield face up so that the mask does not get scratched.

**NOTE:**

Any deviation from this SOP requires approval from the PI/Lab Manager.

 **Documentation of Training** (signature of all users is required)

* Prior to conducting any work in SC 1110, the PI or LM must provide training to his/her laboratory personnel specific to the hazards involved in working with this equipment, work area, and emergency procedures.
* The Principal Investigator must provide his/her laboratory personnel with a copy of this SOP.
* The Principal Investigator must ensure that their laboratory personnel have attended appropriate laboratory safety training and are current with any refresher training required.

**I have read and understand the content of this SOP, and have completed the accompanying safety checklist:**

|  |  |  |
| --- | --- | --- |
| **Name** | **Signature** | **Date** |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |