**THIS IS A TEMPLATE/BASIC STARTING POINT. CUSTOMIZE THIS TEMPLATE WITH INFORMATION PERTINENT TO YOUR SETUP AND THE REACTION YOU WILL BE RUNNING/YOUR GROUP’S PERSONAL USE.**

STANDARD OPERATING PROCEDURE

|  |  |
| --- | --- |
| **Procedure Title:** | Use of Hydrofluoric acid (HF) |
|  |  |
| **Dept:** |  |  | **Bldg/Rm:** |  |  | **Supervisor:** |  |

**Health and safety information for materials used:**

Always read and understand the safety data sheet (SDS) for a chemical before use or storage.

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%) HF 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 **ANY AMOUNT** of Hydrofluoric acid seek medical attention immediately, even if you do not feel pain.

**Hazard Control Measures:**

(Lab coat, eye and hand protection, and fully enclosed shoes must be selected as required by Section D of the ISU Laboratory Safety Manual.)

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| [ ]  | Latex gloves | [ ]  | Insulated gloves | [x]  | Face shield | [ ]  | Respirator |
| [x]  | Nitrile gloves | [ ]  | Safety glasses | [x]  | Lab coat | [x]  | Fume hood |
| [x]  | Neoprene gloves | [ ]  | Vented goggles | [x]  | Apron | [ ]  | Biosafety cabinet |
| [ ]  | Vinyl gloves | [x]  | Splash goggles | [ ]  | Dust mask | [ ]  | Glove box |
| [x]  | Fully enclosed shoes | [ ]  | Flame resistant lab coat |

**Work Practice:**

* Always assume the exterior surface of the rubber glove is contaminated
* Conduct all HF work inside a fume hood.
* Never touch other surfaces (chemical bottles, door handle, phone, etc.) with a glove that

could have contacted HF solution

* **DO NOT use glassware** with HF solution – HF dissolves glass!
* Use dedicated plastic and Teflon containers for all HF solutions – keep all containers of HF inside secondary containment at all times.
* **Always** label HF containers. Visually, HF is indistinguishable from DI water
* Keep calcium gluconate nearby and understand the first aid procedures required for exposure to HF
* Thoroughly clean all lab tools and wafers after contacting HF solution

**Hydrofluoric acid Exposure Kit:**

Before beginning work, an exposure kit should be available and located in the laboratory area. The exposure kit should contain the following items:

* Container of 2.5% calcium gluconate gel. This gel is available from several suppliers. Contact Occupational Medicine (4-2056) for source information if necessary. The gel must be inspected at least monthly to ensure that it is available and has not reached the expiration date. If the gel has exceeded its shelf life or has been opened (i.e., used), a new container must be purchased and the old container discarded.
* Two pairs of thick Neoprene or Nitrile gloves.
* Chemical spill kit
* Copy of these procedures and SDS to provide to emergency response personnel.

**Procedures:**

* Never work alone with hydrofluoric acid.
* All lab personnel, not just those who will be using hydrofluoric acid, must be informed of the dangers of this chemical and the emergency procedures necessary in case of an accident. A sign should be posted to alert people that work with hydrofluoric acid is in progress. These procedures and the HF safety data sheet should be kept readily available.
* All persons who use hydrofluoric acid must have documented training on its properties, hazards, and proper procedures for HF use and disposal.
* Before beginning any procedure involving hydrofluoric acid, make sure the access to the emergency shower and eyewash is unobstructed.

**Storage:**

* Ensure each container of HF is clearly labeled.
* HF must **only** be stored in Teflon or plastic containers, within appropriate secondary containment.
* Secondary containers must be compatible with HF (no glass or metal)
* Keep container tightly closed in a dry and well-ventilated place. Containers which are opened must be carefully resealed and kept upright to prevent leakage.

**Waste Disposal Procedures:**

* Dispose of unwanted hydrofluoric acid or spill cleanup materials by submitting an EH&S online waste pickup request: <https://www.ehs.iastate.edu/services/waste/wasteremoval>
* Handle and store HFwaste following the guidelines above while accumulating wastes and awaiting chemical waste pickup. Waste must be disposed of following the [Waste and Recycling Guidelines.](https://publications.ehs.iastate.edu/warg/)

**First Aid Procedures:**

**In case of skin contact**

* Immediately move to the nearest emergency shower and rinse with water for 15 minutes.
* While rinsing, take off contaminated clothing and shoes.
* Have someone call **911** for emergency medical assistance.
* Apply calcium gluconate gel to exposed area using clean gloves. Take victim immediately to hospital.
* Consult a physician**.**

**In case of eye contact**

* Rinse thoroughly with plenty of water for at least 15 minutes.
* While flushing the eyes, have someone in the lab call **911** for emergency medical assistance.
* Continue rinsing eyes during transport to hospital**.**

**If swallowed**

* Call **911** for emergency medical assistance
* Immediately drink water to dilute the acid.
* Attempt immediate administration of a fluoride binding substance: chewable calcium carbonate tablets (e.g., Tums™) or 4 to 8 ounces (120 to 240 mL) of milk of magnesia or a liquid antacid (e.g., Maalox™). Avoid large amounts of liquid, as this may induce vomiting.
* **Do NOT** induce vomiting.
* Consult a physician.

**If inhaled**

* If breathed in, move person into fresh air.
* Call **911** for emergency medical assistance.
* If breathing stops, begin CPR or use an inhalator
* Oxygen should be administered as soon as emergency medical personnel arrive.
* Consult aphysician.

**All accidents and injuries occurring at work or in the course of employment must be reported to the employee's supervisor as soon as possible (even if no medical attention is required). Submit an incident report via the online portal:** <https://www.ehs.iastate.edu/services/occupational/accidents-injuries>

**Spill/Release Containment, Decontamination, and Clean Up Procedures:**

**Small spills**:

* Notify people in the immediate area
* Use absorbing materials in the chemical spill kit to clean affected area
* In some instances, powdered calcium carbonate or calcium hydroxide may be used to neutralize spilled material.
* Avoid breathing vapors
* Contact the Environmental Health and Safety (EH&S) at 515-294-5359for questions and to report a spill.

**Large spills:**

* **DO NOT** attempt to clean spill area
* **EVACUATE THE AREA IMMEDIATELY!**
* Post “**DO NOT ENTER”** signs on the doors into the lab
* For situations that threaten life or property, activate fire alarms (or chemical safety alarms if applicable) and immediately call **911**
* Notify the laboratory supervisor, principal investigator and EH&S (515-294-5359; after hours contact Public Safety at 515-294-4428).
* Wait for EH&S and/or fire and police officials to inform them of the location and extent of the spill

Use of Hydrofluoric acid requires site specific training and the approval from the professor in charge.

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| --- | --- | --- | --- | --- |
| **Written By:** |  |  | **Date:** |  |
|  |  |  |  |  |
| **Approved By:** |  |  | **Date:** |  |

 (PI or Lab Supervisor)

**HAZARD ASSESSMENT**

Use the hierarchy of controls to document the hazards and the

corresponding control measure(s) involved in each step of the procedure.

Consider *elimination or substitution* of hazards, if possible.

*Engineering Control(s):* items used to isolate the hazard from the user (i.e. fume hood, biosafety cabinet).

*Administrative Control(s):* policies/programs to limit the exposure to the hazard (i.e. authorizations, designated areas, time restrictions, training).

*Required PPE*: indicate PPE including specific material requirements if applicable (i.e. flame resistant lab coat, type of respirator or cartridge).

|  |  |  |  |
| --- | --- | --- | --- |
| **Hazard** | **Engineering Control(s)** | **Administrative Control(s)** | **Required PPE**  |
| TOXIC -- Skin and eye exposure, ingestion, inhalation – severe burns, excruciating pain, death. May be delayed up to 24 hours if the exposure is small. Fluoride ions will bind with the body’s calcium, depleting bones and disrupting biological processes/chemical signaling. **Concentrations as low as 2% may result in death.** | Fume hood, secondary containment | Training, read and understand the SDS, do not work alone.  | Lab coat, apron, gloves, face shield, goggles, long pants, fully enclosed shoes |
| **INSERT SPECIFIC HAZARDS/CONTROLS HERE** |  |  |  |

**Training Record**

Use the following table to record the training associated with this Standard Operating Procedure.

|  |  |  |
| --- | --- | --- |
| **Print Name** | **Signature** | **Date** |
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**Note: Attach to or file with written materials and methods**