

## **SAFETY INFORMATION**

### **Hydrofluoric Acid (HF) – Emergency Procedures**

First aid must be started within seconds in the event of contact of any form!

#### *Procedure for Skin Exposure to HF:*

1. Immediately flood the affected body area with cool water for a minimum of 5 minutes, if calcium gluconate is available. If no calcium gluconate is immediately available, continue rinsing the affected area until emergency medical responders arrive, using copious amounts of water. Remove contaminated clothing and footwear while rinsing.
2. Call or have a co-worker call 9-911 and Public Safety at X7000. Be sure to indicate that you were exposed to hydrofluoric acid.
3. Gently rub calcium gluconate ointment onto the affected area. Continue applying until emergency medical responders arrive.
4. Inform responders and all others that the exposure involved hydrogen fluoride/hydrofluoric acid.

#### *Eye or Inhalation Exposures to HF:*

1. Flush eyes with plenty of cool tap water for 15 minutes.
2. Move inhalation exposure victim to clean air.
3. Call or have a co-worker call 9-911 and Public Safety at X7000.
4. Await emergency medical responders, informing them and all others that the exposure involved hydrogen fluoride/hydrofluoric acid.

Hydrogen fluoride and hydrofluoric acid cause severe, deeply penetrating burns to the skin, eyes, and lungs. Although concentrated forms of these compounds are readily perceived by a burning sensation, more dilute forms are often imperceptible for many hours. This potential time delay between exposure recognition and treatment can lead to insidious and difficult-to-treat burns. If you work with hydrogen fluoride or hydrofluoric acid, make certain you and your co-workers familiarize yourselves with these first aid procedures, and keep an updated supply of 2.5% calcium gluconate ointment in the work area. This ointment is available from the Environmental Health & Radiation Safety Department in the Griffith Hall Central Stockroom.

## STANDARD OPERATING PROCEDURE FOR USING HYDROFLUORIC ACID

### Introduction:

Hydrofluoric acid (HF) has a number of chemical, physical and toxicological properties, which make handling this material especially hazardous. Anhydrous HF is a clear, colorless, fuming, corrosive liquid. HF is also available in the gaseous state. All forms including the solution or the vapor can cause severe burns to tissue.

### Uses:

Concentrated hydrofluoric acid is used in the fabrication of electronic components, to etch glass and in the manufacture of semiconductors. Dilute hydrofluoric acid solutions are used in some biological staining procedures.

### Chemical Properties:

Hydrofluoric acid solutions are clear and colorless with a density similar to that of water. The most widely known property of HF is its ability to dissolve glass. It will also attack glazes, enamels, pottery, concrete, rubber, leather, many metals (especially cast iron) and organic compounds. Upon reaction with metals, explosive hydrogen gas may be formed. Use and store HF in polyethylene, polypropylene, teflon, wax, lead or platinum containers.

### Toxicological Properties:

Fluoride ions are both acutely and chronically toxic. Acute effects of HF 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 hydrofluoric acid, seek medical attention immediately, even if you do not feel pain.**

### Exposure Control, Personal Protective Equipment (PPE) and Work Practices

The ACGIH ceiling limit and OSHA TWA for HF is 3 PPM. Local ventilation should always be used when working with HF. (Always work in a properly working fume hood.)

The purpose of personal protective equipment (PPE) is to shield the individual in the event of a release of vapor, a spill, or other incident. PPE is not a substitute for safe work practices. Eye protection in the form of

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safety glasses or goggles and a face shield should be used. Stanzoil Neoprene or Stanzoil Nitrile (22mil) gloves or other HF resistant gloves should be worn. It is also recommended that an acid resistant suit or apron be used. (Some clothing is able to absorb the toxic material and maintain it close to the skin).

In order to warn and protect others from the hazard of HF, a warning sign indicating the use of HF should be posted.

HF Kit:

Before beginning work involving HF, the following items must be available and located at the fume hood in the laboratory. These items should be placed in a zip-lock bag labeled "HF Kit" and the bag clipped to the fume hood.

- Container of calcium gluconate gel.
  - The gel can be obtained from the Stockroom only after completing this training document and returning the signed acknowledgement form.
  - The gel must be inspected before each use of HF to ensure the gel has not been removed or has not reached the expiration date. If a tube of the gel has been opened, a new container must be purchased and the old container discarded. No work with HF can be done with an expired tube of calcium gluconate gel.
- 2 pairs of Stanzoil Neoprene or Stanzoil Nitrile (22 mil) gloves.
- 1 heavy-duty polyethylene bag to be used for items contaminated by HF.
- Copy of the MSDS and the Agency for Toxic Substances and Disease Registry (ATSDR) Medical Management Guidelines for Hydrofluoric Acid (HF) to take to the emergency room.

***Emergency Response Procedures:***

Skin Exposure:

- Move the victim immediately under an emergency shower or other water source and flush the affected area with large amounts of cool running water for at least 1 minute. While the victim is flushing with water, they should also take off all clothing, shoes and jewelry, removing goggles last. Close your eyes, face water flow and pull goggles over head. **BE EXTREMELY CAREFUL NOT TO CONTAMINATE YOURSELF.** (USE Stanzoil Neoprene or Stanzoil Nitrile (22 mil) gloves LOCATED IN THE HF KIT TO ASSIST).

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- Remove all contaminated clothing while flushing with water. Some clothing is able to absorb the toxic material and maintain it close to the skin.
- While the victim is being rinsed with water, someone should call to arrange treatment by medical personnel. Call 911 and Public Safety at X7000 and tell the dispatcher the following:
  - There is a person that has been exposed to Hydrofluoric Acid and the victim is in this location.
  - Please send an officer and ambulance.

**Immediately washing off the acid is of primary importance!**

- After the affected area is flushed with copious amounts of water for at least one minute, calcium gluconate gel is to be applied using these guidelines. A 2.5% calcium gluconate gel will be located inside the HF kit on the fume hood within the laboratory. In order to prevent cross-contamination, the victim should self apply the calcium gluconate gel. If the victim is unable to self apply, anyone present can apply the gel after putting on the Stanzoil Neoprene or Stanzoil Nitrile (22ml) gloves in the HF kit. Do not use latex gloves; they are not effective against HF. Note the time when the calcium gluconate gel was first applied to the contaminated site. Provide this information to emergency personnel.
- The victim must be escorted to the hospital by the responding person or assisting laboratory personnel.
- A copy of the MSDS and the Agency for Toxic Substances and Disease Registry (ATSDR) Medical Management Guidelines for Hydrogen Fluoride must also be taken to the hospital.
- Instruct Public Safety to notify the hospital of person in transport with Hydrofluoric Acid exposure.

Eye Exposure:

- Immediately flush eyes for at least 5 minutes with copious cool flowing water. The victim should then be transported to a medical facility. Call 911 and Public Safety at X7000 and tell the dispatcher the following:
  - There is a person that has been exposed to Hydrofluoric Acid and the victim is in this location.
  - Please send an officer and ambulance.

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- The victim must be escorted to the hospital by the responding person or assisting laboratory personnel.
- A copy of the MSDS and the Agency for Toxic Substances and Disease Registry ((ATSDR) Medical Management Guidelines for Hydrogen Fluoride must also be taken to the hospital.
- Instruct Public Safety & Security to notify the hospital of person in transport with Hydrofluoric Acid exposure.

Inhalation:

If a large volume of Hydrofluoric Acid gas is inhaled:

- Immediately remove the victim to clean air. Call 911 and Public Safety at X7000.
- Instruct Public Safety to notify the hospital of person in transport with hydrofluoric acid exposure.
- Inhalation of Hydrofluoric Acid fumes may cause swelling in the respiratory tract up to 24 hours after exposure. Persons who have inhaled Hydrofluoric Acid vapors may need prophylactic oxygen treatment and must be seen by a physician as soon as possible.

**USING HYDROFLUORIC ACID SAFELY:**

- **Never use Hydrofluoric Acid when working alone or after hours.** Hydrofluoric Acid may be used when working alone during normal working hours provided knowledgeable laboratory personnel have been alerted and at least one is in the general vicinity.
- All laboratory personnel, not just those who will be using Hydrofluoric Acid, should 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.
- All persons who will be using Hydrofluoric Acid must be made aware of its properties and trained in proper procedures for use and disposal. This training must be done by the laboratory supervisor or principal investigator.
- Laboratories which keep or use Hydrofluoric Acid gas or concentrated solutions (>1% Hydrofluoric Acid) should have these emergency procedures on hand as well as an MSDS.

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- Laboratories which keep or use Hydrofluoric Acid gas or concentrated solutions (>1% Hydrofluoric Acid) must have an operational safety shower and eye wash in their laboratory.

Before beginning any procedure involving Hydrofluoric Acid, make sure the access to the emergency shower and eyewash is unobstructed. (Flush your eyewash for at least 3 minutes prior to beginning work).

- Undergraduate students should never be given the task of mixing Hydrofluoric Acid solutions. Only experienced persons familiar with its properties should handle the concentrated acid.
- A small supply of calcium carbonate or calcium hydroxide for spills should also be kept near the fume hood where the work will be conducted. If a small quantity (100 ml or less) of dilute Hydrofluoric Acid solution is spilled, clean it up by applying powdered calcium carbonate or calcium hydroxide, or use a commercial Hydrofluoric Acid spill kit. Again, have this available prior to beginning work. Bring spill residue/materials to the stockroom for disposal. Call the Griffith Hall Stockroom at X8843 or the Science & Technology Center Stockroom at X3141 to make sure someone is there to accept it. If a larger amount is spilled, or the acid is concentrated, contain the spill as best you can, evacuate the area, and call the Environmental Health & Radiation Safety Dept. at X8925 or X8843 during normal working hours. Contact Public Safety at X7000 after normal working hours.
- Dispose of unwanted hydrofluoric acid by bringing it to the Griffith Hall or Science & Technology Center Stockrooms in a sturdy unbreakable secondary container placed on a cart. Wear proper personal protective equipment.
- When working with Hydrofluoric Acid or concentrated HF solutions (>1%):

Work in a fume hood with the sash as low as possible. Wear goggles and a face shield. Wear a long-sleeved, buttoned lab coat, pants or long skirt, and closed-toe shoes. Wear Stanzoil Neoprene or Stanzoil Nitrile (22 ml) gloves or other Hydrofluoric Acid resistant gloves (hydrofluoric acid burns around the fingernails are extremely painful, difficult to treat, and may require surgical removal of the nail). A chemically resistant apron should also be worn.
- **Any exposure to Hydrofluoric Acid must be medically evaluated.**

**Safety Information Acknowledgement Form  
for the Use of Hydrofluoric Acid (HF)**

I have read, understood, and have implemented the applicable Safety information and Standard Operating Procedures for Hydrofluoric Acid.

**Print Name:** \_\_\_\_\_ **Date:** \_\_\_\_\_

**Signature:** \_\_\_\_\_

**Building/Room where work will be performed:** \_\_\_\_\_

**Phone:** \_\_\_\_\_ **Department:** \_\_\_\_\_

I have read, understood, and have implemented the applicable Safety information and Standard Operating Procedures for Hydrofluoric Acid.

**Principal Investigator Name (if different):** \_\_\_\_\_  
(Please Print)

**Principal Investigator Signature:** \_\_\_\_\_

**Date:** \_\_\_\_\_