



# Hydrofluoric Acid Fact Sheet



***This fact sheet is for general safety awareness. Individual Standard Operating Procedures for all experiments and processes involving hydrofluoric acid must be developed by the laboratory.***

## **PROPERTIES & HAZARDS**

Hydrofluoric acid (HF) is an extremely toxic and corrosive liquid. Solutions containing HF can cause serious health effects through any route of exposure. In addition to acid burns, the HF molecule readily penetrates the skin and can cause deep tissue damage, including destruction of the bone. Systemic effects can occur when fluoride ions bind to calcium and magnesium, forming insoluble salts. The depletion of calcium or magnesium can lead to irregular heart beat and death. Exposing only 1% of the body surface area (approximately the palm of your hand) to 50% or stronger solutions can be fatal. Exposure to dilute solutions (<20%) may not cause immediate pain or visible skin damage, but destruction of deeper tissues can continue and remain unnoticed for over 24 hours. Inhalation of HF vapor can immediately damage tissue of the nose, throat, and lungs and can cause potentially fatal delayed reactions such as pulmonary edema. It is critical to seek medical attention after any exposure, even if it seems minor and no pain is observed.

Commercial etchants may have HF as an active ingredient and should be treated in the same manner as other solutions of HF. Many chemicals containing fluorine, such as ammonium fluoride, sodium fluoride, sulfur tetrafluoride, trifluoroacetic acid and ammonium bifluoride, may react with acid or water to produce HF. HF can release hydrogen gas in contact with some metals which could present a flammability hazard. HF can also release toxic gases in contact with various chemicals or when in contact with water.

In Section 2 – Hazard Identification of the safety data sheet (SDS), or on chemical bottles, the following hazard classifications, pictograms and hazard statements will be listed. More information on material hazards can be found in complete hazard and precautionary statements.

Hazard Classification and Category	Pictogram	Hazard Statement
Acute Toxicity, Oral – Category 2 Acute Toxicity, Inhalation – Category 2 Acute Toxicity, Dermal – Category 1		Fatal if swallowed, in contact with skin, or if inhaled
Skin Corrosion – Category 1A Serious Eye Damage – Category 1		Causes severe skin burns Causes serious eye damage

## **CONTROLS**

### **Engineering Controls**

- Chemical fume hood
- Safety shower and eyewash station (within 55 feet of work area)

### **Personal Protective Equipment**

- A heavy-duty chemical resistant glove in a compatible material is recommended when handling concentrated HF or more than 1L. When working with smaller volumes double gloves is recommended. Consult glove manufacturer's chemical compatibility guides for best glove selection. SDS recommendations on glove type should be reviewed. For assistance choosing gloves contact ESSR
- Splash goggles
- Face shield
- Lab coat
- Chemical Resistant Apron

- Clothing that leaves no exposed skin on legs or feet
- Closed-toe shoes that fully cover the top of the foot

### **Training**

- Laboratory Specific Training must cover all processes using hydrofluoric acid and include information on safe use and emergency response.

### **STORAGE**

- All laboratories that store or use HF must have unexpired 2.5% calcium gluconate gel in a first aid kit, and a printed copy of the SDS to take to the health clinic in case of an exposure.
- Store HF solutions in a cool, dry, and well-ventilated place away from incompatible materials. Storage location must be consistent with storage recommendations on the Safety Data Sheet.
- Store HF solutions in corrosive resistant cabinets with secondary containment.
- Use polyethylene or fluorocarbon plastic containers for secondary containment.
- Avoid storage with glass, concrete, metals, water, other acids, oxidizers, reducers, alkalis, combustibles, organics, and ceramics.

### **USE**

- Always check that the calcium gluconate gel is present and unexpired prior to work with HF solutions.
- Use the minimum amount of HF required and keep solutions as dilute as possible. Consider substituting a less hazardous chemical, if available.
- Do not use HF solutions alone.
- Label all containers of HF solutions, even if you do not leave the area.

### **EMERGENCY RESPONSE**

#### **Exposure**

- Any exposure to HF solutions requires immediate first aid treatment and a medical evaluation, even if no pain is felt. Immediate first aid with calcium gluconate is critical to minimize further injury, however, as it is a topical gel it is not sufficient by itself to prevent serious tissue/bone damage caused by HF that has already absorbed through the skin. If you are exposed to HF in any amount or concentration, seek immediate medical attention by calling (301) 405-3333.
- If liquid is splashed in the eyes, flush with water for at least 15 minutes, and seek medical attention immediately. Do not apply calcium gluconate gel to eyes.
- In cases of skin exposure, rinse off affected skin immediately with copious amounts of water for 5 minutes; if necessary, use the safety shower. Remove contaminated clothes under running water, cut off contaminated clothing to avoid spreading HF exposure, and handle contaminated clothing with gloves. Apply calcium gluconate gel to the affected area while wearing a clean disposable glove. Repeat the application every 15 minutes until medical assistance arrives.
- In case of ingestion, immediately seek medical advice by dialing 911 or (301) 405-3333. Do not induce vomiting or give mouth to mouth resuscitation. Vomit should be treated as HF containing and is therefore hazardous.
- In cases of inhalation, move to fresh air until medical assistance arrives.

#### **Waste**

- Waste should be managed so that incompatible materials are not mixed.
- Waste containers should be compatible with their contents and should be segregated by hazard class into separate secondary containers. Glass containers should never be used to collect HF waste.
- For questions regarding waste management contact ESSR, Environmental Affairs at [envaffairs@umd.edu](mailto:envaffairs@umd.edu).

### **SPILL CLEANUP**

- For spill response consult the Emergency Response Guide in the laboratory for additional details. Minor spills can be typically handled by laboratory personnel. Note: Some spill kit materials may be incompatible with HF. For major spills consult the Emergency Response Guide and call (301) 405-3333 from a safe location.
- Have person knowledgeable of incident and laboratory remain available if possible to provide information to ESSR and emergency personnel.

## **REFERENCES AND ADDITIONAL RESOURCES**

1. OSHA [A Guide to the Globally Harmonized System of Classification and Labeling of Chemicals \(GHS\)](#)
2. OSHA [Occupational Exposure to Hazardous Chemicals in Laboratories](#)
3. [Hydrofluoric Acid Safety Data Sheet \(SDS\) – Sigma Aldrich](#)
4. Centers for Disease Control (CDC) [Facts About Hydrogen Fluoride](#)
5. PubChem [Hydrofluoric Acid](#)
6. University of North Carolina, EHS [Chemical Safety Information – Hydrofluoric Acid](#)
7. Princeton University, EHS [Hydrofluoric Acid](#)
8. University of California – Santa Cruz, EHS [Hydrofluoric Acid](#)
9. [Prudent Practices in the Laboratory: Handling and Management of Chemical Hazards](#), National Academy Press, Washington, DC, 2011.
10. [Cameo Chemicals](#)