

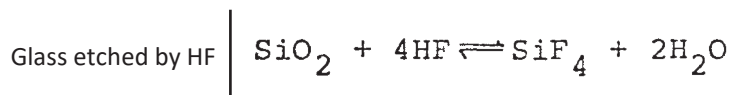
Anhydrous hydrogen fluoride (HF) is a highly corrosive, toxic, and volatile liquid or gas, usually supplied in steel cylinders. When dissolved in water, it forms hydrofluoric acid, a toxic corrosive solution. The acid dissolves silica and related materials; many applications in research labs rely on this property.

In all its forms, HF is exceptionally hazardous and requires great attention to safety planning and practice.

EFFECTS OF EXPOSURE

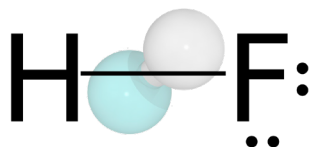
HF rapidly penetrates human tissue by all routes of exposure (skin contact, inhalation, ingestion). Fluoride binds to calcium ions resulting in severe toxic action which may initially be symptom-free, but could subsequently result in fatality. Toxic effects and symptoms may include:

- Severe, deep burns, due to tissue death. Burns may not appear until hours after the exposure.
- Eye irritation at low exposure, progressing to burns, corneal opacity, and potential destruction of eye at higher exposures.
- Respiratory tract irritation at low exposure, progressing to potentially fatal coughing, chest tightness, choking due to constriction of airway, internal burns, and pulmonary edema (fluid in lungs). Pulmonary edema may be delayed up to two days, and may be fatal.
- Nerve malfunction, causing extreme pain.
- Acute systemic toxicity, including heart arrhythmia, cardiac arrest, collapse, and death. This may occur from any route of HF exposure.
- Possible irreversible injuries include scarring, finger loss, limb amputation, blindness, and bronchitis.



SAFE WORK PRACTICES

- Do NOT work with HF when alone or after regular business hours.
- Work with HF in a ducted chemical fume hood only. Ensure that an eyewash/shower station is in the immediate vicinity.
- Keep calcium gluconate salve readily available.



WHAT I NEED TO KNOW...

- HF (aq, g) reacts with:
 - Base (sodium, potassium, ammonium hydroxides) violently.
 - Metals (steel) to produce flammable and explosive hydrogen gas. **NOTE:** Old gas cylinders of HF are especially dangerous since evolution of hydrogen gas will create excessive pressures.
- HF is NOT compatible with glass, ceramic, or metal containers. Keep in plastic containers.
- Store HF in a cool, well-ventilated area away from heat, sunlight, and combustibles.
- Email labsafety@usc.edu for more information and/or consultation.



- Hydrofluoric acid attacks glass, ceramics, and many metals. Always store and use in polyethylene, polypropylene, or PTFE vessels.
- Always store, transport, and use HF inside secondary containment.
- Cylinders of anhydrous HF may generate dangerous internal pressures upon long storage that may lead to explosions. Check the pressure periodically and keep a written or electronic log (text file, spreadsheet, or EHS database).
- Label all process containers and areas where HF is used.
- Purchase or create a HF spill kit that contains: calcium hydroxide (1 kg); thick butyl gloves; disposable neoprene gloves, hazwaste labels, thick Ziplock bags, small dustpan and brush, paper towels, and a plastic screw-top container suitable for holding solid waste.
- Always segregate HF waste in clearly labelled, thick polyethylene waste containers inside secondary containment.



- Keep HF Safety Data Sheet (SDS) readily available.
- Create a standard operating procedure (SOP) for handling HF and provide internal training to new users. EH&S (labsafety@usc.edu) can assist.

PPE AND ACCESSORIES

Wear appropriate PPE when working with HF and have essential accessories available:

- Lab coat (minimum standard cotton)
- Chemical resistant apron
- Splash goggles with face shield. Do NOT wear contact lenses
- Chemical-resistant gloves. Inspect all gloves carefully for pinholes before use. All gloves must be carefully decontaminated before removal. Recommended combination for highest protection is to double glove with disposable neoprene gloves over reusable butyl gloves. Disposable nitrile gloves are not acceptable for HF usage
- [Calgonate® HF first aid instructions](#). Read and understand instructions for use of Calgonate. Incorporate the instructions into the lab's HF SOP and print out for lab use. Additionally, keep a printed copy with the lab's HF first aid kit.
- HF first aid kit. Ensure that the kit contains non-expired calcium gluconate gel, non-expired milk of magnesia, and disposable neoprene gloves.
- [Honeywell® HF medical treatment document](#) and the HF SDS must be printed and kept in the lab. Provide the documents to medical responders in the event of an HF exposure.

FIRST AID MEASURES

In all instances, notify DPS at (213) 740-4321 UPC or (323) 442-1000 HSC of HF exposure and request medical assistance.

Inform medical personnel about HF exposure and supply them with SDS and Honeywell® documents.

- *Skin Contact* - Immediately (within seconds) wash affected area for at least 5 minutes using copious amounts of water. Remove all contaminated clothing immediately.
 - After thorough washing, immediately massage calcium gluconate gel into affected area (using gloves).

- Re-apply gel every 10 to 15 minutes until medical help arrives.
- If calcium gluconate gel is not available, continue rinsing with water until medical help arrives.
- *Eye Contact* - Immediately rinse eyes for 30 minutes. Do NOT apply calcium gluconate gel to eyes.
- *Ingestion* - Dilute the acid by drinking copious amounts of milk (preferable) or water. Do NOT induce vomiting.
- *Inhalation* - Immediately move to fresh air.

HAZARDOUS MATERIAL SPILL

- Notify staff and restrict access.
- Small spills inside a chemical fume hood can be cleaned with the HF spill kit. Follow steps outlined in [EH&S' Guide Sheet Hazardous Material Spill Clean-Up](#).
- For spills outside the chemical fume hood, throw absorbent material or pads on the spill before evacuating. Notify notify DPS immediately at (213) 740-4321 UPC or (323) 442-1000 HSC.
- For HF gas leaks, only attempt to stop gas flow if safe to do so. Otherwise, evacuate the area and notify DPS immediately at (213) 740-4321 UPC or (323) 442-1000 HSC.



REFERENCES

[Calcium Gluconate Gel](#)

[CDC/NIOSH - Hydrogen Fluoride](#)

[NIH/TOXNET - Hydrogen Fluoride](#)

[ASTDR - Hydrogen Fluoride, Anhydrous](#)

NIOSH Skin Notation Profiles - [Hydrogen Fluoride/Hydrofluoric Acid \(HF\)](#)

California Poison Control emergency treatment advice: 1-800-222-1222