

Hydrofluoric Acid Safe Handling and Use

Hydrofluoric acid (HF) is a corrosive acid used for many processes including mineral digestion, surface cleaning, glass etching, and biological staining. HF is a clear and colorless liquid with an irritating odor at low concentrations. HF is a very hazardous acid since it can quickly penetrate tissues causing deep tissue damage and systemic toxicity. Prevention of exposure or injury must be the primary goal when working with HF.

Many chemicals containing fluorine (e.g. ammonium fluoride, sodium fluoride, sulfur tetrafluoride, and ammonium bifluoride) may react with acid or water to produce HF. Review the MSDS of all fluoride compounds and ensure the appropriate safety precautions are followed to reduce risk of creating an HF hazard.

Health Hazards:

The health hazards of HF are dependent upon the concentration, temperature and nature of exposure.

HF readily penetrates human skin, allowing it to destroy soft tissues and decalcify bone. Skin exposure to strong acid concentrations (50% or greater) cause immediate serious and painful destruction of tissues. These high concentrations can lead to systemic toxicity. Skin exposure to HF at lower concentrations may not produce pain or burning sensations for up to twenty-four hours after exposure.

Exposure of the eyes to HF may result in blindness or permanent eye damage.

Inhalation of HF vapor can seriously damage the lungs with symptoms of exposure including coughing, choking, chest tightness, chills and fever not appearing for hours after the initial exposure.

Due to the delayed response, any skin, eye, or tissue contact with HF should receive immediate first aid and medical treatment, even if the injury appears minor and no pain is felt.

Safe Handling:

Any personnel handling HF must read the Material Safety Data Sheet (MSDS), this guideline document and receive job specific training on the hazards, safe handling, and what to do in the event of an exposure or spill of HF. The MSDS must be accessible and HF emergency procedures posted in the work area.

Any work with HF should be done inside a certified chemical fume hood to minimize inhalation of vapors. The fume hood should be identified with a sign to indicate that HF is used in the area. As well ensure the work surface is clean and free of clutter to avoid and safely manage any spills.

In addition, to minimize the risk of spills, limit the quantity of HF used and keep containers capped until actual use.

Personal Protective Equipment:

When using HF, you must wear the following protective equipment and follow these safety precautions:

- Laboratory coat and chemically resistant apron. Ensure closed toed shoes are worn and no exposed skin when handling HF or other corrosive materials.
- Always use goggles together with a face shield when handling concentrated HF to ensure no exposed skin and adequate eye protection is provided.
- Gloves shall be worn at all times when handling HF. Medium or heavyweight viton, nitrile, neoprene or butyl can be worn. A second pair of nitrile exam gloves should be worn under the gloves to protect against leaks. Always consult the manufacturer's glove selection guide when selecting gloves for HF use and inspect gloves prior to use. If gloves become contaminated with HF, remove them immediately, thoroughly wash hand, and check your hands for any sign of contamination. Contaminated gloves must be disposed of as HF waste.
- An emergency eyewash/shower is required within 5 seconds walking distance of the work area but no further than 6 meters (20 feet).
- In the case of HF skin exposure, calcium gluconate gel is a topical antidote that needs to be available. Disposable nitrile exam gloves shall also be available to apply the calcium gluconate gel. Ensure the shelf life of the gel is checked and replaced after the expiration date has passed.
- Never work alone or after hours with HF.

Spill response:

If the spill is beyond your capabilities to safely manage:

- Call Campus Security at 250-721-7599
- In case of serious injuries, also call 911 to summon an ambulance
- Secure the area to prevent others from entering and warn others
- If there is a spread of toxic materials, evacuate the building
- Remain near the scene in a safe location
- Identify yourself to the Campus Security Patrol Officer upon arrival

If the spill can be safely managed by you and your department:

- Get assistance and notify your supervisor. Never rush in or work alone
- Clearly assess the situation before starting clean up and use proper protective

equipment (*as noted in the above Personal Protective Equipment section*)

- Calcium based neutralizer such as lime or a spill absorbent specified for HF should be used for neutralization or clean up. DO NOT USE THE GREY SPILL PADS FOR HF CLEAN UP
- Add neutralizers slowly as the reaction can be vigorous and cover the entire area completely.
- Collect the wastes in a suitable container and request disposal from Occupational Health, Safety and Environment

If at any time additional assistance is required, contact Campus Security at 250-21-7599.

Note: Organic spill kits that contain Floor-dri, kitty litter, sand or the grey spill pads should NOT be used because HF reacts with silica to produce silicon tetrafluoride, a toxic gas.

HF spill kits are available through OHSE.

Storage

Glass, metal and ceramic containers are incompatible with HF and should never be used for storage or transfer. Use chemically compatible containers (made from polyethylene or Teflon) with a sealed lid and clearly labeled. Ensure HF is stored away from incompatible chemicals such as ammonia or other alkaline materials.

Waste

HF waste should be collected in a chemically compatible container with a sealed lid and clearly labeled as HF. Please ensure that each container contains a neon green hazardous waste sticker, which allows our waste contractors to identify containers that need to be removed. Extra stickers are available at Science Stores or by contacting Occupational Health, Safety and Environment.

HF waste can also be collected in the smaller aqueous acidic solutions container. Ensure the container is clearly labeled as HF waste. Complete the hazardous waste disposal form to request a pick-up of any hazardous waste.

Medical Emergency:

Often symptoms of HF exposure are delayed. Any skin, eye, or tissue contact with HF should receive immediate first aid and medical treatment, even if the injury appears minor and no pain is felt.

In the event of HF exposure, immediately start the first aid treatment to prevent burns and serious injury. **Call 911 and Campus Security at 7599.** Provide your name and location and indicate the person was exposed to hydrofluoric acid.

Skin Contact:

1. Immediately proceed to the nearest emergency shower and rinse the affected area thoroughly with water (minimum of 5 minutes).
2. While the victim is being rinsed with water, ensure 911 and Campus Security (7599) has been called for medical assistance.
3. Remove all contaminated clothing while continuing to flush the area with water.
4. Massage calcium gluconate gel into the affected area. Be sure to wear nitrile gloves to prevent possible secondary HF burns. Apply the gel frequently and massage continuously until pain and/or redness disappears or emergency medical assistance arrives.
5. Continue applying calcium gluconate gel to the affected area while transporting to the hospital.

Eye Contact:

1. Immediately proceed to the nearest eyewash station and flush eyes with water for at least 15 minutes. Ensure eyelids are open for thorough flushing.
2. While the victim is flushing eyes with water, ensure 911 and Campus Security (7599) has been called for medical assistance.
3. Continue washing the affected area until emergency medical assistance arrives.
4. Do not apply calcium gluconate gel to eyes.

Ingestion:

1. To dilute the acid, drink large quantities of milk, water, or milk of magnesia. Do not induce vomiting.
2. Ensure 911 and Campus Security (7599) has been called for immediate medical assistance.

Inhalation:

1. Immediately move to an area with fresh air. Ensure 911 and Campus Security (7599) has been called for medical assistance.

Note: To ensure medical personnel are aware of the hazards and treatment of any HF exposure, bring a copy of the MSDS sheet and this document as a further reference.

References

University of Pittsburgh, Guidelines for the Safe Use of Hydrofluoric Acid, March 2010.

Harvard University, Guidelines for the Safe Use of Hydrofluoric Acid, March 2007.

Honeywell, Recommended Medical Treatment for Hydrofluoric Acid Exposure, 2006.