

Best Practices for the Use of HF in Laboratories

Chemical Information

Aqueous HF is a colorless very corrosive liquid that fumes at concentrations greater than 48%. It attacks glass, concrete, and some metals, especially cast iron and alloys containing silica as well as organic materials such as leather, natural rubber, wood, and human tissue. Although HF is nonflammable, its corrosive action on metals can result in the formation of hydrogen in containers and piping, creating a fire and explosion hazard.

It is very aggressive physiologically because the fluoride ion readily penetrates the skin and may cause decalcification of the bones and systemic toxicity, including pulmonary edema, cardiac arrhythmia and death.

When exposed to air, concentrated solutions and anhydrous HF produce pungent fumes which are especially dangerous.

Personal Protective Equipment

You must wear a lab coat and a chemical apron, as well as safety goggles and a face shield. For briefly handling dilute solutions (under 30%), two pairs of nitrile gloves are sufficient. For longer handling or work with more concentrated solutions, wear longer gloves that cover the arm made of butyl rubber or neoprene. Silvershield, Viton, and Ansell barrier gloves are all rated for use with HF. Consult glove compatibility charts before use.

Storage and Disposal

HF should be stored in tightly closed its original container or compatible polyethylene containers. HF attacks glass and therefore should never be stored in a glass container. Store in a secondary container made of polyethylene. Do not store above eye level, or with oxides, bases, organic chemicals, or metals.

HF waste should be placed in a chemically compatible container that is clearly labeled with a Hazardous Waste label. HF containing waste must be disposed of through EH&S.

Experimental Procedures

Only use HF when necessary. Consider substitution of a less hazardous substance whenever possible.

Only use HF in a chemical hood.

Manipulation involving even small quantities of diluted HF solutions must be performed inside the hood. Keep the acid deep inside the fume hood and as far away as possible from the user. Wash your hands thoroughly with soap and water after handling HF.

Never work alone with HF and limit all HF manipulations to regular office hours when possible.

Ensure all containers of HF are clearly labeled. Always work with a chemically compatible secondary containment tray. Ensure HF containing vials and flasks are securely supported and not likely to tip over. Keep containers closed to minimize exposure and prevent etching of fume hood glass from HF vapors.

First Aid Information and Procedures

Spills: Any HF spill outside of a fume hood or any spill in a fume hood greater than 50mL should be treated as a large spill. **Do not attempt to clean up the spill yourself.** Evacuate the area, contact EH&S and wait by the building entrance for EH&S personnel.

Small spills under 50mL inside a fume hood can be cleaned by properly trained laboratory personnel with the appropriate supplies if they feel comfortable doing so.

Skin contact with acid concentrations in the 20% to 50% range may not produce clinical signs or symptoms for 1 to 8 hours. With concentrations less than 20%, the latent period may be up to 24 hours. The usual initial signs of a dilute solution HF burn are redness, swelling, and blistering, accompanied by severe throbbing pain. Burns larger than 25 in.² (160 cm²) may result in serious systemic toxicity.

Skin exposure:

1. **Call 911.** Immediately start rinsing under safety shower or other water source and flush affected area thoroughly with large amounts of water, removing contaminated clothing while rinsing. Speed and thoroughness in washing off the acid is of primary importance.
2. While wearing appropriate gloves to avoid a secondary HF burn, massage 2.5% (w/w) calcium gluconate gel onto the affected area after 15 minutes of flushing with water. If calcium gluconate gel is unavailable, continue flushing the exposed areas with water until medical assistance arrives.
3. Should medical attention take more than 15 minutes, reapply and massage the calcium gluconate gel into affected area of skin every 15 minutes until medical attention is obtained.
4. Send a copy of the safety data sheet (SDS) with the victim.

Eye exposure:

1. **Call 911.** Immediately flush the eyes, holding eyelids open, for at least 15 minutes with large amounts of gently flowing water, preferably using an eyewash station.
2. Do not apply calcium gluconate gel directly onto the eye.
3. Seek medical attention.
4. Send a copy of the SDS with the victim.

Inhalation:

1. **Call 911.** Immediately move to fresh air.
2. Send a copy of the SDS with the victim.

Ingestion:

1. **Call 911.** Ingestion of HF is a life-threatening emergency. Seek immediate medical attention.
2. Drink large amounts of water or milk as quickly as possible to dilute the acid.
3. Do not induce vomiting. Do not ingest emetics or baking soda. Never give anything by mouth to an unconscious person.
4. Send a copy of the-SDS with the victim.

All skin, eye, or tissue contact with HF solutions should receive immediate first aid as well as medical evaluation/treatment, even if the contamination appears minor.