

# Safe Handling Guide

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## Hydrofluoric acid

[HFA]

[7664-39-3]

**Hydrofluoric acid (HFA; HF)** is extremely hazardous and causes unique chemical burns. Aside from localized burns, systemic toxicity can arise as the absorbed fluoride ions react with a number of electrolytes (including calcium and magnesium) and proteins (including Na<sup>+</sup>/K<sup>+</sup> ATPase) with the potential to cause significant and potentially life-threatening electrolyte imbalances.

Exposures to even dilute solutions remain dangerous and symptoms may be delayed. Exposure to solutions >50% results in burns and tissue destruction that is immediately felt. Between 20-50%, symptoms may be delayed up to 8-hours. Below 20%, symptoms may take 24-hours to become apparent. Unlike other mineral acid burns, HFA chemical burns are not self-limiting. If not promptly treated, effects may continue for hours or days after initial exposure. Damage to airways and lungs can occur if aqueous HFA is inhaled as a mist, or HF gas is inhaled. HFA will release significant quantities of hydrogen fluoride gas (HF) even at room temperature.

HFA can dissolve glass and other silicon-containing compounds to produce silicon tetrafluoride, a hazardous colorless gas. HFA can dissolve most metals.

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### SIGNAL WORD: DANGER

### HAZARD SIGNS



- Fatal if inhaled, swallowed or absorbed through skin
- Both liquid and vapor can cause severe burns to all parts of the body
- Medical treatment is required for any exposure to HFA

# PRECAUTIONS

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## Before starting work:

- Review manufacturer's [Safety Data Sheet](#) and additional chemical information.
- Ensure that a written experimental protocol including safety information is available.
- Be familiar with the [Western Emergency Response Guide](#) and the [Exposure Response and Spill Response Posters](#).
- Create the most dilute solutions available that will meet experimental needs. Use only as much as you need.
- Identify the location of the nearest eyewash and shower and verify that they are accessible.
- Post a sign in the work area identifying "DANGER: Hydrofluoric Acid Use In This Area".
- Users of concentrations  $\geq 50$  % (w/w) should contact EHS and their department safety coordinator before use.
- Locate and verify that a full tube of unexpired Calcium gluconate (2.5%)(Calgonate) is immediately available for treatment of skin exposures.
- Locate and verify that appropriate HFA spill cleanup materials are available. Use only those reagents indicated for HFA cleanup. Reagents that are not suitable for HFA cleanup may result in increased HFA exposure. A dedicated HFA spill kit containing one of the following neutralizers is required (or a dilute solution of calcium or magnesium hydroxide):
  - Spilfyter Solidifying Neutralizer for HF Acids; #472101 (solid)
  - Amphomag Universal Spill Neutralizer (solid)
  - Ansul Spill-X-A Acid Neutralizer/Solidifier (solid)
  - PIG Hydrofluoric Acid Neutralizer; #GEN864 (liquid)
- This document does not address use, handling or storage of anhydrous hydrogen fluoride gas (HF)
- Do not perform hazardous HFA work alone. Another person knowledgeable in HFA emergency response procedures must be in the immediate vicinity.

## During work:

- AVOID INHALATION! Perform all operations in a certified chemical fume hood Always work at least 6 inches into the fume hood and behind the sash.
  - AVOID CONTACT! Wear appropriate PPE including:
    - Lab coat worn over long pants covering to the ankles and closed-toed non-woven footwear. On top of the lab coat, wear an acid-resistant apron.
    - Chemical protective goggles and face shield (Do not wear contact lenses while handling this substance).
    - Work behind a sash.
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# PRECAUTIONS

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- Wear appropriate chemically protective gloves at least 12 inches long and with a sufficient break-through time (BT).
  - For splash protection/intermittent contact of HFA <50%:
    - Minimum of 11mil Nitrile
    - Change gloves whenever you know or suspect they have become contaminated.
  - For more than intermittent contact or use of HFA >50% (these may also be used for splash protection, but are much thicker and bulkier than the gloves listed above):
    - MAPA Chem-Ply N 740 (BT >480/30mil) (Neoprene)
    - MAPA StanZoil NL-34/334 (BT>480/30mil)(Neoprene)
  - Whenever possible, wear a single nitrile glove underneath the glove types described above.
  - Gloves must be thoroughly inspected prior to each use. Do not use damaged gloves.
  - Gloves must be changed out as recommended based on manufacturer breakthrough time.
  - Use proper glove removal technique (without touching the outer glove surface) to avoid skin contact.
  - Wash hands and forearms thoroughly with soap and water each time gloves are removed.
- Use materials and containers appropriate for HFA use and remain aware of potential incompatibilities; Do not store in glass or metal containers. Plastic containers (e.g. polyethylene) must be used.
- Keep all containers tightly closed when not in use and during transport.

## After completing the work:

- Dispose of HFA waste following WWU Hazardous Waste Procedures
    - Hazardous Waste Classification: Corrosive/Toxic
    - Do not store waste in glass or metal containers! Primary and secondary containers must be plastic (e.g., polyethylene) and must remain sealed.
    - Return container to storage area:
      - Store in corrosive/acid storage cabinet or standard wooden cabinet (vented if feasible)
      - Store in original primary containers or other appropriate plastic containers. Do not store in glass or metal containers.
      - Store primary containers in designated plastic (polyethylene) secondary containment bin.
    - Wash hands and forearms thoroughly with soap and water before leaving the lab.
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# EMERGENCY PROCEDURES

## FIRST AID

**Call 360-650-3911 or 911 as soon as possible following exposure and follow procedures to get medical attention immediately, even if you do not feel pain. Anyone who assists in first aid response must first don appropriate PPE to prevent being exposed to HFA.**

## SKIN CONTACT

- If the exposure is limited to HF and other water-soluble substances, 5 minutes of water decontamination after the removal of all PPE, clothing, and jewelry is sufficient. Concomitant exposure with hydrocarbons or other substances with limited water solubility require longer water decontamination or the use of other decontaminating agents. If a more definitive treatment (0.13% benzalkonium chloride solution or 2.5% calcium gluconate) is not available, water irrigation should continue until one of these agents is available or transportation to a medical facility is initiated.
- Following water flushing, apply calcium gluconate gel or benzalkonium chloride solution by massaging into the exposed area using a clean pair of gloves. Affected areas do not need to be dried prior to application. Reapply every 10-15 minutes until emergency medical help arrives.
- Call 360-650-3911 or 911 for emergency assistance and provide SDS sheet to responders/physicians.

## EYE CONTACT

- Using eyewash, flush eyes for 15 minutes while hold eyelid open and away from exposed eye. Remove contacts lenses. If sterile 1% calcium gluconate solution is available, after 5 minutes of flushing with water, continuously irrigate the eyes with this solution.
- Call 360-650-3911 or 911 for emergency assistance and provide SDS sheet to responders/physicians.
- Continue flushing with water until emergency medical personnel arrive.

## INHALATION

- If mist or vapors are inhaled, immediately move to fresh air. If breathing has stopped, avoid mouth-to-mouth resuscitation as it may be dangerous to the individual providing aid. Start artificial respiration with an indirect method such as an "AMBU" bag if available.
- Call 360-650-3911 or 911 for emergency assistance and provide SDS sheet to responders/physicians.

## INGESTION

- Do not induce vomiting.
- Call 360-650-3911 or 911 for emergency assistance and provide SDS sheet to responders/physicians.

**In-depth first aid procedures can be found from Honeywell's  
Recommended Medical Treatment for Hydrofluoric Acid Exposure**



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## SPILL RESPONSE

### OUTSIDE FUME HOOD

- Alert others and evacuate to a safe distance and prevent entry.
- Avoid inhalation of vapors and contact with spill.
- Contact EHS at 360-650-3064 during business hours or emergency services at either 360-650-3911 or 911 outside of business hours.
- Remain in a safe location until EH&S or other response personnel arrive.

### INSIDE FUME HOOD (< 500 ml)

- Alert others of the spill.
  - Do Not Work Alone! A team of two or more individuals that are trained and confident is required to cleanup HFA spills < 500mL. Otherwise close fume hood, evacuate to a safe distance and await support.
  - Apply HFA neutralizer wearing PPE described above including face shield.
  - Absorb with appropriate absorbent only after neutralization.
  - Contact EHS at 360-650-3064 during business hours or emergency services at either 360-650-3911 or 911 outside of business hours.
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