HF Safety

Overview

- Similar to other acids:
  - Fuming liquid, very strong respiratory irritant and corrosive to skin
  - Moderately high vapor pressure
- Unlike other acids:
  - Deeply penetrating; symptoms can be delayed for hours
  - Dilute solutions can cause serious, painful delayed burns
  - Splashes of 100-200 ml of concentrated solutions on the body have caused fatalities

Chemical & Physical Properties

- Common concentrations range from 2%-100% (anhydrous)
- Clear, colorless liquid OR dense white vapor
- Highly corrosive
- Non-flammable
- Intolerable, pungent odor
- Odor threshold 0.04 to 0.13 ppm
- Boiling Point @ 67 °F (19.5°C)

Chemical & Physical Properties

- Reactivity:
  - Will attack & dissolve glass, ceramics, leather, natural gum rubber and metals containing silica
  - May react with metals to form explosive hydrogen gas
  - Can react violently with other organics and solvents (check compatibility)

Exposure Limits

- Exposure Limits:
  - TLV- 3ppm (Ceiling)
  - PEL- 3ppm (TWA)
  - STEL- 6ppm (15 min.)
  - IDLH- 30ppm

Hazards

- ***A major exposure to concentrated HF can bind the body's calcium stores from the bones, causing seizures, bone destruction and death.***
- Injuries are dependent on concentration and route of exposure.
- Injuries from dilute HF may be delayed up to 24 hours; there may be no pain immediately following exposure.
- Relief of pain is an important guide to success of treatment.

Inhalation Hazards

- Mild Exposure (3-15 ppm):
  - Irritation of nose, throat, respiratory system. Onset may be delayed.
  - Shortness of breath, coughing and labored breathing.
- Severe Exposure:

- Nose, throat burns, edema, spasm, swelling, lung inflammation and pulmonary edema. Hypocalcemia possible.

Absorption Hazards
- Eye:
  - Liquid and vapor can cause irritation, corneal burns and destruction of eye tissues.
- Skin:
  - SERIOUS, PAINFUL BURNS TO SKIN.
  - Immediate effect upon exposure to strong concentra-tion (>50%) and vapors; symptoms may not show for 8 hrs. if concentration in 20% to 50% range.
  - May have 24 hr. latency for exposures to <20% concentration.

Ingestion Hazards
- Acute exposure:
  - Severe burns to mouth, esophagus and stomach.
  - Severe systemic effects also possible.
  - INGESTION OF EVEN SMALL AMOUNTS OF HF MAY BE FATAL.

Working Safely with HF
- Work in the fume hood
- Transport containers and pour CAREFULLY
- ADD ACID TO WATER
- Make sure fume hood is working properly – keep sash down
- Wear PPE

PPE - Eyewear
- Safety glasses
- Goggles (splash-proof)
- Face shields
- Store in an area where they can remain free of contamination and damage (drawer or plastic bag)

PPE - Gloves
- Wear appropriate gloves (Butyl rubber, Saranex, or Tychem. Neoprene, Viton, Polyethylene, Natural Rubber for short times only)
- Check for leaks each time used - change as needed (inner/outer)

PPE - Chemical Resistant Clothing
- Chemical aprons
- Lab coats
- Coveralls
- Rubber boots
- Closed toed shoes
- **No** shorts
- Clothes that cover the body

Safety Equipment
- All lab personnel should know where to find – and how to use:
  - Eyewash and safety shower
  - Spill kit

- First-aid kit – calcium gluconate, gloves
- Fire extinguisher

Emergency Numbers
- Should be posted near the phone
- Provide a list of who to call in emergencies and their numbers
- "2222" on campus phones

Written References – Chemical Inventory and MSDS
- Each lab should have a Chemical Inventory and Chemical Hygiene Plan
- For each hazardous chemical, the lab should have an MSDS
- Lab personnel must know the location
- Provide copy to emergency personnel

Storage and Compatibility of HF
- Store in a cool, dry place, away from light and ignition sources
- DO NOT store HF in glass container – use plastic or teflon
- Keep containers in corrosive-resistant secondary containment
- Segregate from incompatible materials, including strong bases, metals, glass, water, cyanides

Proper Disposal of HF Acid Waste
- Store in sealed plastic/teflon bottles
- Do not fill bottles to the top
- Fill out a UB hazardous waste label for each bottle when the first drop is added
- Fax EH&S for pickup when bottles full

General Safety
- Keep the lab clean
- ***Do not*** eat, drink or store food/drinks in work areas
- Make sure all containers of HF are properly labeled
- Keep aisles clear
- Keep eyewashes and safety showers accessible

Personnel Exposed to HF
- Contaminated personnel should:
  - ACT IMMEDIATELY!!!
  - Get another person to help if possible
  - Remove contaminated clothing
  - Flush the affected area of the body for a minimum of 15 minutes under the nearest safety shower
  - If calcium gluconate is available, flush skin for 5 minutes and apply
  - If eyes are affected, use the nearest eyewash for a minimum of 15 minutes
  - If ingested, dilute with water, milk or milk of magnesia – do NOT induce vomiting
  - SEEK MEDICAL ATTENTION
  - WEAR GLOVES IF YOU HELP SOMEONE WHO HAS BEEN EXPOSED TO HF

References
- For more information, contact:
  - Your investigator/professor/teacher

- EH&S at 829-2401 or www.ehs.buffalo.edu
- Honeywell website - http://www.honeywell.com/sites/sm/chemicals/hfacid/Tech_Services.htm
- CDC website - http://www.bt.cdc.gov/agent/hydrofluoricacid/basics/facts.asp
- U. of Delaware website - http://www.udel.edu/OHS/hfsop.html