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 concentration (>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
• CDC website - http://www.bt.cdc.gov/agent/hydrofluoricacid/basics/facts.asp
• U. of Delaware website - http://www.udel.edu/OHS/hfsop.html