

# *Buffered HF Oxide Etch*

*(Applicable to all HF containing solutions)*

## *Ingredients:*

- Ammonium Fluoride
- Hydrogen Fluoride
- Water

## *Synonyms*

- Aqueous NH<sub>4</sub>-HF Etchant Solutions

## *Physical Data*

- |                                 |                   |
|---------------------------------|-------------------|
| • Appearance:                   | Colourless liquid |
| • % Volatiles by Volume @ 21°C: | 70°F              |
| • Melting Point:                | 18°C (64° F)      |
| • Solubility:                   | Soluble in water  |
| • Specific Gravity:             | 1.10              |
| • pH: 1.0                       | (0.10M HF)        |

## *Hazardous Decomposition*

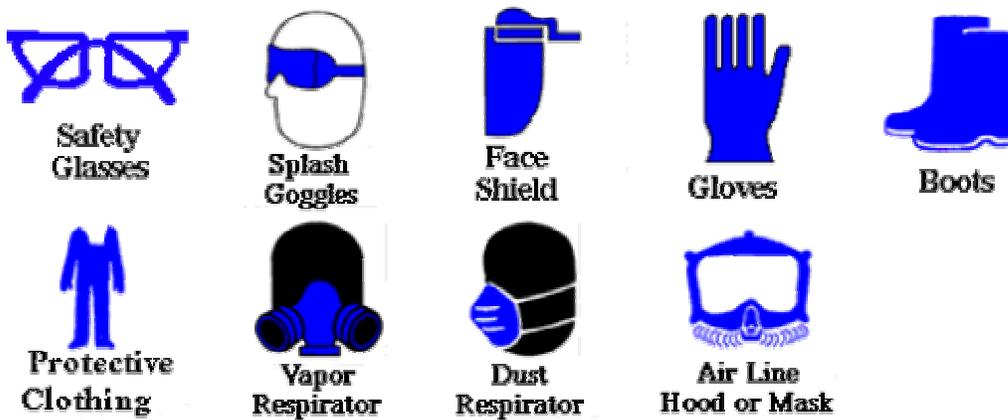
- On heating to decomposition, could yield toxic fumes of fluorides, nitric oxides and ammonia. On contact with metals, liberates hydrogen gas. Attacks glass and other silicon containing compounds. Reacts with silica to produce silicon tetrafluoride, a hazardous colourless gas.

## *Incompatibles*

- Ammonium fluoride reacts with:
  - strong acids to produce hazardous hydrogen fluoride gas or hydrofluoric acid.
  - strong bases to yield ammonia.
- Hydrofluoric acid is incompatible with:
  - arsenic trioxide
  - phosphorous pentoxide
  - ammonia
  - calcium oxide
  - sodium hydroxide
  - sulfuric acid
  - vinyl acetate
  - ethylenediamine
  - acetic anhydride
  - alkalis
  - organic materials
  - most common metals

- rubber
- leather
- water
- strong bases
- carbonates
- sulfides
- cyanides
- oxides of silicon, especially glass, concrete, silica, fluorine.
- Will also react with steam and water to produce toxic fumes.
- Avoid strong oxidizing agents.
- Avoid heat, moisture.

### **Protective Equipment**



### **Eyes**

- Use chemical safety goggles and/or a full face shield where splashing is possible. Maintain eye wash fountain and quick drench facilities in work area.

### **Skin**

- Wear protective clothing including boots or safety shoes with polyvinyl chloride (PVC) or neoprene.
- Use chemical safety goggles and/or a full faceshield.
- Wear coveralls with long sleeves, gauntlets and gloves of PVC or neoprene.
- A high degree of protection is obtained with an air-inflated suit with mask and safety belt.
- Use protection suitable for conditions.

### **Respiratory**

- If the exposure limit is exceeded, a full facepiece respirator with an acid gas cartridge may be worn up to 50 times the exposure limit or the maximum use concentration specified by the appropriate regulatory agency or regulatory supplier, whichever is lowest.

- For emergencies or instances where the exposure limits are not known, use a full-facepiece positive-pressure, air-supplied respirator. WARNING: Air purifying respirators do not protect workers in oxygen-deficient atmospheres. Since the IDLH is low (30ppm), the above cartridge system is not specifically approved for HF. (3M Respirator Section Guide)

### Special Precautions

- **Ventilation:**
  - A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is usually preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document "Industrial Ventilation, A Manual of Recommended Practices", most recent edition, for details.
- **Storage and Handling:**
  - Keep in tightly closed polyethylene containers.
  - Store in a cool, dry place with adequate ventilation separated from other chemicals.
  - Protect from physical damage
  - Storage facilities should be constructed for containment and neutralization of spills.
  - Handling and storage of HF requires special materials and technology for containers, pipes, valves, etc., which is available from suppliers.
  - Containers of this material may be hazardous when empty since they retain product residues (vapours, liquid); observe all warnings and precautions listed for the product.

### Toxicity

- Hydrofluoric acid
- Inhalation rat LC50: 1276 ppm/1H
- Investigated as a mutagen, reproductive effector, systemic poison

### Health

#### Effects:

- **Inhalation:** Severely corrosive to the respiratory tract. May cause sore throat, coughing, laboured breathing and lung congestion/ inflammation. May be absorbed through inhalation of vapours. Symptoms parallel those following ingestion exposure.
- **Eyes:** Corrosive to the eyes. Symptoms of redness, pain, blurred vision, and permanent eye damage may occur.

- **Skin:** Corrosive to the skin. Skin contact causes serious skin burns which may not be immediately apparent or painful. Symptoms may be delayed 8 hours or longer. The fluoride ion readily penetrates the skin causing destruction of deep tissue layers and even bone.
- **Ingestion:** Corrosive. May cause sore throat, abdominal pain, diarrhea, vomiting, severe burns of the digestive tract, kidney dysfunction and brain damage. Affects the heart and circulatory system.

### Chronic Effects:

- Intake of more than 6 mg of fluorine per day may result in fluorosis, bone and joint damage. Hypocalcemia and hypomagnesemia can occur from absorption of fluoride ion into blood stream.

### Medical Conditions Aggravated by Exposure:

- Persons with pre-existing skin disorders, eye problems, or impaired kidney or respiratory function may be more susceptible to the effects of this substance.

### First Aid:

- **Inhalation:** Get medical help immediately. If patient is unconscious, give artificial respiration or use inhalator. Keep patient warm and resting, and send to hospital after first aid is complete.
- **Eyes:** FOR ACID IN THE EYES:
  - 1) Irrigate the eyes for at least 30 minutes with copious amounts of water, keeping the eyelids apart and away from the eyeballs during irrigation.
  - 2) Get competent medical attention immediately, preferably an eye specialist.
  - 3) If a physician is not immediately available, apply one or two drops of 0.5% Pontocaine Hydrochloride solution.
  - 4) Do not use oily drops or ointment. Place ice pack on eyes until reaching emergency room.
- **Skin:** FOR ACID BURNS TO THE BODY:
  - 1) Remove the victim from the contaminated area and immediately place him under a safety shower or wash him with a water hose, whichever is available.
  - 2) Remove all contaminated clothing.
  - 3) Keep washing with large amounts of water for a minimum of 15 to 20 minutes.
  - 4) Have someone make arrangements for medical attention while you continue flushing the affected area with water.
  - 5)a) If available, after thorough washing, the burned area should be immersed in a solution 0.13% iced aqueous Benzalkonium Chloride. If immersion is not practical, towels should be soaked with one of the above solutions and used as a compress for the burn area. Ideally, compresses should be changed every 2 minutes.
  - 5)b) An alternative treatment to 5a is for the physician to inject sterile 10% aqueous calcium gluconate solution subcutaneously beneath, around and in the burned area. Initially use no more than 0.5 cc per square centimeter and

do not distort appearance of skin. If pain is not completely relieved, additional treatment is indicated.

- 6) Seek medical attention as soon as possible for all burns regardless of how minor they may appear initially. Hyamine 1622 is a trade name for Tetracine Benzethonium Chloride, Merck Index Monograph 1078, a quaternary ammonium compound sold by Rohm & Haas, Philadelphia. Zephiran Chloride is a trade name for Benzalkonium Chloride, Merck Index Monograph 1059, also a quaternary ammonium compound, sold by SANOFI Winthrop Pharmaceutical, New York, NY.
- **Ingestion:** If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. Get medical attention immediately.

### *PEL/TLV*

#### **PEL**

- HF    **PEL**            **3ppm (TWA).**

#### **TLV**

- HF    **TLV**            **3ppm Ceiling as F.**

### *Fire Hazard Data*

- **Fire:** Not considered to be a fire hazard. If involved with a fire, can emit toxic fumes and irritating and corrosive gases.
- **Explosion:** Violent exothermic reaction occurs with water. Sufficient heat may be produced to ignite combustible materials. Reacts with metals forming flammable Hydrogen gas.
- **Extinguishing Media:** Keep upwind of fire. Use water or carbon dioxide on fires in which Hydrofluoric Acid is involved . Halon or foam may also be used. In case of fire, the sealed containers can be kept cool by spraying with water.
- **Special Fire-Fighting Procedures:** In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode. Avoid getting water in tanks or drums; water can cause generation of heat and spattering. In contact with air, the acid gives off corrosive fumes which are heavier than air.

## *Disposal*

### **Spill Procedures:**

- Notify safety personnel, provide adequate ventilation, and remove ignition sources since hydrogen may be generated by reactions with metals. Wear appropriate personal protective equipment as specified. Do not flush sewers or waterways. Spills: Evacuate the danger area. Apply chemical spill absorbent or magnesium sulfate (dry) to the spill area. Follow up with inert absorbent and add soda ash or magnesium oxide and slaked lime. Collect in appropriate plastic containers and save for disposal. Wash spill site with soda ash solution. NOTE: Porous materials (concrete, wood, plastic, etc.) will absorb HF and become a hazard for an indefinite time. Such spills should be cleaned and neutralized immediately. 'Low Na+' acid neutralizer is recommended for spills of this product.

### **Disposal:**

- Used BHF should be handled as serious hazardous waste and disposed as Toxic waste.