1. Product Identification

**Synonyms:** Aqueous NH₄-HF Etchant Solutions
**CAS No.:** Not applicable to mixtures.
**Molecular Weight:** Not applicable to mixtures.
**Chemical Formula:** Not applicable to mixtures.
**Product Codes:** 1178, 5098, 5109, 5173, 5192, 5175, 5120, 5326, 5329, 5338, 5359, 5360, 5361, 5843, 9294

2. Composition/Information on Ingredients

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>CAS No.</th>
<th>Percent</th>
<th>Hazardous</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ammonium Fluoride</td>
<td>12125-01-8</td>
<td>30 - 50%</td>
<td>Yes</td>
</tr>
<tr>
<td>Hydrogen Fluoride</td>
<td>7664-39-3</td>
<td>0.5 - 10%</td>
<td>Yes</td>
</tr>
<tr>
<td>Water</td>
<td>7732-18-5</td>
<td>40 - 70%</td>
<td>No</td>
</tr>
</tbody>
</table>

3. Hazards Identification

**Emergency Overview**

POISON! DANGER! CORROSIVE. EXTREMELY HAZARDOUS LIQUID AND VAPOR. CAUSES SEVERE BURNS WHICH MAY NOT BE IMMEDIATELY PAINFUL OR VISIBLE. MAY BE FATAL IF SWALLOWED OR INHALED. LIQUID AND VAPOR CAN BURN SKIN, EYES AND RESPIRATORY TRACT. CAUSES BONE DAMAGE. AFFECTS RESPIRATORY SYSTEM, HEART, CIRCULATORY SYSTEM, CENTRAL NERVOUS SYSTEM AND KIDNEYS. HARMFUL IF ABSORBED THROUGH SKIN. REACTION WITH CERTAIN METALS GENERATES FLAMMABLE AND POTENTIALLY EXPLOSIVE HYDROGEN GAS.

**J.T. Baker SAF-T-DATA™ Ratings (Provided here for your convenience)**

| Health Rating: 4 - Extreme (Poison) |
| Flammability Rating: 0 - None         |
| Reactivity Rating: 2 - Moderate       |
| Contact Rating: 4 - Extreme (Corrosive) |

**Lab Protective Equip:** GOGGLES & SHIELD; LAB COAT & APRON; VENT HOOD; PROPER GLOVES

**Storage Color Code:** White (Corrosive)

**Potential Health Effects**

Exposure to hydrofluoric acid can produce harmful health effects that may not be immediately apparent. If inhaled or swallowed, this compound can cause fluoride poisoning. Early symptoms include nausea, vomiting, diarrhea, and weakness. Later effects include central nervous system effects, cardiovascular effects and death.

**Inhalation:**
Severely corrosive to the respiratory tract. May cause sore throat, coughing, labored breathing and lung congestion/inflammation. May be absorbed through inhalation of vapors. Symptoms parallel those following ingestion exposure.

**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.

**Skin Contact:**
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.

**Eye Contact:**
Corrosive to the eyes. Symptoms of redness, pain, blurred vision, and permanent eye damage may occur.

**Chronic Exposure:**
Intake of more than 6 mg of fluorine per day may result in fluorosis, bone and joint damage. Hypocalcemia and hypomagnesemia can occur from
5. Fire Fighting Measures

Fire:
Not considered to be a fire hazard. If involved in 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.

Fire 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 Information:
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.

6. Accidental Release Measures

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 in Section 8. Do not flush to sewers or waterways. Spills: Evacuate the danger area. Apply 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. US Regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities. The toll free number for the US Coast Guard National Response Center is (800) 424-8802.

J. T. Baker TEAM(R) 'Low Na+' acid neutralizer is recommended for spills of this product.

7. Handling and Storage

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 (vapors, liquid); observe all warnings and precautions listed for the product.

8. Exposure Controls/Personal Protection

Airborne Exposure Limits:
Hydrogen fluoride:
- OSHA Permissible Exposure Limit (PEL):
  3 ppm (TWA)
- ACGIH Threshold Limit Value (TLV):
  3 ppm Ceiling as F.

Ventilation System:
A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally 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.

Personal Respirators (NIOSH Approved):
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 respirator supplier, whichever is lowest. For emergencies or instances where the exposure levels 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 (30 ppm), the above cartridge system is not specifically approved for HF. (3M Respirator Selection Guide)

Skin Protection:
Wear protective clothing, including boots or safety shoes with polyvinyl chloride (PVC) or neoprene. Use chemical goggles and/or a full face shield. 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.

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

9. Physical and Chemical Properties

Appearance:
Colorless liquid.

Odor:
No information found.

Solubility:
Soluble in water.

Specific Gravity:
1.10

pH:
1.0 (0.10M HF)

% Volatiles by volume @ 21C (70F):
80
10. Stability and Reactivity

Stability:
Stable at room temperature (68°F) when stored and used under proper conditions.

Hazardous Decomposition Products:
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 colorless gas.

Hazardous Polymerization:
Will not occur.

Incompatibilities:
Hydrofluoric acid is incompatible with arsenic trioxide, phosphorus 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 or water to produce toxic fumes. Ammonium fluoride reacts with strong acids to produce hazardous hydrogen fluoride gas or hydrofluoric acid. Reacts with strong bases to yield ammonia. Avoid strong oxidizing agents.

Conditions to Avoid:
Heat, moisture, incompatibles.

11. Toxicological Information

Hydrofluoric acid: Inhalation rat LC50: 1276 ppm/1H; Investigated as a mutagen, reproductive effector.

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>Known</th>
<th>Anticipated</th>
<th>IARC Category</th>
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<tr>
<td>Ammonium Fluoride (12125-01-8)</td>
<td>No</td>
<td>No</td>
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<tr>
<td>Hydrogen Fluoride (7664-39-3)</td>
<td>No</td>
<td>No</td>
<td>None</td>
</tr>
<tr>
<td>Water (7732-18-5)</td>
<td>No</td>
<td>No</td>
<td>None</td>
</tr>
</tbody>
</table>

12. Ecological Information

Environmental Fate:
If the pH is > 6.5, soil can bind fluorides tightly. High calcium content will immobilize fluorides, which can be damaging to plants when present in acid soils.

Environmental Toxicity:
This material is expected to be slightly toxic to aquatic life.

13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be handled as hazardous waste and sent to a RCRA approved incinerator or disposed in a RCRA approved waste facility. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

14. Transport Information

Domestic (Land, D.O.T.)

Proper Shipping Name: RQ, CORROSIVE LIQUIDS, TOXIC, N.O.S. (HYDROFLUORIC ACID, AMMONIUM FLUORIDE)
Hazard Class: 8, 6.1
UN/NA: UN2922
**Packing Group: II**
Information reported for product/size: 130LB

**International (Water, I.M.O.)**

**Proper Shipping Name:** CORROSIVE LIQUIDS, TOXIC, N.O.S. (HYDROFLUORIC ACID, AMMONIUM FLUORIDE)
Hazard Class: 8, 6.1
UN/NA: UN2922
Packing Group: II
Information reported for product/size: 130LB

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### 15. Regulatory Information

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#### Chemical Inventory Status - Part 1

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#### Federal, State & International Regulations - Part 1

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#### Federal, State & International Regulations - Part 2

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<tr>
<td>Water (7732-18-5)</td>
<td>No</td>
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</tr>
</tbody>
</table>

Chemical Weapons Convention: No  TSCA 12(b): No  CDTA: No
SARA 311/312: Acute: Yes  Chronic: Yes  Fire: No  Pressure: No
Reactivity: No  (Mixture / Liquid)

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**Australian Hazchem Code:** No information found.

**Poison Schedule:** S6

**WHMIS:**
This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

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### 16. Other Information

**NFPA Ratings:** Health: 4  Flammability: 0  Reactivity: 1

**Label Hazard Warning:**
POISON! DANGER! CORROSIVE. EXTREMELY HAZARDOUS LIQUID AND VAPOR. CAUSES SEVERE BURNS WHICH MAY NOT BE IMMEDIATELY PAINFUL OR VISIBLE. MAY BE FATAL IF SWALLOWED OR INHALED. LIQUID AND VAPOR CAN BURN SKIN, EYES AND RESPIRATORY TRACT. CAUSES BONE DAMAGE. AFFECTS RESPIRATORY SYSTEM, HEART, CIRCULATORY SYSTEM, CENTRAL NERVOUS SYSTEM AND KIDNEYS.
HARMFUL IF ABSORBED THROUGH SKIN. REACTION WITH CERTAIN METALS GENERATES FLAMMABLE AND POTENTIALLY EXPLOSIVE HYDROGEN GAS.

**Label Precautions:**
Do not get in eyes, on skin, or on clothing.
Do not breathe vapor.
Keep container closed.
Cool before opening.
Use only with adequate ventilation.
Wash thoroughly after handling.
Store in a tightly closed container.

**Label First Aid:**
IN ALL CASES, CALL PHYSICIAN IMMEDIATELY. First Aid procedures should be pre-planned for HF emergencies. A supply of 50:50 water/magnesium sulfate paste or 2 1/2% Calcium Gluconate paste should be available where first aid medications are administered. If ingested, DO NOT INDUCE VOMITING. If patient is conscious, give large quantities of milk or water and send to hospital. If inhaled and patient is unconscious, give artificial respiration or use inhalator and send to hospital. In case of eye contact, wash open eyes with large but gentle stream of water for 15 minutes. Place ice pack on eyes until reaching emergency room. In case of skin contact, remove contaminated clothing and wash burn area with plenty of water to remove acid. Cover burn area with a poultice of 50:50 water/magnesium sulfate paste or 2 1/2% calcium gluconate paste. Leave in place until medical help arrives or patient is transferred to hospital.

**Product Use:**
Laboratory Reagent.

**Revision Information:**
MSDS Section(s) changed since last revision of document include: 4.

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