SAFETY DATA SHEET

1. Identification

**Product identifier:** BUFFERED OXIDE ETCH

**Other means of identification**

**Product No.:** 5554, 5540, 1188, 1198, 1178, 5361, 5329, 5326, 5192, 9354, 5175, 5173, 9294

**Recommended use and restriction on use**

**Recommended use:** Not available.

**Restrictions on use:** Not known.

**Manufacturer/Importer/Supplier/Distributor Information**

**Manufacturer**

**Company Name:** Avantor Performance Materials, Inc.
**Address:** 3477 Corporate Parkway, Suite 200
Center Valley, PA 18034
**Telephone:** Customer Service: 855-282-6867
**Fax:**
**Contact Person:** Environmental Health & Safety
**e-mail:** info@avantormaterials.com

**Emergency telephone number:**

24 Hour Emergency: 908-859-2151

Chemtrec: 800-424-9300

2. Hazard(s) identification

**Hazard Classification**

**Physical Hazards**

- Corrosive to metals Category 1

**Health Hazards**

- Acute toxicity (Oral) Category 2
- Acute toxicity (Dermal) Category 2
- Acute toxicity (Inhalation - vapor) Category 2
- Skin Corrosion/Irritation Category 1
- Serious Eye Damage/Eye Irritation Category 1
- Specific Target Organ Toxicity - Single Exposure Category 1
- Specific Target Organ Toxicity - Repeated Exposure Category 1

**Label Elements**

**Hazard Symbol:**

- Corrosive symbol
- Poison symbol
- Eye irritation symbol

**Signal Word:** Danger
Hazard Statement: May be corrosive to metals. Fatal if swallowed. Fatal in contact with skin. Fatal if inhaled. Causes severe skin burns and eye damage. Causes damage to organs. Causes damage to organs through prolonged or repeated exposure.

Precautionary Statement
Prevention: Keep only in original container. Wash thoroughly after handling. Do not eat, drink or smoke when using this product. Do not get in eyes, on skin, or on clothing. Wear protective gloves/protective clothing/eye protection/face protection. Do not breathe dust/fume/gas/mist/vapors/spray. Use only outdoors or in a well-ventilated area. Wear respiratory protection.

Response: IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician. Rinse mouth. IF exposed: Call a POISON CENTER or doctor/physician. Do NOT induce vomiting. IF ON SKIN (or hair): Remove/take off immediately all contaminated clothing. Rinse skin with water/shower. Take off immediately all contaminated clothing and wash it before reuse. IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing. IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.

Storage: Store in corrosive resistant container with a resistant inner liner. Store in a well-ventilated place. Keep container tightly closed. Store locked up.

Disposal: Dispose of contents/container to an appropriate treatment and disposal facility in accordance with applicable laws and regulations, and product characteristics at time of disposal.

Other hazards which do not result in GHS classification: None.

3. Composition/information on ingredients

Mixtures

<table>
<thead>
<tr>
<th>Chemical Identity</th>
<th>Common name and synonyms</th>
<th>CAS number</th>
<th>Content in percent (%)*</th>
</tr>
</thead>
<tbody>
<tr>
<td>AMMONIUM FLUORIDE</td>
<td></td>
<td>12125-01-8</td>
<td>30 - 40%</td>
</tr>
<tr>
<td>HYDROGEN FLUORIDE</td>
<td></td>
<td>7664-39-3</td>
<td>1 - 10%</td>
</tr>
</tbody>
</table>

* All concentrations are percent by weight unless ingredient is a gas. Gas concentrations are in percent by volume.

4. First-aid measures

General information: Get medical advice/attention if you feel unwell. Show this safety data sheet to the doctor in attendance.

Ingestion: Call a physician or poison control center immediately. Do not induce vomiting without advice from poison control center. If vomiting occurs, keep head low so that stomach content doesn’t get into the lungs.

Inhalation: Move to fresh air. Call a physician or poison control center immediately. If breathing is difficult, give oxygen. If breathing stops, provide artificial respiration.
Skin Contact: Immediately remove contaminated clothing and shoes and wash skin with soap and plenty of water. Call a physician or poison control center immediately. Wash contaminated clothing before reuse. Destroy or thoroughly clean contaminated shoes.

Eye contact: Immediately flush with plenty of water for at least 15 minutes. If easy to do, remove contact lenses. Call a physician or poison control center immediately. In case of irritation from airborne exposure, move to fresh air.

Most important symptoms/effects, acute and delayed

Symptoms: Fatal if swallowed. Fatal in contact with skin. Fatal if inhaled. Causes severe skin and eye burns.

Indication of immediate medical attention and special treatment needed

Treatment: Treat symptomatically. Symptoms may be delayed.

5. Fire-fighting measures

General Fire Hazards: In case of fire and/or explosion do not breathe fumes.

Suitable (and unsuitable) extinguishing media

Suitable extinguishing media: Use fire-extinguishing media appropriate for surrounding materials.

Unsuitable extinguishing media: None known.

Specific hazards arising from the chemical: Product is acidic. Fire may produce irritating, corrosive and/or toxic gases.

Special protective equipment and precautions for firefighters

Special fire fighting procedures: Move containers from fire area if you can do so without risk. Use water spray to keep fire-exposed containers cool. Cool containers exposed to flames with water until well after the fire is out. Fight fire from a protected location.

Special protective equipment for fire-fighters: Firefighters must use standard protective equipment including flame retardant coat, helmet with face shield, gloves, rubber boots, and in enclosed spaces, SCBA.

6. Accidental release measures

Personal precautions, protective equipment and emergency procedures: Use personal protective equipment. Keep unauthorized personnel away. Keep upwind. Ventilate closed spaces before entering them. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing. See Section 8 of the MSDS for Personal Protective Equipment.

Methods and material for containment and cleaning up: Neutralize spill area and washings with soda ash or lime. Absorb spill with vermiculite or other inert material, then place in a container for chemical waste. Clean surface thoroughly to remove residual contamination. Dike far ahead of larger spill for later recovery and disposal.

Notification Procedures: Dike for later disposal. Prevent entry into waterways, sewer, basements or confined areas. Stop the flow of material, if this is without risk. Inform authorities if large amounts are involved.
Environmental Precautions: Do not contaminate water sources or sewer. Prevent further leakage or spillage if safe to do so. Avoid discharge into drains, water courses or onto the ground.

7. Handling and storage

Precautions for safe handling: Use personal protective equipment as required. Avoid contact with eyes, skin, and clothing. Wash hands thoroughly after handling. Avoid inhalation of vapors and spray mists. Do not eat, drink or smoke when using the product. Use caution when adding this material to water. Never add water to acid! Always add acid to water while stirring to prevent release of heat, steam and fumes. See Section 8 of the MSDS for Personal Protective Equipment.

Conditions for safe storage, including any incompatibilities: Do not store in metal containers. Keep containers tightly closed. Store in cool, dry place. Store in a well-ventilated place.

8. Exposure controls/personal protection

Control Parameters

Occupational Exposure Limits

<table>
<thead>
<tr>
<th>Chemical Identity</th>
<th>Type</th>
<th>Exposure Limit Values</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>AMMONIUM FLUORIDE - as F</td>
<td>TWA</td>
<td>2.5 mg/m³</td>
<td>US. ACGIH Threshold Limit Values (2011)</td>
</tr>
<tr>
<td></td>
<td>REL</td>
<td>2.5 mg/m³</td>
<td>US. NIOSH: Pocket Guide to Chemical Hazards (2010)</td>
</tr>
<tr>
<td></td>
<td>PEL</td>
<td>2.5 mg/m³</td>
<td>US. OSHA Table Z-1 Limits for Air Contaminants (29 CFR 1910.1000) (02 2006)</td>
</tr>
<tr>
<td></td>
<td>TWA</td>
<td>2.5 mg/m³</td>
<td>US. OSHA Table Z-1-A (29 CFR 1910.1000) (1989)</td>
</tr>
<tr>
<td>AMMONIUM FLUORIDE - Dust.</td>
<td>TWA</td>
<td>2.5 mg/m³</td>
<td>US. OSHA Table Z-2 (29 CFR 1910.1000) (02 2006)</td>
</tr>
<tr>
<td>HYDROGEN FLUORIDE - as F</td>
<td>TWA</td>
<td>0.5 ppm</td>
<td>US. ACGIH Threshold Limit Values (2011)</td>
</tr>
<tr>
<td></td>
<td>REL</td>
<td>3 ppm</td>
<td>US. NIOSH: Pocket Guide to Chemical Hazards (2010)</td>
</tr>
<tr>
<td>HYDROGEN FLUORIDE - as F</td>
<td>PEL</td>
<td>2.5 mg/m³</td>
<td>US. OSHA Table Z-1 Limits for Air Contaminants (29 CFR 1910.1000) (02 2006)</td>
</tr>
<tr>
<td></td>
<td>TWA</td>
<td>3 ppm</td>
<td>US. OSHA Table Z-1-A (29 CFR 1910.1000) (1989)</td>
</tr>
<tr>
<td>HYDROGEN FLUORIDE</td>
<td>TWA</td>
<td>3 ppm</td>
<td>US. OSHA Table Z-2 (29 CFR 1910.1000) (02 2006)</td>
</tr>
</tbody>
</table>

Biological Limit Values

<table>
<thead>
<tr>
<th>Chemical Identity</th>
<th>Exposure Limit Values</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>AMMONIUM FLUORIDE</td>
<td>2 mg/l (Urine)</td>
<td>ACGIH BEL (03 2013)</td>
</tr>
<tr>
<td>(Fluoride: Sampling time: Prior to shift.)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AMMONIUM FLUORIDE</td>
<td>3 mg/l (Urine)</td>
<td>ACGIH BEL (03 2013)</td>
</tr>
<tr>
<td>(Fluoride: Sampling time: End of shift.)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HYDROGEN FLUORIDE</td>
<td>2 mg/l (Urine)</td>
<td>ACGIH BEL (03 2013)</td>
</tr>
<tr>
<td>(Fluoride: Sampling time: Prior to shift.)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HYDROGEN FLUORIDE</td>
<td>3 mg/l (Urine)</td>
<td>ACGIH BEL (03 2013)</td>
</tr>
<tr>
<td>(Fluoride: Sampling time: End of shift.)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Appropriate Engineering Controls

No data available.

SDS_US - SDSMIX000730
Individual protection measures, such as personal protective equipment

**General information:** Good general ventilation (typically 10 air changes per hour) should be used. Ventilation rates should be matched to conditions. If applicable, use process enclosures, local exhaust ventilation, or other engineering controls to maintain airborne levels below recommended exposure limits. If exposure limits have not been established, maintain airborne levels to an acceptable level. An eye wash and safety shower must be available in the immediate work area.

**Eye/face protection:** Wear safety glasses with side shields (or goggles) and a face shield.

**Skin Protection**

**Hand Protection:** Chemical resistant gloves

**Other:** Wear suitable protective clothing.

**Respiratory Protection:** If engineering controls do not maintain airborne concentrations below recommended exposure limits (where applicable) or to an acceptable level (in countries where exposure limits have not been established), an approved respirator must be worn. Chemical respirator with acid gas cartridge.

**Hygiene measures:** Provide eyewash station and safety shower. Always observe good personal hygiene measures, such as washing after handling the material and before eating, drinking, and/or smoking. Routinely wash work clothing to remove contaminants. Discard contaminated footwear that cannot be cleaned.

### 9. Physical and chemical properties

**Appearance**

- **Physical state:** Liquid
- **Form:** Liquid
- **Color:** Colorless
- **Odor:** No data available.
- **Odor threshold:** No data available.
- **pH:** No data available.
- **Melting point/freezing point:** 18 °C
- **Initial boiling point and boiling range:** No data available.
- **Flash Point:** Not applicable
- **Evaporation rate:** As water
- **Flammability (solid, gas):** No data available.

**Upper/lower limit on flammability or explosive limits**

- **Flammability limit - upper (%):** No data available.
- **Flammability limit - lower (%):** No data available.
- **Explosive limit - upper (%):** No data available.
- **Explosive limit - lower (%):** No data available.
- **Vapor pressure:** No data available.
- **Vapor density:** No data available.
- **Relative density:** 1.1 (20 °C)

**Solubility(ies)**

- **Solubility in water:** Miscible with water.
- **Solubility (other):** No data available.
- **Partition coefficient (n-octanol/water):** No data available.
- **Auto-ignition temperature:** No data available.
10. Stability and reactivity

Reactivity: No dangerous reaction known under conditions of normal use.

Chemical Stability: Material is stable under normal conditions.

Possibility of Hazardous Reactions: Hazardous polymerization does not occur.


Hazardous Decomposition Products: Hydrogen fluoride. Nitrogen Oxides

11. Toxicological information

Information on likely routes of exposure

Ingestion: Fatal if swallowed. May cause burns of the gastrointestinal tract if swallowed.

Inhalation: Fatal if inhaled. May cause damage to mucous membranes in nose, throat, lungs and bronchial system.

Skin Contact: Fatal in contact with skin. Causes severe skin burns.

Eye contact: Causes serious eye damage.

Information on toxicological effects

Acute toxicity (list all possible routes of exposure)

Oral Product: LD 50 (Rat): 45.45 mg/kg

Dermal Product: LD 50 (Rabbit): 51.73 mg/kg

Inhalation Product: LC 50 (Rat, 4 h): 0.385 mg/l

Repeated Dose Toxicity Product: No data available.

Skin Corrosion/Irritation Product: Causes severe skin burns.

Serious Eye Damage/Eye Irritation Product: Causes serious eye damage.

Respiratory or Skin Sensitization Product: Not a skin sensitizer.

Carcinogenicity Product: This substance has no evidence of carcinogenic properties.
IARC Monographs on the Evaluation of Carcinogenic Risks to Humans:
No carcinogenic components identified

US. National Toxicology Program (NTP) Report on Carcinogens:
No carcinogenic components identified

No carcinogenic components identified

Germ Cell Mutagenicity
In vitro
Product: No mutagenic components identified

In vivo
Product: No mutagenic components identified

Reproductive Toxicity
Product: No components toxic to reproduction

Specific Target Organ Toxicity - Single Exposure
Product: Blood. Cardiovascular system Respiratory system

Specific Target Organ Toxicity - Repeated Exposure
Product: Endocrine system Bones Teeth.

Aspiration Hazard
Product: Not classified

Other Effects: None known.

12. Ecological information

Ecotoxicity:
Acute hazards to the aquatic environment:

Fish
Product: No data available.

Aquatic Invertebrates
Product: No data available.

Chronic hazards to the aquatic environment:

Fish
Product: No data available.

Aquatic Invertebrates
Product: No data available.

Toxicity to Aquatic Plants
Product: No data available.

Persistence and Degradability

Biodegradation
Product: Expected to be readily biodegradable.

BOD/COD Ratio
Product: No data available.

Bioaccumulative Potential
Bioconcentration Factor (BCF)
Product: No data available on bioaccumulation.

Partition Coefficient n-octanol / water (log Kow)
Product: No data available.

Specified substance(s):
AMMONIUM FLUORIDE Log Kow: -4.37

Mobility in Soil: The product is water soluble and may spread in water systems.

Other Adverse Effects: The product may affect the acidity (pH-factor) in water with risk of harmful effects to aquatic organisms.

13. Disposal considerations

Disposal instructions: Discharge, treatment, or disposal may be subject to national, state, or local laws.

Contaminated Packaging: Since emptied containers retain product residue, follow label warnings even after container is emptied.

14. Transport information

DOT
UN Number: UN 2922
UN Proper Shipping Name: Corrosive liquids, toxic, n.o.s.(HYDROFLUORIC ACID, Ammonium Fluoride)
Transport Hazard Class(es)
   Class(es): 8, 6.1
   Label(s): 8, 6.1
   Packing Group: II
   Marine Pollutant: No

IMDG
UN Number: UN 2922
UN Proper Shipping Name: CORROSIVE LIQUID, TOXIC, N.O.S.(HYDROFLUORIC ACID, Ammonium Fluoride)
Transport Hazard Class(es)
   Class(es): 8, 6.1
   Label(s): 8, 6.1
   EmS No.: F-A, S-B
   Packing Group: II
   Marine Pollutant: No

IATA
UN Number: UN 2922
Proper Shipping Name: Corrosive liquid, toxic, n.o.s.(HYDROFLUORIC ACID, Ammonium Fluoride)
Transport Hazard Class(es)
   Class(es): 8, 6.1
   Label(s): 8, 6.1
   Marine Pollutant: No
   Packing Group: II

15. Regulatory information

US Federal Regulations
TSCA Section 12(b) Export Notification (40 CFR 707, Subpt. D)
SDS_US - SDSMIX000730
US. OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050)
None present or none present in regulated quantities.

CERCLA Hazardous Substance List (40 CFR 302.4):
AMMONIUM FLUORIDE Reportable quantity: 100 lbs.
HYDROGEN FLUORIDE Reportable quantity: 100 lbs.

Superfund Amendments and Reauthorization Act of 1986 (SARA)

Hazard categories

- Acute (Immediate)
- Chronic (Delayed)
- Fire
- Reactive
- Pressure Generating

SARA 302 Extremely Hazardous Substance

<table>
<thead>
<tr>
<th>Chemical Identity</th>
<th>RQ</th>
<th>Threshold Planning Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>HYDROGEN FLUORIDE</td>
<td>100 lbs.</td>
<td>100 lbs.</td>
</tr>
</tbody>
</table>

SARA 304 Emergency Release Notification

<table>
<thead>
<tr>
<th>Chemical Identity</th>
<th>RQ</th>
</tr>
</thead>
<tbody>
<tr>
<td>AMMONIUM FLUORIDE</td>
<td>100 lbs.</td>
</tr>
<tr>
<td>HYDROGEN FLUORIDE</td>
<td>100 lbs.</td>
</tr>
</tbody>
</table>

SARA 311/312 Hazardous Chemical

<table>
<thead>
<tr>
<th>Chemical Identity</th>
<th>Threshold Planning Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>HYDROGEN FLUORIDE</td>
<td>100 lbs.</td>
</tr>
<tr>
<td>AMMONIUM FLUORIDE</td>
<td>500 lbs.</td>
</tr>
<tr>
<td>HYDROGEN FLUORIDE</td>
<td>500 lbs.</td>
</tr>
</tbody>
</table>

SARA 313 (TRI Reporting)

<table>
<thead>
<tr>
<th>Chemical Identity</th>
<th>Reporting threshold for other users</th>
<th>Reporting threshold for manufacturing and processing</th>
</tr>
</thead>
<tbody>
<tr>
<td>AMMONIUM FLUORIDE</td>
<td>10000 lbs.</td>
<td>25000 lbs.</td>
</tr>
<tr>
<td>HYDROGEN FLUORIDE</td>
<td>10000 lbs.</td>
<td>25000 lbs.</td>
</tr>
</tbody>
</table>

Clean Water Act Section 311 Hazardous Substances (40 CFR 117.3)
AMMONIUM FLUORIDE Reportable quantity: 100 lbs.
HYDROGEN FLUORIDE Reportable quantity: 100 lbs.

Clean Air Act (CAA) Section 112(r) Accidental Release Prevention (40 CFR 68.130):
HYDROGEN FLUORIDE Threshold quantity: 1000 lbs

US State Regulations

US. California Proposition 65
No ingredient regulated by CA Prop 65 present.

US. New Jersey Worker and Community Right-to-Know Act
AMMONIUM FLUORIDE Listed
HYDROGEN FLUORIDE Listed

US. Massachusetts RTK - Substance List
AMMONIUM FLUORIDE Listed
HYDROGEN FLUORIDE Listed

US. Pennsylvania RTK - Hazardous Substances
AMMONIUM FLUORIDE Listed
HYDROGEN FLUORIDE Listed
Inventory Status:
- Australia AICS: On or in compliance with the inventory
- Canada DSL Inventory List: On or in compliance with the inventory
- EINECS, ELINCS or NLP: On or in compliance with the inventory
- Japan (ENCS) List: On or in compliance with the inventory
- China Inv. Existing Chemical Substances: On or in compliance with the inventory
- Korea Existing Chemicals Inv. (KECI): On or in compliance with the inventory
- Canada NDSL Inventory: Not in compliance with the inventory
- Philippines PICCS: On or in compliance with the inventory
- US TSCA Inventory: On or in compliance with the inventory
- New Zealand Inventory of Chemicals: On or in compliance with the inventory
- Japan ISHL Listing: Not in compliance with the inventory.
- Japan Pharmacopoeia Listing: Not in compliance with the inventory.

16. Other information, including date of preparation or last revision

NFPA Hazard ID

Hazard rating: 0 - Minimal; 1 - Slight; 2 - Moderate; 3 - Serious; 4 - Severe

Issue Date: 11-13-2014
Revision Date: No data available.
Version #: 1.0
Further Information: No data available.
Disclaimer:

THE INFORMATION PRESENTED IN THIS MATERIAL SAFETY DATA SHEET (MSDS/SDS) WAS PREPARED BY TECHNICAL PERSONNEL BASED ON DATA THAT THEY BELIEVE IN THEIR GOOD FAITH JUDGMENT IS ACCURATE. HOWEVER, THE INFORMATION PROVIDED HEREIN IS PROVIDED “AS IS,” AND AVANTOR PERFORMANCE MATERIALS MAKES AND GIVES NO REPRESENTATIONS OR WARRANTIES WHATSOEVER, AND EXPRESSLY DISCLAIMS ALL WARRANTIES REGARDING SUCH INFORMATION AND THE PRODUCT TO WHICH IT RELATES, WHETHER EXPRESS, IMPLIED, OR STATUTORY, INCLUDING WITHOUT LIMITATION WARRANTIES OF ACCURACY, COMPLETENESS, MERCHANTABILITY, NONINFRINGEMENT, PERFORMANCE, SAFETY, SUITABILITY, STABILITY, AND FITNESS FOR A PARTICULAR PURPOSE, AND ANY WARRANTIES ARISING FROM COURSE OF DEALING, COURSE OF PERFORMANCE, OR USAGE OF TRADE. THIS MSDS/SDS IS INTENDED ONLY AS A GUIDE TO THE APPROPRIATE PRECAUTIONARY HANDLING OF THE MATERIAL BY A PROPERLY TRAINED PERSON USING THIS PRODUCT, AND IS NOT INTENDED TO BE COMPREHENSIVE AS TO THE MANNER AND CONDITIONS OF USE, HANDLING, STORAGE, OR DISPOSAL OF THE PRODUCT. INDIVIDUALS RECEIVING THIS MSDS/SDS MUST ALWAYS EXERCISE THEIR OWN INDEPENDENT JUDGMENT IN DETERMINING THE APPROPRIATENESS OF SUCH ISSUES. ACCORDINGLY, AVANTOR PERFORMANCE MATERIALS ASSUMES NO LIABILITY WHATSOEVER FOR THE USE OF OR RELIANCE UPON THIS INFORMATION. NO SUGGESTIONS FOR USE ARE INTENDED AS, AND NOTHING HEREIN SHALL BE CONSTRUED AS, A RECOMMENDATION TO INFRINGE ANY EXISTING PATENTS OR TO VIOLATE ANY FEDERAL, STATE, LOCAL, OR FOREIGN LAWS. AVANTOR PERFORMANCE MATERIALS REMINDS YOU THAT IT IS YOUR LEGAL DUTY TO MAKE ALL INFORMATION IN THIS MSDS/SDS AVAILABLE TO YOUR EMPLOYEES.