

1. Identification

Material name	BUFFERED ETCH 10:1 W/OHS, SEMI GRADE
Issue date	05-August-2014
Revision date	-
Supersedes date	-
Other means of identification	
Spec ID	100000002018
Synonyms	Ammonium hydrogen fluoride solution
Recommended use	Etchant used in semiconductor manufacturing.
Recommended restrictions	None known.
Supplier information	
	FUJIFILM Electronic Materials U.S.A., Inc. 80 Circuit Drive North Kingstown RI 02852 Transportation Emergency: FOR ALL TRANSPORTATION ACCIDENTS, CALL CHEMTREC: 1-800-424-9300 Medical Emergency (24HR): FOR ANY HEALTH & MEDICAL EMERGENCY, 24 HOURS /7 DAYS CALL: 1-800-365-8951 Non-emergency Telephone: FOR ALL SDS REQUESTS & QUESTIONS, CALL CUSTOMER SERVICE: 1-800-553-6546
SDS file	10050_US_EN_V1.0
Replaces file	None

2. Hazard(s) identification

Physical hazards	Not classified.	
Health hazards	Acute toxicity, oral	Category 3
	Acute toxicity, dermal	Category 2
	Acute toxicity, inhalation	Category 3
	Skin corrosion/irritation	Category 1B
	Serious eye damage/eye irritation	Category 1
OSHA defined hazards	Not classified.	
Label elements		



Signal word	Danger
Hazard statement	Toxic if swallowed. Fatal in contact with skin. Toxic if inhaled. Causes severe skin burns and eye damage.
Precautionary statement	
Prevention	Do not breathe mist/vapors/spray. Do not get in eyes, on skin, or on clothing. Wear protective gloves/protective clothing/eye protection/face protection. Do not eat, drink or smoke when using this product. Use only outdoors or in a well-ventilated area. Wash thoroughly after handling.
Response	If swallowed: Rinse mouth. Do NOT induce vomiting. If on skin (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower. Wash contaminated clothing before reuse. If inhaled: Remove person to fresh air and keep comfortable for breathing. If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a poison center/doctor.
Storage	Store in a well-ventilated place. Keep container tightly closed. Store locked up.
Disposal	Dispose of contents/container in accordance with local/regional/national/international regulations.
Hazard(s) not otherwise classified (HNOC)	None known.

3. Composition/information on ingredients

Mixture

Chemical name	Common name and synonyms	CAS number	%
Ammonium fluoride		12125-01-8	15-40
Hydrofluoric acid		7664-39-3	3-<7

Composition comments All concentrations are in percent by weight unless ingredient is a gas. Gas concentrations are in percent by volume. Ammonium fluoride and hydrofluoric acid in aqueous solution react to form, and are in equilibrium with ammonium bifluoride (ammonium hydrogen difluoride, CAS no. 1341-49-7).

4. First-aid measures

Inhalation	Immediately remove from further exposure. Get immediate medical assistance. For those providing assistance, avoid exposure to yourself or others. Use adequate respiratory protection. Give supplemental oxygen, if available. If breathing has stopped, assist ventilation with a mechanical device or use mouth-to-mouth resuscitation. Be aware that symptoms of chemical pneumonia (shortness of breath) may occur several hours after exposure.
Skin contact	Remove contaminated clothes and rinse skin thoroughly with water for at least 15 minutes. Chemical burns must be treated by a physician. Get medical attention immediately. If 2.5% calcium gluconate is available, the water rinse time should be limited to 5 minutes and then the 2.5% calcium gluconate massaged into the burn site. It should be applied frequently and massaged continuously until pain and/or redness disappears or until more definitive medical care is given. Wear gloves when massaging calcium gluconate into the burn site.
Eye contact	Flush thoroughly with water for at least 15 minutes. Get immediate medical assistance. If medical assistance is not immediately available, flush an additional 15 minutes. Make sure to remove any contact lenses from the eyes before rinsing. A 1.0 pct calcium gluconate gel solution can be used to irrigate the eye using a syringe or a continuous irrigation device.
Ingestion	Rinse mouth thoroughly with water and give large amounts of milk or water to people not unconscious. Do not induce vomiting. If vomiting occurs, the head should be kept low so that stomach vomit doesn't enter the lungs. Lay on the side. Get medical attention immediately.
Most important symptoms/effects, acute and delayed	Inhalation: May cause damage to mucous membranes in nose, throat, lungs and bronchial system. Be aware that symptoms of lung edema (shortness of breath) may develop up to 24 hours after exposure. Eye contact: Prolonged contact causes serious eye and tissue damage. May cause blindness. Skin contact: May cause serious chemical burns to the skin. Ingestion: May cause burns in mucous membranes, throat, esophagus and stomach.
Indication of immediate medical attention and special treatment needed	Symptoms may be delayed. Consult specific guidance on first aid procedures for accidents involving concentrated hydrofluoric acid. Attach a cardiac monitor. Monitor EKG for prolonged Q-T interval or QRS duration. For inhalation exposures, person should be held under observation for at least 24 hours.
General information	Ensure that medical personnel are aware of the material(s) involved, and take precautions to protect themselves.

5. Fire-fighting measures

Suitable extinguishing media	Use fire-extinguishing media appropriate for surrounding materials.
Unsuitable extinguishing media	None.
Specific hazards arising from the chemical	Hydrogen fluoride, a corrosive and toxic gas, and other potentially hazardous fluorine-containing compounds may be released upon combustion.
Special protective equipment and precautions for firefighters	Selection of respiratory protection for firefighting: follow the general fire precautions indicated in the workplace. Self-contained breathing apparatus and full protective clothing must be worn in case of fire.
Fire-fighting equipment/instructions	Use standard firefighting procedures and consider the hazards of other involved materials.

6. Accidental release measures

Personal precautions, protective equipment and emergency procedures	Avoid any exposure. Avoid contact with spilled material. If leakage cannot be stopped, evacuate area. Wear suitable protective clothing. See Section 8 of the SDS for Personal Protective Equipment.
Methods and materials for containment and cleaning up	Absorb spillage with suitable absorbent material. Collect in containers and seal securely. For waste disposal, see Section 13 of the SDS.
Environmental precautions	Do not allow to enter drains, sewers or watercourses unless authorized by permit.

7. Handling and storage

Precautions for safe handling

Should be handled in closed systems, if possible. Avoid any exposure. Wear approved safety goggles. Wear protective gloves and appropriate clothing to prevent skin contact. Observe good industrial hygiene practices.

Conditions for safe storage, including any incompatibilities

Store in closed original container in a dry place. Store above freezing. Store away from incompatible materials.

8. Exposure controls/personal protection

Occupational exposure limits

US. OSHA Table Z-1 Limits for Air Contaminants (29 CFR 1910.1000)

Components	Type	Value
Ammonium fluoride (CAS 12125-01-8)	PEL	2.5 mg/m3
Hydrofluoric acid (CAS 7664-39-3)	PEL	2.5 mg/m3

US. OSHA Table Z-2 (29 CFR 1910.1000)

Components	Type	Value	Form
Ammonium fluoride (CAS 12125-01-8)	TWA	2.5 mg/m3	Dust.
Hydrofluoric acid (CAS 7664-39-3)	TWA	3 ppm	

US. ACGIH Threshold Limit Values

Components	Type	Value
Ammonium fluoride (CAS 12125-01-8)	TWA	2.5 mg/m3
Hydrofluoric acid (CAS 7664-39-3)	Ceiling	2 ppm
	TWA	0.5 ppm

US. NIOSH: Pocket Guide to Chemical Hazards

Components	Type	Value
Ammonium fluoride (CAS 12125-01-8)	TWA	2.5 mg/m3
Hydrofluoric acid (CAS 7664-39-3)	Ceiling	5 mg/m3
	TWA	6 ppm 2.5 mg/m3 3 ppm

Biological limit values

ACGIH Biological Exposure Indices

Components	Value	Determinant	Specimen	Sampling Time
Ammonium fluoride (CAS 12125-01-8)	3 mg/l	Fluoride	Urine	*
	2 mg/l	Fluoride	Urine	*
Hydrofluoric acid (CAS 7664-39-3)	3 mg/l	Fluoride	Urine	*
	2 mg/l	Fluoride	Urine	*

* - For sampling details, please see the source document.

Exposure guidelines

US - California OELs: Skin designation

Hydrofluoric acid (CAS 7664-39-3) Can be absorbed through the skin.

US ACGIH Threshold Limit Values: Skin designation

Hydrofluoric acid (CAS 7664-39-3) Can be absorbed through the skin.

Appropriate engineering controls

Should be handled in closed systems, if possible. If enclosed handling cannot be guaranteed, ventilation and protective clothing must be used. Eye wash facilities and emergency shower must be available when handling this product.

Individual protection measures, such as personal protective equipment

Eye/face protection

Wear approved safety goggles.

Skin protection

Hand protection

Wear protective gloves impervious to the chemicals in use.

Other	Also wear appropriate clothing to prevent any possibility of skin contact. Suitable items can be recommended by the protective equipment supplier or by a qualified industrial hygienist.
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. In the United States of America, if respirators are used, a program should be instituted to assure compliance with OSHA Standard 1910.134. Use a NIOSH/MSHA approved air purifying respirator as needed to control exposure. Consult with respirator manufacturer to determine respirator selection, use, and limitations. Use positive pressure, air-supplied respirator for uncontrolled releases or when air purifying respirator limitations may be exceeded. Follow respirator protection program requirements (OSHA 1910.134 and ANSI Z88.2) for all respirator use.
Thermal hazards	Wear appropriate thermal protective clothing, when necessary.
General hygiene considerations	Always observe good personal hygiene measures, such as washing after handling the material and before eating, drinking, and/or smoking. Routinely wash work clothing and protective equipment to remove contaminants.

9. Physical and chemical properties

Appearance

Physical state	Liquid.
Form	Liquid.
Color	Colorless to pale yellow.

Odor Mild ammoniacal odor.

Odor threshold No data available.

pH 4.5 - 6.5 (25°C)

Melting point/freezing point 50 °F (10 °C)

Initial boiling point and boiling range 219.2 °F (104 °C)

Flash point Not applicable.

Evaporation rate < 1 (Water = 1)

Flammability (solid, gas) Not applicable.

Upper/lower flammability or explosive limits

Flammability limit - lower (%) Not applicable.

Flammability limit - upper (%) Not applicable.

Vapor pressure No data available.

Vapor density No data available.

Relative density 1.11-1.114

Solubility(ies)

Solubility (water) Completely miscible in water.

Partition coefficient (n-octanol/water) No data available.

Auto-ignition temperature None.

Decomposition temperature No data available.

Viscosity No data available.

Other information

Density 1.11-1.114 g/cc

Molecular weight Not applicable/mixture.

Percent volatile 60 - 72 %

10. Stability and reactivity

Chemical stability Stable under normal temperature conditions.

Possibility of hazardous reactions Will not occur.

Conditions to avoid Heat. Freezing.

Incompatible materials Strong acids. Strong bases. Strong oxidizing agents. Cyanides. Sulfides. Glass. Silica. Sodium hypochlorite. Chlorine trifluoride.

Hazardous decomposition products At elevated temperatures: Ammonia. Hydrogen fluoride. Fluorine compounds. Nitrogen oxides.

11. Toxicological information

Information on likely routes of exposure

Ingestion	Toxic if swallowed. Causes digestive tract burns. Erosion of exposed teeth.
Inhalation	Toxic if inhaled. Causes respiratory tract burns. Absorption of fluoride ion can cause hypocalcaemia, hypomagnesaemia, and hyperkalaemia, which can result in cardiac arrest.
Skin contact	Fatal in contact with skin. Causes severe skin burns. Hypocalcaemia should be considered a risk in all instances of inhalation or ingestion and whenever skin burns exceed 25 square inches (an area about the size of the palm).
Eye contact	Causes serious eye damage.

Symptoms related to the physical, chemical and toxicological characteristics

Inhalation: May cause damage to mucous membranes in nose, throat, lungs and bronchial system. Be aware that symptoms of lung edema (shortness of breath) may develop up to 24 hours after exposure. Eye contact: Prolonged contact causes serious eye and tissue damage. Skin contact: May cause serious chemical burns to the skin. Ingestion: May cause burns in mucous membranes, throat, esophagus and stomach.

Information on toxicological effects

Acute toxicity Fatal in contact with skin. Toxic if inhaled. Toxic if swallowed.

Components	Species	Test Results
Ammonium fluoride (CAS 12125-01-8)		
Acute		
<i>Dermal</i>		
LD50	Rabbit	2000 mg/kg
<i>Oral</i>		
LD50	Rat	1000 - 2000 mg/kg
Hydrofluoric acid (CAS 7664-39-3)		
Acute		
<i>Inhalation</i>		
LC50	Rat	1310 ppm, 60 minutes

Skin corrosion/irritation Causes severe skin burns.

Serious eye damage/eye irritation Causes serious eye damage.

Respiratory or skin sensitization

Respiratory sensitization No data available.

Skin sensitization Not a skin sensitizer.

Germ cell mutagenicity No data available.

Carcinogenicity Not classified.

IARC Monographs. Overall Evaluation of Carcinogenicity

Ammonium fluoride (CAS 12125-01-8) 3 Not classifiable as to carcinogenicity to humans.

Hydrofluoric acid (CAS 7664-39-3) 3 Not classifiable as to carcinogenicity to humans.

OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050)

Not listed.

IARC: 1 = Carcinogenic to Humans; There is sufficient evidence of carcinogenicity in humans. 2A = Probably Carcinogenic to Humans; There is limited evidence of carcinogenicity in humans and sufficient evidence of carcinogenicity in experimental animals. 2B = Possibly Carcinogenic to Humans; There is limited evidence of carcinogenicity in humans and less than sufficient evidence of carcinogenicity in experimental animals. 3 = Not classifiable as to carcinogenicity to humans; The evidence of carcinogenicity is inadequate in humans and inadequate or limited in experimental animals. 4 = Probably not carcinogenic to humans; There is inadequate evidence of carcinogenicity in humans but evidence suggesting lack of carcinogenicity in experimental animals. Not listed = Not evaluated by IARC.

Reproductive toxicity No data available.

Specific target organ toxicity - single exposure No data available.

Specific target organ toxicity - repeated exposure No data available.

Aspiration hazard No data available.

Chronic effects Inhalation of vapor or mist may cause lung edema. Symptoms may be delayed. May cause damage to the liver and kidneys. Fluorides: Can cause bone damage. Prolonged overexposure to fluorides may increase fluoride content of bones and teeth, and may result in fluorosis, with mottling of teeth (in children) and brittleness of bones. Absorbed fluoride can cause metabolic imbalances with irregular heartbeat, nausea, dizziness, vomiting and seizures. Risk of hypocalcemia with nervous problems (tetany) and cardiac arrhythmia.

12. Ecological information

Ecotoxicity Harmful to aquatic life.

Components		Species	Test Results
Ammonium fluoride (CAS 12125-01-8)			
Aquatic			
Algae	EC50	Algae	43 mg/l, 96 h
Crustacea	EC50	Daphnia	97 mg/l, 48 h
Fish	LC50	Fish	51 mg/l, 96 h

Persistence and degradability No data available.

Bioaccumulative potential No data available.

Mobility in soil No data available.

Mobility in general The product is miscible with water. May spread in water systems.

Other adverse effects No data available.

13. Disposal considerations

Disposal instructions Disposal recommendations are based on material as supplied. Disposal must be in accordance with current applicable laws and regulations, and material characteristics at time of disposal.

Local disposal regulations Dispose of in accordance with local regulations.

Hazardous waste code Not regulated.

US RCRA Hazardous Waste U List: Reference

Hydrofluoric acid (CAS 7664-39-3) U134

Waste from residues / unused products Dispose of waste and residues in accordance with local authority requirements.

Contaminated packaging Empty containers should be taken to an approved waste handling site for recycling or disposal.

14. Transport information

DOT

UN number UN2817
UN proper shipping name Ammonium hydrogendifluoride, solution
Transport hazard class(es)
Class 8
Subsidiary risk 6.1
Label(s) 8, 6.1
Packing group II
Special precautions for user Read safety instructions, SDS and emergency procedures before handling.
Special provisions IB2, N34, T8, TP2, TP12, TP13
Packaging exceptions 154
Packaging non bulk 202
Packaging bulk 243

IATA

UN number UN2817
UN proper shipping name Ammonium hydrogendifluoride solution
Transport hazard class(es)
Class 8
Subsidiary risk 6.1
Label(s) 8
+6.1
Packing group II
Environmental hazards No
ERG Code 8P
Special precautions for user Read safety instructions, SDS and emergency procedures before handling.

IMDG

UN number UN2817
UN proper shipping name Ammonium hydrogendifluoride solution
Transport hazard class(es)
Class 8
Subsidiary risk 6.1
Label(s) 8
+6.1
Packing group II

Environmental hazards**Marine pollutant** No**EmS** F-A, S-B**Special precautions for user** Read safety instructions, SDS and emergency procedures before handling.**Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code** This substance/mixture is not intended to be transported in bulk.**15. Regulatory information****US federal regulations** This product is hazardous according to OSHA 29 CFR 1910.1200.
TSCA Section 4(a) Final Test Rules & Testing Consent Orders: Not regulated.
TSCA Section 5(e) PMN-Substance Consent Orders: Not regulated.**Drug Enforcement Administration (DEA). List 1(i), Precursor Chemicals (21 CFR 1310.02(a) and 1310.04(f)(1))**
Not listed.**TSCA Section 5(a)(2) Final Significant New Use Rules (SNURs)(40CFR 721, Subpt. E)**
Not regulated.**TSCA Section 12(b) Export Notification (40 CFR 707, Subpt. D)**
Not regulated.**Clean Air Act (CAA) Section 112 Hazardous Air Pollutants (HAPs) List**
Hydrofluoric acid (CAS 7664-39-3)**US EPCRA (SARA Title III) Section 302 - Extremely Hazardous Spill: Reportable quantity**
Hydrofluoric acid (CAS 7664-39-3) 100 LBS**US EPCRA (SARA Title III) Section 302 - Extremely Hazardous Substance: Threshold Planning Quantity**
Hydrofluoric acid (CAS 7664-39-3) 100 LBS**US EPCRA (SARA Title III) Section 313 - Toxic Chemical: De minimis concentration**
Ammonium fluoride (CAS 12125-01-8) 1.0 %
Hydrofluoric acid (CAS 7664-39-3) 1.0 %**US EPCRA (SARA Title III) Section 313 - Toxic Chemical: Listed substance**
Ammonium fluoride (CAS 12125-01-8) Listed.
Hydrofluoric acid (CAS 7664-39-3) Listed.**CERCLA (Superfund) reportable quantity (lbs) (40 CFR 302.4)**
Ammonium fluoride: 100
Hydrofluoric acid: 100**Superfund Amendments and Reauthorization Act of 1986 (SARA)****Hazard categories** Immediate Hazard - Yes
Delayed Hazard - No
Fire Hazard - No
Pressure Hazard - No
Reactivity Hazard - No**Section 302 extremely hazardous substance (40 CFR 355, Appendix A)** No**Section 311/312 (40 CFR 370)** Yes**Drug Enforcement Administration (DEA) (21 CFR 1308.11-15)** Not controlled**Inventory status**

Country(s) or region	Inventory name	On inventory (yes/no)*
Australia	Australian Inventory of Chemical Substances (AICS)	Yes
Canada	Domestic Substances List (DSL)	Yes
Canada	Non-Domestic Substances List (NDSL)	No
New Zealand	New Zealand Inventory	Yes
Philippines	Philippine Inventory of Chemicals and Chemical Substances (PICCS)	Yes
United States & Puerto Rico	Toxic Substances Control Act (TSCA) Inventory	Yes

All ingredients are TSCA compliant.

*A "Yes" indicates this product complies with the inventory requirements administered by the governing country(s)

State regulations This product does not contain a chemical known to the State of California to cause cancer, birth defects or other reproductive harm.

US - California Proposition 65 - Carcinogens & Reproductive Toxicity (CRT): Listed substance

Not listed.

US. Massachusetts RTK - Substance List

Ammonium fluoride (CAS 12125-01-8) Listed.
Hydrofluoric acid (CAS 7664-39-3) Listed.

US. New Jersey Worker and Community Right-to-Know Act

Ammonium fluoride (CAS 12125-01-8)
Hydrofluoric acid (CAS 7664-39-3)

US. Pennsylvania Worker and Community Right-to-Know Law

Ammonium fluoride (CAS 12125-01-8)
Hydrofluoric acid (CAS 7664-39-3)

US. Rhode Island RTK

Ammonium fluoride (CAS 12125-01-8) Listed.
Hydrofluoric acid (CAS 7664-39-3) Listed.

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

Further information	HMIS® is a registered trade and service mark of the NPCA. G - Safety Glasses, Gloves, Vapor Respirator
HMIS® ratings	Health: 3 Flammability: 0 Physical hazard: 0 Personal protection: G
NFPA ratings	Health: - Flammability: - Instability: -
Disclaimer	THIS SAFETY DATA SHEET (SDS) HAS BEEN PREPARED IN COMPLIANCE WITH THE FEDERAL OSHA HAZARD COMMUNICATION STANDARD, 29 CFR 1910.1200. THE INFORMATION IN THIS SDS SHOULD BE PROVIDED TO ALL WHO WILL USE, HANDLE, STORE, TRANSPORT, OR OTHERWISE BE EXPOSED TO THIS PRODUCT. THIS INFORMATION HAS BEEN PREPARED FOR THE GUIDANCE OF PLANT ENGINEERING, OPERATIONS AND MANAGEMENT AND FOR PERSONS WORKING WITH OR HANDLING THIS PRODUCT. FUJIFILM PLANAR SOLUTIONS BELIEVES THIS INFORMATION TO BE RELIABLE AND UP TO DATE AS OF THE DATE OF PUBLICATION BUT, MAKES NO WARRANTY THAT IT IS. ADDITIONALLY, IF THIS SDS IS MORE THAN THREE YEARS OLD, YOU SHOULD CONTACT FUJIFILM PLANAR SOLUTIONS AT THE PHONE NUMBER 1-800-553-6546 (CUSTOMER SERVICE) TO MAKE CERTAIN THAT THIS DOCUMENT IS CURRENT.
SDS file	10050_US_EN_V1.0
Replaces file	None