

1. Identification

Material name	FRECKLE ETCH; CPG GRADE
Issue date	14-April-2014
Revision date	25-September-2017
Supersedes date	25-April-2017
Other means of identification	
Spec ID	100000000033
Synonyms	Metal etchants, aluminum etchants.
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	10320_US_EN_V2.1
Replaces file	10320_US_EN_V2.0

2. Hazard(s) identification

Physical hazards	Corrosive to metals	Category 1
Health hazards	Skin corrosion/irritation	Category 1B
	Serious eye damage/eye irritation	Category 1
OSHA defined hazards	Not classified.	
Label elements		



Signal word	Danger	
Hazard statement	May be corrosive to metals. Causes severe skin burns and eye damage.	
Precautionary statement		
Prevention	Keep only in original container. Wear protective gloves/protective clothing/eye protection/face protection. Do not breathe mist/vapors/spray. Use only outdoors or in a well-ventilated area. Do not eat, drink or smoke when using this product. 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. Absorb spillage to prevent material damage.	
Storage	Store in corrosive resistant container with a resistant inner liner. Store locked up.	
Disposal	Dispose of contents/container in accordance with local/regional/national/international regulations.	
Hazard(s) not otherwise classified (HNOC)	None known.	
Supplemental information	None.	

3. Composition/information on ingredients

Mixture

Chemical name	Common name and synonyms	CAS number	%
Phosphoric acid		7664-38-2	65-85
Acetic acid		64-19-7	5-15
Nitric acid		7697-37-2	1-5
Fluoroboric acid		16872-11-0	1-3

Composition comments All concentrations are in percent by weight unless ingredient is a gas. Gas concentrations are in percent by volume.
The product contains: Water.

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.
Skin contact	Remove contaminated clothes and rinse skin thoroughly with water for at least 15 minutes. Get medical attention immediately. Chemical burns must be treated by a physician.
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.
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. Obtain medical attention and take along this material safety data sheet.
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. 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	Treat symptomatically.
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	This product is not flammable. Use fire-extinguishing media appropriate for surrounding materials.
Unsuitable extinguishing media	None.
Specific hazards arising from the chemical	By heating and fire, toxic and corrosive vapors/gases may be formed.
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. 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. For waste disposal, see Section 13 of the SDS.
Environmental precautions	Avoid discharge into drains, water courses or onto the ground unless authorized by permit.

7. Handling and storage

Precautions for safe handling	Mechanical ventilation or local exhaust ventilation is required. Avoid any exposure. Wear approved safety goggles. Wear protective gloves and appropriate clothing to prevent skin contact. Work practice should minimize contact. Observe good industrial hygiene practices.
Conditions for safe storage, including any incompatibilities	Store in closed original container in a dry place. Store in corrosive resistant container with a resistant inner liner. 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
Acetic acid (CAS 64-19-7)	PEL	25 mg/m3 10 ppm
Fluoroboric acid (CAS 16872-11-0)	PEL	2.5 mg/m3
Nitric acid (CAS 7697-37-2)	PEL	5 mg/m3 2 ppm
Phosphoric acid (CAS 7664-38-2)	PEL	1 mg/m3

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

Components	Type	Value	Form
Fluoroboric acid (CAS 16872-11-0)	TWA	2.5 mg/m3	Dust.

US. ACGIH Threshold Limit Values

Components	Type	Value
Acetic acid (CAS 64-19-7)	STEL	15 ppm
	TWA	10 ppm
Nitric acid (CAS 7697-37-2)	STEL	4 ppm
	TWA	2 ppm
Phosphoric acid (CAS 7664-38-2)	STEL	3 mg/m3
	TWA	1 mg/m3

US. NIOSH: Pocket Guide to Chemical Hazards

Components	Type	Value
Acetic acid (CAS 64-19-7)	STEL	37 mg/m3 15 ppm
	TWA	25 mg/m3 10 ppm
	TWA	2.5 mg/m3
Nitric acid (CAS 7697-37-2)	STEL	10 mg/m3 4 ppm
	TWA	5 mg/m3 2 ppm
Phosphoric acid (CAS 7664-38-2)	STEL	3 mg/m3
	TWA	1 mg/m3

Biological limit values

ACGIH Biological Exposure Indices

Components	Value	Determinant	Specimen	Sampling Time
Fluoroboric acid (CAS 16872-11-0)	3 mg/l	Fluoride	Urine	*
	2 mg/l	Fluoride	Urine	*

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

Appropriate engineering controls

Provide adequate ventilation. Observe Occupational Exposure Limits and minimize the risk of inhalation of vapors. 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. 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. In the United States of America, if respirators are used, a program should be instituted to assure compliance with OSHA Standard 1910.134.

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 Vinegar-like.

Odor threshold No data available.

pH < 2 (25 °C)

Melting point/freezing point No data available.

Initial boiling point and boiling range 235.4 - 244.4 °F (113 - 118 °C)

Flash point None.

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 1.5 - 1.6

Solubility(ies)

Solubility (water) Completely miscible in water.

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

Auto-ignition temperature Not applicable.

Decomposition temperature Not applicable.

Viscosity No data available.

Other information

Density 1.50 - 1.60 g/cc

Molecular weight Not applicable/mixture.

Percent volatile 60 - 80 %

10. Stability and reactivity

Chemical stability Stable under normal temperature conditions.

Possibility of hazardous reactions May be corrosive to metals. Reacts with most metals to form flammable hydrogen gas.

Conditions to avoid Keep away from heat.

Incompatible materials Strong oxidizing agents. Strong bases. Organic compounds. Metals. Alkali metals. Strong alkalis. Cyanides. Sulfides.

Hazardous decomposition products At elevated temperatures: Carbon dioxide. Carbon monoxide. Hydrogen. Phosphorus oxides. Acetic acid. Nitrogen oxides.

11. Toxicological information

Information on likely routes of exposure

Inhalation	Causes respiratory tract burns. High concentrations: May cause lung damage.
Skin contact	Causes severe skin burns.
Eye contact	Causes serious eye damage.
Ingestion	Causes digestive tract burns.

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

Components	Species	Test Results
Acetic acid (CAS 64-19-7)		
Acute		
Dermal		
LD50	Rabbit	1060 mg/kg
Inhalation		
<i>Mist</i>		
LC50	Rat	11.4 mg/l, 4 Hours
Oral		
LD50	Rat	3.31 g/kg
Nitric acid (CAS 7697-37-2)		
Acute		
Inhalation		
LC50	Rat	130 mg/m3, 4 h
Phosphoric acid (CAS 7664-38-2)		
Acute		
Dermal		
LD50	Rabbit	2740 mg/kg
Oral		
LC50	Rat	2600 mg/kg (Approximate)
Skin corrosion/irritation	Causes severe skin burns.	
Serious eye damage/eye irritation	Causes serious eye damage.	
Respiratory or skin sensitization		
Respiratory sensitization	Due to lack of data the classification is not possible.	
Skin sensitization	Due to lack of data the classification is not possible.	
Germ cell mutagenicity	Due to lack of data the classification is not possible.	
Carcinogenicity	Due to lack of data the classification is not possible.	
IARC Monographs. Overall Evaluation of Carcinogenicity		
Not listed.		
NTP Report on Carcinogens		
Not listed.		
OSHA Specifically Regulated Substances (29 CFR 1910.1001-1053)		
Not regulated.		
Reproductive toxicity	Due to lack of data the classification is not possible.	
Specific target organ toxicity - single exposure	Due to lack of data the classification is not possible.	
Specific target organ toxicity - repeated exposure	Due to lack of data the classification is not possible.	
Aspiration hazard	Based on available data, the classification criteria are not met.	
Chronic effects	May cause lung damage. Inhalation of vapor or mist may cause lung edema. Erosion of exposed teeth. Exposure to this product is associated with an increased risk of bronchitis.	

Further information

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.

12. Ecological information**Ecotoxicity**

The product contains a substance which is harmful to aquatic organisms.

Components	Species		Test Results
Acetic acid (CAS 64-19-7)			
Aquatic			
Crustacea	EC50	Daphnia	6000 mg/l, 24 h
	LC50	Common shrimp, sand shrimp (Crangon crangon)	100 - 330 mg/l, 48 hours
Fish	LC50	Channel catfish (<i>Ictalurus punctatus</i>)	446 mg/l, 8 hours
		Fathead minnow (<i>Pimephales promelas</i>)	88 mg/l, 96 hours
		Western mosquitofish (<i>Gambusia affinis</i>)	251 mg/l, 96 hours
Nitric acid (CAS 7697-37-2)			
Aquatic			
Crustacea	LC50	Green or European shore crab (<i>Carcinus maenas</i>)	180 mg/l, 48 hours
Phosphoric acid (CAS 7664-38-2)			
Aquatic			
Crustacea	EC50	Daphnia magna	> 100 mg/l, 48 hours
Fish	LC50	Oryzias latipes	75.1 mg/l, 96 hours

Persistence and degradability

The product contains inorganic compounds which are not biodegradable.

Bioaccumulative potential

Not relevant for inorganic substances.

Octanol/water partition coefficient log Kow

Acetic acid (CAS 64-19-7) -0.31

Mobility in soil

This product is miscible in water and may not disperse in soil.

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**

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.

Hazardous waste code

D002: Waste Corrosive material [pH ≤2 or ≥12.5, or corrosive to steel]

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	UN1760
UN proper shipping name	Corrosive liquids, n.o.s. (Phosphoric acid, Acetic acid)
Transport hazard class(es)	
Class	8
Subsidiary risk	-
Label(s)	8
Packing group	II
Environmental hazards	
Marine pollutant	No
Special precautions for user	Read safety instructions, SDS and emergency procedures before handling.
Special provisions	B2, IB2, T11, TP2, TP27
Packaging exceptions	154
Packaging non bulk	202
Packaging bulk	242

IATA

UN number	UN1760
UN proper shipping name	Corrosive liquid, n.o.s. (Phosphoric acid, Acetic acid)
Transport hazard class(es)	
Class	8
Subsidiary risk	-

Label(s)	Corrosive
Packing group	II
Environmental hazards	No
ERG Code	8L
Special precautions for user	Read safety instructions, SDS and emergency procedures before handling.

IMDG

UN number	UN1760
UN proper shipping name	CORROSIVE LIQUID, N.O.S. (Phosphoric acid, Acetic acid)
Transport hazard class(es)	
Class	8
Subsidiary risk	-
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

Not regulated.

US EPCRA (SARA Title III) Section 302 - Extremely Hazardous Spill: Reportable quantity

Nitric acid (CAS 7697-37-2) 1000 LBS

US EPCRA (SARA Title III) Section 302 - Extremely Hazardous Substance: Threshold Planning Quantity

Nitric acid (CAS 7697-37-2) 1000 LBS

US EPCRA (SARA Title III) Section 313 - Toxic Chemical: De minimis concentration

Nitric acid (CAS 7697-37-2) 1.0 %

US EPCRA (SARA Title III) Section 313 - Toxic Chemical: Listed substance

Nitric acid (CAS 7697-37-2) Listed.

CERCLA (Superfund) reportable quantity (lbs) (40 CFR 302.4)

Phosphoric acid: 5000

Acetic acid: 5000

Nitric acid: 1000

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
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Section 302 extremely hazardous substance (40 CFR 355, Appendix A)	No
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Section 311/312 (40 CFR 370)	Yes
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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

Country(s) or region	Inventory name	On inventory (yes/no)*
Canada	Non-Domestic Substances List (NDSL)	No
Korea	Existing Chemicals List (ECL)	Yes
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. Massachusetts RTK - Substance List

Acetic acid (CAS 64-19-7)	Listed.
Nitric acid (CAS 7697-37-2)	Listed.
Phosphoric acid (CAS 7664-38-2)	Listed.

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

Acetic acid (CAS 64-19-7)
Fluoroboric acid (CAS 16872-11-0)
Nitric acid (CAS 7697-37-2)
Phosphoric acid (CAS 7664-38-2)

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

Acetic acid (CAS 64-19-7)
Fluoroboric acid (CAS 16872-11-0)
Nitric acid (CAS 7697-37-2)
Phosphoric acid (CAS 7664-38-2)

US. Rhode Island RTK

Acetic acid (CAS 64-19-7)	Listed.
Fluoroboric acid (CAS 16872-11-0)	Listed.
Nitric acid (CAS 7697-37-2)	Listed.
Phosphoric acid (CAS 7664-38-2)	Listed.

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

Further information HMIS® is a registered trade and service mark of the ACA.
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 ELECTRONIC MATERIALS 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 ELECTRONIC MATERIALS AT THE PHONE NUMBER 1-800-553-6546 (CUSTOMER SERVICE) TO MAKE CERTAIN THAT THIS DOCUMENT IS CURRENT.

This SDS contains revisions in the following section(s): 1, 11, 16. 1, 11, 12, 16.

SDS file 10320_US_EN_V2.1
Replaces file 10320_US_EN_V2.0