REAGENTS DUKSAN

SAFETY DATA SHEET

Silicon etchant

Date of issue: 2020-03-17 **Revision date: 2020-03-17** **Version: R0002.0001**

1. IDENTIFICATION

A. Product name

- Silicon etchant

B. Recommended use and restriction on use

- General use : for experimental, research and industrial use
- Restriction on use : Never drink, Not used except for experimental, research and industrial applications.

C. Manufacturer / Supplier / Distributor information

○ **Manufacturer information**

- Company name :
- Address :
- Emergency telephone number :

○ **Supplier/Distributer information**

- Company name : DUKSAN PURE CHEMICALS
- Address : 53,SINWONRO 133BEONGIL, DANWONGU, ANSANSHI, GYUNGGIDO, KOREA
- Telephone number : 82-31-495-4055
- Emergency telephone number : 82-31-495-4055
- Fax number : 82-31-495-4058

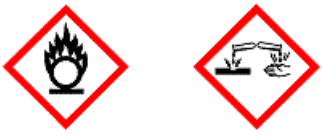
2. HAZARD IDENTIFICATION

A. GHS Classification

- Oxidizing liquids : Category1
- Skin corrosion/irritation : Category1A
- Serious eye damage/irritation : Category1

B. GHS label elements

○ **Hazard symbols**



○ **Signal words**

- Danger

○ **Hazard statements**

- H271 May cause fire or explosion; strong oxidizer
- H314 Causes severe skin burns and eye damage
- H318 Causes serious eye damage

○ **Precautionary statements**

1) Prevention

- P210 Keep away from heat/sparks/open flames/hot surfaces. No smoking.
- P220 Keep/Store away from clothing//combustible materials.
- P221 Take any precaution to avoid mixing with combustibles, incompatibles material
- P260 Do not breathe gas/mist/vapours/spray.
- P264 Wash hands thoroughly after handling.

- P280 Wear protective gloves/protective clothing/eye protection/face protection.
- P283 Wear fire/flame resistant/retardant clothing.

2) Response

- P301+P330+P331 IF SWALLOWED: Rinse mouth. Do NOT induce vomiting.
- P303+P361+P353 IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower.
- P304+P340 IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing.
- P305+P351+P338 IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
- P306+P360 IF ON CLOTHING: Rinse immediately contaminated clothing and skin with plenty of water before removing clothes.
- P310 Immediately call a POISON CENTER or doctor/physician.
- P321 Specific treatment
- P363 Wash contaminated clothing before reuse.
- P370+P378 In case of fire: Use Suitable extinguishing media for extinction(Refer Section MSDS 5).
- P371+P380+P375 In case of major fire and large quantities: Evacuate area. Fight fire remotely due to the risk of explosion.

3) Storage

- P405 Store locked up.

4) Disposal

- P501 Dispose of contents/container in accordance with local/regional/national/international regulation

C. Other hazards which do not result in classification

- Not available

3. COMPOSITION/INFORMATION ON INGREDIENTS

Chemical Name	Trade names and Synonyms	CAS No.	Content(%)
Nitric acid	Fumic acid ; Nital	7697-37-2	47~58
Water	Dihydrogen oxide ; Oxidane	7732-18-5	Balance
Ammonium fluoride	Ammonium fluoride ((Nh4)F) ; Neutral ammonium fluoride	12125-01-8	<2

4. FIRST AID MEASURES

A. Eye contact

- Do not rub your eyes.
- Immediately flush eyes with plenty of water for at least 15 minutes and call a doctor/physician.
- Get medical attention immediately.
- Remove contact lenses if worn.

B. Skin contact

- Flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes.
- Wash contaminated clothing thoroughly before re-using.
- Get medical attention immediately.
- Wash thoroughly after handling.

C. Inhalation contact

- When exposed to large amounts of steam and mist, move to fresh air.
- Take specific treatment if needed.

D. Ingestion contact

- Please be advised by doctor whether induction of vomit is demanded or not.
- Rinse your mouth with water immediately.

E. Delayed and immediate effects and also chronic effects from short and long term exposure

- Not available

F. Notes to physician

- Notify medical personnel of contaminated situations and have them take appropriate protective measures.

5. FIREFIGHTING MEASURES

A. Suitable (Unsuitable) extinguishing media

- Dry chemical, carbon dioxide, regular foam extinguishing agent, spray
- Avoid use of water jet for extinguishing

B. Specific hazards arising from the chemical

- Not available

C. Special protective actions for firefighters

- Keep unauthorized personnel out.
- Withdraw immediately in case of rising sound from venting safety devices or discoloration of tank.
- In case of conflagration, use automatic fire sprinkler. Major fire may require withdrawal, allowing the object itself to burn.
- Avoid inhalation of materials or combustion by-products.
- Do not approach the tank surrounded by fire until it is extinguished.
- Keep containers cool with water spray.
- Vapor or gas is burned at distant ignition sources can be spread quickly.
- Explosion hazards : Keep people away and fight fire from a safe distance.
- Flush skin with plenty of wter for at least 15 minutes while removing contaminated clothing and shoes.
- Move people from the area.

6. ACCIDENTAL RELEASE MEASURES

A. Personal precautions, protective equipment and emergency procedures

- Wear proper personal protective apparatus as indicated in Section 8 and avoid skin contact and inhalation.
- Ventilate closed spaces before entering.
- Do not touch spilled material. Stop leak if you can do it without risk.
- Handle the damaged containers or spilled material after wearing appropriate protective equipment
- Do not direct water at spill or source of leak.
- Avoid skin contact and inhalation.

B. Environmental precautions

- Prevent runoff and contact with waterways, drains or sewers.
- If large amounts have been spilled, inform the relevant authorities.

C. Methods and materials for containment and cleaning up

- Large spill : Stay upwind and keep out of low areas. Dike for later disposal.
- Notify the central and local government if the emission reach the standard threshold.
- Disposal of waste shall be in compliance with the Wastes Control?Act
- Appropriate container for disposal of spilled material collected.
- Small leak: sand or other non-combustible material, please let use absorption.
- Wipe off the solvent.
- Dike for later disposal.

7. HANDLING AND STORAGE

A. Precautions for safe handling

- Avoid direct physical contact.
- Since emptied containers retain product residue(vapor, liquid, solid) follow all MSDS and label warnings even after container is emptied.
- Avoid contact with incompatible materials.
- Dealing only with a well-ventilated place.
- Do not inhale the steam prolonged or repeated.
- Handling only authorized person.

B. Conditions for safe storage, including any incompatibilities

- Do not apply direct heat.

- Do not apply any physical shock to container.
- Keep in the original container.
- Prevent static electricity and keep away from combustible materials or heat sources.
- Collected them in sealed containers.
- Do not store in metal containers.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

A. Exposure limits

○ **ACGIH TLV**

- [Nitric acid] : TWA, 2 ppm (5.2 mg/m3) STEL, 4 ppm (10 mg/m3)

○ **OSHA PEL**

- [Nitric acid]:2ppm 5mg/m3

B. Engineering controls

- Business owner is recommended to maintain below recommended exposure limits for the working place with general exhaust of gas/vapour/mist/fume.

C. Individual protection measures, such as personal protective equipment

○ **Respiratory protection**

- Respiratory protection is ranked in order from minimum to maximum.
- Consider warning properties before use.
- Any chemical cartridge respirator with organic vapor cartridge(s).
- Any chemical cartridge respirator with a full facepiece and organic vaporcartridge(s).
- Any air-purifying respirator with a full facepiece and an organic vapor canister.
- For Unknown Concentration or Immediately Dangerous to Life or Health : Any supplied-air respirator with full facepiece and operated in a pressure-demand or other positive-pressure mode in combination with a separate escape supply. Any self-contained breathing apparatus with a full facepiece.
- Under conditions of frequent use or heavy exposure, Respiratory protection may be needed.

○ **Eye protection**

- Wear primary eye protection such as splash resistant safety goggles with a secondary protection face shield.
- Provide an emergency eye wash station and quick drench shower in the immediate work area.

○ **Hand protection**

- Wear appropriate chemical resistant glove.

○ **Skin protection**

- Wear appropriate chemical resistant protective clothing.

○ **Others**

- Not available

9. PHYSICAL AND CHEMICAL PROPERTIES

A. Appearance	
- Appearance	Liquid
- Color	colorless to yellow
B. Odor	characteristic odor
C. Odor threshold	Not available
D. pH	1
E. Melting point/Freezing point	Not available
F. Initial Boiling Point/Boiling Ranges	Not available
G. Flash point	Not available
H. Evaporation rate	Not available
I. Flammability(solid, gas)	Not available
J. Upper/Lower Flammability or explosive limits	Not available
K. Vapour pressure	Not available
L. Solubility	Not available
M. Vapour density	Not available
N. Specific gravity(Relative density)	Not available

O. Partition coefficient of n-octanol/water	Not available
P. Autoignition temperature	Not available
Q. Decomposition temperature	Not available
R. Viscosity	Not available
S. Molecular weight	Not available

10. STABILITY AND REACTIVITY

A. Chemical Stability

- This material is stable under recommended storage and handling conditions.

B. Possibility of hazardous reactions

- Hazardous Polymerization will not occur.

C. Conditions to avoid

- Avoid contact with incompatible materials and condition.
- Avoid : Accumulation of electrostatic charges, Heating, Flames and hot surfaces
- Avoid contact with heat, sparks, flame or other ignition sources.
- Keep away from heat source.

D. Incompatible materials

- Not available

E. Hazardous decomposition products

- May emit flammable vapour if involved in fire.

11. TOXICOLOGICAL INFORMATION

A. Information on the likely routes of exposure

○ **(Respiratory tracts)**

- Not available

○ **(Oral)**

- Not available

○ **(Eye·Skin)**

- Causes serious eye damage
- Causes severe skin burns and eye damage

B. Delayed and immediate effects and also chronic effects from short and long term exposure

○ **Acute toxicity**

*** Oral**

- Product (ATEmix) : 2000mg/kg < ATEmix <= 5000mg/kg
- [Nitric acid] : Corrosive substance
- [Water] : LD50 > 90000 ㎎/㎏ Rat (KOSHA)
- [Ammonium fluoride] : LD50 200 ㎎/㎏ Rat (OECD TG423, GLP) (ECHA)

*** Dermal**

- Product (ATEmix) : >5000mg/kg
- [Ammonium fluoride] : LD50 > 2000 ㎎/㎏ Rat (OECD Guideline 401, GLP) (ECHA)

*** Inhalation**

- Product (ATEmix) : 2.0mg/L < ATEmix <= 10.0mg/L
- [Nitric acid] : Vapor LC50 > 2.65 ㎎/ℓ 4 hr Rat (OECD TG 403, GLP, Female/Male)
- [Ammonium fluoride] : Dust LC50 1 ㎎/ℓ 4 hr Rat (Read-across, OECD Guideline 403, GLP)

○ **Skin corrosion/irritation**

- Causes severe skin burns and eye damage

○ **Serious eye damage/irritation**

- Causes serious eye damage

○ **Respiratory sensitization**

- Not available

○ **Skin sensitization**

- Not available

○ **Carcinogenicity**

*** IARC**

- Not available

*** OSHA**

- Not available

*** ACGIH**

- Not available

*** NTP**

- Not available

*** EU CLP**

- Not available

○ **Germ cell mutagenicity**

- Not available

○ **Reproductive toxicity**

- Not available

○ **STOT-single exposure**

- Not available

○ **STOT-repeated exposure**

- Not available

○ **Aspiration hazard**

- Not available

12. ECOLOGICAL INFORMATION

A. Ecotoxicity

○ **Fish**

- [Nitric acid] : LC50 4400 ㎎/ℓ 96 hr (Salmo sp., Read-across CAS No. 7631-99-4)
- [Ammonium fluoride] : LC50 209 ㎎/ℓ 96 hr Cyprinus carpio (Read-across,OECD Guideline 203) (EHCA)

○ **Crustaceans**

- [Nitric acid] : LC50 4.4 ㎎/ℓ 48 hr Ceriodaphnia dubia (48h-LC50Ceriodaphnia dubia=4.4 other: pH standard units / 48h-LC50Daphnia magna=39 ㎎/ℓ , Read-across based on CAS No. 7757-79-1), the effects assessment of nitric acid is focused on the pH effect and to a certain extent, this is also a read across exercise that identifies a category of substances which toxicological behavior can be characterized based on the acid properties of the substance. The substance will therefore not be classified for environmental hazards, based on the available information.
- [Ammonium fluoride] : EC50 48 ㎎/ℓ ~ 26 ㎎/ℓ 96 hr (trichoptera aquatic larvaea, (Read-across,US Environmental Protection Agency, 440/5-86-001; Method for Acute Toxicity Tests with Fish, Macroinvertebrates and Amphibians.) (EHCA)

○ **Algae**

- [Ammonium fluoride] : EbC50 43 ㎎/ℓ 96 hr (various algae species, Read-across based on CAS No. 7681-49-4, 1st Priority List, Volume 8, EC 793/93) (EHCA)

B. Persistence and degradability

○ **Persistence**

- [Water] : log Kow = -1.38
- [Ammonium fluoride] : log Kow -4.37 (est) (HSDB)

○ **Degradability**

- Not available

C. Bioaccumulative potential

○ **Bioaccumulative potential**

- [Ammonium fluoride] : BCF 58 BCF ~ 53 (Read-across) (ECHA)

○ **Biodegration**

- Not available

D. Mobility in soil

- Not available

E. Other adverse effects

- Not available

13. DISPOSAL CONSIDERATIONS

A. Disposal methods

- Stabilization and minimization treatment by incineration or similar method can be applied, if more than two kinds of designated wastes are in mixture state and it is impractical to separate them
- Oil water separation technology shall be applied as pre-waste treatment if it is applicable
- It shall be treated by incineration

B. Special precautions for disposal

- Anyone with business license number who generates industrial wastes shall treat the waste by him/herself or by entrusting to the legal entities who treat the wastes, recycle the wastes of others or install and operate the waste treatment facilities according to the Wastes Control Act
- Dispose of waste in accordance with all applicable laws and regulations.

14. TRANSPORT INFORMATION

A. UN No. (IMDG CODE/IATA DGR)

- 2031

B. Proper shipping name

- NITRIC ACID OTHER THAN RED FUMING, WITH NOT MORE THAN 70 PERCENT NITRIC ACID

C. Hazard Class

- 8

D. IMDG CODE/IATA DGR Packing group

- II

E. Marine pollutant

- Not applicable

F. Special precautions for user related to transport or transportation measures

- Local transport follows in accordance with Dangerous goods Safety Management Law.
- Package and transport follow in accordance with Department of Transportation (DOT) and other regulatory agency requirements.
- EmS FIRE SCHEDULE : F-A (General fire schedule)
- EmS SPILLAGE SCHEDULE : S-Q (Oxidizing substances)

15. REGULATORY INFORMATION

A. National and/or international regulatory information

○ **POPs Management Law**

- Not applicable

○ **Information of EU Classification**

*** Classification**

- [Nitric acid] : H272, H314
- [Ammonium fluoride] : H331, H311, H301

○ **U.S. Federal regulations**

*** OSHA PROCESS SAFETY (29CFR1910.119)**

- [Nitric acid] : 226.7995 kg 500 lb

*** CERCLA Section 103 (40CFR302.4)**

- [Nitric acid] : 453.599 kg 1000 lb
- [Ammonium fluoride] : 45.3599 kg 100 lb

*** EPCRA Section 302 (40CFR355.30)**

- [Nitric acid] : 453.599 kg 1000 lb

*** EPCRA Section 304 (40CFR355.40)**

- [Nitric acid] : 453.599 kg 1000 lb

*** EPCRA Section 313 (40CFR372.65)**

- [Nitric acid] : Applicable

○ **Rotterdam Convention listed ingredients**

- Not applicable

○ **Stockholm Convention listed ingredients**

- Not applicable

○ **Montreal Protocol listed ingredients**

- Not applicable

16. OTHER INFORMATION

A. Reference

- The information contained herein is believed to be accurate. It is provided independently of any sale of the product for purpose of hazard communication. It is not intended to constitute performance information concerning the product. No express warranty, or implied warranty of merchantability or fitness for a particular purpose is made with respect to the product or the information contained herein.
- This Safety Data Sheet was compiled with data and information from the following sources: KOSHA, NITE, ESIS, NLM, SIDS, IPCS

B. Issue date

- 2020-03-17

C. Revision number and Last date revised

- 1 times, 2020-03-17

D. Other

- This SDS is prepared according to the Globally Harmonized System (GHS).