RIGAS 리가스
Research Institute of Gas Analytical Science

SAFETY DATA SHEET

Fluorine* 0.09 cmol/mol and 2 others mix / Neon*

Date of issue: 2020-05-15 **Revision date: 2020-01-16** **Version: 3.0**

1. IDENTIFICATION

A. Product name

- Fluorine* 0.09 cmol/mol and 2 others mix / Neon*

B. Recommended use and restriction on use

- General use : Not available
- Restriction on use : Not available

C. Manufacturer / Supplier / Distributor information

○ **Manufacturer information**

- Company name : RIGAS Co.,Ltd
- Address : 46,Munpyeongseo-ro 17 beon-gil, Daedeok-gu,Daejeon, KOREA
- Dept. : Management Planning Dept.
- Telephone number : 82-42-934-6900
- Emergency telephone number : 82-42-934-6900
- Fax number : 82-42-935-8814
- E-mail address : master@rigas.co,kr

○ **Supplier/Distributer information**

- Company name : RIGAS Co.,Ltd
- Address : 46,Munpyeongseo-ro 17 beon-gil, Daedeok-gu,Daejeon, KOREA
- Dept. : Management Planning Dept.
- Telephone number : 82-42-934-6900
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- Fax number : 82-42-935-8814
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2. HAZARD IDENTIFICATION

A. GHS Classification

- Not applicable

B. GHS label elements

○ **Hazard symbols**

- Not applicable

○ **Signal words**

- Not applicable

○ **Hazard statements**

- Not applicable

○ **Precautionary statements**

1) Prevention

- Not applicable

2) Response

- Not applicable

3) Storage

- Not applicable

4) Disposal

- Not applicable

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(%)
Krypton	-	7439-90-9	3.82
Helium	Helium, refrigerated liquid (cryogenic) liquid ; Helium Gas ; Helium, compressed ; Atomic helium ; o-Helium ; p-Helium ;	7440-59-7	1.68
Neon	-	7440-01-9	Balance
Fluorine	Fluorine, gas ; Difluorine ; Diatomic fluorine	7782-41-4	0.09

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.

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.

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

- Cool containers with water until well after fire is out.
- Keep unauthorized personnel out.
- Withdraw immediately in case of rising sound from venting safety devices or discoloration of tank.
- Notify your local firestation and inform the location of the fire and characteristics hazard.
- In case of conflagration, use automatic fire sprinkler. Major fire may require withdrawal, allowing the object itself to burn.
- Keep containers cool with water spray.

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.
- Must work against the wind, let the upwind people to evacuate.
- Do not touch spilled material. Stop leak if you can do it without risk.
- Move container to safe area from the leak area.

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.

7. HANDLING AND STORAGE

A. Precautions for safe handling

- Avoid contact with incompatible materials.
- Dealing only with a well-ventilated place.
- Do not handle until all safety precautions have been read and understood.

B. Conditions for safe storage, including any incompatibilities

- Save in cool, dry and well ventilated place.
- Do not apply direct heat.
- Avoid direct sunlight.
- Prevent static electricity and keep away from combustible materials or heat sources.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

A. Exposure limits

○ **ACGIH TLV**

- [Helium] : Asphyxia
- [Neon] : Asphyxia
- [Fluorine] : TWA, 1 ppm (1.6 mg/m3) STEL, 2 ppm (3.1 mg/m3)

○ **OSHA PEL**

- [Fluorine]:0.1ppm 0.2mg/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 glove.

○ **Skin protection**

- Wear appropriate clothing.

○ **Others**

- Not available

9. PHYSICAL AND CHEMICAL PROPERTIES

A. Appearance	**F2**
- Appearance	Gas
- Color	Not available
B. Odor	Pungent odor
C. Odor threshold	Not available
D. pH	Not available
E. Melting point/Freezing point	-219 ℃
F. Initial Boiling Point/Boiling Ranges	-188 ℃
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	202000000 ㎜Hg (25℃(estimated))
L. Solubility	0.000169 g/100㎖ (25℃)
M. Vapour density	1.3
N. Specific gravity	Not available
O. Partition coefficient of n-octanol/water	0.22 (estimated)
P. Autoignition temperature	Not available
Q. Decomposition temperature	Not available
R. Viscosity	Not available
S. Molecular weight	38

A. Appearance	**Xe**
- Appearance	Gas
- Color	colorless
B. Odor	odorless
C. Odor threshold	Not available
D. pH	Not available
E. Melting point/Freezing point	-112℃
F. Initial Boiling Point/Boiling Ranges	-108 ℃
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	760 mmHg @ -108 C
L. Solubility	0.11%
M. Vapour density	4.561
N. Specific gravity	Not available
O. Partition coefficient of n-octanol/water	Not available
P. Autoignition temperature	Not available
Q. Decomposition temperature	Not available
R. Viscosity	0.528 cP @ 17 C
S. Molecular weight	131.3

A. Appearance	**Ar**
- Appearance	Gas
- Color	무색
B. Odor	무취
C. Odor threshold	자료없음

D. pH	(해당없음)
E. Melting point/Freezing point	-189.2 ℃
F. Initial Boiling Point/Boiling Ranges	-185.9 ℃
G. Flash point	자료없음
H. Evaporation rate	자료없음
I. Flammability(solid, gas)	자료없음
J. Upper/Lower Flammability or explosive limits	- / -
K. Vapour pressure	88200000 ㎜Hg (25℃)
L. Solubility	(3.4 ml/100 ml at 20°C)
M. Vapour density	1.66
N. Specific gravity	1.40 (186℃)
O. Partition coefficient of n-octanol/water	0.94
P. Autoignition temperature	자료없음
Q. Decomposition temperature	자료없음
R. Viscosity	0.283 cP (189℃)
S. Molecular weight	39.95

A. Appearance	**Ne**
- Appearance	Gas
- Color	colorless
B. Odor	odorless
C. Odor threshold	Not available
D. pH	Not available
E. Melting point/Freezing point	-249℃
F. Initial Boiling Point/Boiling Ranges	-246 ℃
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	760 mmHg @ -246 C
L. Solubility	slightly soluble
M. Vapour density	0.6964
N. Specific gravity	Not available
O. Partition coefficient of n-octanol/water	Not available
P. Autoignition temperature	Not available
Q. Decomposition temperature	Not available
R. Viscosity	0.03181 cP @ 26.8 C
S. Molecular weight	20.179

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

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)**

- Not available

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

○ **Acute toxicity**

*** Oral**

- Not available

*** Dermal**

- Not available

*** Inhalation**

- Product (ATEmix) : Not available
- [Fluorine] : Gas LC50 92.5 ppm 4 hr Rat

○ **Skin corrosion/irritation**

- Not available

○ **Serious eye damage/irritation**

- Not available

○ **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**

- [Krypton] : LC50 686.5 ㎎/ℓ 96 hr (Estimate)
- [Helium] : LC50 12.245 ㎎/ℓ 96 hr (Estimate)
- [Neon] : LC50 619.044 ㎎/ℓ 96 hr (Estimate)
- [Fluorine] : LC50 60 ㎎/ℓ 96 hr (HSDB)

○ **Crustaceans**

- [Krypton] : LC50 681.3 ㎎/ℓ 48 hr (Estimate)

- [Helium] : LC50 116.827 ㎎/ℓ 48 hr (Estimate)
- [Neon] : LC50 589.008 ㎎/ℓ 48 hr (Estimate)

○ **Algae**

- [Krypton] : EC50 399.6 ㎎/ℓ 96 hr (Estimate)
- [Helium] : EC50 66.152 ㎎/ℓ 96 hr (Estimate)
- [Neon] : LC50 333.519 ㎎/ℓ 96 hr (Estimate)

B. Persistence and degradability

○ **Persistence**

- [Krypton] : log Kow 1.2 (IPCS INCHEM)
- [Helium] : log Kow 0.28 (Estimate)

○ **Degradability**

- Not available

C. Bioaccumulative potential

○ **Bioaccumulative potential**

- [Krypton] : BCF 3.162 (Estimate)
- [Helium] : BCF 3.162 (Estimate)

○ **Biodegradation**

- 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)

- 1956

B. Proper shipping name

- COMPRESSED GAS, N.O.S.

C. Hazard Class

- 2.2

D. IMDG CODE/IATA DGR Packing group

- Not applicable

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-C (Non-flammable gases)
- EmS SPILLAGE SCHEDULE : S-V (Gases (non-flammable, non-toxic))

15. REGULATORY INFORMATION

A. National and/or international regulatory information

○ **POPs Management Law**

- [Krypton] : Not applicable
- [Neon] : Not applicable
- [Helium] : Not applicable
- [Fluorine] : Not applicable

○ **Information of EU Classification**

*** Classification**

- [Fluorine] : H270, H330, H314

○ **U.S. Federal regulations**

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

- [Fluorine] : 453.599 kg 1000 lb

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

- [Fluorine] : 4.53599 kg 10 lb

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

- [Fluorine] : 226.7995 kg 500 lb

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

- [Fluorine] : 4.53599 kg 10 lb

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

- [Fluorine] : 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

- 2020-05-08

C. Revision number and Last date revised

- 3 times, 2020-01-16

D. Other

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