

SAFETY DATA SHEET
According to OSHA Hazcom Standard 29 CFR 1910.1200
Methane 0.009 cmol/mol and 27 others mix

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1. IDENTIFICATION

A. Product name

- Methane 0.009 cmol/mol and 27 others mix

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
- Emergency telephone number : 82-42-934-6900

○ **Supplier/Distributor information**

- Company name : RIGAS Co.,Ltd
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2. HAZARD IDENTIFICATION

A. GHS Classification

- Gases under pressure : Liquefied gas
- Flammable liquids : Category1
- Acute toxicity (inhalation: vapor) : Category4
- Skin corrosion/irritation : Category2
- Serious eye damage/irritation : Category2
- Germ cell mutagenicity : Category1B
- Carcinogenicity : Category1A
- Reproductive toxicity : Category2
- Specific target organ toxicity(Single exposure) : Category2
- Specific target organ toxicity(Single exposure) : Category3(Narcotic effects)
- Specific target organ toxicity(Single exposure) : Category3(Respiratory tract irritation)
- Specific target organ toxicity(Repeated exposure) : Category1
- Aspiration hazard : Category1
- Chronic aquatic toxicity : Category2

B. GHS label elements

○ **Hazard symbols**



○ **Signal words**

- Danger

○ **Hazard statements**

- H224 Extremely flammable liquid and vapour
- H280 Compressed gas ; Contains gas under pressure; may explode if heated
- H304 May be fatal if swallowed and enters airways

- H315 Causes skin irritation
- H332 Harmful if inhaled
- H335 May cause respiratory irritation.
- H336 May cause drowsiness and dizziness.
- H340 May cause genetic defects
- H350 May cause cancer
- H361 Suspected of damaging fertility or the unborn child
- H371 May cause damage to organs (Refer Section SDS 11)
- H372 Causes damage to organs through prolonged or repeated exposure (Refer Section SDS 11)
- H411 Toxic to aquatic life with long lasting effects

o **Precautionary statements**

1) Prevention

- P201 Obtain special instructions before use.
- P202 Do not handle until all safety precautions have been read and understood.
- P210 Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.
- P233 Keep container tightly closed.
- P240 Ground and bond container and receiving equipment.
- P241 Use explosion-proof electrical/ventilating/lighting/equipment.
- P242 Use non-sparking tools.
- P243 Take action to prevent static discharges.
- P260 Do not breathe dust/fume/gas/mist/vapours/spray.
- P261 Avoid breathing dust/fume/gas/mist/vapours/spray.
- P264 Wash hands thoroughly after handling.
- P270 Do not eat, drink or smoke when using this product.
- P271 Use only outdoors or in a well-ventilated area.
- P273 Avoid release to the environment.
- P280 Wear protective gloves/protective clothing/eye protection/face protection/hearing protection.

2) Response

- P301+P310 IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician.
- P302+P352 IF ON SKIN: Wash with plenty of soap and water.
- 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 person to fresh air and keep comfortable for breathing.
- P308+P311 If exposed: Call a POISON CENTER or doctor/physician.
- P308+P313 If exposed or concerned: Get medical advice/attention.
- P312 Call a POISON CENTER or doctor/physician if you feel unwell.
- P314 Get medical advice/attention if you feel unwell.
- P321 Specific treatment
- P331 Do NOT induce vomiting.
- P332+P313 If skin irritation occurs: Get medical advice/attention.
- P362+P364 Take off contaminated clothing and wash before reuse.
- P370+P378 In case of fire: Use Suitable extinguishing media for extinction(Refer Section MSDS 5).
- P391 Collect spillage.

3) Storage

- P403+P233 Store in a well-ventilated place. Keep container tightly closed.
- P403+P235 Store in a well-ventilated place. Keep cool.
- P405 Store locked up.
- P410+P403 Protect from sunlight. Store in a well-ventilated place.

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(%)
Propane	Dimethylmethane ; Propyl hydride ; n-Propane ; Propyldihydride ;	74-98-6	97.9935

2-Methylpropane	Propane, 2-methyl- ; 1,1-Dimethylethane ; i-Butane ; iso-Butane ; Trimethylmethane ;	75-28-5	1.0
Ethane	Not available	74-84-0	0.5
Butane	N-Butane ; Butyl hydride ; Methylmethane ;	106-97-8	0.4
1-Propene	Methylethene ; Methylene ; Propene ; 1-Propene ; 1-Propylene ;	115-07-1	0.05
2-Methylbutane	Butane, 2-methyl- (TSCA, DSL, ENCS, AICS, SWISS, PICCS, ASIA-PAC, NZIoC) ; 2-Methylbutane (English, French) (DSL, EINECS, ECL) ; 2-Methylbutan (german) (EINECS) ; 2-metilbutano (spanish) (EINECS) ; ISOPENTAN (german) (SWISS) ; ISOPENTANE (PICCS) ; BUTANE,2-METHYL (PICCS) ; 1,1,2-Trimethylethane ; Borger Isopentane ; Ethyl dimethyl methane ; Exxsol Isopentane S ; iso-Pentane ; Isoamyl hydride ; Methylbutane ; Isopentane ; 2-Methylbutane ; Ethyldimethylmethane	78-78-4	0.02
Pentane	Amyl hydride ; Normal pentane ; N-Pentane ;	109-66-0	0.01
Methane	Methyl hydride ; Fire damp	74-82-8	0.009
Isobutylene	1-Propene, 2-methyl- ; 2-Methylpropene ; 2-Methyl-1-propene ; Propene, 2-methyl- ; g-Butylene ; 1,1-Dimethylethene ; 1,1-Dimethylethylene ; 2-Methyl-2-propene ; 2-Methylpropylene ; i-Butene ; iso-Butene ; Isopropylideneethylene ;	115-11-7	0.002
1-Pentene	pent-1-ene	109-67-1	0.001
n-Hexane	Dipropyl ; Hexyl hydride ; n-Hexane	110-54-3	0.001
1,3-Butadiene	Butadiene ; Butadiene monomer ; Alpha-butadiene ; Alpha, gamma-butadiene ; Buta-1,3-diene ; Methylallene ; 1-Methylallene ; Vinyl ethylene ; Divinyl ; 2-Butene-1,4-diyl	106-99-0	0.001
2-Methylpentane	Pentane, 2-methyl- ; 1,1-Dimethylbutane ; Isohexane ;	107-83-5	0.001
Ethylene	Acetylene ; Bicarburetted hydrogen ;	74-85-1	0.001
Ethyne	Ethyne ; Acetylene ; Ethenylene ;	74-86-2	0.001
(E)-2-Butene	Not available	624-64-6	0.001
cis-2-Pentene	2-Pentene, (2Z)-	627-20-3	0.001
trans-Pent-2-ene	Not available	646-04-8	0.001
2-Methyl-2-butene	1,1,2-Trimethylethylene	513-35-9	0.001
3-Methylbut-1-ene	Not available	563-45-1	0.001
2-Methylbut-1-ene	2-METHYL-1-BUTENE	563-46-2	0.001
(Z)-2-Butene	cis-2-butene	590-18-1	5.0E-4
1,2-Butadiene	1-Methylallene	590-19-2	5.0E-4
1-Propyne	Not available	74-99-7	5.0E-4
Cyclopropane	Not available	75-19-4	5.0E-4
1-Butene	Alpha-butene ; Butene-1 ; Alpha-butylene ; 1-Butylene ; Ethylethylene ; Butylene ; n-Butene ; n-Butylene ;	106-98-9	5.0E-4
1,2-Propadiene	Not available	463-49-0	5.0E-4
2,2-dimethylpropane	Not available	463-82-1	5.0E-4

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.
- Go to the hospital immediately if symptoms (flare, irritate) occur.
- 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.
- Accidental contact with liquefied gas or refrigerated liquefied gas may cause burn, severe mayhem and perfrigeration, so please take emergency medical action.
- Get medical attention immediately.
- Go to the hospital immediately if symptoms (flare, irritate) occur.
- In case of accidental contact with liquefied gas or refrigerated liquefied gas, warm up the contact part with lukewarm water.
- Remove contaminated clothing, shoes and isolate.

- Wash thoroughly after handling.
- Wear gloves when washing the patient, and please avoid contact with contaminated clothing.

C. Inhalation contact

- Take specific treatment if needed.
- When exposed to large amounts of steam and mist, move to fresh air.
- Get medical attention immediately.
- If breathing is stopped or irregular, give artificial respiration and supply oxygen.

D. Ingestion contact

- Please be advised by doctor whether induction of vomit is demanded or not.
- Rinse your mouth with water immediately.
- Get medical attention immediately.
- If swallowed, large amounts of water to drink and do not induce vomiting.

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.
- If exposed or concerned, get medical attention/advice.

5. FIREFIGHTING MEASURES

A. Suitable (Unsuitable) extinguishing media

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

B. Specific hazards arising from the chemical

- Causes damage to organs through prolonged or repeated exposure (Refer Section SDS 11)
- Causes skin irritation
- Compressed gas ; Contains gas under pressure; may explode if heated
- Extremely flammable liquid and vapour
- Harmful if inhaled

C. Special protective actions for firefighters

- Avoid inhalation of materials or combustion by-products.
- Cool containers with water until well after fire is out.
- Do not approach the tank surrounded by fire until it is extinguished.
- In case of conflagration, use automatic fire sprinkler. Major fire may require withdrawal, allowing the object itself to burn.
- Keep unauthorized personnel out.

6. ACCIDENTAL RELEASE MEASURES

A. Personal precautions, protective equipment and emergency procedures

- 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
- Move container to safe area from the leak area.
- Must work against the wind, let the upwind people to evacuate.
- Remove all sources of ignition.

B. Environmental precautions

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

C. Methods and materials for containment and cleaning up

- Appropriate container for disposal of spilled material collected.
- Disposal of waste shall be in compliance with the Wastes Control Act
- 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.

7. HANDLING AND STORAGE

A. Precautions for safe handling

- Avoid contact with incompatible materials.
- Avoid direct physical contact.
- Comply with all applicable laws and regulations for handling
- 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

- Avoid direct sunlight.
- Check regularly for leaks.
- Do not apply any physical shock to container.
- Do not apply direct heat.
- Do not use damaged containers.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

A. Exposure limits

- **ACGIH TLV**
 - [Propane] : Asphyxia
 - [2-Methylpropane] : STEL 1000 ppm
 - [Ethane] : Asphyxia
 - [Butane] : STEL 1000 ppm
 - [1-Propene] : TWA 500 ppm (860 mg/m³)
 - [2-Methylbutane] : TWA, 1000 ppm (2950 mg/m³)
 - [Pentane] : TWA, 1000 ppm (2950 mg/m³)
 - [Methane] : Asphyxia
 - [Isobutylene] : TWA, 250 ppm (574 mg/m³)
 - [n-Hexane] : TWA, 50 ppm (176 mg/m³)
 - [1,3-Butadiene] : TWA, 2 ppm (4.4 mg/m³)
 - [2-Methylpentane] : TWA, 500 ppm (1760 mg/m³) STEL, 1000 ppm (3500 mg/m³)
 - [Ethylene] : TWA 200 ppm (Asphyxia)
 - [Ethyne] : Asphyxia
 - [(E)-2-Butene] : TWA, 250 ppm (574 mg/m³)
 - [2-Methyl-2-butene] : TWA 10 ppm
 - [(Z)-2-Butene] : TWA, 250 ppm (574 mg/m³)
 - [1-Propyne] : TWA 1000 ppm
 - [1-Butene] : TWA, 250 ppm (574 mg/m³)
 - [2,2-dimethylpropane] : TWA, 1000 ppm (2950 mg/m³)
- **OSHA PEL**
 - [Propane] : 1800
 - [Pentane] : 2950
 - [n-Hexane] : 1800
 - [1-Propyne] : 1650

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**
 - Consider warning properties before use.
 - Respiratory protection is ranked in order from minimum to maximum.
- **Eye protection**
 - Provide an emergency eye wash station and quick drench shower in the immediate work area.
 - Wear primary eye protection such as splash resistant safety goggles with a secondary protection face shield.
- **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	Not available
- Color	Not available
B. Odor	Not available
C. Odor threshold	Not available
D. pH	Not available
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

- high-pressure gas; May explode when heated.

B. Possibility of hazardous reactions

- Contact with other combustible material may cause fire.
- Cylinders exposed to fire may vent and release flammable gas.

C. Conditions to avoid

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

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**
 - May be fatal if swallowed and enters airways
 - May cause respiratory irritation.
- **Oral**
 - Not available
- **Eye/Skin**
 - Causes skin irritation

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

o Acute toxicity

* Oral

- Product (ATEmix) : Not available
- [Pentane] : LD50>2000 mg/kg Rat (ECHA)
- [n-Hexane] : LD50 15,864 mg/kg (conversion value of 24 mL/kg) Rat (OECD TG 401, ECHA)
- [2-Methylpentane] : LD50 15840 mg/kg (Rat) (ECHA)
- [2-Methyl-2-butene] : LD50 700 mg/kg Rat(IUCLID)

* Dermal

- Product (ATEmix) : Not available
- [2-Methylbutane] : LD50 > 2000 mg/kg Rat (OSHRI)
- [n-Hexane] : LD50 >2000 mg/kg Rat (ECHA)
- [2-Methyl-2-butene] : LD50 > 2000 mg/kg Rat(OECD Screening Information Data Set)

* Inhalation

- Product (ATEmix) : Not available
- [Propane] : LC50 142500 ppm/4hr (570000 ppm/15min) Rat (ECHA)
- [2-Methylpropane] : LC50 > 13023ppm 4hr No death, Not classified (ECHA)
- [Ethane] : Gas LC50 > 200000ppm/4hr (800000ppm/15min) Rat (Read-across CAS No. 74-98-6)(ECHA), LC50 658 mg/ℓ 4 hr Rat (KOSHA)
- [Butane] : Gas LC50 > 200000ppm 4hr Rat (conversion of 800000ppm 15min) (Read-across CAS No. 74-98-6) (ECHA)
- [1-Propene] : Gas LC50 50,000 ppm/4 hr Rat (IARC, 1994)
- [2-Methylbutane] : Steam LC50 = 280 mg/ℓ 4 hr Rat (Hazardous substances: Galogenated hydrocarbons) Bandman A.L. et al., Chimia, 1990.
- [Pentane] : LC50 364 mg/L/4 hr Rat (HSDB, ChemIDPlus)
- [Methane] : Gas LC50 353553 ppm 4 hr (LC50 500000 2 hr) Mouse (RTECS)
- [Isobutylene] : gas LC50 270000 ppm 4 hr Rat (SIDS)
- [1-Pentene] : Steam LC50 11 mg/L/4 hr (IUCLID)
- [n-Hexane] : Vapor LC50 > 43.17 mg/L 4 hr Rat (conversion of 5000 ppm 24 hr) (OECD TG 403, ECHA)
- [1,3-Butadiene] : LC50=128827 ppm (285 mg/L) Rat (NIER)
- [2-Methylpentane] : Vapor LC50 >20 mg/ℓ 4 hr Rat Not classified (OSHRI Risk Assessment, 2010)
- [2-Methyl-2-butene] : Steam LC50 > 174.97 mg/L 4 hr Rat(IUCLID)

o Skin corrosion/irritation

- Causes skin irritation

o Serious eye damage/irritation

- Not available

o Respiratory sensitization

- Not available

o Skin sensitization

- Not available

o Carcinogenicity

* IARC

- [1-Propene] : Group 3
- [1,3-Butadiene] : Group 1
- [Ethylene] : Group 3

* OSHA

- [1,3-Butadiene] : Applicable

* ACGIH

- [1-Propene] : A4
- [Isobutylene] : A4
- [1,3-Butadiene] : A2
- [Ethylene] : A4
- [(E)-2-Butene] : A4
- [(Z)-2-Butene] : A4
- [1-Butene] : A4

* NTP

- [1,3-Butadiene] : K

* EU CLP

- [2-Methylpropane] : Carc.1A (isobutane (containing ≥ 0.1% butadiene (203-450-8)))

- [Butane] : Carc.1A (butane (containing $\geq 0.1\%$ butadiene (203-450-8)))
- [1,3-Butadiene] : 1A
- **Germ cell mutagenicity**
 - May cause genetic defects
- **Reproductive toxicity**
 - Suspected of damaging fertility or the unborn child
- **STOT-single exposure**
 - May cause damage to organs (Refer Section SDS 11)
 - May cause drowsiness and dizziness.
 - May cause respiratory irritation.
- **STOT-repeated exposure**
 - Causes damage to organs through prolonged or repeated exposure (Refer Section SDS 11)
- **Aspiration hazard**
 - May be fatal if swallowed and enters airways

12. ECOLOGICAL INFORMATION

A. Ecotoxicity

- **Fish**
 - [Propane] : LC50 > 100 mg/l 96 hr (Species : Fish TLm) (IUCLID)
 - [Butane] : LC50 27.98 mg/l 96 hr Other (Read across, Estimate)
 - [2-Methylbutane] : LC50 4.26 mg/L 96h (ECHA)
 - [Pentane] : LC50 4.26 mg/l 96 hr Oncorhynchus mykiss (Semi-static, OECD Guideline 203, GLP) (ECHA)
 - [Isobutylene] : LC50 19.9 mg/l 96 hr (OECD Screening Information Data Set)
 - [1-Pentene] : LC50 12.461 mg/l 96 hr (Estimate)
 - [n-Hexane] : LC50 >1 mg/l 48 hr Oryzias latipes (no guideline followed, ECHA)
 - [1,3-Butadiene] : LC50 45 mg/l 96 hr Pimephales promelas (Estimate)
 - [cis-2-Pentene] : LC50 14.816 mg/l 96 hr (Estimate)
 - [trans-Pent-2-ene] : LC50 14.816 mg/l 96 hr (Estimate)
 - [2-Methyl-2-butene] : LC50 4.99 mg/l 96 hr (OECD Screening Information Data Set)
 - [3-Methylbut-1-ene] : LC50 4.418 mg/l 96 hr (Estimate)
 - [2-Methylbut-1-ene] : LC50 3.551 mg/l 96 hr (Estimate)
 - [1,2-Propadiene] : LC50 63.353 mg/l 96 hr (Estimate)
 - [2,2-dimethylpropane] : LC50 14.353 mg/l 96 hr (Estimate)
- **Crustaceans**
 - [Propane] : LC50 52.157 mg/l 48 hr (Estimate)
 - [Butane] : LC50 69.43 mg/l 48 hr Daphnia sp. (Read across, Estimate)
 - [2-Methylbutane] : EC50 = 2.3 mg/l 48 hr Daphnia magna (NITE: IUCLID, 2000)
 - [Pentane] : LC50 9.1 mg/l 48 hr Daphnia magna(static) (ECHA)
 - [Methane] : LC50 164.244 mg/l 48 hr (Estimate)
 - [1-Pentene] : LC50 13.975 mg/l 48 hr (Estimate)
 - [n-Hexane] : LC50 30 mg/l 48 hr Daphnia magna (ECHA)
 - [1,3-Butadiene] : EC50 33 mg/l 48 hr Daphnia magna (Estimate)
 - [2-Methylpentane] : LC50 3.649 mg/l 48 hr Daphnia magna (Estimate) (ECHA)
 - [cis-2-Pentene] : LC50 16.525 mg/l 48 hr (Estimate)
 - [trans-Pent-2-ene] : EC50 16.525 mg/l 48 hr (Estimate)
 - [2-Methyl-2-butene] : EC50 3 mg/l 48 hr Daphnia magna (SIDS)
 - [3-Methylbut-1-ene] : LC50 16.182 mg/l 48 hr (Estimate)
 - [2-Methylbut-1-ene] : LC50 12.342 mg/l 48 hr (Estimate)
 - [1,2-Propadiene] : LC50 66.263 mg/l 48 hr (Estimate)
 - [2,2-dimethylpropane] : LC50 8.682 mg/l 48 hr (estimate)
- **Algae**
 - [Propane] : LC50 32.252 mg/l 96 hr (Estimate)
 - [Butane] : EC50 16.47 mg/l 96 hr Green algea (Read across, Estimate)
 - [Pentane] : ErC50 10.7 mg/l 72 hr Selenastrum capricornutum(static, OECD Guideline 201, GLP) (ECHA)
 - [Methane] : EC50 95.717 mg/l 96 hr (Estimate)
 - [1-Pentene] : EC50 9.075 mg/l 96 hr (Estimate)
 - [n-Hexane] : EL50 9.285 mg/L (ECHA)
 - [1,3-Butadiene] : EC50 33 mg/l 72 hr (Estimate)

- [(E)-2-Butene] : EC50 14.814 mg/ℓ 96 hr (Estimate)
- [cis-2-Pentene] : EC50 10.682 mg/ℓ 96 hr (Estimate)
- [trans-Pent-2-ene] : EC50 10.682 mg/ℓ 96 hr (Estimate)
- [3-Methylbut-1-ene] : EC50 10.466 mg/ℓ 96 hr (Estimate)
- [2-Methylbut-1-ene] : EC50 8.030 mg/ℓ 96 hr (Estimate)
- [1,2-Butadiene] : EC50 23.770 mg/ℓ 96 hr (Estimate)
- [1,2-Propadiene] : EC50 40.599 mg/ℓ 96 hr (Estimate)
- [2,2-dimethylpropane] : EC50 8.403 mg/ℓ 96 hr (estimate)

B. Persistence and degradability

○ Persistence

- [Propane] : log Kow 2.36
- [2-Methylpropane] : log Kow = 2.76 (HSDB)
- [Ethane] : log Kow 1.81
- [Butane] : log Kow 2.89 (HSDB)
- [1-Propene] : log Kow = 1.77 (ICSC)
- [2-Methylbutane] : log Kow=4 (25C)(ECHA)
- [Pentane] : log Kow 3.45 (ECHA)
- [Methane] : log Pow 1.09 (ECHA)
- [Isobutylene] : log Kow 2.35 (ICSC)
- [1-Pentene] : log Kow 2.66
- [n-Hexane] : 4 log Kow (20°C, pH=7) (ECHA)
- [1,3-Butadiene] : log Kow 1.99 (ECHA)
- [2-Methylpentane] : log Pow 3.214 (25 °C) (ECHA)
- [Ethylene] : log Kow 1.13 (ECHA)
- [Ethyne] : log Kow 0.37 (Estimate)
- [(E)-2-Butene] : log Kow 2.31 (ICSC)
- [cis-2-Pentene] : log Kow 2.6 (NLM/HSDB)
- [trans-Pent-2-ene] : log Kow 2.58 (Estimate)
- [2-Methyl-2-butene] : log Kow 2.67 (SIDS)
- [3-Methylbut-1-ene] : log Kow 2.59 (NLM)
- [2-Methylbut-1-ene] : log Kow 2.72 (NLM)
- [(Z)-2-Butene] : log Kow 2.33 (ICSC)
- [1,2-Butadiene] : log Kow 2.060 (NLM)
- [1-Propyne] : log Kow 0.94 (HSDB)
- [Cyclopropane] : log Kow 1.72 (NLM)
- [1-Butene] : log Kow 2.4
- [1,2-Propadiene] : log Kow 1.65 (Estimate)
- [2,2-dimethylpropane] : log Kow -2.69 (Estimate)

○ Degradability

- [2-Methyl-2-butene] : BOD5/COD 0.05 (SIDS)

C. Bioaccumulative potential

○ Bioaccumulative potential

- [Propane] : BCF 13 (HSDB)
- [2-Methylpropane] : BCF = 30 (estimate)(HSDB)
- [1-Propene] : BCF = 13.18 (IUCLID)
- [Pentane] : BCF 171 (Estimate) (ECHA)
- [Methane] : BCF 1 (HSDB)
- [1-Pentene] : BCF 22 (HSDB)
- [n-Hexane] : BCF 501.187 (Estimate) (ECHA)
- [2-Methylpentane] : BCF 100 ~ 408 (HSDB)
- [(E)-2-Butene] : BCF 11.99 (Estimate)
- [cis-2-Pentene] : BCF 19 (NLM/HSDB)
- [trans-Pent-2-ene] : BCF 19 (NLM/HSDB)
- [2-Methyl-2-butene] : BCF 22.69 (SIDS)
- [3-Methylbut-1-ene] : BCF 20 (NLM/HSDB)
- [2-Methylbut-1-ene] : BCF 25 (NLM/HSDB)

- [(Z)-2-Butene] : BCF 11.99 (Estimate)
- [1,2-Butadiene] : BCF 8 (NLM/HSDB)
- [Cyclopropane] : BCF 12 (NLM/HSDB)
- [1,2-Propadiene] : BCF 2.609 (Estimate)
- [2,2-dimethylpropane] : BCF 52.36 (estimate)
- **Biodegradation**
 - [Propane] : 65.7 (%) 35 day
 - [2-Methylpropane] : Biodegradability = 65.7 (%) 35 day (Aerobic, Microorganism, readily biodegradable)(HSDB)
 - [Ethane] : 65.7 (%) 35 day (Aerobic, Microorganism, readily biodegradable)
 - [Butane] : 100% 385.5 hr (Read across, ECHA)
 - [1-Propene] : 65.7 %, 35 day (NLM/HSDB)
 - [2-Methylbutane] : 71.43% 28 days (ECHA)
 - [Pentane] : 87 (%) 28 day (OECD Guideline 301 F, GLP) (ECHA)
 - [Methane] : 65.7 (%) 35 d (IUCLID)
 - [Isobutylene] : readily biodegradable (Estimate)(ECHA)
 - [n-Hexane] : 98 % 28 day (Read-across CAS No.64742-49-0 OECD TG 301 F, GLP) (ECHA)
 - [2-Methylpentane] : Readily biodegradable (OECD TG 301 C, GLP) (ECHA)
 - [2-Methyl-2-butene] : 7 (%) 28 day (SIDS)

D. Mobility in soil

- [1-Propene] : Koc 220 (NLM/HSDB)
- [Isobutylene] : Koc 450 (NLM/HSDB)
- [n-Hexane] : 2187.76 Koc (Estimate)
- [cis-2-Pentene] : Koc 81 (NLM/HSDB)
- [trans-Pent-2-ene] : Koc 81 (NLM/HSDB)
- [3-Methylbut-1-ene] : Koc 68(NLM/HSDB)
- [2-Methylbut-1-ene] : Koc 68(NLM/HSDB)
- [Cyclopropane] : Koc 210 (NLM/HSDB)
- [1,2-Propadiene] : Koc 9.99(Estimate)
- [2,2-dimethylpropane] : Koc 499.8 (Estimate)

E. Other adverse effects

- [Pentane] : Algae(Scenedesmus capricornutum); NOErC(72h) 7.51mg/L (OECD Guideline 201, GLP) (ECHA)
- [n-Hexane] : Chronic aquatic toxicity Category 2 (Harmonized classification ECHA)
- [2-Methylpentane] : 장기적인 영향에 의해 수생생물에게 유독함 (EU Harmonized Cat. 2)

13. DISPOSAL CONSIDERATIONS

A. Disposal methods

- It shall be treated by incineration
- Oil water separation technology shall be applied as pre-waste treatment if it is applicable
- 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

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)

- 3161

B. Proper shipping name

- LIQUEFIED GAS, FLAMMABLE, N.O.S.

C. Hazard Class

- 2.1

D. IMDG CODE/IATA DGR Packing group

- Not applicable

E. Marine pollutant

- 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-D (Flammable gases)
- EmS SPILLAGE SCHEDULE : S-U (Gases (flammable, toxic or corrosive))

15. REGULATORY INFORMATION**A. National and/or international regulatory information**○ **POPs Management Law**

- [Propane] : Not applicable
- [2-Methylpropane] : Not applicable
- [Ethane] : Not applicable
- [Butane] : Not applicable
- [1-Propene] : Not applicable
- [2-Methylbutane] : Not applicable
- [Pentane] : Not applicable
- [Methane] : Not applicable
- [Isobutylene] : Not applicable
- [1-Pentene] : Not applicable
- [n-Hexane] : Not applicable
- [1,3-Butadiene] : Not applicable
- [2-Methylpentane] : Not applicable
- [Ethylene] : Not applicable
- [Ethyne] : Not applicable
- [(E)-2-Butene] : Not applicable
- [cis-2-Pentene] : Not applicable
- [trans-Pent-2-ene] : Not applicable
- [2-Methyl-2-butene] : Not applicable
- [3-Methylbut-1-ene] : Not applicable
- [2-Methylbut-1-ene] : Not applicable
- [(Z)-2-Butene] : Not applicable
- [1,2-Butadiene] : Not applicable
- [1-Propyne] : Not applicable
- [Cyclopropane] : Not applicable
- [1-Butene] : Not applicable
- [1,2-Propadiene] : Not applicable
- [2,2-dimethylpropane] : Not applicable

○ **Information of EU Classification***** Classification**

- [Propane] : H220,H280
- [2-Methylpropane] : H220,H280,H340,H350
- [Ethane] : H220,H280
- [Butane] : H220,H280,H340,H350
- [1-Propene] : H220,H280
- [2-Methylbutane] : H224,H304,H336,H411
- [Pentane] : H225,H304,H336,H411
- [Methane] : H220,H280
- [Isobutylene] : H220
- [n-Hexane] : H225,H304,H315,H336,H361,H373,H411
- [1,3-Butadiene] : H220,H340,H350
- [2-Methylpentane] : H225,H304,H315,H336,H411

- [Ethylene] : H220,H280,H336
- [Ethyne] : H220,H280
- [(E)-2-Butene] : H220,H280
- [(Z)-2-Butene] : H220,H280
- [Cyclopropane] : H220,H280
- [1-Butene] : H220,H280
- [2,2-dimethylpropane] : H220,H280,H411

○ **U.S. Federal regulations**

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

- Not applicable

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

- [n-Hexane] : 2267.995 kg 5000 lb
- [1,3-Butadiene] : 4.53599 kg 10 lb

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

- Not applicable

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

- Not applicable

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

- [1-Propene] : Applicable
- [n-Hexane] : Applicable
- [1,3-Butadiene] : Applicable
- [Ethylene] : 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

- 2022-08-30

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).