



Material Safety Data

Product Name: C4
RAFFINATE-1

긴급전화번호 (Emergency Telephone Number)
061 - 688 - 6140 (주간, Day)
061 - 688 - 6284 (야간, Night)

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

1. Product

- Product Name : C4 RAFFINATE-1
- UN NO. : 1075

2. Advisable use and Restriction

- Advisable use : Raw material for manufacturing MTBE/POLYBUTENE
- Restriction : Do not handle until all safety precautions have been read and understood.

3. Manufacturer information

- Manufacture company : YEOCHUN NCC
- Address: 2 Yeosusandan-3ro(205-6, Pyeongyeo-dong), Yeosu, Jeollanam-Do, Korea (555-210)
- Telephone: 82-61-688-6140 (Day) / 82-61-688-6284 (Night)

2. HAZARD IDENTIFICATION

1. Hazard classification

- FLAMMABLE GASES Category 1
- GASES UNDER PRESSURE Liqueied gas
- SKIN CORROSION/IRRITATION Category 2
- SERIOUS EYE DAMAGE/EYE IRRITATION Category 2
- CARCINOGENICITY Category 1A
- GERM CELL MUTAGENICITY Category 1B
- SPECIFIC TARGET ORGAN TOXICITY SINGLE EXPOSURE Category 3(Narcotic effects)
- LONG-TERM AQUATIC HAZARD Category 2

2. Allocation label elements

- Symbol



- Signal Word : Danger

○ Hazard statements

- H220 Extremely flammable gas.
- H280 Contains gas under pressure: may explode if heated.
- H315 Causes skin irritation.
- H319 Causes serious eye irritation.
- H336 May cause drowsiness or dizziness.
- H340 May cause genetic defects.
- H350 May cause cancer
- H411 Toxic to aquatic life with long lasting effects.

○ Precautionary statements

– 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/sparks/open flames/hot surfaces. – No smoking.
- P261 Avoid breathing dust/fume/gas/mist/vapours/spray.
- P264 Wash thoroughly after handling.
- 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.

– Response

- P302 + P352 IF ON SKIN: Wash with plenty of soap and water.
- P304 + P340 IF INHALED: Remove 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.
- P308 + P313 IF exposed or concerned: Get medical advice/attention.
- P312 Call a POISON CENTER or doctor/physician if you feel unwell.
- P321 Specific treatment (see on this label).
- P332 + P313 If skin irritation occurs: Get medical advice/attention.
- P337 + P313 If eye irritation persists: Get medical advice/attention.
- P362 + P364 Take off contaminated clothing and wash it before reuse.
- P377 Leaking gas fire: Do not extinguish, unless leak can be stopped safely.
- P381 Eliminate all ignition sources if safe to do so.
- P391 Collect spillage.

– Storage

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

– Disposal

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

3. Other hazard information not included in hazard classification (NFPA)

Chemical Name	NFPA Level		
	Health	Flammability	Reactivity
1,3 BUTADIENE	2	4	2
ISOBUTENE	2	4	1
BUTENE 1	1	4	0
BUTANE	1	4	0
CIS 2 BUTENE	1	4	0
TRANS 2 BUTENE	2	4	1
LIQUEFIED PETROLEUM GAS	2	4	0

3. INGREDIENT INFORMATION

Components	Common name	CAS No.	PCT(M%)
ISOBUTENE	아이소뷰틸렌	115-11-7	45 ~ 50
BUTENE 1	1-BUTENE	106-98-9	20 ~ 30
BUTANE	BUTANE	106-97-8	5 ~ 15
CIS 2 BUTENE	CIS-2-BUTENE	590-18-1	3 ~ 7
TRANS 2 BUTENE	2-BUTENE, (E)-	624-64-6	7 ~ 9
LIQUEFIED PETROLEUM GAS	LIQUEFIED PETROLEUM GAS	68476-85-7	1 ~ 7
1,3 BUTADIENE	1,3-BUTADIENE	106-99-0	0.1 ~ 0.9

4. FIRST AID MEASURES

1. Following eye contact

- It is unlikely that emergency treatment will be required for contact with the gas form.
- If contact with liquefied or compressed gas occurs, flush eyes with large amounts of water for at least 15-20 minutes until no evidence of chemical remains.
- Get medical attention immediately.

2. Following skin contact

- It is unlikely that emergency treatment will be required for contact with the gas form.
- If contact with liquefied or compressed gas occurs, flush skin with large amounts of water for at least 15-20 minutes until no evidence of chemical remains.
- Get medical aid immediately.
- Wash skin with soap and water.
- If frostbite or cryogenic burns occur, warm affected area in warm water at a temperature of 107°F (41.7°C).
- Seek immediate medical assistance.

3. Following inhalation

- Administer oxygen if breathing is difficult.

_ Do not use mouth-to-mouth method if victim ingested or inhaled the substance; give artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device.

- Give artificial respiration if victim is not breathing.
- Keep victim warm and quiet.
- Move to fresh air.
- Seek immediate medical assistance.

4. Following ingestion

- It is unlikely that emergency treatment will be required for contact with the gas form..
- It is unlikely that emergency treatment will be required.

5. Advice to physician

- Do not apply drugs of the adrenaline ephedrine group.
- _ Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.
- Exposures require specialized first aid with contact and medical follow-up .

5. FIRE FIGHTING MEASURES

1. Suitable/Unsuitable extinguishing media

Suitable extinguishing media

- CO2.
- Dry chemical.
- Use alcohol foam, carbon dioxide, or water spray when fighting fires involving this material.
- Use dry sand or earth to smother fire.
- Water spray.

Unsuitable extinguishing media

- Direct water.

2. Specific hazards arising from the chemical

Pyrolytic product

- Can decompose at high temperatures forming toxic gases.

Risk of fire and explosion

- Containers may explode when heated.
- Contains gas under pressure; may explode if heated.
- Cylinders exposed to fire may vent and release flammable gas through pressure relief devices.
- Extremely flammable gas.
- Extremely flammable.
- Fire may produce irritating and/or toxic gases.
- May ignited from heat, friction or contamination.
- May violently polymerize and result in fire and explosion.
- Some may burn but none ignite readily.
- _ When heated, vapors may form explosive mixtures with air: indoors, outdoors and sewers explosion hazards.
- Will be easily ignited by heat, sparks or flames.
- Will form explosive mixtures with air.

3. Special protective equipment for firefighters

- Contact may cause burns to skin and eyes.
- DO NOT EXTINGUISH A LEAKING GAS FIRE UNLESS LEAK CAN BE STOPPED.
- Damaged cylinders should be handled only by specialists.
- Evacuate area and fight fire from a safe distance.
- Fire involving Tanks: ALWAYS stay away from tanks engulfed in fire.
- Fire involving Tanks: Cool containers with flooding quantities of water until well after fire is out.
- Fire involving Tanks: Do not direct water at source of leak or safety devices; icing may occur.
- Fire involving Tanks: Fight fire from maximum distance or use unmanned hose holders or monitor nozzles.
- Fire involving Tanks: For massive fire, use unmanned hose holders or monitor nozzles; if this is impossible, withdraw from area and let fire burn.
- Fire involving Tanks: Withdraw immediately in case of rising sound from venting safety devices or discoloration of tank.
- Move containers from fire area if you can do it without risk.
- Rescuers should put on appropriate protective gear.
- Runoff may cause pollution.
- Ruptured cylinders may rocket.
- Substance may be transported hot.
- Use extinguishing agent suitable for type of surrounding fire.
- Vapors from liquefied gas are initially heavier than air and spread along ground.

6. ACCIDENTAL RELEASE MEASURES

1. Health considerations and protective equipment

- All equipment used when handling the product must be grounded.
- Allow substance to evaporate.
- Do not direct water at source of leak.
- Do not enter areas which have more than 23.5% oxygen in the atmosphere, without respirator or air supplied mask.
- Do not touch damaged containers or spilled material unless wearing appropriate protective clothing.
- Do not touch or walk through spilled material.
- ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area).
- If possible, turn leaking containers so that gas escapes rather than liquid.
- Isolate area until gas has dispersed.
- Isolate hazard area.
- Keep unnecessary and unprotected personnel from entering.
- Please note that materials and conditions to be avoided.
- Stop leak if you can do it without risk.
- The very fine particles can cause a fire or explosion, eliminate all ignition sources.
- Ventilate the contaminated area.

2. Environmental precautions

- Prevent entry into waterways, sewers, basements or confined areas.

3. For cleaning up

- Absorb or cover with dry earth, sand or other non-combustible material and transfer to containers.
- Dike and collect water used to fight fire.
- Small Spill: Flush area with flooding quantities of water.

7. HANDLING AND STORAGE

1. Precautions for safe handling

- Caution: Dangerous fire hazard when exposed to heat, or flame, sparks.
- Use adequate machine for prevention when package handling.
- Wear an appropriate Personal protection. (See Exposure Controls/Personal Protection section.)

2. Conditions for safe storage (including any incompatibilities)

- Choose a place that can be protected from strong oxidizers and acid.
- Store containers: AVOID the place where can be damage and contamination.
- Store in a cool/low-temperature, well-ventilated {dry} place {away from heat and ignition sources}

8. EXPOSURE CONTROLS AND PERSONAL PROTECTION

1. Exposure exposure limits, Biological exposure standard :

Components	Occupational exposure	ACGIH	Biological standard
1,3 BUTADIENE	TWA : 2ppm STEL : 10ppm	TWA 2 ppm	2.5 mg/L Medium: urine Time: end of shift Parameter: 1,2Dihydroxy4(Nacetylcysteinyl)butane (background, semiquantitative); 2.5 pmol/g hemoglobin Medium: blood Time: not critical Parameter: Mixture of N1 and N2(hydroxybutenyl)valine hemoglobin adducts (semiquantitative)
ISOBUTENE	No data available	TWA 250 ppm (Butenes, All isomers)	No data available
BUTENE 1	No data available	TWA 250 ppm (Butenes, All isomers)	No data available
BUTANE	TWA : 800ppm	TWA 1000 ppm	No data available
CIS 2 BUTENE	No data available	TWA 250 ppm (Butenes, All isomers)	No data available
TRANS 2 BUTENE	No data available	TWA 250 ppm	No data available
LIQUEFIED PETROLEUM GAS	TWA : 1000ppm	TWA 1000 ppm	No data available

2. Appropriate engineering controls

- Use adequate general or local exhaust ventilation to keep airborne concentrations below the permissible exposure limits.
- Use process enclosures, local exhaust ventilation, or other engineering controls to control airborne levels below recommended exposure limits.

3. Personal protection equipment

- Respiratory protection
 - If high frequency of use or exposure, wear air respirator.
- Eye protection
 - Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower.
 - Provide emergency showers and eyewash.
 - Wear suitable protective goggles and face shields.
- Hand protection
 - Wear Non-moisture permeable chemical resistance protective gloves(latex, nitrile rubber, PC) for prevent skin contact.
 - Wear insulated gloves.
 - Wear suitable protective gloves.
- Body protection
 - Wear suitable protective clothing.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance	Colorless liquid or gas.
Odour	No data available
Odour threshold	No data available
pH Values	N/A
Melting point/freezing point	-138 °C
Initial boiling point and boiling range	-0.5 °C
Flash point	-60 °C
Evaporation rate	N/A
Flammability(solid, gas)	Flammable gas
Upper/lower flammability or explosive limits	1.7 ~ 9.5 Vol %
Vapour pressure	2.137 x 10 ² kPa (21.1 °C)
Solubility(ies)	6 x 10 ⁽⁻³⁾ g/100mℓ (25 °C, Water)
Vapor Densities	1.94 (Air =1)
Relative density	0.6 (Water =1)
n-octanol/water partition coefficient	2.89 (Log Kow)
Auto ignition temperature	365 °C
Decomposition temperature	No data available
Viscosity	7.54 x 10 ⁽⁻³⁾ cP (7.5 μPa s, 27 °C)
Molecular weight(mass)	56.4

10. STABILITY AND REACTIVITY

1. Stability and hazardous reactivity

- Can decompose at high temperatures forming toxic gases.
- Containers may explode when heated.
- Contains gas under pressure; may explode if heated.
- Cylinders exposed to fire may vent and release flammable gas through pressure relief devices.
- Extremely flammable gas.
- Extremely flammable.
- Fire may produce irritating and/or toxic gases.
- Fire may produce irritating, corrosive and/or toxic gases.
- May cause toxic effects if inhaled.
- May violently polymerize and result in fire and explosion.
- Some may burn but none ignite readily.
- Stable under normal temperatures and pressures.
- When heated, vapors may form explosive mixtures with air: indoors, outdoors and sewers explosion hazards.
- Will be easily ignited by heat, sparks or flames.
- Will form explosive mixtures with air.

2. Conditions to avoid

- Ignition source(heat, spark, flame, etc.).

3. Materials to avoid

- Combustibles, reducing material.
- Irritating and/or toxic gas.

4. Hazardous decomposition products

- Corrosive/toxic fume.
- Irritating, corrosive and/or toxic gas.

11. TOXICOLOGICAL INFORMATION

1. Exposure route information

- Dermal, Inhalation exposure is possible since GAS

2. Health hazard information

- ※ No data of the product. thus data was described by the product component.

Acute toxicity

- Oral PRODUCT : N/A (ATE mix > 2000 mg/kg)
 - 1,3 BUTADIENE : N/A / LD50 5480 mg/kg Rat
 - ISOBUTENE : No data
 - BUTENE 1 : No data
 - BUTANE : No data
 - CIS 2 BUTENE : No data
 - TRANS 2 BUTENE : No data
 - LIQUEFIED PETROLEUM GAS : No data

- Dermal PRODUCT : No data
 - 1,3 BUTADIENE : No data
 - ISOBUTENE : No data
 - BUTENE 1 : No data
 - BUTANE : No data
 - CIS 2 BUTENE : No data
 - TRANS 2 BUTENE : No data
 - LIQUEFIED PETROLEUM GAS : No data
- Inhalation-Gases PRODUCT : N/A (ATE mix > 20000 ppm)
 - 1,3 BUTADIENE : N/A / LC50 285 mg/L/4h Rat
 - ISOBUTENE : N/A / LC50 270000 ppm/4h Rat
 - BUTENE 1 : N/A / LC50 > 10000 ppm Rat
 - BUTANE : N/A / LC50 > 800000 ppm/15min Rat
 - CIS 2 BUTENE : No data
 - TRANS 2 BUTENE : No data
 - LIQUEFIED PETROLEUM GAS : No data
- Inhalation-Vapours PRODUCT : N/A
 - 1,3 BUTADIENE : N/A
 - ISOBUTENE : N/A
 - BUTENE 1 : N/A
 - BUTANE : N/A
 - CIS 2 BUTENE : N/A
 - TRANS 2 BUTENE : N/A
 - LIQUEFIED PETROLEUM GAS : N/A
- Inhalation-Dust/mist PRODUCT : N/A
 - 1,3 BUTADIENE : N/A
 - ISOBUTENE : N/A
 - BUTENE 1 : N/A
 - BUTANE : N/A
 - CIS 2 BUTENE : N/A
 - TRANS 2 BUTENE : N/A
 - LIQUEFIED PETROLEUM GAS : N/A
- SKIN CORROSION/IRRITATION PRODUCT : No data
 - 1,3 BUTADIENE : No data
 - ISOBUTENE : Category 2 / Causes irritation (sometimes severe) when touching the skin.
 - BUTENE 1 : No data
 - BUTANE : No data
 - CIS 2 BUTENE : Category 2 / Short-term exposure causes skin irritation (severe cases).
 - TRANS 2 BUTENE : Category 2 / Causes irritation (sometimes severe) when touching the skin.
 - LIQUEFIED PETROLEUM GAS : No data
- SERIOUS EYE DAMAGE/EYE IRRITATION PRODUCT : N/A
 - 1,3 BUTADIENE : N/A / Not irritating Rabbit
 - ISOBUTENE : Category 2 / Causes irritation when touching eyes (severe cases).
 - BUTENE 1 : N/A / Mild irritating Human
 - BUTANE : N/A / Not irritating Rabbit

- CIS 2 BUTENE : Category 2 / Short-term exposure may cause symptoms such as poor eyesight.
- TRANS 2 BUTENE : Category 2 / Symptoms of poor eyesight when touching the eyes.
- LIQUEFIED PETROLEUM GAS : No data
- RESPIRATORY SENSITIZATION PRODUCT : No data
 - 1,3 BUTADIENE : No data
 - ISOBUTENE : No data
 - BUTENE 1 : No data
 - BUTANE : No data
 - CIS 2 BUTENE : No data
 - TRANS 2 BUTENE : No data
 - LIQUEFIED PETROLEUM GAS : No data
- SKIN SENSITIZATION PRODUCT : No data
 - 1,3 BUTADIENE : No data
 - ISOBUTENE : No data
 - BUTENE 1 : No data
 - BUTANE : No data
 - CIS 2 BUTENE : No data
 - TRANS 2 BUTENE : No data
 - LIQUEFIED PETROLEUM GAS : No data
- CARCINOGENICITY PRODUCT : Category 1A
 - 1,3 BUTADIENE : Category 1A / 1A
 - OSHA : No data
 - Notice of Employment and Labor : No data
 - NTP : K
 - IARC : 2A
 - EU CLP : 1A
 - ACGIH : A2
 - ISOBUTENE : No data
 - OSHA : No data
 - Notice of Employment and Labor : No data
 - NTP : No data
 - IARC : No data
 - EU CLP : No data
 - ACGIH : No data
 - BUTENE 1 : No data
 - OSHA : No data
 - Notice of Employment and Labor : No data
 - NTP : No data
 - IARC : No data
 - EU CLP : No data
 - ACGIH : No data
 - BUTANE : N/A / 1A (containing $\geq 0,1$ % 1,3 butadiene)
 - OSHA : No data
 - Notice of Employment and Labor : No data
 - NTP : No data
 - IARC : No data

- EU CLP : 1A (containing $\geq 0,1$ % butadiene (203-450-8))
- ACGIH : No data
- CIS 2 BUTENE : No data
 - OSHA : No data
 - Notice of Employment and Labor : No data
 - NTP : No data
 - IARC : No data
 - EU CLP : No data
 - ACGIH : No data
- TRANS 2 BUTENE : No data
 - OSHA : No data
 - Notice of Employment and Labor : No data
 - NTP : No data
 - IARC : No data
 - EU CLP : No data
 - ACGIH : No data
- LIQUEFIED PETROLEUM GAS : N/A / 1A (However, only if butadiene content is 0.1% or more.)
 - OSHA : No data
 - Notice of Employment and Labor : No data
 - NTP : No data
 - IARC : No data
 - EU CLP : 1A (However, only if butadiene content is 0.1% or more.)
 - ACGIH : No data
- GERM CELL MUTAGENICITY PRODUCT : Category 1B
 - 1,3 BUTADIENE : Category 1B / Positive, in vivo test Mouse
 - ISOBUTENE : N/A / Negative on microbial return stool test result.
 - BUTENE 1 : N/A / Negative Rat lymphocytes
 - BUTANE : N/A / Mammals (human) in vitro chromosomal aberrations test results, whether or not metabolic activators are present, negative. (OECD Guideline 473, GLP)
 - CIS 2 BUTENE : No data
 - TRANS 2 BUTENE : No data
 - LIQUEFIED PETROLEUM GAS : N/A / The result of the return stool test using microorganisms in the test tube is negative regardless of metabolic activation.
- REPRODUCTIVE TOXICITY PRODUCT : N/A
 - 1,3 BUTADIENE : N/A / No harmful effects were observed as a result of reproductive toxicity test using rats. (NOAEC=13,276 mg/m³)(OECD Guideline 421, GLP)
 - ISOBUTENE : N/A / Animal testing does not show reproductive toxicity and developmental toxicity.
 - BUTENE 1 : N/A / At concentrations of 0, 500, 2000 and 8000 ppm in rats, no adverse effects on reproductive function were observed upon repeated inhalation exposure.
 - BUTANE : N/A / Rats-based reproductive toxicity test results do not show any particular abnormalities related to reproduction and development. (OECD Guideline 422, GLP)
 - CIS 2 BUTENE : No data
 - TRANS 2 BUTENE : No data
 - LIQUEFIED PETROLEUM GAS : N/A / The results of the maternal toxicity/maximum formation test using rats do not have any significant impact. (NOAEL = 10426 ppm)(OECD Guideline 414, GLP)
- SPECIFIC TARGET ORGAN TOXICITY SINGLE EXPOSURE PRODUCT : Category 3(Respiratory tract irritation), Category 3(Narcotic effects)

- 1,3 BUTADIENE : Category 3(Respiratory tract irritation) / In humans, cough accompanying eye, nasal, larynx, and lung irritation appear.
 - ISOBUTENE : Category 3(Narcotic effects) / Function similar to asphyxiation and mild anesthesia in humans
 - BUTENE 1 : No data
 - BUTANE : N/A / Acute toxicity test results with rabbits do not show toxicity to the eyes.
 - CIS 2 BUTENE : Category 3(Narcotic effects) / Affecting the central nervous system. Unconsciousness (ICSC) at exposure, causing irritation.
 - TRANS 2 BUTENE : Category 3(Narcotic effects) / Inhalation can cause vomiting, headaches, calming symptoms, loss of endurance, choking, and convulsions.
 - LIQUEFIED PETROLEUM GAS : No data
- SPECIFIC TARGET ORGAN TOXICITY REPEATED EXPOSURE PRODUCT : N/A
- 1,3 BUTADIENE : Category 2 / 103-week inhalation carcinogenicity test using rats (OECD TG 453, GLP) Results : In the concentration group of 8000 ppm 17701 mg/m³, increased heart weight and renal tubular degeneration renal disease were observed, NOAEC=1000 ppm 2212 mg/m³ ※ Target organ: ovaries, spermatosis, bone marrow
 - ISOBUTENE : N/A / Chronic or repetitive exposure can cause skin irritation as it has been removed from the skin.
 - BUTENE 1 : N/A / As a result of exposure to rats at 500, 2000 and 8000 ppm, no typical full-format toxicity was observed.
 - BUTANE : N/A / Repeat suction toxicity test (4 weeks) using rats does not show any particular abnormalities other than weight loss. (NOAEC = 4000ppm)(OECD Guideline 422, GLP)
 - CIS 2 BUTENE : No data
 - TRANS 2 BUTENE : No data
 - LIQUEFIED PETROLEUM GAS : N/A / Repetitive absorption toxicity (91d) test results in coma, tremors, bent posture, etc. using rats.
- ASPIRATION HAZARD PRODUCT : No data
- 1,3 BUTADIENE : No data
 - ISOBUTENE : No data
 - BUTENE 1 : No data
 - BUTANE : No data
 - CIS 2 BUTENE : No data
 - TRANS 2 BUTENE : No data
 - LIQUEFIED PETROLEUM GAS : No data

12. ECOLOGICAL INFORMATION

1. Aquatic toxicity PRODUCT

- ACUTE AQUATIC HAZARD : Not classified, LONG-TERM AQUATIC HAZARD : Category 2

● Fish

- 1,3 BUTADIENE : LC50 45 mg/L/96h Fish(Pimephales promelas)
- ISOBUTENE : LC50 19.9 mg/L/96h Fish
- BUTENE 1 : LC50 19 mg/L Fish
- BUTANE : LC50 27.98 mg/L Fish
- CIS 2 BUTENE : LC50 34.232 mg/L Fish
- TRANS 2 BUTENE : No data
- LIQUEFIED PETROLEUM GAS : Category 1 / LC50 0.362 mg/L/96h Oncorhynchus mykiss

● Crustacea

- 1,3 BUTADIENE : EC50 33 mg/L/48h Aquatic invertebrates(Daphnia magna)
- ISOBUTENE : No data
- BUTENE 1 : LC50 11 mg/L Aquatic invertebrates(Daphnia sp.)
- BUTANE : LC50 69.43 mg/L/48h Aquatic invertebrates
- CIS 2 BUTENE : No data
- TRANS 2 BUTENE : No data
- LIQUEFIED PETROLEUM GAS : Category 1 / EC50 0.018 mg/L/48h Daphnia magna

● Aquatic algae

- 1,3 BUTADIENE : EC50 33 mg/L/72h Aquatic algae(Algae)
- ISOBUTENE : No data
- BUTENE 1 : EC50 6.5 mg/L Aquatic algae(Green algae)
- BUTANE : EC50 16.47 mg/L/96h Aquatic algae
- CIS 2 BUTENE : No data
- TRANS 2 BUTENE : EC50 14.814 mg/L/96h
- LIQUEFIED PETROLEUM GAS : N/A / ErC50 7.6 mg/L/72h (Pseudokirchneriella subcapitata)

2. Persistence and degradation

● Degradation

- 1,3 BUTADIENE : No data
- ISOBUTENE : No data
- BUTENE 1 : No data
- BUTANE : No data
- CIS 2 BUTENE : No data
- TRANS 2 BUTENE : No data
- LIQUEFIED PETROLEUM GAS : No data

● n-octanol water partition coefficient

- 1,3 BUTADIENE : 1.99 log Kow
- ISOBUTENE : 2.35 log Kow
- BUTENE 1 : log Kow 2.4
- BUTANE : 2.89 log Kow
- CIS 2 BUTENE : 2.33 log Kow
- TRANS 2 BUTENE : 2.31 log Kow
- LIQUEFIED PETROLEUM GAS : No data

3. Bioaccumulative potential

● Bioaccumulation

- 1,3 BUTADIENE : No data
- ISOBUTENE : No data
- BUTENE 1 : No data
- BUTANE : No data
- CIS 2 BUTENE : 11.99
- TRANS 2 BUTENE : 11.99
- LIQUEFIED PETROLEUM GAS : No data

● Biodegradation

- 1,3 BUTADIENE : No data
- ISOBUTENE : No data
- BUTENE 1 : No data

- BUTANE : 100 % 385.5 hr
- CIS 2 BUTENE : No data
- TRANS 2 BUTENE : No data
- LIQUEFIED PETROLEUM GAS : 100 % 385.5 hr

4. Mobility in soil

- Soil adsorption coefficient(Koc)
 - 1,3 BUTADIENE : No data
 - ISOBUTENE : 450
 - BUTENE 1 : Koc 109.6
 - BUTANE : No data
 - CIS 2 BUTENE : No data
 - TRANS 2 BUTENE : No data
 - LIQUEFIED PETROLEUM GAS : No data

5. Other adverse effects

- Hazardous to ozone layer
 - 1,3 BUTADIENE : N/A
 - ISOBUTENE : N/A
 - BUTENE 1 : N/A
 - BUTANE : N/A
 - CIS 2 BUTENE : N/A
 - TRANS 2 BUTENE : N/A
 - LIQUEFIED PETROLEUM GAS : N/A
- Others
 - 1,3 BUTADIENE : N/A
 - ISOBUTENE : N/A
 - BUTENE 1 : N/A
 - BUTANE : N/A
 - CIS 2 BUTENE : N/A
 - TRANS 2 BUTENE : N/A
 - LIQUEFIED PETROLEUM GAS : LONG-TERM AQUATIC HAZARD Category 1 / Fish:Oncorhynchus mykiss: NOEC, 90d, = 24.8 ug/L, Crustacea:Daphnia magna: NOEC, 21d, = 9.8 ug/L, Algae:Pseudokirchneriella subcapitata: NOEC, 96h, = 400 ug/L

13. DISPOSAL CONSIDERATIONS

1. Disposal methods

- Dispose of container and unused contents in accordance with all applicable regulations.

2. Precautions (including disposal of contaminated container of package)

- Empty containers may explode and residues can be ignited when pressured, cut, weld, heated.
- Empty containers may rupture when pressured.
- Empty containers recycled under environmental laws.
- Wear an appropriate Personal protection. (See Exposure Controls/Personal Protection section.)

14. TRANSPORT INFORMATION

1. UN No : 1075
3. Class or division : 2.1
4. Packing group : Not established
5. Marine pollutant : Not established
6. Special safety response for transportation or transportation measure :
 - Emergency measures in case of fire : F-D
 - Emergency measures in the effluent : S-U

15. REGULATORY INFORMATION

- EU Classification (CLASSIFICATION) PRODUCT : Not established
 - BUTANE : F+; R12
 - BUTENE 1 : F+; R12
 - 1,3 BUTADIENE : F+; R12 Carc.Cat.1; R45 Muta.Cat.2; R46
 - ISOBUTENE : F+; R12
 - CIS 2 BUTENE : F+; R12
 - TRANS 2 BUTENE : F+; R12
 - LIQUEFIED PETROLEUM GAS : F+; R12 Carc.Cat.1; R45 Muta.Cat.2; R46
- EU Classification (Risk Phrases) PRODUCT : Not established
 - BUTANE : R12
 - BUTENE 1 : R12
 - 1,3 BUTADIENE : R12, R45, R46
 - ISOBUTENE : R12
 - CIS 2 BUTENE : R12
 - TRANS 2 BUTENE : R12
 - LIQUEFIED PETROLEUM GAS : R12, R45, R46
- EU Classification (Safety Phrases) PRODUCT : Not established
 - BUTANE : S:(2)-9-16
 - BUTENE 1 : S:(2)-9-16-33
 - 1,3 BUTADIENE : S:53-45
 - ISOBUTENE : S:(2)-9-16-33
 - CIS 2 BUTENE : S:(2)-9-16-33
 - TRANS 2 BUTENE : S:(2)-9-16-33
 - LIQUEFIED PETROLEUM GAS : S:53-45
- 2006/507/EC PRODUCT : Not established
 - BUTANE : Not established
 - BUTENE 1 : Not established
 - 1,3 BUTADIENE : Not established
 - ISOBUTENE : Not established
 - CIS 2 BUTENE : Not established
 - TRANS 2 BUTENE : Not established
 - LIQUEFIED PETROLEUM GAS : Not established
- 689/2008/EC PRODUCT : Not established

- BUTANE : Not established
- BUTENE 1 : Not established
- 1,3 BUTADIENE : Not established
- ISOBUTENE : Not established
- CIS 2 BUTENE : Not established
- TRANS 2 BUTENE : Not established
- LIQUEFIED PETROLEUM GAS : Not established
- Designation, Reportable Quantities, and Notification PRODUCT : Not established
 - BUTANE : Not established
 - BUTENE 1 : Not established
 - 1,3 BUTADIENE : 10 lb final RQ; 4.54 kg final RQ
 - ISOBUTENE : Not established
 - CIS 2 BUTENE : Not established
 - TRANS 2 BUTENE : Not established
 - LIQUEFIED PETROLEUM GAS : Not established
- Emergency Planning and Notification PRODUCT : Not established
 - BUTANE : Not established
 - BUTENE 1 : Not established
 - 1,3 BUTADIENE : Not established
 - ISOBUTENE : Not established
 - CIS 2 BUTENE : Not established
 - TRANS 2 BUTENE : Not established
 - LIQUEFIED PETROLEUM GAS : Not established
- Toxic Chemical Release Reporting – Community Right-to-Know PRODUCT : Not established
 - BUTANE : Not established
 - BUTENE 1 : Not established
 - 1,3 BUTADIENE : 0.1 % de minimis concentration
 - ISOBUTENE : Not established
 - CIS 2 BUTENE : Not established
 - TRANS 2 BUTENE : Not established
 - LIQUEFIED PETROLEUM GAS : Not established
- Process Safety Management of Highly Hazardous Chemicals PRODUCT : Not established
 - BUTANE : Not established
 - BUTENE 1 : Not established
 - 1,3 BUTADIENE : Not established
 - ISOBUTENE : Not established
 - CIS 2 BUTENE : Not established
 - TRANS 2 BUTENE : Not established
 - LIQUEFIED PETROLEUM GAS : Not established

16. OTHER INFORMATION

1. Reference

- ACGIH
- American Chemical Society, Washington DC.

- CCR
- CRC Press Inc. Boca Raton. USA.
- ECOWIN v1 ECOSAR Classes for Microsoft Windows
- EU CLP
- EnviChem
- Environ. Toxicol. Chem. 11, 267-282.
- Exploring QSAR: Hydrophobic, Electronic, and Steric Constants.
- HSDB
- IARC
- ICSC
- IUCLID
- J Ind Hyg Toxicol 26: 69-78
- Journal of Health Science, 48 (1); 73-78
- MITI
- Mutagenesis 1, 449-452
- Mutation Research
- NITE
- NTP
- Non-Fluorinated Propellants and Solvents for Aerosols, chapter 6 pp 61-72. CRC Press, Cleveland, Ohio, USA
- OECD SIDS
- OSHA
- Publication
- QSAR
- SIAM
- Study report
- The Estimation Programs Interface (EPI) Suite™ v4.00
- USEPA OPPT Risk Assessment Division
- Washington, DC: American Chemical Society.
- ECHA

2. Prepare date : 2000.01.01

3. Revised date

- 0.0.0 : 2000.01.01
- 1.0.0 : 2018.11.06
- 2.0.0 : 2020.12.01
- 3.0.0 : 2022.01.07
- 4.0.0 : 2022.06.07

4. Other

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text.