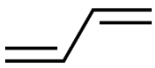
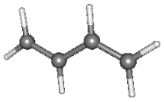
1. Identification of the substance and of the supplier

1.1 Trade Name : 1,3-Butadiene

1.2 Molecular Formula : C_4H_6 , CH_2=CH-CH=CH_2

2D  3D 

1.3 Manufacturer /Import : Bangkok Synthetic Company Limited

1.4 Address : 5, I-7 Road, Map Ta Phut, Mueang Rayong, Rayong 21150 Thailand

Phone number : (+66) 3869 8698

Fax : (+66) 3869 8699

Emergency Phone number : (+66) 3869 8601 (Mutual Aid Coordinator Center)

1.5 Relevant identified uses of the substance or mixture and uses advised against : Not available

1.6 Identified uses : Use as an intermediate for synthetic rubbers production, latexes production, plastic materials and liquid rubbers productions.

2. Hazards Identification

2.1 Classification of the mixture according to Globally Harmonized System (GHS) standards (GHS hazard statements and category)

Physical Hazard :

Flammable gases	Category 1
Gases under pressure (Liquefied gas)	

Health Hazard :

Carcinogenicity	Category 1A
Germ cell mutagenicity	Category 1B

Environmental Hazard :

Not available

Others hazard :

Not available

2.2 GHS label elements

Hazard Pictogram :

Signal Word : Danger

Hazard Statement :

H220 Extremely flammable gas

H280 Contains gas under pressure; may explode if heated

H340 May cause genetic defects

H350 May cause cancer

Precautionary Statement :

P203 Obtain, read and follow all safety instructions before use.

P210 Keep away from heat, hot surface, sparks, open flames and other ignition sources. No smoking.

P222 Do not allow contact with air.

P280 Wear protective gloves/protective clothing/eye protection/face protection

P318 If exposed or concerned, get medical advice.

P403 Store in a well-ventilated place.

P405 Store locked up.

P501 Dispose of contents/container

2.3 There hazards which do not result in classification : Not available

3. Composition/ Information on Ingredients

3.1 Chemical type (Substance/Mixture) : Substance

3.2 Chemical identity : 1,3-Butadiene

3.3 Common name and synonym : Bivinyl, Erythrene, Vinyl Ethylene, Pyrrolyene 1-Methyllallence, Gamma-Butadiene

3.4 CAS number : 106-99-0

3.5 EC number : 203-450-8

3.6 Impurities and stabilizing additives : Not available

3.7 Ingredient :

Substances	CAS No.	EC No.	% by weight
1,3-Butadiene	106-99-0	203-450-8	> 99%

4. First Aid Measures

4.1 Description of first aid measures

Skin **:** In case frostbite, do not remove clothing. IMMEDIATELY wash affected areas gently with water for at least 20 minutes while removing and isolating all contaminated clothing. If symptoms such as inflammation or irritation develop, IMMEDIATELY go to a hospital for treatment.

Eyes **:** Remove contact lenses if present. Flush with water or normal saline solution for 20 to 30 minutes. Do not put any ointments, or medication in the victim's eyes without specific instructions from a physician. IMMEDIATELY transport the victim after flushing eyes to a hospital even if no symptoms (such as redness or irritation) develop.

Inhalation **:** IMMEDIATELY leave the contaminated area; take deep breaths of fresh air. If symptoms (such as wheezing, coughing, shortness of breath, or burning in the mouth, throat, or chest) develop, call a physician and be prepared to transport the victim to a hospital.

Ingestion **:** This compound is a gas, therefore inhalation is the first route of exposure.

4.2 Most important symptoms and effects, both acute and delayed

Potential acute health effects :

Skin **:** May cause irritation, with redness and possible swelling. Liquid may cause frostbite.

Eye **:** May irritate the eyes, with redness and excess tearing. Liquid may cause freezing.

Inhalation : Asphyxiant. May mildly irritating to the mucous membranes. High concentration may cause drowsiness. Very high concentration may cause headache, drowsiness, dizziness, excitation, excess salivation, vomiting and unconsciousness. Lack of oxygen can kill.

Ingestion **:** An unlikely route of exposure. This product is a gas at normal temperature and pressure, but frostbite of the lip and mouth may result from contact with the liquid.

Potential Chronic health effects : Repeated skin exposure may cause dermatitis. Repeated exposure to butadiene vapor may cause kidney and liver injury. The substance may effect on the bone marrow. This substance is carcinogenic to humans. May cause heritable genetic damage in humans.

4.3 Indication of any immediate medical attention and special treatment needed Notes to : This product may be a cardiac sensitizer, avoid use of epinephrine. There is no specific antidote. Treatment of the overexposure should be directed at the control of symptoms and the clinical condition of the patient.

5. Fire Fighting Measures

5.1 Extinguishing Media

Suitable Extinguishing Media **:** Use water spray, alcohol-resistant foam, dry chemical or Carbon Dioxide.

Unsuitable Extinguishing Media **:** Not available

5.2 Special Exposure Hazards :

Hazards from the Substance or Mixture :

- EXTREMELY FLAMMABLE.
- Will be easily ignited by heat, sparks or flames.
- Vapors from liquefied gas are initially heavier than air and spread along ground.
- Vapors may travel to source of ignition and flash back.
- Cylinders exposed to fire may vent and release flammable gas through pressure relief devices.
- Containers may explode when heated.

Hazardous De-Combustion Products : Complete combustion may proceed Carbon Dioxide, water vapor. Incomplete combustion may proceed Carbon Monoxide, Carbon Dioxide and/or low molecular weight hydrocarbons aldehydes and ketones.

5.3 Advice for Firefighters

Special Fire-Fighting Procedures :

- DO NOT EXTINGUISH A LEAKING GAS FIRE UNLESS LEAK CAN BE STOPPED.
- If it can be done safely, move undamaged containers away from the area around the fire.
- Fight fire from maximum distance or use unmanned master stream devices or monitor nozzles.
- Cool containers with flooding quantities of water until well after fire is out.
- Do not direct water at source of leak or safety devices; icing may occur.

- Withdraw immediately in case of rising sound from venting safety devices or discoloration of tank.

- ALWAYS stay away from tanks in direct contact with flames.

- For massive fire, use unmanned master stream devices or monitor nozzles; if this is impossible, withdraw from area and let fire burn.

Special Protective Equipment for Firefighters : Firefighters must use standard protective equipment including flame retardant coat, helmet with face shield, gloves, rubber boots, and in enclosed spaces, SCBA.

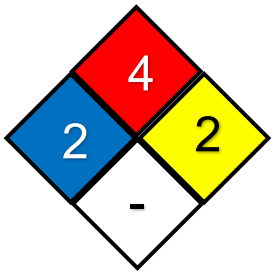
5.4 NFPA 704 Diamond

Health hazard (Blue) : 2

Fire hazard (Red) : 4

Reactivity (Yellow) : 2

Specific hazard (White) : -



5.5 Fire and explosion protection : Keep tank cool by spraying with water

6. Accidental Release Measures

6.1 Personal precautions, protective equipment and emergency procedures :

- Evacuate area.
- ELIMINATE all ignition sources (no smoking, flares, sparks or flames) from immediate area.
- All equipment used when handling the product must be grounded.
- Stop leak if you can do it without risk.
- Do not touch or walk through spilled material.
- Do not direct water at spill or source of leak.
- Use water spray to reduce vapors or divert vapor cloud drift. Avoid allowing water runoff to contact spilled material.
- If possible, turn leaking containers so that gas escapes rather than liquid.
- Prevent entry into waterways, sewers, basements or confined areas.
- Isolate area until gas has dispersed.

6.2 Environmental precautions : Try to stop release. Prevent from entering sewers, basements and work pits, or any place where its accumulation can be dangerous.

6.3 Methods and materials for containment and cleaning up : Not available

6.4 Spill Management : Butadiene is a waste chemical stream constituent which may be subjected to ultimate disposal by controlled incineration.

7. Handling and Storage

7.1 Precautions for safe handling : Store only if stabilized. Fireproof. Cool. Keep in a well-ventilated room. Separated from incompatible materials and food and feedstuffs.

7.2 Conditions for safe storage, including any incompatibilities :

Conditions for safe storage :

- Outside or detached storage is preferred.
- Store in a cool, dry, well-ventilated location.
- Isolate from oxidizing materials.
- STORAGE IS USUALLY UNDER PRESSURE OR IN INSULATED TANKS BELOW 35 °F (1.7 °C).
- Venting: safety relief.

Incompatibilities : Strong oxidizer (ignition) Peroxides, Oxygen, Alkaline agents, metal compounds such as Aluminum Chloride and Iron (III) Chloride act as the catalyst, the initiate the polymerization reaction Copper (from explosive Acetylene)

8. Exposure Controls/ Personal Protection

8.1 Control parameters

TLV-TWA (ACGIH) : 2 ppm

TLV-STEL (ACGIH) : Not available

PEL-TWA (OSHA) : 1 ppm (2.2 mg/m^3)

PEL-STEL (OSHA) : 5 ppm (11.0 mg/m^3)

TLV-TWA (Thai) : 1 ppm

TLV-STEL (Thai) : 5 ppm

IDLH (NIOSH) : 2,000 ppm (10% LEL)

8.2 Personal protective equipment

Respirators : A respiratory protection program that meet OSHA 29 CFR 1910.134, ANSI Z88.2, or MSHA 30 CFR 72.710 (where applicable) requirements must be followed whenever workplace conditions warrant respirator use. Use an air-supplied or air-purifying cartridge if the action level is exceeded. Ensure the respirator has the appropriate protection factor for the exposure level. If cartridge type respirators are used, the cartridge must be appropriate for the chemical exposure (e.g., an organic vapor cartridge). For emergencies or instances with unknown exposure levels, use a self-contained breathing apparatus. Refer to OSHA 29 CFR 1910.1051 for respiratory protection requirements.

Skin : Wear work gloves for cylinder handling; polyvinyl chloride gloves when changing out cylinders or wherever contact with product is possible. Metatarsal shoes for cylinder handling. Protective equipment where needed. Select in accordance with OSHA 29 CFR 1910.132 and 1910.133. Regardless of protective equipment, never touch live electrical parts.

Eyes : Face shield and safety glasses. Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166 (EU).

Other Protection : Put on SCBA before fire fighting

8.3 Appropriate engineering controls : Engineering methods to reduce hazardous exposure are preferred controls. Methods include mechanical ventilation process or personal enclosure, remote and automated operation, control of process conditions, leak detection and repair systems.

9. Physical and chemical properties

9.1 General information Appearance

Physical State : Gas at normal temperature and pressure

Color : Colorless gas

9.2 Odor : Mild aromatic odor

9.3 Odor threshold limit : Above 1.3 ppm

9.4 pH : Not available

9.5 Melting point : -109°C (-164.2°F)

9.6 Freezing point : -109°C (-164.2°F)

9.7 Boiling point : -4.9°C (24.6°F)

9.8 Flash point : Closed Cup -79**°**C

9.9 Evaporation rate (Butyl Acetate = 1) : More than 25

9.10 Flammability (solid, gas) : Flammable gas

9.11 Lower Flammability/Explosive limits (LFL/LEL) **:** 2%

9.12 Upper Flammability/Explosive limits (UFL/UEL) **:** 11.5%

9.13 Vapor pressure **:** 3,309 mm.Hg (at 38°C)

9.14 Vapor density **:** 0.1399 lb/ft^3 (2.240 kg/m^3) at 70°F (21.1°C) and 1 atm

9.15 Relative density **:** Not available

9.16 Solubility **:** Slightly soluble in water (735 mg/L at 20°C)

9.17 Partition coefficient : n-octanol/water : Not available

9.18 Auto-ignition temperature **:** 414°C

9.19 Decomposition temperature **:** Not available

9.20 Viscosity **:** Not available

9.21 Molecular Weight **:** 54.09 g/mol

9.22 Specific gravity **:** 0.627 (at 20°C)

9.23 Surface Tension **:** Not available

10. Stability and reactivity

10.1 Reactivity **:** Heating up and atmospheric oxygen activity - danger of the polymerization with explosive character

10.2 Chemical stability **:** Stability is dependent on content of inhibitor in product and on storage temperature and storage time of product

10.3 Possibility of hazardous reactions : Heating up and atmospheric oxygen activity - danger of the polymerization with explosive character; acrid smokes are liberated, thermal decomposition produces carbon oxides. In case of leakage of liquid into water system or drains, cower inlets and prevent from leakage of product into the rivers.

10.4 Condition to avoids : Aerobic storage, high temperature, absence of stabilizing agent. Prevent from contact with water and oxygen. Heating under pressure, in atmosphere, by mixing with phenol and crotonaldehyde may give explosion. Peroxides, acids, alkaline earth metals and various metals compounds (Aluminum, Iron and Antimony chloride) catalyst - possibility of polymerization with explosive character.

10.5 Incompatible materials : Strong oxidizer (ignition) Peroxides, Oxygen, Alkaline agents, metal compounds such as Aluminum Chloride and Iron (III) Chloride act as the catalyst, the initiate the polymerization reaction Copper (from explosive Acetylene)

10.6 Hazardous decomposition products : Thermal decomposition and burning may produce CO/CO_2

11. Toxicological information

11.1 Information on toxicological effects

Skin **:** May cause irritation, with redness and possible swelling. Liquid may cause frostbite.

Eyes **:** May irritate the eyes, with redness and excess tearing. Liquid may cause freezing.

Inhalation **:** Asphyxiant. May irritates to the mucous membranes. High concentration may cause drowsiness. Very high concentration may cause headache, drowsiness, dizziness, excitation, excess salivation, vomiting and unconsciousness. Lack of oxygen can kill.

Ingestion **:** An unlikely route of exposure. This product is a gas at normal temperature and pressure, but frostbite of the lip and mouth may result from contact with the liquid.

11.2 Potential chronic health effects : Repeated skin exposure may cause dermatitis. Repeated exposure to butadiene vapor may cause kidney and liver injury. The substance may effect on the bone marrow. This substance is carcinogenic to humans. May cause heritable genetic damage in humans.

11.3 Routes of Entry : Dermal, Inhalation, Ingestion

11.4 Acute toxicity

11.4.1 LD50

Oral (mg/kg) **:** LD50 Oral - rat : 5480 mg/kg

Dermal (mg/kg) **:** LD50 Dermal - rat: 669 mg/kg

11.4.2 LC50

Inhalation (ppm, mg/m³) : LC50 Inhalation - rat : 285 mg/m^3 / 4 hr

11.5 Carcinogenicity/Germ cell mutagenicity (GHS or IARC) :

- The ACGIH classifies 1,3-Butadiene as “Group A2, suspected human carcinogen.”
- NTP lists it as group A, “known to be a human carcinogen.”
- IARC lists it as “Group 1, carcinogenic in humans.”

12. Ecological Information

12.1 Eco-Toxicity :

- LC50 Fishes 71,500 mg/m^3 96 hr
- EC50 Daphnia not determined 48 hr
- IC50 Algae not determined 72 hr

12.2 Persistence and Degradability :

Air : The product evaporates readily. Prone to photochemical degradation, reacting with OH radicals and ozone. Estimated atmospheric half-life < 1 day.

Soil : The product evaporates readily. 99,9% is spred in the air, so there is almost no penetration of the product into the soil, sediments.

Water : Degradation in water. Half-life value 4 h.

12.3 Bioaccumulative potential : Small bioaccumulative potential in the environment : log Kow < 3.

12.4 Mobility in soil : The product evaporates readily.

12.5 Other adverse effects : The product has not classified as dangerous for the environment. The product evaporates readily exposure to aquatic life is expected to be minimal

13. Disposal considerations

13.1 Waste and safe handling information : Dispose of non-refillable cylinders in accordance with federal, state and local regulations.

13.2 Waste treatment methods : Allow gas to vent slowly to atmosphere in an unconfined area or exhaust hood. Burn in incinerator.

13.3 Contaminated containers/Packages : If the cylinders are the refillable type, return cylinders to supplier with any valve outlet plugs or caps secured and valve protection caps in place.

14. Transport information

14.1 UN number : 1010

14.2 UN proper shipping name : BUTADIENE , STABILIZED

14.3 Transport hazard class : 2.1

14.4 Packing group : Not available

14.5 Marine pollutant : This material is not listed as a marine pollutant by DOT.

14.6 Transport in bulk according to annex II of MARPOL73/78 and the ICB code : Not available

14.7 Special precautions : Cylinders should be transported in a secure position, in a well-ventilated vehicle. Cylinders transported in an enclosed, nonventilated compartment of a vehicle can present serious safety hazards.

14.8 Further information : Not available

15. Regulatory Information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

15.1.1 Thailand Regulation

Ministry of Labour : Notification of the Department of Labour Protection and Welfare: Occupational Exposure Limits for Hazardous Chemicals (3 August 2017)

Notification of the Department of Labour Protection and Welfare: List of Hazardous Chemicals (20 December 2013)

Ministry of Industry : Hazardous Substance Act, B.E. 2535 (1992)

Ministry of Public Health : Not available

Ministry of Natural Resources and Environment : Not available

Ministry of Transport : Not available

Further information : Not available

15.1.2 Federal and State Regulations (Foreign country) :

CLP Regulation : European Regulation (EC) No 1272/2008 on Classification, Labelling and Packaging of Substances and Mixtures, ; Material is listed in Annex VI

OSHA : 29 CFR 1910.119: PROCESS SAFETY MANAGEMENT OF HIGHLY HAZARDOUS CHEMICALS: Requires facilities to develop a process safety management program based on

Threshold Quantities (TQ) of highly hazardous chemicals. 1,3-Butadiene is not listed in Appendix A as a highly hazardous chemical. However, any process that involves a flammable gas on site in one location in quantities of 10,000 lb (4536 kg) or greater is covered under this regulation unless the gas is used as a fuel.

TSCA : 1,3-Butadiene is listed on the TSCA inventory.

SARA :

SECTIONS 302/304: Require emergency planning based on Threshold Planning Quantity (TPQ) and release reporting based on Reportable Quantities (RQ) of Extremely Hazardous Substances (EHS) (40 CFR Part 355):

TPQ : None EHS RQ (40 CFR 355) : None

SECTIONS 311/312: Require submission of MSDSs and reporting of chemical inventories with identification of EPA hazard categories. The hazard categories for this product are as follows:

IMMEDIATE : Yes PRESSURE : Yes

DELAYED : Yes REACTIVITY : Yes

FIRE : Yes

SECTION 313: Requires submission of annual reports of release of toxic chemicals that appear in 40 CFR Part 372.

1,3-Butadiene is subject to the reporting requirements of Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 (SARA) and 40CFR Part 372.

40 CFR 68: RISK MANAGEMENT PROGRAM FOR CHEMICAL ACCIDENTAL RELEASE PREVENTION: Requires development and implementation of risk management programs at facilities that manufacture, use, store, or otherwise handle regulated substances in quantities that exceed specified thresholds.

1,3-Butadiene is listed as a regulated substance in quantities of 10,000 lb (4,536 kg) or greater.

EU REACH (EC Regulation 1907/2006)

Restrictions relating to the product or contained substances pursuant to Annex XVII to EC Regulation 1907/2006 : Material is listed on REACH.

Substances in Candidate List (Art. 59 REACH) : Material is not listed

Substances subject to authorization (Annex XIV REACH) : Material is not listed

16. Other information

16.1 Manufacturer's Recommendation : Users of the chemical shall conduct a comprehensive risk assessment of all production processes or activities involving the substance to identify and control potential hazards to personnel, property, and the environment. Appropriate preventive and control measures shall be implemented and maintained throughout all stages of handling, including transportation, storage, use, and final disposal.

16.2 References :

1. http://msds.pcd.go.th/
2. MSDS of Praxair Canada Inc.
3. MSDS of BOC Gases
4. OSHA Regulation (http://www.osha.slc gov/oshstd-data/1910-1051.ht)
5. Notification of the Department of Labor Protection and Welfare, dated June 28, B.E.2560 (2017), which was published in the Royal Government Gazette, Vol.134, Special Part 198D, dated August 3, B.E.2560 (2017)
6. https://www.osha.gov/dsg/annotated-pels/tablez-1.html
7. https://www.cdc.gov/niosh/idlh/intridl4.html#Notes
8. https://pubchem.ncbi.nlm.nih.gov/compound/7845
9. https://www.erg4thai.com/web/#/guide/search/19
10. https://cameochemicals.noaa.gov/chemical/4891
11. https://echa.europa.eu/registration-dossier/-/registered-dossier/15570/1/1

16.3 Key or legend to abbreviations and acronyms used in the safety data sheet :

ACGIH	: American Conference of Government Industrial Hygienists
NFPA	: National Fire Protection Agency
NIOSH	: National Institute for Occupational Safety & Health
OSHA	: Occupational Safety & Health Administration
IARC	: International Agency for Research on Cancer
SARA	: Superfund Amendments and Reauthorization Act.
GHS	: Globally Harmonized System
TSCA	: Toxic Substance Control Act
WHMIS	: Workplace Hazardous Materials Information System
CNS	: Central Nervous System NTP National Toxicology Program

LD50 : Lethal Dose 50%

EC50 : Effective Concentration NOAEL No Observable Adverse Effect Level

EC50 : Effective Concentration 50% NOEC No Observed Effect Concentration

PEL : Permissible Exposure Limit

STEL : Short-term Exposure Limit

TLV : Threshold Limit Value

TWA : Time Weighted Average

16.4 Further information : Ensure operators understand the flammability hazard. Ensure all nation/local regulations are observed. Before using this product in any new process or experiment, a thorough material compatibility and safety study should be carried out.