

1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Trade Name : 1,3-Butadiene

Chemical Name : 1,3-Butadiene

Synonyms : Bivinylyl, Erythrene, Vinyl ethylene, Pyrrolyene 1-Methylallence,
Gamma-Butadiene

Molecular Formula : : C₄H₆, CH₂=CH-CH=CH₂

1.2 Use : For synthetic rubbers production, latexes production , plastic materials and liquid rubbers productions.

1.3 Manufacturer : Bangkok Synthetic Company Limited

1.4 Address : 5 , I-7 Rd. Maptaphut Industrial Estate , Muang District , Rayong 21150

Tel. : +66(0) 3869-8698 Fax: +66(0) 3869-8690

2.HAZARD IDENTIFICATION

2.1 Classification of Substance or Mixture :

Flammable gases (Category 1)

Gases under pressure (Liquefied gas)

Carcinogenicity (Category 1A)

Germ cell mutagenicity (Category 1B)

2.2 Label Elements :

1) Hazard Symbol or Symbol :



2) **Signal Word** : DANGER!

3) **Hazards Statement**

Extremely flammable gas.

Contains gas under pressure; may explode if heated.

May cause genetic defects.

cause cancer.

4) **Precautionary Statements**:

Obtain special instructions before use.

Keep away from heat/sparks/open flames/hot surfaces. - No smoking.

IF exposed or concerned: Get medical advice/ attention.

Protect from sunlight. Store in a well-ventilated place

2.3 Other Hazards

Other hazards which do not result in classification : None.

3.COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Chemical Name : 1,3-Butadiene

3.2 Synonyms : Bivinyll, Erythrene, Vinyl ethylene, Pyrrolyene 1-Methylallence, Gamma-Butadiene

3.3 Component

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

4.First - aid measures

4.1 Description of first aid measures

Skin : For exposure to liquid , immediately warm frostbite area with warm water , not to exceed 105 F(41 oC). In case of massive exposure, remove clothing while showering with warm water. Call a physician.

Eye : For contact with the liquid , immediately flush eyes thoroughly with water for at least 15 minutes. Hold the eyelids open and away from the eyeballs to ensure that all surfaces are thoroughly flushed. See a physician, preferably an ophthalmologist, immediately.

Inhalation : If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

Ingestion : An unlikely route exposure. This product is a gas at normal temperature and pressure.

4.2 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 be 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.

4.3 Potential Chronic health effects.

Chronic 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, resulting in leukaemia. This substance is carcinogenic to humans. May cause heritable genetic damage in humans..

Carcinogenicity : 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.” An OSHA Standard, 29 CFR 1910.1051, has been published for 1,3-butadiene.

4.4 Notes to physician : 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 : None known

5.2 Special Hazards arising from the substance or mixture

Hazards from the substance or mixture : Flammable gas. Forms explosive mixtures with air and oxidizing agents. Heat of fire can build pressure in cylinder and cause it to rupture. No part of a cylinder should be subjected to a temperature higher than 125°F (52°C). Cylinders containing 1,3-butadiene are equipped with pressure relief devices. (Exceptions may exist where authorized by DOT.) If venting or leaking product catches fire, do not extinguish flames. Flammable gas may spread from leak, creating an explosive re-ignition hazard. Vapors can be ignited by pilot lights, other flames, smoking, sparks, heaters, electrical equipment, static discharge, or other ignition sources at locations distant from product handling point. Explosive atmospheres may linger. Before entering area, especially confined areas, check atmosphere with an appropriate device.

Hazardous de-combustion products : Complete combustion may proceed: carbon dioxide, water vapour. Incomplete combustion may proceed: carbon monoxide, carbon dioxide and/or low molecular weight hydrocarbons aldehydes and ketones.

5.3 Advice for Firefighters

Special precautions for fire fighter : *Suspect cancer agent. Flammable liquid and gas under pressure.* Evacuate all personnel from danger area. Immediately spray cylinders with water from maximum distance until cool, taking care not to extinguish flames. Remove sources of ignition if without risk. Remove all cylinders from fire area if without risk; continue cooling water spray while moving cylinders. Do not extinguish any flames emitted from cylinders; stop flow of gas if without risk, or allow flames to burn out. Self-contained breathing apparatus may be required by rescue workers.

Special protective equipment for fire-fighters : Wear self contained breathing apparatus and full fire-fighting turnout gear.

5.4 Flash Point : - 79 °C

5.5 Explosion Limits :

- LEL% : 2 - UEL% : 11.5

5.6 Auto ignition Temperature : 414 °C.

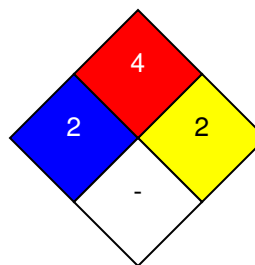
5.7 NFPA Hazard Classification:

5.6.1 Health Hazard: Level 2

5.6.2 Flammable: Level 4

5.6.3 Reactivity: Level 2

5.6.4 Special data: -



5.8 Hazard class : Flammable gas

6.ACCIDENTAL RELEASE MEASURES

6.1 Personal precaution : Forms explosive mixtures with air. Immediately evacuate all personnel from danger area. Use self-contained breathing apparatus where needed. Remove all sources of ignition if without risk. Reduce vapors with fog or fine water spray. Shut off flow if without risk. Ventilate area or move cylinder to a well-ventilated area. Flammable vapors may spread from leak. Before entering area, especially confined areas, check atmosphere with an appropriate device.

Protective equipment and emergency procedure : Complete protective clothing including self-contained breathing apparatus..

6.2 Environmental Precaution : Prevent waste from contaminating the surrounding environment. Keep personnel away. Discard any product, residue, disposable container, or liner in an environmentally acceptable manner, in full compliance with federal, state, and local regulations.If necessary, call your local supplier for assistance

6.3 Method and materials for containment and cleaning up.

Liquefied product evaporated rapidly. Let product „controllably" burn up in the presence of the firemen if needed. Remove all sources of ignition if without risk. Reduce vapors with fog or fine water spray. Shut off flow if without risk. Ventilate area or move cylinder to a well-ventilated area. Flammable vapors may spread from leak. Before entering area, especially confined areas, check atmosphere with an appropriate device.

7.HANDLING AND STORAGE

7.1 Precaution for safe handling :

- Use of fire must be strictly prohibited in vicinity of the material handling.
- Use non-spark generating tools and equipments.

- Operator must put on appropriate protective gears to prevent contact by the eye or skin, and the prevent inhalation of gas.
- Special care must be taken to prevent leakage of gas, as the material tends to form an explosive gas when mixed with air. In addition, remove all spark/flame/arc generation substances equipments, high temperature materials and strong oxidizing agents from the vicinity.
- Be sure to use static electricity preventive equipments and to connect the grounding cables to used equipments. Besides, operators must put on electricity conductive work clothes and shoes not to accumulative static electricity.
- Never use copper and copper alloy (in excess of 62% copper), as the material easily forms an explosive acetylide in reaction with copper.
- Explosive peroxide are formed, When the material come into contact with air. Remove oxygen cylinder/vessels/equipments as much as possible to prevent formation of peroxides.
- Use explosion-proof type electrical equipments.
- Pay enough attention to ventilate and to keep the gas concentration as low as possible, when the material is to be used in and indoor workplace.
- If it is necessary for operators to enter the tanks or other enclosed space, conduct forced ventilation to keep the gas concentration as low as possible and secure the oxygen concentration (over 18% at an atmospheric pressure), or have each of the operators put on the air mask. Check the gas concentration by gas detector before commencing the work

7.2 Condition for safe storage , including any incompatibilities :

- Store the cylinders in a non-flammable structure with natural ventilation always below 40°C, and display alarm signboards.
- Maintain the distance between the storage tank and the nearby resistance houses as provided in the High Pressure Gas Control Law (excepting the case where the area of the tank firm in is below 8 m² and protective wall structure is provided).
- Conduct the gas detection periodically. Upon discovery of gas leakage from the cylinder(s), remove the cylinder(s) for appropriate countermeasures.
- Use explosion-proof type electrical equipments and instruments for the storage tanks.

- Never store the material in excess of 90% of tank capacity.
- Maintain the distance between the storage tank and the nearby residence houses as provided in the High Pressure Gas Control Law. Paint a red belt with a width over 1/10 boards with descriptions."LIQUEFIDE BUTADIENE", "USE OF FIRE STRICTLY PROHIBITED" in red paint.
- Provide emergency shutdown devices on the tank lines.
- Strictly prohibit the use of fire around the storage area.
- Take countermeasures to prevent static electricity accumulation.
- Never store the material close to strong oxidizing agents.

7.3 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)

8.EXPOSURE CONTROLS / PERSONAL PROTECTION

8.1 Control Parameter

Exposure limit value :

ACGIH (2012) TLV-TWA : 2 ppm

OSHA PEL : 1 ppm

OSHA 15 min STEL : 5 ppm

IDLH : 2,000 ppm

Thailand Regulation ; Not data available

8.2 Engineer Exposure Control

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.

8.3 personal protection measure

- 1) **Respiratory protection** : 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.

2) Skin Protection : 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..

3) Eye Protection : Employee must wear splash-proof or dust resistant safety goggles to prevent eye contact with this substance. Select in accordance with OSHA 29 CFR 1910.133.

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 General information Appearance

Physical State : Gas at normal temperature and pressure

Colour : Colorless gas,

Odour : mild aromatic odor

9.2 Odour treshold limit : Above 1.3 ppm.

9.3 pH : No data available.

9.4 Melting Point / Freezing point : -109°C (-164.2°F).

9.5 Initial boiling point and boiling range : -4.9°C (24.6°F).

9.6 Flash point : Closed cup : - 79 °C.

9.7 Evaporation Rate (Butyl acetate=1) : More than 25

9.8 Flammability (Solid/Gas): Flammable gas.

9.9 Upper Flammability/Explosive limits : 11.5%

Lower Flammability/Explosive limits : 2 %.

9.10 Vapor Pressure : 3,309 mm.Hg (at 38°C).

9.11 Vapor density ; at 70°F (21.1°C) and 1 atm : 0.1399 lb/ft³ (2.240 kg/m³)

9.12 Relative density : No data available.

9.13 Solubility : Slightly soluble in water (735 mg/l at 20°C).

9.14 partition Coefficient : n-octanol / water : No data available

9.15 Specific Gravity (Air=1) : 1.9, (Water=1) : 0.627 (at 20°C)

9.16 Auto ignition temperature : 414 °C.

9.17 Decomposition temperature : No data available.

9.18 Viscosity: No data available.

9.19 Molecular Weight: 54.09

10. STABILITY AND REACTIVITY

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

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

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

10.4 Conditions to Avoid :

Aerobic storage, high temperature, absence of stabilising 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 (Aluminium, Iron and Antimony chloride) catalyse - possibility of polymerization with explosive character.

10.5 Incompatible material: 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/CO₂.

11. TOXICOLOGICAL INFORMATION

11.1 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 be 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.

Skin : May cause mechanical irritation (abrasion). Contact with hot material will cause thermal burns.

Eye : May cause mechanical irritation (abrasion).

Inhalation : May cause mechanical irritation (abrasion).

Ingestion : No known significant effects or critical hazards.

11.2 Potencial Chronic health effects.

Chronic 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, resulting in leukaemia. Thissubstance is carcinogenic to humans. May cause heritable genetic damage in humans.

Carcinogenicity : 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.” An OSHA Standard, 29 CFR 1910.1051, has been published for 1,3-butadiene.

11.3 Acute Toxicity Level :

Acute oral toxicity ; LD₅₀ Oral –rat : 5480 mg/kg

Acute dermal toxicity ; LD₅₀ Dermal-rat: 669 mg/kg

Acute inhalation toxicity ; LC₅₀ Inhalation -rat : 285 mg/m³/4hr

12. ECOLOGICAL INFORMATION

12.1 Eco-Toxicity:

Ecotoxicity – Acute toxicity

LC50 Fishes 71,500 mg/m³ 96 hrs

EC50 Daphnia not determined 48 hrs

IC50 Algae not determined 72 hrs

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 spread 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 K_{ow} < 3.

12.4 Mobility in soil : The product evaporates readily..

12.5 Other Adverse effect : 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 Dispose of non-refillable cylinders in accordance with federal, state and local regulations.

13.2 Allow gas to vent slowly to atmosphere in an unconfined area or exhaust hood. 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.

13.3 Disposal method : Burn in incinerator

14. TRANSPORT INFORMATION

14.1 UN No. : 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 pollutants : 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 for user/Additional information : 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.

15. REGULATORY INFORMATION

15.1 Thailand Regulation

- **Labour Protection Act B.E.2541** : Material is not listed

- **Hazardous Substance Act B.E. 2535** : Material is listed on Hazardous Substance Act B.E. 2535

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

15.3 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.

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

15.5 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 (4536 kg) or greater.

15.6 REACH Regulation : Material is listed on REACH.

16. OTHER INFORMATION

16.1 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

LD50 : Lethal Dose 50%

CNS : Central Nervous System NTP National Toxicology Program

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

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>)

Remark

Additional Information Available from

Name: Bangkok Synthetics Company Limited

Address: 5, I-7 Road. Maptaphut Industrial Estate, Muang District, Rayong 21150

Tel.: 0-3869-8698 Ext. 1194 – 1195 Fax.: 0-3869-8699