SAFETY DATA SHEET

1,3-BUTADIENE

Lotte Chemical Titan (M) Sdn Bhd

SECTION 1 IDENTIFICATION OF THE SUBSTANCE / MIXTURE AND OF THE COMPANY / UNDERTAKING

Product Identifier

Product name	1,3-BUTADIENE
Chemical Name	1,3-butadiene
Synonyms	Butadiene, C4H6
Proper shipping name	BUTADIENES, STABILIZED or BUTADIENES AND HYDROCARBON MIXTURE, STABILIZED, containing more than 40% butadienes
Chemical formula	C4H6
Other means of identification	Not Available
CAS number	106-99-0

Relevant identified uses of the substance or mixture and uses advised against

Relevant identified uses	Used as a polymer component in the manufacture of synthetic rubbers, and as an organic synthesis reagent.

Details of the manufacturer/importer

Registered company name	Lotte Chemical Titan (M) Sdn Bhd
Address	PLO 312, Jalan Tembaga 4, Pasir Gudang Industrial Estate, 81700 Pasir Gudang, Johor, Malaysia
Telephone	+607 253 8888
Fax	+607 251 0784
Website	www.lottechem.my
Email	css@lottechem.my

Emergency telephone number

Association / Organization	Not Available
Emergency telephone numbers	+607 253 8888 Ext: 8654 (Office hours only) Ext: 3158 (24 hours)

SECTION 2 HAZARDS IDENTIFICATION

Classification of the substance

CLASS Classification	Flammable Gas Category 1, Gas under Pressure (Refrigerated liquefied gas), Germ Cell Mutagen Category 1B, Carcinogen Category 1A

Label elements

CLASS label	
SIGNAL WORD	**DANGER**

Hazard statement(s)

H220	Extremely flammable gas
H280	Contains gas under pressure; may explode if heated
H340	May cause genetic defects
H350	May cause cancer

Precautionary statement(s) Prevention

P201	Obtain special instructions before use.
P210	Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.
P280	Wear protective gloves/protective clothing/eye protection/face protection.

Precautionary statement(s) Response

P308+P313	IF exposed or concerned: Get medical advice/attention.
P377	Leaking gas fire: Do not extinguish, unless leak can be stopped safely.
P381	Eliminate all ignition sources if safe to do so.

Precautionary statement(s) Storage

P405	Store locked up.
P410+P403	Protect from sunlight. Store in a well-ventilated place.

Precautionary statement(s) Disposal

P501	Dispose of contents/container to authorised chemical landfill or if organic to high temperature incineration

SECTION 3 COMPOSITION / INFORMATION ON INGREDIENTS

Substances

CAS No	%[Weight]	Name	CLASS Classification
106-99-0	>99	1,3-butadiene	Flammable Gas Category 1, Gas under Pressure (Refrigerated liquefied gas), Germ Cell Mutagen Category 1B, Carcinogen Category 1A

Mixtures

See section above for composition of Substances

SECTION 4 FIRST AID MEASURES

Description of first aid measures

Eye Contact	▸ If product comes in contact with eyes remove the patient from gas source or contaminated area. ▸ Take the patient to the nearest eye wash, shower or other source of clean water. ▸ Open the eyelid(s) wide to allow the material to evaporate. ▸ Gently rinse the affected eye(s) with clean, cool water for at least 15 minutes. Have the patient lie or sit down and tilt the head back. Hold the eyelid(s) open and pour water slowly over the eyeball(s) at the inner corners, letting the water run out of the outer corners. ▸ The patient may be in great pain and wish to keep the eyes closed. It is important that the material is rinsed from the eyes to prevent further damage. ▸ Ensure that the patient looks up, and side to side as the eye is rinsed in order to better reach all parts of the eye(s) ▸ Transport to hospital or doctor. ▸ Even when no pain persists and vision is good, a doctor should examine the eye as delayed damage may occur. ▸ If the patient cannot tolerate light, protect the eyes with a clean, loosely tied bandage. ▸ Ensure verbal communication and physical contact with the patient. **DO NOT** allow the patient to rub the eyes **DO NOT** allow the patient to tightly shut the eyes **DO NOT** introduce oil or ointment into the eye(s) without medical advice **DO NOT** use hot or tepid water.
Skin Contact	If skin or hair contact occurs: Flush skin and hair with running water (and soap if available). Seek medical attention in event of irritation.
Inhalation	Following exposure to gas, remove the patient from the gas source or contaminated area. NOTE: Personal Protective Equipment (PPE), including positive pressure self-contained breathing apparatus may be required to assure the safety of the rescuer. Prostheses such as false teeth, which may block the airway, should be removed, where possible, prior to initiating first aid procedures.
	If the patient is not breathing spontaneously, administer rescue breathing. ▸ If the patient does not have a pulse, administer CPR. ▸ If medical oxygen and appropriately trained personnel are available, administer 100% oxygen. ▸ Summon an emergency ambulance. If an ambulance is not available, contact a physician, hospital, or Poison Control Centre for further instruction. Keep the patient warm, comfortable and at rest while awaiting medical care. **MONITOR THE BREATHING AND PULSE, CONTINUOUSLY.** Administer rescue breathing (preferably with a demand-valve resuscitator, bag-valve mask-device, or pocket mask as trained) or CPR if necessary.
Ingestion	Not considered a normal route of entry.

Indication of any immediate medical attention and special treatment needed

As in all cases of suspected poisoning, follow the ABCDEs of emergency medicine (airway, breathing, circulation, disability, exposure), then the ABCDEs of toxicology (antidotes, basics, change absorption, change distribution, change elimination).
For poisons (where specific treatment regime is absent):

----- BASIC TREATMENT

- Establish a patent airway with suction where necessary.
- Watch for signs of respiratory insufficiency and assist ventilation as
- necessary. Administer oxygen by non-rebreather mask at 10 to 15 L/min.
- Monitor and treat, where necessary, for pulmonary
- oedema. Monitor and treat, where necessary, for shock.
- Anticipate seizures.
- **DO NOT** use emetics. Where ingestion is suspected rinse mouth and give up to 200 ml water (5 ml/kg recommended) for dilution where patient is able to swallow, has a strong gag reflex and does not drool.

----- ADVANCED TREATMENT

- Consider orotracheal or nasotracheal intubation for airway control in unconscious patient or where respiratory arrest has
- occurred. Positive-pressure ventilation using a bag-valve mask might be of use.
- Monitor and treat, where necessary, for arrhythmias.
- Start an IV D5W TKO. If signs of hypovolaemia are present use lactated Ringers solution. Fluid overload might create
- complications. Drug therapy should be considered for pulmonary oedema.
- Hypotension with signs of hypovolaemia requires the cautious administration of fluids. Fluid overload might create
- complications. Treat seizures with diazepam.
- Proparacaine hydrochloride should be used to assist eye irrigation.

BRONSTEIN, A.C. and CURRANCE, P.L.
EMERGENCY CARE FOR HAZARDOUS MATERIALS EXPOSURE: 2nd Ed. 1994

For gas exposures:

----- BASIC TREATMENT

- Establish a patent airway with suction where necessary.
- Watch for signs of respiratory insufficiency and assist ventilation as
- necessary. Administer oxygen by non-rebreather mask at 10 to 15 l/min.
- Monitor and treat, where necessary, for pulmonary
- oedema . Monitor and treat, where necessary, for
  shock.
- Anticipate seizures.

----- ADVANCED TREATMENT

- Consider orotracheal or nasotracheal intubation for airway control in unconscious patient or where respiratory arrest has
- occurred. Positive-pressure ventilation using a bag-valve mask might be of use.
- Monitor and treat, where necessary, for arrhythmias.
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- complications. Drug therapy should be considered for pulmonary oedema.
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- complications. Treat seizures with diazepam.
- Proparacaine hydrochloride should be used to assist eye irrigation.

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SECTION 5 FIREFIGHTING MEASURES

Extinguishing media

	DO NOT EXTINGUISH BURNING GAS UNLESS LEAK CAN BE STOPPED SAFELY: **OTHERWISE: LEAVE GAS TO BURN.** **FOR SMALL FIRE:** - Dry chemical, CO_2 or water spray to extinguish gas (only if absolutely necessary and safe to do so). - **DO NOT** use water jets. **FOR LARGE FIRE:** - Cool cylinder by direct flooding quantities of water onto upper surface until well after fire is out.

Special hazards arising from the substrate or mixture

Fire Incompatibility	- Avoid contamination with oxidising agents i.e. nitrates, oxidising acids, chlorine bleaches, pool chlorine etc. as ignition may result

Advice for firefighters

Fire/Explosion Hazard	- HIGHLY FLAMMABLE: will be easily ignited by heat, sparks or flames. - Will form explosive mixtures with air - Fire exposed containers may vent contents through pressure relief valves thereby increasing fire intensity and/ or vapour concentration. - Vapours may travel to source of ignition and flash back. - Containers may explode when heated - Ruptured cylinders may rocket - Fire may produce irritating, poisonous or corrosive gases.
Fire Fighting	FOR FIRES INVOLVING MANY GAS CYLINDERS: - To stop the flow of gas, specifically trained personnel may inert the atmosphere to reduce oxygen levels thus allowing the capping of leaking container(s). - Reduce the rate of flow and inject an inert gas, if possible, before completely stopping the flow to prevent flashback. - **DO NOT extinguish the fire until the supply is shut off** otherwise an explosive re-ignition may occur. - If the fire is extinguished and the flow of gas continues, used increased ventilation to prevent build-up, of explosive atmosphere.

SECTION 6 ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures

Minor Spills	- Avoid breathing vapour and any contact with liquid or gas. Protective equipment including respirator should be used. - **DO NOT** enter confined spaces where gas may have accumulated. - Shut off all sources of possible ignition and increase ventilation.
Major Spills	- Clear area of all unprotected personnel and move upwind. - Alert Emergency Authority and advise them of the location and nature of hazard. May be violently or explosively reactive. Wear full body clothing with breathing apparatus.
	Personal Protective Equipment advice is contained in Section 8 of the MSDS.

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SECTION 7 HANDLING AND STORAGE

Precautions for safe handling

Safe handling	The substance forms explosive levels of peroxides without concentration by evaporation or distillation. Purchases of peroxidisable chemicals should be restricted to ensure that the chemical is used completely before it can become peroxidised. ▸ A responsible person should maintain an inventory of peroxidisable chemicals or annotate the general chemical inventory to indicate which chemicals are subject to peroxidation. An expiration date should be determined.
Other information	Easily peroxidisable. ▸ Products formed as a result of peroxidation are not only safety hazards but may chemically alter the chemical behavior of the parent compound. ▸ Should have a warning label affixed bearing the date of receipt in the laboratory and the date on which the container label is first opened, or laboratory synthesised materials are the responsibility of the individual chemist. ▸ **WARNING**:This product may form peroxides which themselves are not themselves particularly hazardous but which on decomposition may initiate explosive polymerisation of the bulk monomer (Trommsdorf effect).

Conditions for safe storage, including any incompatibilities

Suitable container	▸ Cylinder: ▸ Ensure the use of equipment rated for cylinder pressure. ▸ Ensure the use of compatible materials of construction. ▸ Valve protection cap to be in place until cylinder is secured, connected. ▸ Cylinder must be properly secured either in use or in storage.
Storage incompatibility	1,3-Butadiene: ▸ is self-reactive ▸ forms heat-, shock-, and impact-sensitive peroxides in air unless inhibited (stabilisation with tert-butylcatechol or other inhibitors at all times and ensure these levels are maintained) ▸ may polymerise violently, may ignite or explode on contact with strong oxidisers, copper, high copper alloys, chlorine dioxide, crotonaldehyde, strong acids, nitrogen dioxide, ozone, phenol, sodium nitrite, or polymerisation initiators, such as azobisisobutylonitrile, hydroquinone, or peroxyacetic acid ▸ is incompatible with rubber, plastics, halogen and silica-aluminium molecular sieves ▸ may generate electrostatic charges due to low conductivity ▸ uninhibited vapours may form polymers in plug vents, confined spaces, or flame arresters of storage tanks ▸ The various oxides of nitrogen and peroxyacids may be dangerously reactive in the presence of alkenes. BRETHERICK L.: Handbook of Reactive Chemical Hazards ▸ Avoid reaction with strong Lewis or mineral acids. ▸ Reaction with halogens requires carefully controlled conditions. ▸ Free radical initiators should be avoided.

PACKAGE MATERIAL INCOMPATIBILITIES

Not Available

SECTION 8 EXPOSURE CONTROLS / PERSONAL PROTECTION

Control parameters

OCCUPATIONAL EXPOSURE LIMITS (OEL)

INGREDIENT DATA

Source	Ingredient	Material name	TWA	STEL	Peak	Notes
US ACGIH Threshold Limit Values (TLV)	1,3-butadiene	1, 3-Butadiene	2 ppm	Not Available	Not Available	TLV® Basis: Cancer

EMERGENCY LIMITS

Ingredient	Material name	TEEL-1	TEEL-2	TEEL-3
1,3-butadiene	Butadiene, 1,3-	Not Available	Not Available	Not Available

Ingredient	Original IDLH	Revised IDLH
1,3-butadiene	20,000 [LEL] ppm	2,000 [LEL] ppm

Exposure controls

Appropriate engineering controls	Engineering controls are used to remove a hazard or place a barrier between the worker and the hazard. Well-designed engineering controls can be highly effective in protecting workers and will typically be independent of worker interactions to provide this high level of protection. The basic types of engineering controls are: Process controls which involve changing the way a job activity or process is done to reduce the risk. Enclosure and/or isolation of emission source which keeps a selected hazard "physically" away from the worker and ventilation that strategically "adds" and "removes" air in the work environment.
Personal protection	
Eye and face protection	Safety glasses with side shields. Chemical goggles. Contact lenses may pose a special hazard; soft contact lenses may absorb and concentrate irritants. A written policy document, describing the wearing of lenses or restrictions on use, should be created for each workplace or task.
Skin protection	See Hand protection below
Hands/feet protection	When handling sealed and suitably insulated cylinders wear cloth or leather gloves.

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Body protection	See Other protection below
Other protection	Employees working with confirmed human carcinogens should be provided with, and be required to wear, clean, full body protective clothing (smocks, coveralls, or long-sleeved shirt and pants), shoe covers and gloves prior to entering the regulated area. [AS/NZS ISO 6529:2006 or national equivalent] Employees engaged in handling operations involving carcinogens should be provided with, and required to wear and use half-face filter-type respirators with filters for dusts, mists and fumes, or air purifying canisters or cartridges. A respirator affording higher levels of protection may be substituted. [AS/NZS 1715 or national equivalent] Emergency deluge showers and eyewash fountains, supplied with potable water, should be located near, within sight of, and on the same level with locations where direct exposure is likely.
Thermal hazards	Not Available

SECTION 9 PHYSICAL AND CHEMICAL PROPERTIES

Information on basic physical and chemical properties

Appearance	Colourless gas with a mild aromatic odour; does not mix with water. Soluble in organic solvents.

Physical state	Compressed Gas	**Relative density (Water = 1)**	0.65 @ -6 C
Odour	Not Available	**Partition coefficient n-octanol / water**	Not Available
Odour threshold	Not Available	**Auto-ignition temperature (°C)**	420
pH (as supplied)	Not Applicable	**Decomposition temperature**	Not Available
Melting point / freezing point (°C)	-108.9	**Viscosity (cSt)**	Not Applicable
Initial boiling point and boiling range (°C)	-4.4	**Molecular weight (g/mol)**	54.09
Flash point (°C)	-76	**Taste**	Not Available
Evaporation rate	Not Available	**Explosive properties**	Not Available
Flammability	HIGHLY FLAMMABLE.	**Oxidising properties**	Not Available
Upper Explosive Limit (%)	11.5	**Surface Tension (dyn/cm or mN/m)**	Not Available
Lower Explosive Limit (%)	2.0	**Volatile Component (%vol)**	100
Vapour pressure (kPa)	245 @ 20 C	**Gas group**	IIB
Solubility in water (g/L)	0.735 g/L (20°C)	**pH as a solution**	Not Applicable
Vapour density (Air = 1)	1.87	**VOC g/L**	Not Available

SECTION 10 STABILITY AND REACTIVITY

Reactivity	See section 7
Chemical stability	▸ Unstable in the presence of incompatible materials. ▸ Product is considered stable. ▸ Hazardous polymerisation will not occur.
Possibility of hazardous reactions	See section 7
Conditions to avoid	See section 7
Incompatible materials	See section 7
Hazardous decomposition products	See section 5

SECTION 11 TOXICOLOGICAL INFORMATION

Information on toxicological effects

Inhaled	Inhalation of vapours may cause drowsiness and dizziness. This may be accompanied by sleepiness, reduced alertness, loss of reflexes, lack of co-ordination, and vertigo. Inhalation of vapours or aerosols (mists, fumes), generated by the material during the course of normal handling, may be damaging to the health of the individual. There is some evidence to suggest that the material can cause respiratory irritation in some persons.
Ingestion	Not normally a hazard due to physical form of product. Considered an unlikely route of entry in commercial/industrial environments
Skin Contact	Skin contact is not thought to produce harmful health effects (as classified under EC Directives using animal models). Systemic harm, however, has been identified following exposure of animals by at least one other route and the material may still produce health damage following entry through wounds, lesions or abrasions. The diepoxide of butadiene has been reported to cause mild effect of causing skin tumours in mice when applied topically on its skin. Open cuts, abraded or irritated skin should not be exposed to this material Entry into the blood-stream, through, for example, cuts, abrasions or lesions, may produce systemic injury with harmful effects.

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Eye	Although the material is not thought to be an irritant (as classified by EC Directives), direct contact with the eye may produce transient discomfort characterised by tearing or conjunctival redness (as with windburn). Not considered to be a risk because of the extreme volatility of the gas.
Chronic	There is sufficient evidence to suggest that this material directly causes cancer in humans. Based on experiments and other information, there is ample evidence to presume that exposure to this material can cause genetic defects that can be inherited. There is some evidence from animal testing that exposure to this material may result in toxic effects to the unborn baby. Principal route of occupational exposure to the gas is by inhalation.
1,3-butadiene	**TOXICITY** Oral (rat) LC50: 5480 ppm/4H[1] Inhalation (rat) LC50: 128000 mg/L/4h[2] **IRRITATION** Not Available
Legend:	*1. Value obtained from European Union Risk Assessment Report 2. Value obtained from Europe ECHA Registered Substances - Acute toxicity*

1,3-BUTADIENE	For 1,3-butadiene: 1,3-butadiene has low acute toxicity in animal testing; however long-term exposure has been associated with shrinkage of the ovaries and testes. There is no conclusive evidence that 1,3-butadiene causes birth defects or causes toxicity to the foetus at levels below those that are toxic to the mother. In some animal tests, the substance affects blood counts and the bone marrow. 1,3-butadiene has been shown to cause cancer and mutations.

Acute Toxicity	✔	**Carcinogenicity**	✔
Skin Irritation/Corrosion	⊘	**Reproductivity**	⊘
Serious Eye Damage/Irritation	⊘	**STOT - Single Exposure**	⊘
Respiratory or Skin sensitisation	⊘	**STOT - Repeated Exposure**	⊘
Mutagenicity	✔	**Aspiration Hazard**	⊘

Legend: ✔ *– Data required to make classification available*
✘ *– Data available but does not fill the criteria for classification*
⊘ *– Data Not Available to make classification*

SECTION 12 ECOLOGICAL INFORMATION

Toxicity

For Butadiene: Kow: 1.99; Koc: 72-228; Half-life (hr) air: 4.9; Henry's Pa m3 /mol: 2.57; Henry's atm: m3 /mol; 7.24E-02; BCF: 19.1E
Atmospheric Fate: Butadiene will partition predominately to the atmospheric compartment where it is not expected to be adsorbed to particulate matter to any significant extent. 1,3-Butadiene will volatilize rapidly from either moist or dry soil to the atmosphere where it's most rapid reaction is with photochemically produced hydroxyl radicals. Destruction by nitrate radicals is expected to be a significant night-time process in urban areas. Polluted urban atmospheres increase the rate of degradation somewhat during daylight hours.

Persistence and degradability

Ingredient	Persistence: Water/Soil	Persistence: Air
1,3-butadiene	LOW (Half-life = 56 days)	LOW (Half-life = 0.33 days)

Bioaccumulative potential

Ingredient	Bioaccumulation
1,3-butadiene	LOW (BCF = 19)

Mobility in soil

Ingredient	Mobility
1,3-butadiene	LOW (KOC = 43.79)

SECTION 13 DISPOSAL INFORMATIONS

Waste treatment methods

Product / Packaging disposal	▸ Evaporate or incinerate residue at an approved site. ▸ Return empty containers to supplier. ▸ Ensure damaged or non-returnable cylinders are gas-free before disposal.

SECTION 14 TRANSPORTATION INFORMATION

Labels Required

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Marine Pollutant	NO
HAZCHEM	2YE

Land transport (UN)

UN number	1010
Packing group	Not Applicable
UN proper shipping name	BUTADIENES, STABILIZED or BUTADIENES AND HYDROCARBON MIXTURE, STABILIZED, containing more than 40% butadienes
Environmental hazard	No relevant data
Transport hazard class(es)	Class: 2.1 Subrisk: Not Applicable
Special precautions for user	Special provisions: Not Applicable Limited quantity: 0

Air transport (ICAO-IATA / DGR)

UN number	1010
Packing group	Not Applicable
UN proper shipping name	Butadienes and hydrocarbon mixture, stabilized containing more than 40% butadienes; Butadienes, stabilized
Environmental hazard	No relevant data
Transport hazard class(es)	ICAO/IATA Class: 2.1 ICAO / IATA Subrisk: Not Applicable ERG Code: 10L
Special precautions for user	Special provisions: A1 Cargo Only Packing Instructions: 200 Cargo Only Maximum Qty / Pack: 150 kg Passenger and Cargo Packing Instructions: Forbidden Passenger and Cargo Maximum Qty / Pack: Forbidden Passenger and Cargo Limited Quantity Packing Instructions: Forbidden Passenger and Cargo Limited Maximum Qty / Pack: Forbidden

Sea transport (IMDG-Code / GGVSee)

UN number	1010
Packing group	Not Applicable
UN proper shipping name	BUTADIENES, STABILIZED or BUTADIENES AND HYDROCARBON MIXTURE, STABILIZED, containing more than 40% butadienes
Environmental hazard	Not Applicable
Transport hazard class(es)	IMDG Class: 2.1 IMDG Subrisk: Not Applicable
Special precautions for user	EMS Number: F-D , S-U Special provisions: Not Applicable Limited Quantities: 0

SECTION 15 REGULATORY INFORMATION

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

1,3-butadiene(106-99-0) is found on the following regulatory lists	"Malaysia Permissible Exposure Limits","International Agency for Research on Cancer (IARC) - Agents Classified by the IARC Monographs","International Air Transport Association (IATA) Dangerous Goods Regulations - Prohibited List Passenger and Cargo Aircraft"

This safety data sheet is in compliance with the Occupational Safety and Health (Classification, Labelling and Safety Data Sheet of Hazardous Chemicals) Regulations 2013 (CLASS).

SECTION 16 OTHER INFORMATION

Revision Date: 06/02/2021

This information supplied has been based upon the current level of information available, for the purpose of specifying the requirements regarding environment, health and safety in conjunction with the product. They are not to be interpreted as a warranty for specific product characteristics.

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