



SAFETY DATA SHEET (SDS) C4-RAFFINATE

1. Identification

SDS Record Number	:	PCS 01001
Date of SDS	:	01 March 2019
Identity of the substance	:	C4-Raffinate
Name of the supplier	:	Petrochemical Corporation of Singapore (Private) Limited
Contact detail of the supplier	:	100 Ayer Merbau Road, Singapore 628277 +65 68672102
24-Hour Emergency contact	:	Asia Pacific +65 3158 1074 (Singapore) China +86 10 5100 3039 (Beijing) Europe, Israel & Americas +44 (0) 1235 239 670 (UK) Middle East & Africa +44 (0) 1235 239 671 (UK)

2. Hazard Identification

GHS Classification

<u>Hazard Class</u>	<u>Hazard Category</u>
• Flammable Gases	1
• Gases under pressure	Liquefied gas
• STOT (Single exposure)	3 (narcotic effects)

Pictograms



Signal Word: Danger

Hazard Statements

- Extremely flammable gas
- Contains gas under pressure; may explode if heated
- May cause drowsiness or dizziness

Precautionary Statements

Prevention

- Keep away from heat/sparks/open flames/hot surfaces. – No smoking.
- Avoid breathing dust/fume/gas/mist/vapours/spray.
- Use only outdoors or in a well-ventilated area.

Response

- Call a POISON CENTER/doctor/physician if you feel unwell.



- IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing.
- Leaking gas fire: Do not extinguish, unless leak can be stopped safely.
- Eliminate all ignition sources if safe to do so.

Storage

- Store in a well-ventilated place. Keep container tightly closed.
- Store locked up.
- Protect from sunlight. Store in well-ventilated place.

Disposal

- Dispose of the contents in accordance to the local mandatory rules and regulations

3. Composition/ Information On Ingredients

Chemical identification : C4 Raffinate
Common name(s) / synonym(s) : Raffinate-2
CAS number / EC number : 95465-89-7 / 306-004-1

Seq	Chemical Name	Typical Range
01	Trans-2-Butene	20 – 60 wt%
02	1-Butene	10 – 40 wt%
03	Cis-2-Butene	10 – 40 wt%
04	Normal Butane	5 - 20 wt%
05	1,3 Butadiene	0 – 100 ppm

4. First-Aid Measures

Swallowing: This product is a gas at normal temperature and pressure.

Inhalation: Remove to fresh air. Give artificial respiration if not breathing. Give oxygen if breathing is difficult. Call a physician.

Skin Contact: For exposure to liquid, immediately warm frostbite area with warm water (not to exceed 40 deg C). In case of massive exposure, remove clothing while showering with warm water. Call a physician.

Eye Contact: In case of splash contamination, immediately flush eyes thoroughly with water for at least 15 minutes. See a physician, preferably an ophthalmologist, immediately.

Notes To Physician: There is no specific antidote. Treatment of overexposure should be directed at the control of symptoms and the clinical condition.

5. Fire-Fighting Measures

Extinguishing media: CO₂, dry chemical, water spray or fog.

Special Fire Fighting Procedures:

Evacuate all personnel from danger area. Immediately cool containers with water spray from maximum distance, taking care not to extinguish flames. Remove ignition sources if without risk. If flames are accidentally extinguished, explosive re-ignition may occur; therefore, appropriate measures should be



taken, eg. total evacuation. Reapproach with extreme caution. Use Self-contained breathing apparatus. Stop flow of gas if without risk while continuing cooling water spray. Remove all containers from area of fire if without risk. Allow fire to burn out.

Flammable: Forms explosive mixtures with air and oxidizing agents. Usual fire and explosion hazards:

Forms explosive mixtures with air and oxidising agents. Container may rupture due to heat of fire. Do not extinguish flames due to possibility of explosive re-ignition. Vapour form from this product and may travel or be moved by air currents and ignited by pilot lights, other flames, smoking, sparks, heaters, electrical equipment, static discharges or other ignition sources at locations distant from product handling point. Explosive atmosphere may linger. Before entering area, especially confined area, check atmosphere with approved device. No part of a container should be subjected to a temperature higher than 50 deg C (approximately 125 deg F).

Hazardous combustion products: Carbon monoxide/Carbon dioxide
Sensitivity to impact: Avoid impacts against container.

6. Accidental Release Measures

Steps to be taken if material is released or spilled:

Danger: 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 vapours with fog or fine water spray. Shut off leak if without risk. Ventilate area of leak or more leaking container to well-ventilated area. Flammable vapours may spread from spill. Before entering area, especially confined area, check atmosphere with appropriate device.

7. Handling and Storage

Precautions for safe handling

Use spark-proof tools.

Conditions for safe storage, including any incompatibilities

Ground and bond shipping container, transfer line, and receiving container. Keep away from heat, sparks, flame, and other sources of ignition. Protect containers against static electricity, lightning, and physical damage.

8. Exposure Controls/Personal Protection

Control Parameters/ Exposure Limits

1,3-Butadiene (CAS: 106-99-0)

Permissible Exposure Level (Long Term) in Singapore: 2ppm (4.4mg/m³)

TLV: 2 ppm as TWA; A2 (suspected human carcinogen); (ACGIH).

Carcinogen category: 1; Germ cell mutagen group: 2; (DFG).

OSHA PEL: 1910.1051 TWA 1 ppm ST 5 ppm

1-Butene (CAS: 106-98-9)

TLV: 250 ppm as TWA; (ACGIH).

Trans-2-Butene (CAS: 624-24-6)

TLV: 250 ppm as TWA; (ACGIH).



Cis-2-Butene (CAS: 590-18-1)
TLV: 250 ppm as TWA; (ACGIH).

Butane (CAS: 106-97-8)
Permissible Exposure Level (Long Term) in Singapore: 800ppm (1900mg/m³)

Appropriate Engineering Controls

Ventilation: Use explosion-proof equipment to maintain adequate ventilation to meet occupational exposure limits. Prevent accumulation of explosive air-gas mixtures, and avoid significant oxygen displacement.

Respiratory Protection: Select in accordance with the provincial/local regulations or guidelines. Selection should also be based on the current CSA standards Z94.4, "Selection, care and use of respirators". Respirator should be approved by NIOSH and MSHA.

Protective Gloves: Neoprene.

Eye Protection: Select in accordance with the current CSA Standard Z94.3, "Industrial eye and face protection", and any provincial/local regulations or guidelines.

Others: Metatarsal shoes for cylinder handling. Protective clothing where needed. Select in accordance with the current CSA Standard Z195, "Protective foot wear", and any provincial/local regulations or guidelines.

9. Physical and Chemical Properties

Property	Value, Description
Appearance (physical state, colour etc);	Colorless gas
Odour;	Camphor odor
pH;	Not applicable
Melting point/freezing point;	Not applicable
Initial boiling point and boiling range;	-5 to 5
Vapour pressure;	354 to 380 KPA @37.8 degree C
Vapour density;	1.9 to 2
Solubility(ies);	Negligible in Water
Viscosity.	Not applicable

Specific Gravity (water=1): 0.6

10. Stability and Reactivity

Reactivity/Chemical Stability: This product is stable.

Possibility Of Hazardous Reactions: Hazardous polymerization: May occur.

Conditions To Avoid: Do not expose to heat or sources of ignition.

Incompatible Materials: Oxidizing agents, halogens, acids.

Hazardous Decomposition Products: Thermal decomposition or burning may produce CO/CO₂.

Conditions Of Reactivity: Elevated temperatures and pressures and/or presence of a catalyst.

11. Toxicological Information

Toxicological Information (Animal Toxicity Data)



The following toxicological information refers 1,3 Butadiene, which is present in trace amount.

Median Lethal Dose

Oral LD50: 5480 mg/kg (Rat); 3210 mg/kg (Mouse)

Inhalation LC50: 285 mg/1/4 hr. (Rat)

Dermal: LD50 Not applicable; material is a gas.

Irritation Index, Estimation of Irritation (Species)

Skin: Draize) Believed to be < .50 /8.0 (rabbit) no appreciable effect

Eyes: (Draize) Believed to be > 15.00 - 25.00 /110 (rabbit) slightly irritating

Sensitization:

Not determined.

Other: Prolonged and repeated inhalation of 1,3-butadiene has produced tumors in multiple sites in rats and mice. In Sprague-Dawley rats exposed to 1000 or 8000 ppm butadiene, tumor sites have included the mammary gland, thyroid, and testes. The National Toxicology Program concluded there was "clear evidence" of carcinogenicity in B6C3F1 mice exposed to 6.25 ppm to 1250 ppm butadiene. This was based on increased tumors in the hematopoietic system, heart, lung, forestomach, liver and harderian gland in males and females, preputial gland, brain, and kidney (males), and in ovary and mammary gland (females). IARC has concluded that there is sufficient evidence for 1,3- butadiene carcinogenicity in experimental animals.

Repeated exposure to 1,3-butadiene has produced genetic toxicity, bone marrow toxicity, and anemia in the mouse. Noncarcinogenic damage to the ovary, testes, liver, nasal tissue, and forestomach have also been observed in the mouse, and evidence of kidney damage has been observed in the rat.

Exposure of pregnant rodents to maternally toxic 1,3-butadiene concentrations has affected the developing fetus. Malformations (birth defects) have been reported in the developing fetus of pregnant rats exposed to 8000 ppm 1,3-butadiene. There was no evidence of teratogenic effects in a second developmental study in the rat or a developmental study in the mouse, both involving butadiene exposures up to 1000 ppm.

The B6C3F1 mouse has been demonstrated to be substantially more susceptible to toxic and carcinogenic responses to 1,3-butadiene exposure than the Sprague-Dawley rat. Repeated exposure to 6.25 ppm 1,3-butadiene has produced lung tumors and ovarian atrophy in females, and evidence of genetic toxicity in males and females of this mouse strain. By contrast, evidence for toxic and carcinogenic responses in the rat is more limited and has been observed primarily following prolonged exposure to 1,3- butadiene concentrations of 1000 ppm or higher. In an effort to explain the higher toxic and carcinogenic potency of 1,3-butadiene in the mouse and evaluate the relevance of these animal bioassay results to humans, pharmacokinetic and metabolism studies have been conducted using rodents, monkeys, and tissues from rodents and humans. The results of these studies suggest that the mouse may not be an appropriate model from which to predict human health effects from exposure to 1,3-butadiene.

12. Ecological Information

Aquatic Toxicity : Not determined.

Mobility: Not determined.

Persistence and Biodegradability : Not determined.

Potential to Bioaccumulate: Not determined.

Remarks: None

13. Disposal Considerations

Waste Disposal Methods

This product (as presently constituted) has the RCRA characteristics of ignitability, and, if discarded in its present form, would have the hazardous waste number of D001. Under RCRA, it is the responsibility



of the user of the product to determine, at the time of disposal, whether the product meets RCRA criteria for hazardous waste. This is because product uses, transformations, mixtures, processes, etc. may change the classification to non-hazardous, or hazardous for reasons other than, or in addition to ignitability.

Remarks: Do not allow to enter drains or sewers. Can cause explosion.

14. Transport Information

Land (ADR)

UN No.: UN 1965

Proper shipping name: HYDROCARBON GAS MIXTURE, LIQUEFIED, N.O.S.

Classification Code: 2F

Labels: 2.1

Hazard Identification Number: 23

Air (IATA)

UN No.: UN 1965

Proper shipping name: HYDROCARBON GAS MIXTURE, LIQUEFIED, N.O.S.

Class: 2.1

Labels: 2.1

Sea (IMDG)

UN No.: UN 1965

Proper shipping name: HYDROCARBON GAS MIXTURE, LIQUEFIED, N.O.S.

Class: 2.1

Labels: 2.1

Marine pollutant: No

Sea (Annex II of MARPOL 73/78 and the IBC code)

Not applicable

15. Regulatory Information

Applicable National Regulations:

Workplace Safety and Health Act & Workplace Safety and Health (General Provisions) Regulations:
This product is subject to the SDS, labelling and PEL and other requirements in the Act/Regulations.

Fire Safety Act and Fire Safety (Petroleum and Flammable Materials) Regulations:
This product is subject to the requirements of this Regulations.

Maritime and Port Authority of Singapore (Dangerous Goods, Petroleum and Explosives) Regulations:
This product is subject to the requirements of this Regulations.

16. Other Information

Prepared By: Material Safety Committee

SDS Prepared on: 1/6/2012

Reviewed 1 on: 1/3/2014




Revised 2 on: 1/3/2019



Revision (2) Notes	
1	Sect. 3: Included CAS number identifier for the mixture
2	Sect. 7: Added information regarding Handling and Storage
3	Sect. 8: Added/updated Control Parameters and Exposure Limits for components in the mixture
4	Sect. 10: Added information regarding Conditions to Avoid
5	Sect. 14: Added information regarding Transport information
6	Sect. 15: Included applicable national regulations (Singapore)

CAUTION: The information given above (“**the Information**”) relates only to the substance or mixture listed herein. The Information may not be valid when used in combination with any other substance or mixture or in any process. If the substance or mixture is to be used for a purpose other than that stated herein or under conditions other than specified herein, the Information cannot be relied upon as being complete or accurate, and the user is advised to consult the supplier before using the substance or mixture for such other purpose or under such other conditions. The Information is given based on information available at the indicated date of preparation and no representation or warranty is given that it will be correct as of any time after the indicated date of preparation.

GHS Label

C4-Raffinate			
			DANGER
<u>Hazard Statements</u>	<u>Precautionary Statements</u>		
<ul style="list-style-type: none">• Extremely flammable gas• Contains gas under pressure; may explode if heated• May cause drowsiness or dizziness	<ul style="list-style-type: none">• Keep away from heat/sparks/open flames/hot surfaces. – No smoking.• Avoid breathing dust/fume/gas/mist/vapours/spray.• Use only outdoors or in a well-ventilated area.		
For further information on this product, refer to Manufacturer's Safety Data Sheet			
Contact detail of the supplier :	100 Ayer Merbau Road, Singapore 628277		
Emergency contact :	+65 68672102		