SAFETY DATA SHEET
According to EC No 1907/2006 as amended as at the date of this SDS

Raffinate 2 Sustainable

Version	Revision Date:	SDS Number:	Date of last issue: -
1.0	05.06.2024	800010064704	Print Date 12.06.2024

SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Trade name	:	Raffinate 2 Sustainable
Product code	:	Y2143
Registration number EU	:	01-2119474204-43-0001
Synonyms	:	Raffinate 2 (SDO), Mixed C4
CAS-No.	:	92045-23-3

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

Use of the Substance/Mixture	:	The substance/product is registered with strictly controlled conditions as defined in Article 18(4) of Regulation (EC) No. 1907/2006 (REACH Regulation) and must therefore be handled as such. Base chemical., Raw material for use in the chemical industry.
Uses advised against	:	This product must not be used in applications other than the above without first seeking the advice of the supplier., Restricted to professional users.

1.3 Details of the supplier of the safety data sheet

Manufacturer/Supplier	:	**Shell Chemicals Europe B.V.** PO Box 2334 3000 CH Rotterdam Netherlands
Telephone	:	+31 (0)10 441 5137 / +31 (0)10 441 5191
Telefax	:	+31 (0)20 716 8316 / +31 (0)20 713 9230
Contact for Safety Data Sheet	:	sccmsds@shell.com

1.4 Emergency telephone number

+44 (0) 1235 239 670 (This telephone number is available 24 hours per day, 7 days per week)
Giftnotruf (Berlin): +49 (0) 30 3068 6700

SECTION 2: Hazards identification

2.1 Classification of the substance or mixture

Classification (REGULATION (EC) No 1272/2008)

Flammable gases, Category 1A	H220: Extremely flammable gas.
Gases under pressure, Liquefied gas	H280: Contains gas under pressure; may explode if heated.

Germ cell mutagenicity, Category 1B	H340: May cause genetic defects.
Carcinogenicity, Category 1B	H350: May cause cancer.

2.2 Label elements

Labelling (REGULATION (EC) No 1272/2008)

Hazard pictograms :

Signal word : Danger

Hazard statements :

PHYSICAL HAZARDS:
H220 Extremely flammable gas.
H280 Contains gas under pressure; may explode if heated.
HEALTH HAZARDS:
H340 May cause genetic defects.
H350 May cause cancer.
ENVIRONMENTAL HAZARDS:
Not classified as environmental hazard according to CLP criteria.

Precautionary statements :

Prevention:

P202 Do not handle until all safety precautions have been read and understood.
P210 Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.
P243 Take action to prevent static discharges.
P280 Wear protective gloves/ protective clothing/ eye protection/ face protection.

Response:

P377 Leaking gas fire: Do not extinguish, unless leak can be stopped safely.
P381 In case of leakage, eliminate all ignition sources.

Storage:

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

Disposal:

P501 Dispose of contents/ container to an approved waste disposal plant.

2.3 Other hazards

Ecological information: The substance/mixture does not contain components considered to have endocrine disrupting properties according to REACH Article 57(f) or Commission Delegated regulation (EU) 2017/2100 or Commission Regulation (EU) 2018/605 at levels of 0.1% or higher.

Toxicological information: The substance/mixture does not contain components considered to have endocrine disrupting properties according to REACH Article 57(f) or Commission Delegated regulation (EU) 2017/2100 or Commission Regulation (EU) 2018/605 at levels of 0.1% or higher.

Vapours may cause drowsiness and dizziness.
Slightly irritating to respiratory system.
Exposure to rapidly expanding gases may cause frost burns to eyes and/or skin.
Vapours may be irritating to the eye.
Possibility of organ or organ system damage from prolonged exposure; see Section 11 for details.
Target organ(s):
Blood forming organs
Reproductive system.
This material is a static accumulator.
Even with proper grounding and bonding, this material can still accumulate an electrostatic charge.
If sufficient charge is allowed to accumulate, electrostatic discharge and ignition of flammable air-vapour mixtures can occur.
Highly reactive.
May form explosive peroxides.
The vapour is heavier than air, spreads along the ground and distant ignition is possible.
May form flammable/explosive vapour-air mixture.

SECTION 3: Composition/information on ingredients

3.1 Substances

Components

Chemical name	CAS-No. EC-No.	Concentration (% w/w)
Hydrocarbons, C4, steam-cracker distillate	92045-23-3 295-405-4	<= 100

Further information

Contains:

Chemical name	Identification number	Classification	Concentration (% w/w)
1,3-butadiene	106-99-0, 203-450-8	Flam. Gas1A; H220 Press. GasLiquefied gas; H280 Muta.1B; H340 Carc.1A; H350	< 5

SECTION 4: First aid measures

4.1 Description of first aid measures

General advice : Not expected to be a health hazard when used under normal conditions.

Protection of first-aiders : When administering first aid, ensure that you are wearing the appropriate personal protective equipment according to the incident, injury and surroundings.

If inhaled : Call emergency number for your location / facility.
Remove to fresh air. Do not attempt to rescue the victim unless proper respiratory protection is worn. If the victim has difficulty breathing or tightness of the chest, is dizzy, vomiting, or unresponsive, give 100% oxygen with rescue breathing or Cardio-Pulmonary Resuscitation as required and transport to the nearest medical facility.

In case of skin contact : Slowly warm the exposed area by rinsing with warm water.
Transport to the nearest medical facility for additional treatment.

In case of eye contact : Slowly warm the exposed area by rinsing with warm water.
Transport to the nearest medical facility for additional treatment.

If swallowed : In general no treatment is necessary unless large quantities are swallowed, however, get medical advice.

4.2 Most important symptoms and effects, both acute and delayed

Symptoms : Respiratory irritation signs and symptoms may include a temporary burning sensation of the nose and throat, coughing, and/or difficulty breathing.
Breathing of high vapour concentrations may cause central nervous system (CNS) depression resulting in dizziness, lightheadedness, headache, nausea and loss of coordination. Continued inhalation may result in unconsciousness and death.

Rapid release of gases which are liquids under pressure may cause frost burns of exposed tissues (skin, eye) due to evaporative cooling.

No specific hazards under normal use conditions.
Ingestion may result in nausea, vomiting and/or diarrhoea.

4.3 Indication of any immediate medical attention and special treatment needed

Treatment : IMMEDIATE TREATMENT IS EXTREMELY IMPORTANT!
Artificial respiration and/or oxygen may be necessary.
Call a doctor or poison control center for guidance.

Treat symptomatically.

SECTION 5: Firefighting measures

5.1 Extinguishing media

Suitable extinguishing media : Shut off supply. If not possible and no risk to surroundings, let the fire burn itself out.

Unsuitable extinguishing media : Data not available

5.2 Special hazards arising from the substance or mixture

Specific hazards during fire-fighting : Sustained fire attack on vessels may result in a Boiling Liquid Expanding Vapor Explosion (BLEVE).
The vapour is heavier than air, spreads along the ground and distant ignition is possible.
Contents are under pressure and can explode when exposed to heat or flames.
As the vapours become lighter than air, the vapours may reach ignition sources at ground or elevated locations.

5.3 Advice for firefighters

Special protective equipment for firefighters : Wear full protective clothing and self-contained breathing apparatus.

Proper protective equipment including chemical resistant gloves are to be worn; chemical resistant suit is indicated if large contact with spilled product is expected. Self-Contained Breathing Apparatus must be worn when approaching a fire in a confined space. Select fire fighter's clothing approved to relevant Standards (e.g. Europe: EN469).

Specific extinguishing methods : Standard procedure for chemical fires.

Further information : Clear fire area of all non-emergency personnel.
Keep adjacent containers cool by spraying with water.

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures

Personal precautions : Avoid contact with spilled or released material. Immediately remove all contaminated clothing. For guidance on selection of personal protective equipment see Section 8 of this Safety Data Sheet. For guidance on disposal of spilled material see Section 13 of this Safety Data Sheet.
Be ready for fire or possible exposure.
Stay upwind and keep out of low areas.
6.1.1 For non emergency personnel:

Avoid contact with skin, eyes and clothing.
Isolate hazard area and deny entry to unnecessary or unprotected personnel.
Do not breathe fumes, vapour.
Do not operate electrical equipment.
6.1.2 For emergency responders:
Avoid contact with skin, eyes and clothing.
Isolate hazard area and deny entry to unnecessary or unprotected personnel.
Do not breathe fumes, vapour.
Do not operate electrical equipment.

6.2 Environmental precautions

Environmental precautions : Shut off leaks, if possible without personal risks. Remove all possible sources of ignition in the surrounding area and evacuate all personnel. Attempt to disperse the gas or to direct its flow to a safe location for example by using fog sprays. Take precautionary measures against static discharge. Ensure electrical continuity by bonding and grounding (earthing) all equipment. Monitor area with combustible gas meter.

6.3 Methods and material for containment and cleaning up

Methods for cleaning up : Allow to evaporate.
Attempt to disperse the vapour or to direct its flow to a safe location, for example by using fog sprays. Otherwise treat as for small spillage.

6.4 Reference to other sections

Risk of explosion. Inform the emergency services if liquid enters surface water drains., Vapour may form an explosive mixture with air.
Local authorities should be advised if significant spillages cannot be contained.

SECTION 7: Handling and storage

7.1 Precautions for safe handling

Technical measures : Avoid breathing of or direct contact with material. Only use in well ventilated areas. Wash thoroughly after handling. For guidance on selection of personal protective equipment see Section 8 of this Safety Data Sheet.
Use the information in this data sheet as input to a risk assessment of local circumstances to help determine appropriate controls for safe handling, storage and disposal of this material.
Ensure that all local regulations regarding handling and storage facilities are followed.

Advice on safe handling : Avoid inhaling vapour and/or mists.
Avoid contact with skin, eyes and clothing.
Extinguish any naked flames. Do not smoke. Remove ignition sources. Avoid sparks.

The vapour is heavier than air. Beware of accumulation in pits and confined spaces.
Use local exhaust ventilation if there is risk of inhalation of vapours, mists or aerosols.
Bulk storage tanks should be diked (bunded).
Properly dispose of any contaminated rags or cleaning materials in order to prevent fires.
Even with proper grounding and bonding, this material can still accumulate an electrostatic charge.
If sufficient charge is allowed to accumulate, electrostatic discharge and ignition of flammable air-vapour mixtures can occur.
Be aware of handling operations that may give rise to additional hazards that result from the accumulation of static charges.
These include but are not limited to pumping (especially turbulent flow), mixing, filtering, splash filling, cleaning and filling of tanks and containers, sampling, switch loading, gauging, vacuum truck operations, and mechanical movements.
These activities may lead to static discharge e.g. spark formation.
Restrict line velocity during pumping in order to avoid generation of electrostatic discharge (≤ 1 m/s until fill pipe submerged to twice its diameter, then ≤ 7 m/s). Avoid splash filling.
Do NOT use compressed air for filling, discharging, or handling operations.

Product Transfer : Refer to guidance under Handling section.

Hygiene measures : Wash hands before eating, drinking, smoking and using the toilet. Launder contaminated clothing before re-use.

7.2 Conditions for safe storage, including any incompatibilities

Requirements for storage areas and containers : Refer to section 15 for any additional specific legislation covering the packaging and storage of this product.

Storage class (TRGS 510) : 2A, Gases

Further information on storage stability : Electrostatic charges will be generated during pumping.
Electrostatic discharge may cause fire. Ensure electrical continuity by bonding and grounding (earthing) all equipment to reduce the risk.
The vapours in the head space of the storage vessel may lie in the flammable/explosive range and hence may be flammable.
Keep away from aerosols, flammables, oxidizing agents, corrosives and from other flammable products which are not harmful or toxic to man or to the environment.
Must be stored in a diked (bunded) well- ventilated area, away from sunlight, ignition sources and other sources of heat.
Must be kept inhibited during storage and shipment as material can polymerise.

Vapours from tanks should not be released to atmosphere.
Breathing losses during storage should be controlled by a suitable vapour treatment system.
Storage Temperature:
Ambient.
Nitrogen blanket recommended.
The product is normally supplied in a stabilized form. If the permissible storage period and/or storage temperature is noticeably exceeded, the product may polymerise with heat evolution.
Stable under recommended storage conditions.

Packaging material : Suitable material: For containers, or container linings use mild steel, stainless steel.
Unsuitable material: Copper., Copper alloys., Magnesium., Mercury., Monel., Silver.

7.3 Specific end use(s)

Specific use(s) : The substance/product is registered with strictly controlled conditions as defined in Article 18(4) of Regulation (EC) No. 1907/2006 (REACH Regulation) and must therefore be handled as such. Refer to the industry guidance prepared by Concawe/Cefic for advice on the demonstration of strictly controlled conditions available from: http://cefic.org.

See additional references that provide safe handling practices for liquids that are determined to be static accumulators: American Petroleum Institute 2003 (Protection Against Ignitions Arising out of Static, Lightning and Stray Currents) or National Fire Protection Agency 77 (Recommended Practices on Static Electricity).
IEC/TS 60079-32-1: Electrostatic hazards, guidance

SECTION 8: Exposure controls/personal protection

8.1 Control parameters

Occupational Exposure Limits

Components	CAS-No.	Value type (Form of exposure)	Control parameters	Basis
1,3-butadiene	106-99-0	Acceptable concentration	0,2 ppm 0,5 mg/m3	DE TRGS 910
1,3-butadiene		Tolerable concentration	2 ppm 5 mg/m3	DE TRGS 910
	Peak-limit: excursion factor (category): 8 - Excursion factor according to Number 3.2.6			

Biological occupational exposure limits

Substance name	CAS-No.	Control parameters	Sampling time	Basis
1,3-butadiene	106-99-0	3,4-dihydroxybutylmer-	Equivalence Value for Tolerable con-	TRGS 910

		capturic acid (DHBMA): 2900 µg/g creatinine (Urine)	centration: end of exposure or end of shift, Equivalence Value for Tolerable concentration: with long-term exposure: at the end of the shift after several previous shifts	
		3,4-dihydroxybutylmercapturic acid (DHBMA): 600 µg/g creatinine (Urine)	Equivalence Value for Acceptance concentration: end of exposure or end of shift, Equivalence Value for Acceptance concentration: with long-term exposure: at the end of the shift after several previous shifts	TRGS 910
		2-hydroxy-3-butenyl-mercapturic acid (MHBMA): 80 µg/g creatinine (Urine)	Equivalence Value for Tolerable concentration: end of exposure or end of shift, Equivalence Value for Tolerable concentration: with long-term exposure: at the end of the shift after several previous shifts	TRGS 910
		2-hydroxy-3-butenyl-mercapturic acid (MHBMA): 10 µg/g creatinine (Urine)	Equivalence Value for Acceptance concentration: end of exposure or end of shift, Equivalence Value for Acceptance concentration: with long-term exposure: at the end of the shift after several previous shifts	TRGS 910

Derived No Effect Level (DNEL) according to Regulation (EC) No. 1907/2006:

Substance name	End Use	Exposure routes	Potential health effects	Value
Hydrocarbons, C4, steam-cracker distillate	Workers	Inhalation	Long-term systemic effects	2,21 mg/m3
Hydrocarbons, C4,	Workers	Inhalation	Long-term local ef-	1530 mg/m3

steam-cracker distillate			fects	
Hydrocarbons, C4, steam-cracker distillate	Consumers	Inhalation	Long-term systemic effects	0,0664 mg/m3
Hydrocarbons, C4, steam-cracker distillate	Consumers	Inhalation	Long-term local effects	918 mg/m3
1,3-butadiene	Workers	Inhalation	Long-term systemic effects	2,21 mg/m3
1,3-butadiene	Consumers	Inhalation	Long-term systemic effects	0,0664 mg/m3

Predicted No Effect Concentration (PNEC) according to Regulation (EC) No. 1907/2006:

Substance name	Environmental Compartment	Value
Remarks:	Substance is a hydrocarbon with a complex, unknown or variable composition. Conventional methods of deriving PNECs are not appropriate and it is not possible to identify a single representative PNEC for such substances.	

8.2 Exposure controls

Engineering measures

Use sealed systems as far as possible.
Adequate explosion-proof ventilation to control airborne concentrations below the exposure guidelines/limits.
Local exhaust ventilation is recommended.
Firewater monitors and deluge systems are recommended.
Eye washes and showers for emergency use.
The level of protection and types of controls necessary will vary depending upon potential exposure conditions. Select controls based on a risk assessment of local circumstances. Appropriate measures include:

General Information:
Consider technical advances and process upgrades (including automation) for the elimination of releases. Minimise exposure using measures such as closed systems, dedicated facilities and suitable general/local exhaust ventilation. Drain down systems and clear transfer lines prior to breaking containment. Clean/flush equipment, where possible, prior to maintenance. Where there is potential for exposure: restrict access to authorised persons; provide specific activity training to operators to minimise exposures; wear suitable gloves and coveralls to prevent skin contamination; wear respiratory protection when there is potential for inhalation; clear up spills immediately and dispose of wastes safely.Ensure safe systems of work or equivalent arrangements are in place to manage risks. Regularly inspect, test and maintain all control measures. Consider the need for risk based health surveillance.

Personal protective equipment

The provided information is made in consideration of the PPE directive (Council Directive 89/686/EEC) and the CEN European Committee for Standardisation (CEN) standards.

Personal protective equipment (PPE) should meet recommended national standards. Check with PPE suppliers.

Eye protection : Wear goggles for use against liquids and gas, combined with face shield with chin guard.

Approved to EU Standard EN166.

Hand protection

Remarks	:	Where hand contact with the product may occur the use of gloves approved to relevant standards (e.g. Europe: EN374, US: F739) made from the following materials may provide suitable chemical protection. When prolonged or frequent repeated contact occurs. Viton. For incidental contact/splash protection - Neoprene rubber. If contact with liquefied product is possible or anticipated, gloves should be thermally insulated to prevent cold burns. For continuous contact we recommend gloves with breakthrough time of more than 240 minutes with preference for > 480 minutes where suitable gloves can be identified. For short-term/splash protection we recommend the same but recognize that suitable gloves offering this level of protection may not be available and in this case a lower breakthrough time maybe acceptable so long as appropriate maintenance and replacement regimes are followed. Glove thickness is not a good predictor of glove resistance to a chemical as it is dependent on the exact composition of the glove material. Glove thickness should be typically greater than 0.35 mm depending on the glove make and model. Suitability and durability of a glove is dependent on usage, e.g. frequency and duration of contact, chemical resistance of glove material, dexterity. Always seek advice from glove suppliers. Contaminated gloves should be replaced. Personal hygiene is a key element of effective hand care. Gloves must only be worn on clean hands. After using gloves, hands should be washed and dried thoroughly. Application of a non-perfumed moisturizer is recommended.
Skin and body protection	:	Chemical and cryogenic gloves/gauntlets, boots, and apron. Wear antistatic and flame-retardant clothing. Protective clothing approved to EU Standard EN14605.
Respiratory protection	:	If engineering controls do not maintain airborne concentrations to a level which is adequate to protect worker health, select respiratory protection equipment suitable for the specific conditions of use and meeting relevant legislation. Check with respiratory protective equipment suppliers. Where air-filtering respirators are unsuitable (e.g. airborne concentrations are high, risk of oxygen deficiency, confined space) use appropriate positive pressure breathing apparatus. Where air-filtering respirators are suitable, select an appropriate combination of mask and filter. If air-filtering respirators are suitable for conditions of use: Select a filter suitable for organic gases and vapours [Type AX boiling point < 65°C (149°F)] meeting EN14387.

Thermal hazards	:	When handling cold material that can cause frost burns, wear cryogenic gloves, safety hat and visor, cold resistant overalls (with cuffs over gloves and legs over boots) and heavy duty boots e.g. leather for cold resistance.

SECTION 9: Physical and chemical properties

9.1 Information on basic physical and chemical properties

Physical state	:	Clear liquid under pressure.
Colour	:	colourless
Odour	:	Hydrocarbon
Odour Threshold	:	Data not available
Melting point/freezing point	:	Not applicable
Boiling point/boiling range	:	-6 °C
Flammability		
Flammability (solid, gas)	:	Flammable gas.
Lower explosion limit and upper explosion limit / flammability limit		
Upper explosion limit / upper flammability limit	:	9,5 %(V)
Lower explosion limit / Lower flammability limit	:	1,5 %(V)
Flash point	:	< -70 °C
Auto-ignition temperature	:	estimated value(s) > 350 °C
Decomposition temperature		
Decomposition temperature	:	Data not available
pH	:	Not applicable
Viscosity		
Viscosity, dynamic	:	Data not available
Viscosity, kinematic	:	Data not available
Solubility(ies)		
Water solubility	:	0,05 g/l negligible

Solubility in other solvents	:	Data not available
Partition coefficient: n-octanol/water	:	log Pow: 2,4
Vapour pressure	:	Data not available (50 °C)
Relative density	:	Data not available
Density	:	Method: ASTM D4052 Data not available
Relative vapour density	:	1,94
Particle characteristics		
Particle size	:	Data not available

9.2 Other information

Explosive properties	:	Not applicable
Oxidizing properties	:	Not applicable
Evaporation rate	:	Data not available
Conductivity	:	Low conductivity: < 100 pS/m, The conductivity of this material makes it a static accumulator., A liquid is typically considered nonconductive if its conductivity is below 100 pS/m and is considered semi-conductive if its conductivity is below 10,000 pS/m., A number of factors, for example liquid temperature, presence of contaminants, and anti-static additives can greatly influence the conductivity of a liquid
Surface tension	:	Data not available
Molecular weight	:	Data not available

SECTION 10: Stability and reactivity

10.1 Reactivity

Reacts violently with strong oxidising agents.

10.2 Chemical stability

Oxidises on contact with air to form unstable peroxides.
Unstable at elevated temperatures.

10.3 Possibility of hazardous reactions

Hazardous reactions : Polymerisation may occur at elevated temperatures.

10.4 Conditions to avoid

Conditions to avoid : Heat, flames, and sparks.
Exposure to air.

10.5 Incompatible materials

Materials to avoid : Strong oxidising agents.
If copper, copper alloys, monel, silver, mercury or magnesium is used during construction or maintenance, the formation of explosive acetylides can occur as a result of contact with butadiene. If Teflon® or Delrin® is used, polymer formation may result.

10.6 Hazardous decomposition products

Thermal decomposition is highly dependent on conditions. A complex mixture of airborne solids, liquids and gases, including carbon monoxide, carbon dioxide and other organic compounds will be evolved when this material undergoes combustion or thermal or oxidative degradation.

SECTION 11: Toxicological information

11.1 Information on hazard classes as defined in Regulation (EC) No 1272/2008

Information on likely routes of exposure : Inhalation is the primary route of exposure although exposure may occur through skin or eye contact.

Acute toxicity

Components:

Hydrocarbons, C4, steam-cracker distillate:

Acute oral toxicity :

Remarks: Based on available data, the classification criteria are not met.

Acute inhalation toxicity : LC 50 (Rat, male and female): > 10000 ppm
Exposure time: 4 h
Test atmosphere: gas
Method: Test(s) equivalent or similar to OECD Test Guideline 403
Remarks: High concentrations may cause central nervous system depression resulting in headaches, dizziness and nausea; continued inhalation may result in unconsciousness and/or death.
Based on available data, the classification criteria are not met.

Acute dermal toxicity : Remarks: Based on available data, the classification criteria are not met.

Skin corrosion/irritation

Components:

Hydrocarbons, C4, steam-cracker distillate:

Species	:	Rabbit
Method	:	Acceptable non-standard method.
Remarks	:	Rapid release of gases which are liquids under pressure may cause frost burns of exposed tissues (skin, eye) due to evaporative cooling. Slightly irritating to skin. Insufficient to classify.

Serious eye damage/eye irritation

Components:

Hydrocarbons, C4, steam-cracker distillate:

Species	:	Rabbit
Method	:	Acceptable non-standard method.
Remarks	:	Rapid release of gases which are liquids under pressure may cause frost burns of exposed tissues (skin, eye) due to evaporative cooling. Based on available data, the classification criteria are not met.

Respiratory or skin sensitisation

Components:

Hydrocarbons, C4, steam-cracker distillate:

Remarks	:	Based on available data, the classification criteria are not met.

Germ cell mutagenicity

Components:

Hydrocarbons, C4, steam-cracker distillate:

Genotoxicity in vitro	:	Method: Test(s) equivalent or similar to OECD Guideline 471 Remarks: May cause genetic defects. Method: Test(s) equivalent or similar to OECD Test Guideline 476 Remarks: May cause genetic defects. Method: Test(s) equivalent or similar to OECD Test Guideline 476 Remarks: May cause genetic defects. Method: OECD Test Guideline 482 Remarks: May cause genetic defects.

Genotoxicity in vivo : Species: Mouse
Method: OECD Test Guideline 474
Remarks: May cause heritable genetic damage
Contains 1,3-butadiene.

Species: Mouse
Method: Test(s) equivalent or similar to OECD Test guideline 478
Remarks: May cause heritable genetic damage
Contains 1,3-butadiene.

Germ cell mutagenicity- Assessment : May cause genetic defects.

Carcinogenicity

Components:

Hydrocarbons, C4, steam-cracker distillate:

Species : Mouse, male and female
Application Route : Inhalation
Method : Test(s) equivalent or similar to OECD Test Guideline 453
Remarks : May cause cancer.
Known human carcinogen.
Contains 1,3-butadiene.

Species : Rat, male and female
Application Route : Inhalation
Method : Test(s) equivalent or similar to OECD Test Guideline 453
Remarks : May cause cancer.
Known human carcinogen.
Contains 1,3-butadiene.

Carcinogenicity - Assessment : May cause cancer.

Material	GHS/CLP Carcinogenicity Classification
Hydrocarbons, C4, steam-cracker distillate	Carcinogenicity Category 1B
1,3-butadiene	Carcinogenicity Category 1A

Material	Other Carcinogenicity Classification
1,3-butadiene	IARC: Group 1: Carcinogenic to humans

Reproductive toxicity

Components:

Hydrocarbons, C4, steam-cracker distillate:

Effects on fertility	:	Species: Rat Sex: male and female Application Route: Inhalation Method: OECD Test Guideline 422 Remarks: Based on available data, the classification criteria are not met.
Reproductive toxicity - Assessment	:	This product does not meet the criteria for classification in categories 1A/1B.

STOT - single exposure

Components:

Hydrocarbons, C4, steam-cracker distillate:

Remarks	:	Inhalation of vapours or mists may cause irritation to the respiratory system. Based on available data, the classification criteria are not met.

STOT - repeated exposure

Components:

Hydrocarbons, C4, steam-cracker distillate:

Remarks	:	Blood-forming organs: repeated exposure affects the bone marrow. Reproductive system: repeated exposure affects the ovaries and testes in mice. Contains 1,3-butadiene. Exposure to very high concentrations of similar materials has been associated with irregular heart rhythms and cardiac arrest. Based on available data, the classification criteria are not met.

Repeated dose toxicity

Components:

Hydrocarbons, C4, steam-cracker distillate:

Species	:	Rat, male and female
Application Route	:	Oral
Method	:	Test(s) equivalent or similar to OECD Test Guideline 407
Target Organs	:	No specific target organs noted
Species	:	Rat, male and female
Application Route	:	Inhalation

Test atmosphere	:	vapour
Method	:	OECD Test Guideline 422
Target Organs	:	No specific target organs noted

Aspiration toxicity

Components:

Hydrocarbons, C4, steam-cracker distillate:
Based on available data, the classification criteria are not met.

11.2 Information on other hazards

Endocrine disrupting properties

Product:

Assessment	:	The substance/mixture does not contain components considered to have endocrine disrupting properties according to REACH Article 57(f) or Commission Delegated regulation (EU) 2017/2100 or Commission Regulation (EU) 2018/605 at levels of 0.1% or higher.

Further information

Product:

Remarks	:	Unless indicated otherwise, the data presented is representative of the product as a whole, rather than for individual component(s).

Components:

Hydrocarbons, C4, steam-cracker distillate:

Remarks	:	Classifications by other authorities under varying regulatory frameworks may exist.

SECTION 12: Ecological information

12.1 Toxicity

Components:

Hydrocarbons, C4, steam-cracker distillate:

Toxicity to fish	:	LC50 : 19 mg/l Exposure time: 96 h Method: QSAR Remarks: Data not available
Toxicity to daphnia and other aquatic invertebrates	:	LC50 (Daphnia (water flea)): 11 mg/l Exposure time: 48 h Method: Information given is based on data obtained from

similar substances.
Remarks: Data not available

Toxicity to algae/aquatic plants : EC50 : 7,7 mg/l
Exposure time: 96 h
Method: Information given is based on data obtained from similar substances.
Remarks: Data not available

Toxicity to microorganisms :
Remarks: Data not available

Toxicity to fish (Chronic toxicity) : Remarks: Data not available

Toxicity to daphnia and other aquatic invertebrates (Chronic toxicity) : Remarks: Data not available

12.2 Persistence and degradability

Components:

Hydrocarbons, C4, steam-cracker distillate:

Biodegradability : Biodegradation: 0 - 4 %
Exposure time: 28 d
Remarks: Not readily biodegradable.
Based on weight of evidence.

12.3 Bioaccumulative potential

Components:

Hydrocarbons, C4, steam-cracker distillate:

Bioaccumulation : Remarks: Does not bioaccumulate.

12.4 Mobility in soil

Components:

Hydrocarbons, C4, steam-cracker distillate:

Mobility : Remarks: Because of their extreme volatility, air is the only environmental compartment that petroleum gases will be found.

12.5 Results of PBT and vPvB assessment

Components:

Hydrocarbons, C4, steam-cracker distillate:

Assessment : The substance does not fulfill all screening criteria for persis-

tence, bioaccumulation and toxicity and hence is not considered to be PBT or vPvB..

12.6 Endocrine disrupting properties

Product:

Assessment : The substance/mixture does not contain components considered to have endocrine disrupting properties according to REACH Article 57(f) or Commission Delegated regulation (EU) 2017/2100 or Commission Regulation (EU) 2018/605 at levels of 0.1% or higher.

12.7 Other adverse effects

Product:

Additional ecological information : Unless indicated otherwise, the data presented is representative of the product as a whole, rather than for individual component(s).

Components:

Hydrocarbons, C4, steam-cracker distillate:

Additional ecological information : Physical properties indicate that petroleum gases will rapidly volatilise from the aquatic environment and that acute and chronic effects would not be observed in practice.

SECTION 13: Disposal considerations

13.1 Waste treatment methods

Product : Recover or recycle if possible.
It is the responsibility of the waste generator to determine the toxicity and physical properties of the material generated to determine the proper waste classification and disposal methods in compliance with applicable regulations.

Do not dispose into the environment, in drains or in water courses.
Waste product should not be allowed to contaminate soil or water.

Disposal should be in accordance with applicable regional, national, and local laws and regulations.
Local regulations may be more stringent than regional or national requirements and must be complied with.

Contaminated packaging : Drain container thoroughly.
After draining, vent in a safe place away from sparks and fire.
Residues may cause an explosion hazard.
Do not puncture, cut, or weld uncleaned drums.
Send to drum recoverer or metal reclaimer.

SECTION 14: Transport information

14.1 UN number or ID number

ADN : 1965

ADR : 1965

RID : 1965

IMDG : 1965

IATA : 1965

14.2 UN proper shipping name

ADN : HYDROCARBON GAS MIXTURE, LIQUEFIED, N.O.S. (Mixture A)

ADR : HYDROCARBON GAS MIXTURE, LIQUEFIED, N.O.S. (Mixture A)

RID : HYDROCARBON GAS MIXTURE, LIQUEFIED, N.O.S. (Mixture A)

IMDG : HYDROCARBON GAS MIXTURE, LIQUEFIED, N.O.S. (Hydrocarbons, C4)

IATA : HYDROCARBON GAS MIXTURE, LIQUEFIED, N.O.S. (Hydrocarbons, C4)

14.3 Transport hazard class(es)

ADN : 2

ADR : 2

RID : 2

IMDG : 2.1

IATA : 2.1

14.4 Packing group

ADN

Packing group	:	Not Assigned
Classification Code	:	2F
Hazard Identification Number	:	23
Labels	:	2.1 (CMR)
CDNI Inland Water Waste Agreement	:	NST 3303 Hydrocarbon mixtures

ADR

Packing group	:	Not assigned by regulation
Classification Code	:	2F
Hazard Identification Number	:	23
Labels	:	2.1

RID

Packing group	:	Not assigned by regulation
Classification Code	:	2F

Hazard Identification Number : 23
Labels : 2.1

IMDG
Packing group : Not assigned by regulation
Labels : 2.1

IATA
Packing group : Not Assigned
Labels : 2.1

14.5 Environmental hazards

ADN
Environmentally hazardous : yes

ADR
Environmentally hazardous : yes

RID
Environmentally hazardous : yes

IMDG
Marine pollutant : yes

14.6 Special precautions for user

Remarks : Special Precautions: Refer to Section 7, Handling & Storage, for special precautions which a user needs to be aware of or needs to comply with in connection with transport.

14.7 Maritime transport in bulk according to IMO instruments

Ship type : 2G/2PG
Product name : Mixed C4 cargoes

Additional Information **:** Transport in bulk according to the IGC code

This product may be transported under nitrogen blanketing. Nitrogen is an odourless and invisible gas. Exposure to nitrogen enriched atmospheres displaces available oxygen which may cause asphyxiation or death. Personnel must observe strict safety precautions when involved with a confined space entry.

SECTION 15: Regulatory information

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

REACH - Restrictions on the manufacture, placing on the market and use of certain dangerous substances, mixtures and articles (Annex XVII) : Conditions of restriction for the following entries should be considered: Hydrocarbons, C4, steam-cracker distillate (Number on list 29, 28) 1,3-butadiene (Number on list 29, 28)

REACH - List of substances subject to authorisation (Annex XIV)	:	Product is not subject to Authorisation under REACH.
REACH - Candidate List of Substances of Very High Concern for Authorisation (Article 59).	:	This product does not contain substances of very high concern (Regulation (EC) No 1907/2006 (REACH), Article 57).

Seveso III: Directive 2012/18/EU of the European Parliament and of the Council on the control of major-accident hazards involving dangerous substances.	18	Liquefied flammable gases (including LPG) and natural gas

Water hazard class (Germany)	:	WGK 3 highly hazardous to water Code Number: 218 Remarks: Classification according to AwSV

Other regulations:

The regulatory information is not intended to be comprehensive. Other regulations may apply to this material.

Product is subject Betriebs-Sicherheits-Verordnung (BetrSichV).
Compliance with paragraph 22 of Youth Employment Law.
Take note of Law on the protection of mothers at work, in education and in studies (Maternity Protection Act - MuSchG).
Product is subject to Stoerfallverordnung (12. BImSchV) based on Seveso III directive (2012/18/EU).

The product is subject to the supply restrictions of the Ordinance on the Prohibition of Chemicals.

The components of this product are reported in the following inventories:

AIIC	:	Not listed
DSL	:	Not listed
IECSC	:	Not listed
KECI	:	Listed
NZIoC	:	Not listed
PICCS	:	Not listed
TSCA	:	Not listed
ENCS	:	Not listed

TCSI	:	Listed

15.2 Chemical safety assessment

A Chemical Safety Assessment has been carried out for this substance.

SECTION 16: Other information

Full text of other abbreviations

DE TRGS 910	:	Germany. TRGS 910 - Substance-specific acceptable and tolerable concentrations and equivalence values for carcinogenic hazardous substances.
TRGS 910	:	Germany. TRGS 910 - Substance-specific acceptable and tolerable concentrations and equivalence values for carcinogenic hazardous substances
DE TRGS 910 / Acceptable concentration	:	Acceptable concentration
DE TRGS 910 / Tolerable concentration	:	Tolerable concentration

ADN - European Agreement concerning the International Carriage of Dangerous Goods by Inland Waterways; ADR - Agreement concerning the International Carriage of Dangerous Goods by Road; AIIC - Australian Inventory of Industrial Chemicals; ASTM - American Society for the Testing of Materials; bw - Body weight; CLP - Classification Labelling Packaging Regulation; Regulation (EC) No 1272/2008; CMR - Carcinogen, Mutagen or Reproductive Toxicant; DIN - Standard of the German Institute for Standardisation; DSL - Domestic Substances List (Canada); ECHA - European Chemicals Agency; EC-Number - European Community number; ECx - Concentration associated with x% response; ELx - Loading rate associated with x% response; EmS - Emergency Schedule; ENCS - Existing and New Chemical Substances (Japan); ErCx - Concentration associated with x% growth rate response; GHS - Globally Harmonized System; GLP - Good Laboratory Practice; IARC - International Agency for Research on Cancer; IATA - International Air Transport Association; IBC - International Code for the Construction and Equipment of Ships carrying Dangerous Chemicals in Bulk; IC50 - Half maximal inhibitory concentration; ICAO - International Civil Aviation Organization; IECSC - Inventory of Existing Chemical Substances in China; IMDG - International Maritime Dangerous Goods; IMO - International Maritime Organization; ISHL - Industrial Safety and Health Law (Japan); ISO - International Organisation for Standardization; KECI - Korea Existing Chemicals Inventory; LC50 - Lethal Concentration to 50 % of a test population; LD50 - Lethal Dose to 50% of a test population (Median Lethal Dose); MARPOL - International Convention for the Prevention of Pollution from Ships; n.o.s. - Not Otherwise Specified; NO(A)EC - No Observed (Adverse) Effect Concentration; NO(A)EL - No Observed (Adverse) Effect Level; NOELR - No Observable Effect Loading Rate; NZIoC - New Zealand Inventory of Chemicals; OECD - Organization for Economic Co-operation and Development; OPPTS - Office of Chemical Safety and Pollution Prevention; PBT - Persistent, Bioaccumulative and Toxic substance; PICCS - Philippines Inventory of Chemicals and Chemical Substances; (Q)SAR - (Quantitative) Structure Activity Relationship; REACH - Regulation (EC) No 1907/2006 of the European Parliament and of the Council concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals; RID - Regulations concerning the International Carriage of Dangerous Goods by Rail; SADT - Self-Accelerating Decomposition Temperature; SDS - Safety Data Sheet; SVHC - Substance of Very High Concern; TCSI - Taiwan Chemical Substance Inventory; TECI - Thailand Existing Chemicals Inventory; TRGS - Technical Rule for Hazardous Substances; TSCA - Toxic Substances Control Act (United States); UN - United Nations; vPvB - Very Persistent and Very Bioaccumulative

Further information

Training advice	:	Provide adequate information, instruction and training for operators.
Other information	:	The substance/product is registered with strictly controlled conditions as defined in Article 18(4) of Regulation (EC) No. 1907/2006 (REACH Regulation) and must therefore be handled as such. Refer to the industry guidance prepared by Concawe/Cefic for advice on the demonstration of strictly controlled conditions available from: http://cefic.org. If this substance/product is sold onto third parties, confirmation that the substance/product will be handled in accordance with 'strictly controlled conditions' needs to be obtained from the third party prior to sale. For Industry guidance and tools on REACH please visit the CEFIC website at http://cefic.org/Industry-support. The substance does not fulfill all screening criteria for persistence, bioaccumulation and toxicity and hence is not considered to be PBT or vPvB. A vertical bar (|) in the left margin indicates an amendment from the previous version.
Sources of key data used to compile the Safety Data Sheet	:	The quoted data are from, but not limited to, one or more sources of information (e.g. toxicological data from Shell Health Services, material suppliers' data, CONCAWE, EU IUCLID date base, EC 1272 regulation, etc).

Classification of the mixture:		**Classification procedure:**
Flam. Gas 1A	H220	On basis of test data.
Press. Gas Liquefied gas	H280	On basis of test data.
Muta. 1B	H340	Expert judgement and weight of evidence determination.
Carc. 1B	H350	Expert judgement and weight of evidence determination.

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.

DE / EN