

SAFETY DATA SHEET

Benzene

Version 9.0

Revision Date 2024.12.27

Print Date 2025.01.03

1. PRODUCT AND COMPANY IDENTIFICATION

Chemical product name : Benzene

Product code : Q9112, Q9169, Q9262, Q9249

CAS-No. : 71-43-2

ENCS/ISHL number : 3-1 (CAS: 71-43-2)

Manufacturer or supplier's details

Supplier's company name, address and phone number : SHELL EASTERN CHEMICALS (S)
A REGISTERED BUSINESS OF SHELL EASTERN
TRADING (PTE) LTD (UEN:198902087C)
9 North Buona Vista Drive , #07-01
The Metropolis Tower 1
Singapore 138588
Singapore

Telephone : +65 6384 8269

Telefax : +65 6384 8454

Contact for Safety Data Sheet :

Emergency telephone number : +65 6542 9595 (Alert SGS)

Recommended use of the chemical and restrictions on use

Recommended use : Raw material for use in the chemical industry.

Restrictions on use : This product must not be used in applications other than the above without first seeking the advice of the supplier.

2. HAZARDS IDENTIFICATION

GHS classification of chemical product

Flammable liquids : Category 2

Aspiration hazard : Category 1

Skin irritation : Category 2

Eye irritation : Category 2A

Germ cell mutagenicity : Category 1B

Carcinogenicity : Category 1A

Specific target organ toxicity - repeated exposure : Category 1 (Blood, Blood-forming organs)

Short-term (acute) aquatic hazard : Category 2

Long-term (chronic) aquatic hazard : Category 3

GHS label elements

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Hazard pictograms

:



Signal word

:

Danger

Hazard statements

:

PHYSICAL HAZARDS:
H225 Highly flammable liquid and vapour.
HEALTH HAZARDS:
H304 May be fatal if swallowed and enters airways.
H315 Causes skin irritation.
H319 Causes serious eye irritation.
H340 May cause genetic defects.
H350 May cause cancer.
H372 Causes damage to organs (Blood, Blood forming organs) through prolonged or repeated exposure.
ENVIRONMENTAL HAZARDS:
H401 Toxic to aquatic life.
H412 Harmful to aquatic life with long lasting effects.

Precautionary statements

:

Prevention:

P201 Obtain special instructions before use.
P202 Do not handle until all safety precautions have been read and understood.
P210 Keep away from heat/ sparks/ open flames/ hot surfaces. No smoking.
P233 Keep container tightly closed.
P240 Ground/bond container and receiving equipment.
P241 Use explosion-proof electrical/ ventilating/ lighting equipment.
P242 Use only non-sparking tools.
P243 Take precautionary measures against static discharge.
P260 Do not breathe dust/ fume/ gas/ mist/ vapours/ spray.
P264 Wash hands thoroughly after handling.
P270 Do not eat, drink or smoke when using this product.
P280 Wear protective gloves/ protective clothing/ eye protection/ face protection.
P273 Avoid release to the environment.

Response:

P303 + P361 + P353 IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/ shower.
P370 + P378 In case of fire: Use appropriate media to extinguish.
P301 + P310 IF SWALLOWED: Immediately call a POISON CENTER/ doctor.
P331 Do NOT induce vomiting.
P302 + P352 IF ON SKIN: Wash with plenty of water and soap.
P332 + P313 If skin irritation occurs: Get medical advice/ attention.
P362 + P364 Take off contaminated clothing and wash it before

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reuse.
P305 + P351 + P338 IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P337 + P313 If eye irritation persists: Get medical advice/attention.
P308 + P313 IF exposed or concerned: Get medical advice/attention.
P314 Get medical advice/ attention if you feel unwell.

Storage:

P403 + P235 Store in a well-ventilated place. Keep cool.
P405 Store locked up.

Disposal:

P501 Dispose of contents and container to appropriate waste site or reclaimer in accordance with local and national regulations.

Other hazards which do not result in classification

May form flammable/explosive vapour-air mixture. 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. May cause cancer. May cause leukaemia (AML - acute myelogenous leukaemia).

3. COMPOSITION/INFORMATION ON INGREDIENTS

Substance / Mixture : Substance

3.1 Substances

Components

Substance name	CAS-No.	Classification	Concentration (% w/w)
Benzene	71-43-2	Flam. Liq.2; H225 Asp. Tox.1; H304 Skin Irrit.2; H315 Eye Irrit.2A; H319 Muta.1B; H340 Carc.1A; H350	<= 100

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		STOT RE1; H372 Aquatic Acute2; H401 Aquatic Chronic3; H412	
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For explanation of abbreviations see section 16.

4. FIRST-AID MEASURES

General advice	: Not expected to be a health hazard when used under normal conditions.
If inhaled	: No treatment necessary under normal conditions of use. If symptoms persist, obtain medical advice.
In case of skin contact	: Remove contaminated clothing. Immediately flush skin with large amounts of water for at least 15 minutes, and follow by washing with soap and water if available. If redness, swelling, pain and/or blisters occur, transport to the nearest medical facility for additional treatment.
In case of eye contact	: Immediately flush eye(s) with plenty of water. Remove contact lenses, if present and easy to do. Continue rinsing. Transport to the nearest medical facility for additional treatment.
If swallowed	: Call emergency number for your location / facility. If swallowed, do not induce vomiting: transport to nearest medical facility for additional treatment. If vomiting occurs spontaneously, keep head below hips to prevent aspiration. If any of the following delayed signs and symptoms appear within the next 6 hours, transport to the nearest medical facility: fever greater than 101° F (38.3°C), shortness of breath, chest congestion or continued coughing or wheezing.
Most important symptoms and effects, both acute and delayed	: Not considered to be an inhalation hazard under normal conditions of use. Possible respiratory irritation signs and symptoms may include a temporary burning sensation of the nose and throat, coughing, and/or difficulty breathing. Skin irritation signs and symptoms may include a burning sensation, redness, swelling, and/or blisters. If material enters lungs, signs and symptoms may include coughing, choking, wheezing, difficulty in breathing, chest congestion, shortness of breath, and/or fever. If any of the following delayed signs and symptoms appear within the next 6 hours, transport to the nearest medical

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facility: fever greater than 101° F (38.3°C), shortness of breath, chest congestion or continued coughing or wheezing.

Breathing of high vapour concentrations may cause central nervous system (CNS) depression resulting in dizziness, light-headedness, headache, nausea and loss of coordination. Continued inhalation may result in unconsciousness and death.

Damage to blood-forming organs may be evidenced by: a) fatigue and anaemia (RBC), b) decreased resistance to infection, and/or excessive bruising and bleeding (platelet effect).

Eye irritation signs and symptoms may include a burning sensation, redness, swelling, and/or blurred vision.

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.

Notes to physician : IMMEDIATE TREATMENT IS EXTREMELY IMPORTANT!
Call a doctor or poison control center for guidance.
Potential for chemical pneumonitis.
Treat symptomatically.
Potential for cardiac sensitisation, particularly in abuse situations. Hypoxia or negative inotropes may enhance these effects. Consider: oxygen therapy.

5. FIRE-FIGHTING MEASURES

Suitable extinguishing media : Foam, water spray or fog. Dry chemical powder, carbon dioxide, sand or earth may be used for small fires only.

Unsuitable extinguishing media : Do not use water in a jet.

Specific hazards during firefighting : Clear fire area of all non-emergency personnel.
Hazardous combustion products may include:
A complex mixture of airborne solid and liquid particulates and gases (smoke).
Carbon monoxide.
Unidentified organic and inorganic compounds.
Flammable vapours may be present even at temperatures below the flash point.
The vapour is heavier than air, spreads along the ground and distant ignition is possible.
Will float and can be reignited on surface water.

Specific extinguishing methods : Standard procedure for chemical fires.
Keep adjacent containers cool by spraying with water.

Special protective equipment : Proper protective equipment including chemical resistant

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for firefighters

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).

6. ACCIDENTAL RELEASE MEASURES

Personal precautions,
protective equipment and
emergency procedures

- : Observe all relevant local and international regulations. Notify authorities if any exposure to the general public or the environment occurs or is likely to occur. Local authorities should be advised if significant spillages cannot be contained.
- : 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.

Environmental precautions

- : Shut off leaks, if possible without personal risks. Remove all possible sources of ignition in the surrounding area. Use appropriate containment to avoid environmental contamination. Prevent from spreading or entering drains, ditches or rivers by using sand, earth, or other appropriate barriers. Attempt to disperse the vapour 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. Ventilate contaminated area thoroughly.

Methods and materials for
containment and cleaning up

- : For large liquid spills (> 1 drum), transfer by mechanical means such as vacuum truck to a salvage tank for recovery or safe disposal. Do not flush away residues with water. Retain as contaminated waste. Allow residues to evaporate or soak up with an appropriate absorbent material and dispose of safely. Remove contaminated soil and dispose of safely. For small liquid spills (< 1 drum), transfer by mechanical means to a labeled, sealable container for product recovery or safe disposal. Allow residues to evaporate or soak up with an appropriate absorbent material and dispose of safely. Remove contaminated soil and dispose of safely.

Avoid contact with skin, eyes and clothing.

Take precautionary measures against static discharges.

Avoid contact with spilled or released material. For guidance on selection of personal protective equipment see Section 8 of this Safety Data Sheet.

Additional advice

- : 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.

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Notify authorities if any exposure to the general public or the environment occurs or is likely to occur.

Local authorities should be advised if significant spillages cannot be contained.

Observe all relevant local and international regulations.

7. HANDLING AND STORAGE

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.
Avoid exposure. Obtain special instructions before use.
Extinguish any naked flames. Do not smoke. Remove ignition sources. Avoid sparks.
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.
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.
Properly dispose of any contaminated rags or cleaning materials in order to prevent fires.

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- Facial protective equipment : Wear goggles for use against liquids and gas.
Wear full face shield if splashes are likely to occur.
- Hygiene measures : Wash hands before eating, drinking, smoking and using the toilet.
Laundry contaminated clothing before re-use.
- Describe contact avoidance, etc : Strong oxidising agents.
- Product Transfer : Refer to guidance under Handling section.

Storage

- Conditions for safe storage : Refer to section 15 for any additional specific legislation covering the packaging and storage of this product.
- Other data : Storage Temperature:
Ambient.
- Bulk storage tanks should be diked (bunded).
Locate tanks away from heat and other sources of ignition.
Cleaning, inspection and maintenance of storage tanks is a specialist operation, which requires the implementation of strict procedures and precautions.
Must be stored in a diked (bunded) well- ventilated area, away from sunlight, ignition sources and other sources of heat.
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.
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.
- Packaging material : Suitable material: For containers, or container linings use mild steel, stainless steel.
Unsuitable material: Natural, butyl, neoprene or nitrile rubbers.
- Specific use(s) : Not applicable
- 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

8. EXPOSURE CONTROLS AND PERSONAL PROTECTION

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Threshold limit value and permissible exposure limits for each component in the work environment

Components	CAS-No.	Value type (Form of exposure)	Control parameters / Permissible concentration	Basis
Benzene	71-43-2	ACL	1 ppm	JP OEL ISHL
Benzene		REF-Carc	1 ppm	JP OEL JSOH
	Further information: Skin absorption, Group 1: carcinogenic to humans			
Benzene		REF-Carc	0.1 ppm	JP OEL JSOH
	Further information: Skin absorption, Group 1: carcinogenic to humans			
Benzene	71-43-2	TWA	0.25 ppm 0.8 mg/m3	Shell Internal Standard (SIS) for 8-12 hour TWA.
Benzene		STEL	2.5 ppm 8 mg/m3	Shell Internal Standard (SIS) for 15 min (STEL)
Benzene	71-43-2	STEL	2.5 ppm	ACGIH
Benzene	71-43-2	TWA	0.02 ppm	ACGIH
Benzene	71-43-2	STEL	2.5 ppm	ACGIH
Benzene		PEL	1 ppm	OSHA CARC
Benzene		STEL	5 ppm	OSHA CARC
Benzene		TWA	10 ppm	OSHA Z-2
Benzene		CEIL	25 ppm	OSHA Z-2
Benzene		Peak	50 ppm	OSHA Z-2

Biological occupational exposure limits

No biological limit allocated.

Monitoring Methods

Monitoring of the concentration of substances in the breathing zone of workers or in the general workplace may be required to confirm compliance with an OEL and adequacy of exposure controls. For some substances biological monitoring may also be appropriate.

Validated exposure measurement methods should be applied by a competent person and samples analysed by an accredited laboratory.

Examples of sources of recommended exposure measurement methods are given below or contact the supplier. Further national methods may be available.

National Institute of Occupational Safety and Health (NIOSH), USA: Manual of Analytical Methods <http://www.cdc.gov/niosh/>

Occupational Safety and Health Administration (OSHA), USA: Sampling and Analytical Methods <http://www.osha.gov/>

Health and Safety Executive (HSE), UK: Methods for the Determination of Hazardous Substances <http://www.hse.gov.uk/>

Institut für Arbeitsschutz Deutschen Gesetzlichen Unfallversicherung (IFA) , Germany <http://www.dguv.de/inhalt/index.jsp>

L'Institut National de Recherche et de Sécurité, (INRS), France <http://www.inrs.fr/accueil>

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Standard concentration values and application methods for chemical substances were determined to prevent health problems among workers (mhlw.go.jp)

Engineering measures : 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.

Items that cannot be decontaminated should be destroyed (see Chapter 13).

Personal protective equipment

Protective measures

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

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 suitable, select an appropriate combination of mask and filter. Select a filter suitable for organic gases and vapours [boiling point >65 °C (149 °F)]. Where respiratory protective equipment is required, use a full-face mask. Where air-filtering respirators are unsuitable (e.g. airborne

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concentrations are high, risk of oxygen deficiency, confined space) use appropriate positive pressure breathing apparatus.

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. Longer term protection: Viton. Incidental contact/Splash protection: Nitrile rubber. 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.

Eye and face protection

: Wear goggles for use against liquids and gas.
Wear full face shield if splashes are likely to occur.

Skin and body protection

: Wear chemical resistant gloves/gauntlets and boots. Where risk of splashing, also wear an apron.
Wear antistatic and flame-retardant clothing.

Thermal hazards

: Not applicable

Hygiene measures

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

Environmental exposure controls

General advice

: Local guidelines on emission limits for volatile substances must be observed for the discharge of exhaust air containing vapour.
Minimise release to the environment. An environmental assessment must be made to ensure compliance with local environmental legislation.
Information on accidental release measures are to be found in section 6.

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9. PHYSICAL AND CHEMICAL PROPERTIES

Physical state	: Liquid.
Colour	: colourless
Odour	: aromatic
Odour Threshold	: 2.7 ppm
pH	: Not applicable
Melting point/freezing point	: 5.5 °C / 41.9 °F
Boiling point, initial boiling point and boiling range	: 80.1 °C / 176.2 °F
Flash point	: -11 °C / 12 °F Method: No information available.
Evaporation rate	: 5.1 Method: ASTM D 3539, nBuAc=1
Flammability	
Flammability (solid, gas)	: Not applicable
Lower explosion limit and upper explosion limit / flammability limit	
Upper explosion limit	: 7.1 %(V)
Lower explosion limit	: 1.4 %(V)
Vapour pressure	: 10 kPa (20 °C / 68 °F)
Relative vapour density	: 2.7 (15 °C / 59 °F) (Air = 1.0)
Density and / or relative density	
Relative density	: 0.8787 (20 °C / 68 °F) Method: ASTM D4052
Density	: 883 kg/m ³ (15 °C / 59 °F) Method: ASTM D4052
Solubility(ies)	
Water solubility	: 1.8 kg/m ³ Slight (20 °C / 68 °F)

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Partition coefficient: n-octanol/water	: log Pow: 2.13 Method: Literature data.
Auto-ignition point	: 498 °C / 928 °F
Decomposition temperature	: Data not available
Viscosity	
Viscosity (Dynamic)	: 0.6 mPa.s (20 °C / 68 °F) Method: ASTM D445
Viscosity, kinematic	: 0.65 mm ² /s (20 °C / 68 °F) Method: ASTM D445
Particle characteristics	
Particle size	: Data not available
Explosive properties	: Not applicable
Oxidizing properties	: Data not available
Surface tension	: 0.03 mN/m
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., Whether a liquid is nonconductive or semi-conductive, the precautions are the same., A number of factors, for example liquid temperature, presence of contaminants, and anti-static additives can greatly influence the conductivity of a liquid
Molecular weight	: 78.11 g/mol

10. STABILITY AND REACTIVITY

Reactivity	: The product does not pose any further reactivity hazards in addition to those listed in the following sub-paragraph.
Chemical stability	: No hazardous reaction is expected when handled and stored according to provisions
Possibility of hazardous reactions	: Stable under normal conditions of use.
Conditions to avoid	: Avoid heat, sparks, open flames and other ignition sources. Prevent vapour accumulation.

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- | | |
|----------------------------------|--|
| Incompatible materials | : Strong oxidising agents. |
| Hazardous decomposition products | : Thermal decomposition is highly dependent on conditions. A complex mixture of airborne solids, liquids and gases including carbon monoxide, carbon dioxide, sulphur oxides and unidentified organic compounds will be evolved when this material undergoes combustion or thermal or oxidative degradation.
Carbon monoxide, carbon dioxide and unburned hydrocarbons (smoke). |

11. TOXICOLOGICAL INFORMATION

- | | |
|--|--|
| Basis for assessment | : Information given is based on product testing.
Unless indicated otherwise, the data presented is representative of the product as a whole, rather than for individual component(s). |
| Information on likely routes of exposure | : Exposure may occur via inhalation, ingestion, skin absorption, skin or eye contact, and accidental ingestion. |

Acute toxicity

Components:

Benzene:

- | | |
|---------------------------|---|
| Acute oral toxicity | : LD 50 Rat, male: > 2,000 mg/kg
Method: Test(s) equivalent or similar to OECD Test Guideline 401
Remarks: Based on available data, the classification criteria are not met. |
| Acute inhalation toxicity | : LC 50 Rat, female: > 20 mg/l
Exposure time: 4 h
Test atmosphere: vapour
Method: Test(s) equivalent or similar to OECD Test Guideline 403
Remarks: Based on available data, the classification criteria are not met.
High concentrations may cause central nervous system depression resulting in headaches, dizziness and nausea; continued inhalation may result in unconsciousness and/or death. |
| Acute dermal toxicity | : LD 50 Rabbit: > 2,000 mg/kg
Method: Test(s) equivalent or similar to OECD Test Guideline 402
Remarks: Based on available data, the classification criteria are not met. |

Skin corrosion/irritation

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Components:

Benzene:

Species: Rabbit

Method: OECD Test Guideline 404

Remarks: Causes skin irritation.

Serious eye damage/eye irritation

Components:

Benzene:

Species: Rabbit

Method: Literature data

Remarks: Causes serious eye irritation.

Respiratory or skin sensitisation

Components:

Benzene:

Species: Mouse

Method: Literature data

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

Germ cell mutagenicity

Components:

Benzene:

Genotoxicity in vitro

: Method: OECD Test Guideline 471

Remarks: May cause genetic defects.

: Method: Other guideline method.

Remarks: May cause genetic defects.

: Method: Literature data

Remarks: May cause genetic defects.

: Test species: Mouse Method: Test(s) equivalent or similar to OECD Test Guideline 474

Remarks: May cause genetic defects.

Germ cell mutagenicity-
Assessment

: May cause genetic defects.

Carcinogenicity

Components:

Benzene:

Species: Rat, (male and female)

Application Route: Oral

Method: Other guideline method.

Remarks: May cause cancer., Known human carcinogen., May cause leukaemia (AML - acute myelogenous leukaemia).

Species: Mouse, (male and female)

Application Route: Inhalation

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Method: Literature data

Remarks: May cause cancer., Known human carcinogen., May cause leukaemia (AML - acute myelogenous leukaemia).

Carcinogenicity - Assessment : May cause cancer.

Material	GHS/CLP Carcinogenicity Classification
Benzene	Carcinogenicity Category 1A

Material	Other Carcinogenicity Classification
Benzene	IARC: Group 1: Carcinogenic to humans

Reproductive toxicity

Components:

Benzene:

: Species: Rat
Sex: male and female
Application Route: Inhalation

Method: Test(s) equivalent or similar to OECD Test Guideline 415.

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

Effects on foetal development

: Species: Rat, female
Application Route: Inhalation
Method: Test(s) equivalent or similar to OECD Test Guideline 414
Remarks: Based on available data, the classification criteria are not met., Causes foetotoxicity in animals at doses which are maternally toxic.

Reproductive toxicity - Assessment

: This product does not meet the criteria for classification in categories 1A/1B.

STOT - single exposure

Components:

Benzene:

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

STOT - repeated exposure

Components:

Benzene:

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Exposure routes: Oral, Inhalation

Target Organs: hematopoietic system

Remarks: Causes damage to organs through prolonged or repeated exposure., Blood-forming organs: repeated exposure affects the bone marrow., Blood: may cause haemolysis of red blood cells and/or anaemia., Immune System: animal studies on this material or its components have demonstrated immunotoxicity., May cause MDS (Myelodysplastic Syndrome)., Exposure to very high concentrations of similar materials has been associated with irregular heart rhythms and cardiac arrest., Myelodysplastic syndrome (MDS) was observed in individuals exposed to very high levels (50 ppm to 300 ppm range) of benzene over a long period of time in the workplace. The relevance of these results to lower levels of exposure is not known.

Repeated dose toxicity

Components:

Benzene:

Rat, male and female:

Application Route: Oral

Method: Test(s) equivalent or similar to OECD Test Guideline 408

Target Organs: hematopoietic system

Mouse, male and female:

Application Route: Inhalation

Test atmosphere: vapour

Method: Literature data

Target Organs: hematopoietic system

Aspiration toxicity

Components:

Benzene:

May be fatal if swallowed and enters airways.

Aspiration into the lungs when swallowed or vomited may cause chemical pneumonitis which can be fatal.

Further information

Components:

Benzene:

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

12. ECOLOGICAL INFORMATION

Basis for assessment : Information given is based on product testing.
Unless indicated otherwise, the data presented is representative of the product as a whole, rather than for individual component(s).

Ecotoxicity

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Components:

Benzene :

- Toxicity to fish (Acute toxicity) : LC50 (Oncorhynchus mykiss (rainbow trout)): 5.3 mg/l
Exposure time: 96 h
Method: Test(s) equivalent or similar to OECD Guideline 203
Remarks: Toxic
LL/EL/IL50 > 1 <= 10 mg/l
- Toxicity to crustacean (Acute toxicity) : EC50 (Daphnia magna (Water flea)): 10 mg/l
Exposure time: 48 h
Method: OECD Test Guideline 202
Remarks: Toxic
LL/EL/IL50 > 1 <= 10 mg/l
- Toxicity to algae/aquatic plants (Acute toxicity) : ErC50 (Selenastrum capricornutum (green algae)): 100 mg/l
Exposure time: 72 h
Method: OECD Test Guideline 201
Remarks: Harmful
LL/EL/IL50 >10 <= 100 mg/l
- Toxicity to microorganisms (Acute toxicity) : IC50 (Nitrosomonas): 13 mg/l
Exposure time: 24 h
Method: Literature data.
Remarks: Harmful
LL/EL/IL50 >10 <= 100 mg/l
- Toxicity to fish (Chronic toxicity) : NOEC: 0.8 mg/l
Exposure time: 32 d
Species: Pimephales promelas (fathead minnow)
Method: Other guideline method.
Remarks: NOEC/NOEL > 0.1 - <=1.0 mg/l
- Toxicity to crustacean(Chronic toxicity) : NOEC: 3 mg/l
Exposure time: 7 d
Species: Ceriodaphnia dubia (Water flea)
Method: Other guideline method.
Remarks: NOEC/NOEL > 1.0 - <= 10 mg/l

Persistence and degradability

Components:

Benzene :

- Biodegradability : Biodegradation: 96 %
Exposure time: 28 d
Method: OECD Test Guideline 301F
Remarks: Readily biodegradable.
Not Persistent per IMO criteria.
International Oil Pollution Compensation (IOPC) Fund definition: "A non-persistent oil is oil, which, at the time of shipment, consists of hydrocarbon fractions, (a) at least 50% of which, by volume, distills at a temperature of 340°C (645°F) and (b) at least 95% of which, by volume, distills at a temperature of 370°C (700°F) when tested by the ASTM

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Method D-86/78 or any subsequent revision thereof."

Bioaccumulation

Product:

Partition coefficient: n-octanol/water

: log Pow: 2.13Method: Literature data.

Components:

Benzene :

Bioaccumulation

: Species: Leuciscus idus (Golden orfe)

Exposure time: 3 d

Bioconcentration factor (BCF): < 10

Method: Test(s) equivalent or similar to OECD Test Guideline 305

Remarks: Does not bioaccumulate significantly.

Mobility in soil

Components:

Benzene :

Mobility

: Remarks: Floats on water.

Other adverse effects

Components:

Benzene :

Results of PBT and vPvB assessment

: The substance does not fulfill all screening criteria for persistence, bioaccumulation and toxicity and hence is not considered to be PBT or vPvB.

Hazardous to the ozone layer

Not applicable

13. DISPOSAL CONSIDERATIONS

Disposal methods

Chemicals (residual waste)

: 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.

MARPOL - see International Convention for the Prevention of

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Pollution from Ships (MARPOL 73/78) which provides technical aspects at controlling pollutions from ships.

Contaminated containers and 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.

14. TRANSPORT INFORMATION

Regulatory information when there are domestic regulations

Refer to section 15 for specific national regulation.

International Regulations

ADR

UN number : 1114
Product Name (Proper shipping name) : BENZENE
Class (Hazard class in transportation) : 3
Packing group : II
Labels : 3
Hazard Identification Number : 33
Environmentally hazardous : no

IATA-DGR

UN/ID No. : UN 1114
Product Name (Proper shipping name) : BENZENE
Class (Hazard class in transportation) : 3
Packing group : II
Labels : 3

IMDG-Code

UN number : UN 1114
Product Name (Proper shipping name) : BENZENE
Class (Hazard class in transportation) : 3
Packing group : II
Labels : 3
Marine pollutant : no

Maritime transport in bulk according to IMO instruments

Pollution category : Y
Ship type : 3; Must be Double Hulled
Product name : Benzene and mixtures having 10% benzene or more (i)

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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.

Additional Information : This product may be transported under nitrogen blanketing. Nitrogen is an odourless and invisible gas. Exposure to nitrogen may cause asphyxiation or death. Personnel must observe strict safety precautions when involved with a confined space entry.
Transport in bulk according to Annex II of Marpol and the IBC Code

15. REGULATORY INFORMATION

Related Regulations

Fire Service Law

Group 4, Type 1 petroleum, Water insoluble liquid, (200 litre), Hazardous rank II

Chemical Substance Control Law

Priority Assessment Chemical Substance

Chemical name	Number
Benzene	45

Industrial Safety and Health Law

Harmful Substances Prohibited from Manufacture

Not applicable

Substances Subject to be Indicated Names

Label required.

Substances Subject to be Notified Names

Notification required

Harmful Substances Required Permission for Manufacture

Not applicable

Substances Prevented From Impairment of Health

Not applicable

Circular concerning Information on Chemicals having Mutagenicity - Annex 2: Information on Existing Chemicals having Mutagenicity

Not applicable

Circular concerning Information on Chemicals having Mutagenicity - Annex 1: Information on Notified Substances having Mutagenicity

Not applicable

Ordinance on Prevention of Hazards Due to Specified Chemical Substances - Group 2 Substance

Chemical name
benzene

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Ordinance on Prevention of Organic Solvent Poisoning

Not applicable

Enforcement Order of the Industrial Safety and Health Law - Attached table 1 (Dangerous Substances)

Inflammable Substance

Poisonous and Deleterious Substances Control Law

Not applicable

Act on Confirmation, etc. of Release Amounts of Specific Chemical Substances in the Environment and Promotion of Improvements to the Management Thereof

Specified Class I Designated Chemical Substances

Chemical name	Number	Concentration (%)
Benzene	400	100

Vessel Safety Law

Flammable liquids (Article 2 and 3 of rules on shipping and storage of dangerous goods and its Attached Table 1)

Aviation Law

Flammable liquid (Article 194 of The Enforcement Rules of Aviation Law and its Attached Table 1)

Marine Pollution and Sea Disaster Prevention etc Law

Bulk transportation : (Category Y)

Water Pollution Control Law

Hazardous substance (Law Art. 2, Enforcement Order Art. 2, Cabinet Order Art. 1), Designated substance (Law Art. 2-4, Enforcement Order Art. 3-3)

Waste Disposal and Public Cleansing Law

Specially Controlled Industrial Waste

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

AIIC : Listed

DSL : Listed

IECSC : Listed

ENCS : Listed

KECI : Listed

NZIoC : Listed

PICCS : Listed

TCSI : Listed

TSCA : Listed

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16. OTHER INFORMATION

Full text of H-Statements

H225	Highly flammable liquid and vapour.
H304	May be fatal if swallowed and enters airways.
H315	Causes skin irritation.
H319	Causes serious eye irritation.
H340	May cause genetic defects.
H350	May cause cancer.
H372	Causes damage to organs through prolonged or repeated exposure.
H401	Toxic to aquatic life.
H412	Harmful to aquatic life with long lasting effects.

Full text of other abbreviations

Aquatic Acute	Short-term (acute) aquatic hazard
Aquatic Chronic	Long-term (chronic) aquatic hazard
Asp. Tox.	Aspiration hazard
Carc.	Carcinogenicity
Eye Irrit.	Eye irritation
Flam. Liq.	Flammable liquids
Muta.	Germ cell mutagenicity
Skin Irrit.	Skin irritation
STOT RE	Specific target organ toxicity - repeated exposure

Abbreviations and Acronyms

AIIC - Australian Inventory of Industrial Chemicals; ANTT - National Agency for Transport by Land of Brazil; ASTM - American Society for the Testing of Materials; bw - Body weight; CMR - Carcinogen, Mutagen or Reproductive Toxicant; DIN - Standard of the German Institute for Standardisation; DSL - Domestic Substances List (Canada); 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; ERG - Emergency Response Guide; 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; Nch - Chilean Norm; NO(A)EC - No Observed (Adverse) Effect Concentration; NO(A)EL - No Observed (Adverse) Effect Level; NOELR - No Observable Effect Loading Rate; NOM - Official Mexican Norm; NTP - National Toxicology Program; 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; SADT - Self-Accelerating Decomposition Temperature; SDS - Safety Data Sheet; TCSI - Taiwan Chemical Substance Inventory; TDG - Transportation of Dangerous Goods; TECI - Thailand Existing Chemicals Inventory; TSCA - Toxic Substances Control Act (United States); UN - United Nations; UNRTDG - United Nations

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Recommendations on the Transport of Dangerous Goods; vPvB - Very Persistent and Very Bioaccumulative; WHMIS - Workplace Hazardous Materials Information System

Further information

Training advice : Provide adequate information, instruction and training for operators.

Other information : 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 data base, EC 1272 regulation, etc).

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.

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