

# SAFETY DATA SHEET

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

## BC Styrene Monomer

|         |                |              |                                |
|---------|----------------|--------------|--------------------------------|
| Version | Revision Date: | SDS Number:  | Date of last issue: 31.01.2024 |
| 3.0     | 10.01.2025     | 800010059075 | Print Date 17.01.2025          |

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

#### 1.1 Product identifier

|                               |   |
|-------------------------------|---|
| Trade name                    | : BC Styrene Monomer                            |
| Product code                  | : Q9279   |
| Registration number EU        | : 01-2119457861-32-0009, 01-2119457861-32-0011  |
| CAS-No.                       | : 100-42-5                                      |
| Other means of identification | : Phenyl ethene, Phenyl ethylene, Vinyl benzene |

EC-No. : 202-851-5

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

|                               |  |
|-------------------------------|--|
| Use of the Sub-stance/Mixture | : Base chemical for the production of polystyrene, rubbers and resins.<br>Please refer to section 16 and/or the annexes for the registered uses under REACH. |
|-------------------------------|--|

|                      |   |
|----------------------|---|
| Uses advised against | : Restricted to professional users., This product must not be used in applications other than the above without first seeking the advice of the supplier. |
|----------------------|---|

This product must not be used in applications other than those listed in Section 1 without first seeking the advice of the supplier.

#### 1.3 Details of the supplier of the safety data sheet

|                               |   |
|-------------------------------|---|
| Manufacturer/Supplier         | : <b>Shell Chemicals Europe B.V.</b><br>PO Box 2334<br>3000 CH Rotterdam<br>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

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### SECTION 2: Hazards identification

#### 2.1 Classification of the substance or mixture

**Classification (REGULATION (EC) No 1272/2008)**

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|   |  |
|---|--|
| Flammable liquids, Category 3   | H226: Flammable liquid and vapour.   |
| Aspiration hazard, Category 1   | H304: May be fatal if swallowed and enters airways.                              |
| Skin irritation, Category 2   | H315: Causes skin irritation.  |
| Eye irritation, Category 2  | H319: Causes serious eye irritation.   |
| Acute toxicity, Category 4, Inhalation  | H332: Harmful if inhaled.  |
| Specific target organ toxicity - single exposure, Category 3, Respiratory Tract | H335: May cause respiratory irritation.  |
| Reproductive toxicity, Category 2   | H361d: Suspected of damaging the unborn child.                                   |
| Specific target organ toxicity - repeated exposure, Category 1, Auditory system | H372: Causes damage to organs through prolonged or repeated exposure if inhaled. |
| Long-term (chronic) aquatic hazard, Category 3                                  | H412: Harmful to aquatic life with long lasting effects.                         |

### 2.2 Label elements

#### Labelling (REGULATION (EC) No 1272/2008)

Hazard pictograms :



Signal word : Danger

Hazard statements :

PHYSICAL HAZARDS:

H226 Flammable liquid and vapour.

HEALTH HAZARDS:

H304 May be fatal if swallowed and enters airways.

H315 Causes skin irritation.

H319 Causes serious eye irritation.

H332 Harmful if inhaled.

H335 May cause respiratory irritation.

H361d Suspected of damaging the unborn child.

H372 Causes damage to organs (Auditory system) through prolonged or repeated exposure if inhaled.

ENVIRONMENTAL HAZARDS:

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, hot surfaces, sparks, open

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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:

P303 + P361 + P353 IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water or shower.  
P305 + P351 + P338 IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.  
P308 + P313 IF exposed or concerned: Get medical advice/ attention.

### Storage:

P403 + P233 Store in a well-ventilated place. Keep container tightly closed.  
P235 Keep cool.

### 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 are heavier than air. Vapours may travel across the ground and reach remote ignition sources causing a flashback fire danger.

Highly reactive.

Maintain dissolved oxygen and inhibitor at proper levels to prevent runaway polymerisation.

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.

## SECTION 3: Composition/information on ingredients

### 3.1 Substances

#### Components

| Chemical name | CAS-No.<br>EC-No. | Concentration (% w/w) |
|---------------|-------------------|-----------------------|
| styrene       | 100-42-5          | 99 - 100              |

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|  |           |  |
|--|-----------|--|
|  | 202-851-5 |  |
|--|-----------|--|

Stabilised with tertiary butyl catechol.  
10-15 ppm.

### 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.<br>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    | : 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.<br>Remove contact lenses, if present and easy to do. Continue rinsing.<br>Transport to the nearest medical facility for additional treatment.  |
| If swallowed               | : Call emergency number for your location / facility.<br>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. |

#### 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. |
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Skin irritation signs and symptoms may include a burning sensation, redness, swelling, and/or blisters.

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

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

Defatting dermatitis signs and symptoms may include a burning sensation and/or a dried/cracked appearance.  
Auditory system effects may include temporary hearing loss and/or ringing in the ears.  
Visual system disturbances may be evidenced by decreases in the ability to discriminate between colours.

### 4.3 Indication of any immediate medical attention and special treatment needed

|           |  |
|-----------|--|
| Treatment | : IMMEDIATE TREATMENT IS EXTREMELY IMPORTANT!<br>Call a doctor or poison control center for guidance.<br>Potential for chemical pneumonitis.<br>Treat symptomatically. |
|-----------|--|

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## SECTION 5: Firefighting measures

### 5.1 Extinguishing media

|                                |  |
|--------------------------------|--|
| 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.   |

### 5.2 Special hazards arising from the substance or mixture

|                                       |   |
|---------------------------------------|---|
| Specific hazards during fire-fighting | : Flammable vapours may be present even at temperatures below the flash point.<br>Sustained fire attack on vessels may result in a Boiling Liquid Expanding Vapor Explosion (BLEVE).<br>The vapour is heavier than air, spreads along the ground and distant ignition is possible.<br>Will float and can be reignited on surface water.<br>Hazardous combustion products may include:<br>Carbon monoxide.<br>Formaldehyde |
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### 5.3 Advice for firefighters

- Special protective equipment for firefighters : 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.  
All storage areas should be provided with adequate fire fighting facilities.  
Keep adjacent containers cool by spraying with water.

## SECTION 6: Accidental release measures

### 6.1 Personal precautions, protective equipment and emergency procedures

- Personal precautions : 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.
- 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.  
Be ready for fire or possible exposure.  
Do not operate electrical equipment.  
Stay upwind and keep out of low areas.
- 6.1.2 For emergency responders:  
Avoid contact with skin, eyes and clothing.  
Isolate hazard area and deny entry to unnecessary or unprotected personnel.  
Be ready for fire or possible exposure.  
Do not operate electrical equipment.  
Stay upwind and keep out of low areas.

### 6.2 Environmental precautions

- 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.

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Monitor area with combustible gas indicator.

### 6.3 Methods and material for containment and cleaning up

Methods for cleaning up : 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.

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.

### 6.4 Reference to other sections

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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## 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 addi-

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tional 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 ( $\leq 1$  m/s until fill pipe submerged to twice its diameter, then  $\leq 7$  m/s). Avoid splash filling.

Do NOT use compressed air for filling, discharging, or handling operations.

Inhibitor levels should be maintained.

Protect against light.

Product Transfer : If positive displacement pumps are used, these must be fitted with a non-integral pressure relief valve. 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) : 3, Flammable liquids

Further information on storage stability : Storage Temperature:  
30 °C / 86 °F maximum.

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.

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.



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- Packaging material : Suitable material: For container paints, use epoxy paint, zinc silicate paint., For containers, or container linings use mild steel, stainless steel.  
Unsuitable material: Copper., Copper alloys.
- Container Advice : Containers, even those that have been emptied, can contain explosive vapours. Do not cut, drill, grind, weld or perform similar operations on or near containers.

### 7.3 Specific end use(s)

- Specific use(s) : Please refer to section 16 and/or the annexes for the registered uses under REACH.

Ensure that all local regulations regarding handling and storage facilities are followed.  
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   |
|------------|--|-------------------------------|--------------------------------|---|
| styrene    | 100-42-5   | AGW                           | 20 ppm<br>86 mg/m <sup>3</sup> | DE TRGS 900                                   |
|            | Peak-limit: excursion factor (category): 2;(II)  |                               |                                |   |
|            | Further information: When there is compliance with the OEL and biological tolerance values, there is no risk of harming the unborn child |                               |                                |   |
| styrene    |  | TWA                           | 20 ppm<br>85 mg/m <sup>3</sup> | Shell Internal Standard (SIS) for 8 hour TWA. |
|            | Further information: The value is provided by the Industry Association. This value is provided for information only.                     |                               |                                |   |

#### Biological occupational exposure limits

| Substance name | CAS-No.  | Control parameters  | Sampling time   | Basis    |
|----------------|----------|---|---|----------|
| styrene        | 100-42-5 | mandelic acid + phenylglyoxylic acid: 600 mg/g creatinine (Urine) | In case of long-term exposure: after more than one shift, Immediately after exposure or after work- | TRGS 903 |

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|  |  | mandelic acid plus phenylglyoxylic acid: 600 mg/g creatinine (Urine) | ing hours<br>end of shift, for long-term exposures after several previous shifts, Immediately after exposition or after working hours | DE DFG BAT |
|--|--|--|---|------------|

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

| Substance name | End Use | Exposure routes | Potential health effects   | Value     |
|----------------|---------|-----------------|----------------------------|-----------|
| styrene        | Workers | Inhalation      | Acute systemic effects     | 289 mg/m3 |
| styrene        | Workers | Inhalation      | Acute local effects        | 306 mg/m3 |
| styrene        | Workers | Inhalation      | Long-term systemic effects | 85 mg/m3  |

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

| Substance name | Environmental Compartment | Value        |
|----------------|---------------------------|--------------|
| styrene        | Fresh water               | 0,028 mg/l   |
| styrene        | Marine water              | 0,00028 mg/l |
| styrene        | Fresh water sediment      | 0,614 mg/kg  |
| styrene        | Marine sediment           | 0,0614 mg/kg |
| styrene        | Soil                      | 0,2 mg/kg    |

## 8.2 Exposure controls

### Engineering measures

Read in conjunction with the Exposure Scenario for your specific use contained in the Annex.  
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.

Where material is heated, sprayed or mist formed, there is greater potential for airborne concentrations to be generated.

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.

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### Personal protective equipment

Read in conjunction with the Exposure Scenario for your specific use contained in the Annex. 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.  
Wear full face shield if splashes are likely to occur.  
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. Longer term protection: Viton. Incidental contact/Splash protection: Nitrile rubber. For continuous contact we recommend gloves with break-through 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 : Wear chemical resistant gloves/gauntlets and boots. Where risk of splashing, also wear an apron.  
Protective clothing approved to EU Standard EN14605.  
Wear antistatic and flame-retardant clothing, if a local risk assessment deems it so.

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.

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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 A boiling point > 65°C (149°F)] meeting EN14387.

Thermal hazards : When handling heated product, wear heat resistant gloves, safety hat with chin strap, face shield (preferably with a chin guard), safety glasses, heat resistant coveralls (with cuffs over gloves and legs over boots), neck protection and heavy duty boots, e.g. leather for heat resistance.

## SECTION 9: Physical and chemical properties

### 9.1 Information on basic physical and chemical properties

Physical state : Oily liquid.

Colour : Colourless to yellowish

Odour : Aromatic hydrocarbon

Odour Threshold : 0,1 ppm

Melting / freezing point : -31 °C

Boiling point : 145 °C

#### Flammability

Flammability (solid, gas) : Data not available

#### Lower explosion limit and upper explosion limit / flammability limit

Upper explosion limit /  
upper flammability limit : 6,1 %(V)

Lower explosion limit /  
Lower flammability limit : 1,1 %(V)

Flash point : 32 °C  
Method: closed cup

Auto-ignition temperature : 490 °C

Decomposition temperature  
Decomposition temperature : Data not available

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ture

pH : Not applicable

Viscosity

Viscosity, dynamic : 0,7 mPa.s (25 °C)  
Method: ASTM D445

Viscosity, kinematic : <= 1 mm<sup>2</sup>/s (40,0 °C)  
Method: Unspecified

Solubility(ies)

Water solubility : 0,29 kg/m<sup>3</sup> (20 °C)

Partition coefficient: n-octanol/water

: log Pow: 2,96  
Method: Literature data.

Vapour pressure

: 670 Pa (20 °C)

Relative density

: Data not available

Density

: 906 kg/m<sup>3</sup> (20 °C)  
Method: ASTM D4052

Relative vapour density

: 3,6

Particle characteristics

Particle size : Data not available

### 9.2 Other information

Explosive properties : Not applicable

Oxidizing properties : Not applicable

Self-heating substances : At high temperatures, for example fire conditions, exothermic polymerisation may occur causing possible container rupture., Dangerous polymerisation can occur on contact with highly catalytic surfaces., In case of contact with water the inhibitor concentration might decrease and cause polymerisation.

Evaporation rate

: 12,4  
Method: ASTM D 3539, nBuAc=1

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 semiconductive, 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 liq-

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uid

Surface tension : 34 mN/m

Molecular weight : 104,15 g/mol

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### SECTION 10: Stability and reactivity

#### 10.1 Reactivity

Polymerises with risk of fire and explosion.  
Reacts with strong oxidising agents.

#### 10.2 Chemical stability

Material is stable when properly inhibited and an appropriate dissolved oxygen level is maintained (see Storage in Chapter 7).  
Polymerises with risk of fire and explosion.  
Reacts with strong oxidising agents.

#### 10.3 Possibility of hazardous reactions

Hazardous reactions : Normally stable under ambient conditions and if properly inhibited.

#### 10.4 Conditions to avoid

Conditions to avoid : Heat, flames, and sparks.  
Exposure to sunlight.  
Exposure to air.  
In certain circumstances product can ignite due to static electricity.

#### 10.5 Incompatible materials

Materials to avoid : Strong oxidising agents.  
Copper alloys.

#### 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 absorption may occur through skin contact or following accidental ingestion.

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### Acute toxicity

#### Components:

##### **styrene:**

|                           |   |  |
|---------------------------|---|--|
| Acute oral toxicity       | : | LD 50 (Rat, male and female): > 5.000 mg/kg<br>Method: Based on weight of evidence.<br>Remarks: Low toxicity   |
| Acute inhalation toxicity | : | LC 50 (Rat, Unspecified): 11,8 mg/l, 2770 ppm<br>Exposure time: 4 h<br>Test atmosphere: vapour<br>Method: Based on weight of evidence.<br>Remarks: Harmful if inhaled. |
| Acute dermal toxicity     | : | LD 50 (Rat, male and female): > 2.000 mg/kg<br>Method: OECD Test Guideline 402<br>Remarks: Based on available data, the classification criteria are not met.           |

### Skin corrosion/irritation

#### Components:

##### **styrene:**

|         |   |                              |
|---------|---|------------------------------|
| Species | : | Rabbit                       |
| Method  | : | Based on weight of evidence. |
| Remarks | : | Causes skin irritation.      |

### Serious eye damage/eye irritation

#### Components:

##### **styrene:**

|         |   |                                |
|---------|---|--------------------------------|
| Species | : | Rabbit                         |
| Method  | : | Based on weight of evidence.   |
| Remarks | : | Causes serious eye irritation. |

### Respiratory or skin sensitisation

#### Components:

##### **styrene:**

|         |   |   |
|---------|---|---|
| Species | : | Humans  |
| Method  | : | Based on Human Evidence   |
| Remarks | : | Based on available data, the classification criteria are not met. |

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### Germ cell mutagenicity

#### Components:

##### **styrene:**

Genotoxicity in vitro : Method: Based on weight of evidence.  
Remarks: Based on available data, the classification criteria are not met.

Genotoxicity in vivo : Method: Based on weight of evidence.  
Remarks: Based on available data, the classification criteria are not met.

Germ cell mutagenicity- Assessment : This product does not meet the criteria for classification in categories 1A/1B.

### Carcinogenicity

#### Components:

##### **styrene:**

Species : Humans  
Application Route : Occupational exposure  
Method : Based on weight of evidence.  
Remarks : Based on available data, the classification criteria are not met.

Species : Rat  
Application Route : Inhalation  
Method : Based on weight of evidence.  
Remarks : Based on available data, the classification criteria are not met.

Species : Rat  
Application Route : Oral  
Method : Based on weight of evidence.  
Remarks : Based on available data, the classification criteria are not met.

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

| Material | GHS/CLP Carcinogenicity Classification |
|----------|--|
| styrene  | No carcinogenicity classification.     |

| Material | Other Carcinogenicity Classification            |
|----------|---|
| styrene  | IARC: Group 2A: Probably carcinogenic to humans |



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### Reproductive toxicity

#### Components:

##### **styrene:**

Effects on fertility : Species: Rat  
Application Route: Inhalation  
  
Method: OECD Test Guideline 416  
Remarks: Based on available data, the classification criteria are not met., This product does not meet the criteria for classification in categories 1A/1B.

Reproductive toxicity - Assessment : Suspected of damaging the unborn child.

### STOT - single exposure

#### Components:

##### **styrene:**

Exposure routes : Inhalation  
Target Organs : Respiratory system  
Remarks : Inhalation of vapours or mists may cause irritation to the respiratory system.

### STOT - repeated exposure

#### Components:

##### **styrene:**

Exposure routes : Inhalation  
Target Organs : ear  
Remarks : Harmful: danger of serious damage to health by prolonged exposure through inhalation.  
Can cause liver damage.  
Respiratory system: repeated exposure affects the respiratory system. Effects were seen at high doses only.  
Auditory system: prolonged and repeated exposures to high concentrations have resulted in hearing loss in rats.

### Repeated dose toxicity

#### Components:

##### **styrene:**

Species : Humans, Unspecified  
Application Route : Inhalation  
Method : Occupational exposure  
Target Organs : ear  
Remarks : Harmful: danger of serious damage to health by prolonged exposure through inhalation.

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Can cause liver damage.  
Respiratory System: repeated exposure affects the respiratory system.  
Auditory system: prolonged and repeated exposures to high concentrations have resulted in hearing loss in rats. Solvent abuse and noise interaction in the work environment may cause hearing loss.  
Nervous system: repeated exposure affects the nervous system. Effects were seen at high doses only.

|                   |   |
|-------------------|---|
| Species           | : Rat, Unspecified  |
| Application Route | : Inhalation  |
| Test atmosphere   | : vapour  |
| Method            | : Acceptable non-standard method.   |
| Target Organs     | : ear   |
| Remarks           | : Harmful: danger of serious damage to health by prolonged exposure through inhalation.<br>Can cause liver damage.<br>Respiratory System: repeated exposure affects the respiratory system.<br>Auditory system: prolonged and repeated exposures to high concentrations have resulted in hearing loss in rats. Solvent abuse and noise interaction in the work environment may cause hearing loss.<br>Nervous system: repeated exposure affects the nervous system. Effects were seen at high doses only. |

### Aspiration toxicity

#### Components:

##### styrene:

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

## 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 com- |
|---------|---|

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ponent(s).

### Components:

#### **styrene:**

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

## SECTION 12: Ecological information

### 12.1 Toxicity

#### Components:

#### **styrene:**

|  |  |
|--|--|
| Toxicity to fish   | : LC50 (Pimephales promelas (fathead minnow)): 4,02 mg/l<br>Exposure time: 96 h<br>Method: OECD Test Guideline 203<br>Remarks: Toxic<br>LC/EC/IC50 >1 - <=10 mg/l  |
| Toxicity to daphnia and other aquatic invertebrates                    | : EC50 (Daphnia magna (Water flea)): 4,7 mg/l<br>Exposure time: 48 h<br>Method: OECD Test Guideline 202<br>Remarks: Toxic<br>LC/EC/IC50 >1 - <=10 mg/l   |
| Toxicity to algae/aquatic plants                                       | : ErC50 (Pseudokirchneriella subcapitata (algae)): 4,9 mg/l<br>Exposure time: 96 h<br>Method: Test(s) equivalent or similar to OECD Test Guideline 201<br>Remarks: Toxic<br>NOEC/NOEL > 1.0 - <= 10 mg/l |
| Toxicity to microorganisms   | : LC50 (Activated sludge): 500 mg/l<br>Exposure time: 3 h<br>Method: Test(s) equivalent or similar to OECD Guideline 209<br>Remarks: Practically non toxic:<br>LL/EL/IL50 > 100 mg/l                     |
| Toxicity to fish (Chronic toxicity)                                    | : Remarks: Data not available  |
| Toxicity to daphnia and other aquatic invertebrates (Chronic toxicity) | : NOEC: 1,01 mg/l<br>Exposure time: 21 d<br>Species: Daphnia magna (Water flea)<br>Method: OECD Test Guideline 211<br>Remarks: NOEC/NOEL > 1.0 - <=10 mg/l (based on test data)                          |

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### 12.2 Persistence and degradability

#### Components:

##### **styrene:**

|                  |   |  |
|------------------|---|--|
| Biodegradability | : | Biodegradation: 70,9 %<br>Exposure time: 28 d<br>Method: ISO DIS 9408<br>Remarks: Readily biodegradable. |
|------------------|---|--|

### 12.3 Bioaccumulative potential

#### Components:

##### **styrene:**

|                 |   |  |
|-----------------|---|--|
| Bioaccumulation | : | Remarks: Does not bioaccumulate significantly. |
|-----------------|---|--|

### 12.4 Mobility in soil

#### Components:

##### **styrene:**

|          |   |  |
|----------|---|--|
| Mobility | : | Remarks: Floats on water., If product enters soil, it will be highly mobile and may contaminate groundwater. |
|----------|---|--|

### 12.5 Results of PBT and vPvB assessment

#### Components:

##### **styrene:**

|            |   |   |
|------------|---|---|
| Assessment | : | The substance does not fulfill all screening criteria for persistence, 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). |
|-----------------------------------|---|--|

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### 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.  
Waste product should not be allowed to contaminate soil or ground water, or be disposed of into the environment.  
Do not discharge extinguishing waters into the aquatic environment.  
Do not dispose of tank water bottoms by allowing them to drain into the ground. This will result in soil and groundwater contamination.  
Waste arising from a spillage or tank cleaning should be disposed of in accordance with prevailing regulations, preferably to a recognised collector or contractor. The competence of the collector or contractor should be established beforehand.
- 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 Pollution from Ships (MARPOL 73/78) which provides technical aspects at controlling pollutions from ships.
- 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.
- Packing: Emptying: Place the package upside down, and tilt slightly, circa 10 degrees, to enable drainage in such a way that the lowest part of the package is at the exit orifice. On some packing an extra hole must be made. Drainage should be carried out at room temperature (at least 15 °C). Wait until the package is drip dry. Do not close package after draining. Please note the risks connected with emptying package and containers with flammable liquids. Emptied package should be ventilated in a safe place away from sparks and fire. Residues may be an explosion risk. Do not puncture, cut or weld in non-cleaned package, containers or drums.

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### SECTION 14: Transport information

#### 14.1 UN number or ID number

|      |        |
|------|--------|
| ADN  | : 2055 |
| ADR  | : 2055 |
| RID  | : 2055 |
| IMDG | : 2055 |
| IATA | : 2055 |

#### 14.2 UN proper shipping name

|      |                               |
|------|-------------------------------|
| ADN  | : STYRENE MONOMER, STABILIZED |
| ADR  | : STYRENE MONOMER, STABILIZED |
| RID  | : STYRENE MONOMER, STABILIZED |
| IMDG | : STYRENE MONOMER, STABILIZED |
| IATA | : STYRENE MONOMER, STABILIZED |

#### 14.3 Transport hazard class(es)

|      |     |
|------|-----|
| ADN  | : 3 |
| ADR  | : 3 |
| RID  | : 3 |
| IMDG | : 3 |
| IATA | : 3 |

#### 14.4 Packing group

|                                   |                    |
|-----------------------------------|--------------------|
| ADN                               |                    |
| Packing group                     | : III              |
| Classification Code               | : F1               |
| Labels                            | : 3 (INST, N3)     |
| CDNI Inland Water Waste Agreement | : NST 8191 Styrene |

|                              |       |
|------------------------------|-------|
| ADR                          |       |
| Packing group                | : III |
| Classification Code          | : F1  |
| Hazard Identification Number | : 39  |
| Labels                       | : 3   |

|                              |       |
|------------------------------|-------|
| RID                          |       |
| Packing group                | : III |
| Classification Code          | : F1  |
| Hazard Identification Number | : 39  |
| Labels                       | : 3   |

|               |       |
|---------------|-------|
| IMDG          |       |
| Packing group | : III |
| Labels        | : 3   |

IATA

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|               |   |     |
|---------------|---|-----|
| Packing group | : | III |
| Labels        | : | 3   |

### 14.5 Environmental hazards

#### ADN

|                           |   |     |
|---------------------------|---|-----|
| Environmentally hazardous | : | yes |
|---------------------------|---|-----|

#### ADR

|                           |   |    |
|---------------------------|---|----|
| Environmentally hazardous | : | no |
|---------------------------|---|----|

#### RID

|                           |   |    |
|---------------------------|---|----|
| Environmentally hazardous | : | no |
|---------------------------|---|----|

#### IMDG

|                  |   |    |
|------------------|---|----|
| Marine pollutant | : | no |
|------------------|---|----|

### 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

|                    |   |                          |
|--------------------|---|--------------------------|
| Pollution category | : | Y                        |
| Ship type          | : | 3; Must be Double Hulled |
| Product name       | : | Styrene monomer          |

|                               |   |  |
|-------------------------------|---|--|
| <b>Additional Information</b> | : | 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: Number on list 40, 3                    |
| 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 | P5c | FLAMMABLE LIQUIDS |
|---|-----|-------------------|

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control of major-accident hazards involving dangerous substances.

Water hazard class (Germany) : WGK 2 obviously hazardous to water  
Code Number: 187  
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 to 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 Störfallverordnung (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.

Technische Anleitung Luft: Product not listed by name. Observe section 5.2.5 in connection with section 5.2.6

### 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

TSCA : Listed

TCSI : Listed

### 15.2 Chemical safety assessment

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

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## SECTION 16: Other information

### Full text of other abbreviations



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|                   |   |   |
|-------------------|---|---|
| DE DFG BAT        | : | Germany. MAK BAT Annex XIII                             |
| DE TRGS 900       | : | Germany. TRGS 900 - Occupational exposure limit values. |
| TRGS 903          | : | TRGS 903 - Biological limit values                      |
| DE TRGS 900 / AGW | : | Time Weighted Average                                   |

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 : 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.

This product is classified as H304 (May be fatal if swallowed)

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and enters airways). The risk relates to potential for aspiration. The risk arising from aspiration hazard is solely related to the physico-chemical properties of the substance. The risk can therefore be controlled by implementing risk management measures tailored to this specific hazard and included within Section 8 of the SDS. An exposure scenario is not presented.

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).

### Classification of the mixture:

|                   |       |
|-------------------|-------|
| Flam. Liq. 3      | H226  |
| Asp. Tox. 1       | H304  |
| Skin Irrit. 2     | H315  |
| Eye Irrit. 2      | H319  |
| Acute Tox. 4      | H332  |
| STOT SE 3         | H335  |
| Repr. 2           | H361d |
| STOT RE 1         | H372  |
| Aquatic Chronic 3 | H412  |

### Classification procedure:

On basis of test data.  
Expert judgement and weight of evidence determination.  
Expert judgement and weight of evidence determination.  
Expert judgement and weight of evidence determination.  
Expert judgement and weight of evidence determination.  
Expert judgement and weight of evidence determination.  
Expert judgement and weight of evidence determination.  
Expert judgement and weight of evidence determination.  
Expert judgement and weight of evidence determination.

### Identified Uses according to the Use Descriptor System

#### Uses - Worker

Title : Manufacture of substance  
- Industrial

#### Uses - Worker

Title : Manufacturing of UP/VE resins and formulated resins (Gelcoat, Colour Paste, Putty, Bonding paste / Adhesive, etc.)

#### Uses - Worker

Title : Production of Styrenic Copolymers

#### Uses - Worker

Title : Batch suspension polymerisation of Polystyrene (HIPS and GPPS)

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|         |                |              |                                |
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### Uses - Worker

Title : FRP manufacturing in an industrial setting, using UP/VE resins and/or formulated resins (gelcoat, bonding paste, putty etc.)

### Uses - Worker

Title : FRP manufacturing in a professional setting, using UP/VE resins and/or formulated resins (gelcoat, bonding paste, putty 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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### Exposure Scenario - Worker

|                         |   |
|-------------------------|---|
| <b>300000000709</b>     |   |
| <b>SECTION 1</b>        | <b>EXPOSURE SCENARIO TITLE</b>  |
| <b>Title</b>            | Manufacture of substance- Industrial  |
| <b>Use Descriptor</b>   | <b>Sector of Use:</b> SU3, SU8<br><b>Process Categories:</b> PROC1, PROC2, PROC8a, PROC8b, PROC15<br><b>Environmental Release Categories:</b> ERC1  |
| <b>Scope of process</b> | Manufacture of the substance or use as a process chemical or extraction agent. Includes recycling/ recovery, material transfers, storage, maintenance and loading (including marine vessel/barge, road/rail car and bulk container), sampling and associated laboratory activities. |

|   |  |  |
|---|--|--|
| SECTION 2   | OPERATIONAL CONDITIONS AND RISK MANAGEMENT MEASURES  |  |
| Section 2.1   | Control of Worker Exposure   |  |
| Product Characteristics   |  |  |
| Physical form of product  | Liquid, vapour pressure 0.5 - 10 kPa at STP  |  |
| Concentration of the Substance in Mixture/Article   | Covers use of substance/product up to 100% (unless stated differently).,   |  |
| Frequency and Duration of Use   |  |  |
| Covers daily exposures up to 8 hours (unless stated differently).   |  |  |
| Other Operational Conditions affecting Exposure   |  |  |
| Assumes a good basic standard of occupational hygiene is implemented.<br>Assumes use at not more than 20°C above ambient temperature (unless stated differently). |  |  |
| Contributing Scenarios  | Risk Management Measures   |  |
| General measures (eye irritants).   | Use suitable eye protection.<br>Avoid direct eye contact with product, also via contamination on hands.  |  |
| General measures (skin irritants).  | Avoid direct skin contact with product. Identify potential areas for indirect skin contact. Wear gloves (tested to EN374) if hand contact with substance likely. Clean up contamination/spills as soon as they occur. Wash off any skin contamination immediately. Provide basic employee training to prevent / minimise exposures and to report any skin problems that may develop. |  |
| General exposures (closed systems)with occasional controlled exposure.PROC2   | Handle substance within a closed system.   |  |
| Additivition and stabilisationPROC8b  | Use in semi-automated and predominantly enclosed filling lines.  |  |

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|   |   |
|---|---|
| Process samplingPROC8a  | Use a sampling system designed to control exposure.   |
| Laboratory activitiesPROC15   | No other specific measures identified.  |
| Material transfersBulk product storagePROC1   | Transfer via enclosed lines.<br>Store substance within a closed system.   |
| Dedicated facilityRoad tanker/rail car loading.Marine vessel/barge (un)loading.PROC8b                     | Clear transfer lines prior to de-coupling.<br>Ensure operation is undertaken outdoors.<br>Avoid carrying out activities involving exposure for more than 1 hour.<br>, or:<br>Operate activity away from sources of substance emission or release. |
| Equipment maintenance-PROC8b  | Drain down system prior to equipment opening or maintenance.<br>Retain drain downs in sealed storage pending disposal or for subsequent recycle.<br>Avoid carrying out activities involving exposure for more than 1 hour.                        |
| Material transfersDisposal of wastesPROC8b  | Avoid carrying out activities involving exposure for more than 1 hour.  |
| <b>Section 2.2</b>  | <b>Control of Environmental Exposure</b>  |
| Substance is a unique structure.  |   |
| <b>Amounts Used</b>   |   |
| Fraction of EU tonnage used in region:  | 1   |
| Regional use tonnage (tonnes/year):   | 4,5E+06   |
| Fraction of Regional tonnage used locally:  | 1   |
| Annual site tonnage (tonnes/year):  | 4,5E+06   |
| Maximum daily site tonnage (kg/day):  | 2,85E+06  |
| <b>Frequency and Duration of Use</b>  |   |
| Emission Days (days/year):  | 350   |
| <b>Environmental factors not influenced by risk management</b>  |   |
| Local freshwater dilution factor:   | 41  |
| Local marine water dilution factor:   | 100   |
| <b>Other Operational Conditions affecting Environmental Exposure</b>                                      |   |
| Release fraction to air from process (initial release prior to RMM):                                      | 1,3E-04   |
| Release fraction to soil from process (initial release prior to RMM):                                     | 4,8E-05   |
| <b>Technical conditions and measures at process level (source) to prevent release</b>                     |   |
| Common practices vary across sites thus conservative process release estimates used.                      |   |
| <b>Organisational measures to prevent/limit release from site</b>   |   |
| Do not apply industrial sludge to natural soils.<br>Sludge should be incinerated, contained or reclaimed. |   |
| <b>Conditions and Measures related to municipal sewage treatment plant</b>                                |   |
| Estimated substance removal from wastewater via domestic sewage   | 95,6  |

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|  |            |
|--|------------|
| treatment (%)  |            |
| Assumed domestic sewage treatment plant flow (m3/d)                                | 1,0000E+08 |
| <b>Conditions and Measures related to external treatment of waste for disposal</b> |            |
| During manufacturing no waste of the substance is generated.                       |            |
| <b>Conditions and measures related to external recovery of waste</b>               |            |
| During manufacturing no waste of the substance is generated.                       |            |

|   |                            |
|---|----------------------------|
| <b>SECTION 3</b>  | <b>EXPOSURE ESTIMATION</b> |
| <b>Section 3.1 - Health</b>   |                            |
| The Easy TRA tool has been used to estimate workplace exposures unless otherwise indicated. |                            |

|                                 |  |
|---------------------------------|--|
| <b>Section 3.2 -Environment</b> |  |
| Used Easy TRA model.            |  |

|   |  |
|---|--|
| <b>SECTION 4</b>  | <b>GUIDANCE TO CHECK COMPLIANCE WITH THE EXPOSURE SCENARIO</b> |
| <b>Section 4.1 - Health</b>   |  |
| Predicted exposures are not expected to exceed the DN(M)EL when the Risk Management Measures/Operational Conditions outlined in Section 2 are implemented.<br>Where other Risk Management Measures/Operational Conditions are adopted, then users should ensure that risks are managed to at least equivalent levels. |  |

|  |  |
|--|--|
| <b>Section 4.2 -Environment</b>  |  |
| Guidance is based on assumed operating conditions which may not be applicable to all sites; thus, scaling may be necessary to define appropriate site-specific risk management measures. |  |
| Required removal efficiency for wastewater can be achieved using onsite/offsite technologies, either alone or in combination.  |  |
| Required removal efficiency for air can be achieved using on-site technologies, either alone or in combination.  |  |
| Further details on scaling and control technologies are provided in SpERC factsheet ( <a href="http://cefic.org">http://cefic.org</a> ).   |  |

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### Exposure Scenario - Worker

|                         |   |
|-------------------------|---|
| <b>300000000713</b>     |   |
| <b>SECTION 1</b>        | <b>EXPOSURE SCENARIO TITLE</b>  |
| <b>Title</b>            | Manufacturing of UP/VE resins and formulated resins (Gel-coat, Colour Paste, Putty, Bonding paste / Adhesive, etc.)   |
| <b>Use Descriptor</b>   | <b>Sector of Use:</b> SU3, SU12<br><b>Process Categories:</b> PROC1, PROC3, PROC4, PROC5, PROC8a, PROC8b, PROC9, PROC15<br><b>Environmental Release Categories:</b> ERC2  |
| <b>Scope of process</b> | Formulation, packing and re-packing of the substance and its mixtures in batch or continuous operations, including storage, materials transfers, mixing, tableting, compression, pelletisation, extrusion, large and small scale packing, sampling, maintenance and associated laboratory activities. |

|   |  |
|---|--|
| <b>SECTION 2</b>  | <b>OPERATIONAL CONDITIONS AND RISK MANAGEMENT MEASURES</b>   |
| <b>Section 2.1</b>  | <b>Control of Worker Exposure</b>  |
| <b>Product Characteristics</b>  |  |
| Physical form of product  | Liquid, vapour pressure 0.5 - 10 kPa at STP  |
| Concentration of the Substance in Mixture/Article   | Covers use of substance/product up to 100% (unless stated differently).,   |
| <b>Frequency and Duration of Use</b>  |  |
| Covers daily exposures up to 8 hours (unless stated differently).   |  |
| <b>Other Operational Conditions affecting Exposure</b>  |  |
| Assumes a good basic standard of occupational hygiene is implemented.<br>Assumes use at not more than 20°C above ambient temperature (unless stated differently). |  |
| <b>Contributing Scenarios</b>   | <b>Risk Management Measures</b>  |
| General measures (eye irritants).   | Use suitable eye protection.<br>Avoid direct eye contact with product, also via contamination on hands.  |
| General measures (skin irritants).  | Avoid direct skin contact with product. Identify potential areas for indirect skin contact. Wear gloves (tested to EN374) if hand contact with substance likely. Clean up contamination/spills as soon as they occur. Wash off any skin contamination immediately. Provide basic employee training to prevent / minimise exposures and to report any skin problems that may develop. |
| General exposures (closed systems)PROC1   | Handle substance within a closed system.   |
| Bulk transfersPROC3   | Store substance within a closed system.<br>Use in semi-automated and predominantly enclosed filling lines.   |

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|---|---|
|   | Use bulk or semi-bulk handling systems.<br>Provide extraction ventilation at points where emissions occur.<br>Ensure operatives are trained to minimise exposures.  |
| Mixing operations (closed systems) elevated temperature<br>Batch processes at elevated temperature-<br>sPROC3                               | Use in semi-automated and predominantly enclosed filling lines.<br>Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour).  |
| Drum/batch transfers<br>Pouring from small containers<br>Transfer from/pouring from containers<br>Mixing operations (open systems)<br>PROC5 | Provide extraction ventilation at points where emissions occur.<br>Put lids on containers immediately after use.  |
| Process sampling<br>PROC4   | Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour).<br>Ensure dedicated sample points are provided.<br>Avoid dip sampling.  |
| Laboratory activities<br>PROC15   | Handle within a fume cupboard or implement suitable equivalent methods to minimise exposure.  |
| Drum and small package filling<br>Drum/batch transfers<br>sPROC9  | Fill containers/cans at dedicated filling points supplied with local extract ventilation.   |
| Bulk transfers<br>Road tanker/rail car loading.<br>PROC8b   | Use bulk or semi-bulk handling systems.<br>Use dedicated equipment.<br>Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour).<br>, or:<br>Ensure operation is undertaken outdoors.   |
| Equipment cleaning and maintenance<br>PROC8a  | Drain down system prior to equipment opening or maintenance.<br>Retain drain downs in sealed storage pending disposal or for subsequent recycle.  |
| Disposal of wastes<br>PROC8a  | Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour).<br>Dispose of empty containers and wastes safely.<br>Dispose of waste in accordance with environmental legislation.<br>Avoid carrying out activities involving exposure for more than 1 hour.<br>, or:<br>Wear a respirator conforming to EN140 with Type A filter or better. |
| <b>Section 2.2</b>  | <b>Control of Environmental Exposure</b>  |
| Substance is a unique structure.  |   |



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|   |            |
|---|------------|
| <b>Amounts Used</b>   |            |
| Fraction of EU tonnage used in region:  | 0,1        |
| Regional use tonnage (tonnes/year):   | 2,28E+05   |
| Fraction of Regional tonnage used locally:  | 0,6        |
| Annual site tonnage (tonnes/year):  | 1,37E+04   |
| Maximum daily site tonnage (kg/day):  | 4,57E+04   |
| <b>Frequency and Duration of Use</b>  |            |
| Emission Days (days/year):  | 300        |
| <b>Environmental factors not influenced by risk management</b>  |            |
| Local freshwater dilution factor:   | 41         |
| Local marine water dilution factor:   | 100        |
| <b>Other Operational Conditions affecting Environmental Exposure</b>                                      |            |
| Release fraction to air from process (initial release prior to RMM):                                      | 2,0E-03    |
| Release fraction to wastewater from process (initial release prior to RMM):                               | 4,9E-05    |
| Release fraction to soil from process (initial release prior to RMM):                                     | 0E+00      |
| <b>Technical conditions and measures at process level (source) to prevent release</b>                     |            |
| Common practices vary across sites thus conservative process re-lease estimates used.                     |            |
| <b>Organisational measures to prevent/limit release from site</b>   |            |
| Do not apply industrial sludge to natural soils.<br>Sludge should be incinerated, contained or reclaimed. |            |
| <b>Conditions and Measures related to municipal sewage treatment plant</b>                                |            |
| Estimated substance removal from wastewater via domestic sewage treatment (%)                             | 91,9       |
| Assumed domestic sewage treatment plant flow (m3/d)   | 1,0000E+08 |
| <b>Conditions and Measures related to external treatment of waste for disposal</b>                        |            |
| External treatment and disposal of waste should comply with applicable local and/or regional regulations. |            |
| <b>Conditions and measures related to external recovery of waste</b>                                      |            |
| External recovery and recycling of waste should comply with applicable local and/or regional regulations. |            |

|   |                            |
|---|----------------------------|
| <b>SECTION 3</b>  | <b>EXPOSURE ESTIMATION</b> |
| <b>Section 3.1 - Health</b>   |                            |
| The Easy TRA tool has been used to estimate workplace exposures unless otherwise indicated.<br>For some of the Contributing Scenarios workplace exposures have been estimated from measured data. |                            |

|                                 |  |
|---------------------------------|--|
| <b>Section 3.2 -Environment</b> |  |
| Used Easy TRA model.            |  |

|                             |  |
|-----------------------------|--|
| <b>SECTION 4</b>            | <b>GUIDANCE TO CHECK COMPLIANCE WITH THE EXPOSURE SCENARIO</b> |
| <b>Section 4.1 - Health</b> |  |

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Predicted exposures are not expected to exceed the DN(M)EL when the Risk Management Measures/Operational Conditions outlined in Section 2 are implemented. Where other Risk Management Measures/Operational Conditions are adopted, then users should ensure that risks are managed to at least equivalent levels.

### Section 4.2 -Environment

Guidance is based on assumed operating conditions which may not be applicable to all sites; thus, scaling may be necessary to define appropriate site-specific risk management measures.

Required removal efficiency for wastewater can be achieved using onsite/offsite technologies, either alone or in combination.

Required removal efficiency for air can be achieved using on-site technologies, either alone or in combination.

Further details on scaling and control technologies are provided in SpERC factsheet (<http://cefic.org>).

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### Exposure Scenario - Worker

|                         |   |
|-------------------------|---|
| <b>300000000720</b>     |   |
| <b>SECTION 1</b>        | <b>EXPOSURE SCENARIO TITLE</b>  |
| <b>Title</b>            | Production of Styrenic Copolymers   |
| <b>Use Descriptor</b>   | <b>Sector of Use:</b> SU3, SU11<br><b>Process Categories:</b> PROC2, PROC3, PROC8a, PROC8b, PROC9, PROC15<br><b>Environmental Release Categories:</b> ERC6c   |
| <b>Scope of process</b> | Manufacture of polymers from monomers in continuous and batch processes. Including production, re-cycling and recovery, degassing, discharging, reactor maintenance and immediate polymer product formation (i.e. compounding, pelletisation, product off-gassing). |

|   |  |                          |
|---|--|--------------------------|
| SECTION 2   | OPERATIONAL CONDITIONS AND RISK MANAGEMENT MEASURES  |                          |
| Section 2.1   | Control of Worker Exposure   |                          |
| Product Characteristics   |  |                          |
| Physical form of product  | Liquid, vapour pressure 0.5 - 10 kPa at STP  |                          |
| Concentration of the Substance in Mixture/Article   | Covers use of substance/product up to 100% (unless stated differently).,   |                          |
| Frequency and Duration of Use   |  |                          |
| Covers daily exposures up to 8 hours (unless stated differently).   |  |                          |
| Other Operational Conditions affecting Exposure   |  |                          |
| Assumes a good basic standard of occupational hygiene is implemented.<br>Assumes use at not more than 20°C above ambient temperature (unless stated differently). |  |                          |
| Contributing Scenarios  |  | Risk Management Measures |
| General measures (eye irritants).   | Use suitable eye protection.<br>Avoid direct eye contact with product, also via contamination on hands.  |                          |
| General measures (skin irritants).  | Avoid direct skin contact with product. Identify potential areas for indirect skin contact. Wear gloves (tested to EN374) if hand contact with substance likely. Clean up contamination/spills as soon as they occur. Wash off any skin contamination immediately. Provide basic employee training to prevent / minimise exposures and to report any skin problems that may develop. |                          |
| Bulk closed unloading.PROC8b  | Clear transfer lines prior to de-coupling.<br>Avoid carrying out activities involving exposure for more than 1 hour.   |                          |
| Bulk product storagePROC2   | Store substance within a closed system.  |                          |

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|   |   |
|---|---|
| Material transfersinternal-PROC3  | Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour).   |
| Batch processUse in contained batch processesPROC3                                    | Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour).   |
| Batch processes at elevated temperaturesUse in contained batch processesPROC3         | Handle substance within a closed system.<br>Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). |
| Process samplingPROC8a  | Use a sampling system designed to control exposure.   |
| Laboratory activitiesPROC15   | No other specific measures identified.  |
| Small package fillingPROC9  | Limit the substance content in the product to 5 %.  |
| Equipment maintenance-PROC8b  | Avoid carrying out activities involving exposure for more than 1 hour.  |
| Bulk transfersPROC8b  | Limit the substance content in the product to 5 %.  |
| General exposures.with occasional controlled exposure.PROC2                           | Handle substance within a closed system.  |
| Disposal of wastesPROC8b  | Avoid carrying out activities involving exposure for more than 1 hour.  |
| <b>Section 2.2</b>  | <b>Control of Environmental Exposure</b>  |
| Substance is a unique structure.  |   |
| <b>Amounts Used</b>   |   |
| Fraction of EU tonnage used in region:  | 0,1   |
| Regional use tonnage (tonnes/year):   | 2,42E+06  |
| Fraction of Regional tonnage used locally:  | 0,6   |
| Annual site tonnage (tonnes/year):  | 1,45E+05  |
| Maximum daily site tonnage (kg/day):  | 4,83E+05  |
| <b>Frequency and Duration of Use</b>  |   |
| Emission Days (days/year):  | 300   |
| <b>Environmental factors not influenced by risk management</b>                        |   |
| Local freshwater dilution factor:   | 10  |
| Local marine water dilution factor:   | 100   |
| <b>Other Operational Conditions affecting Environmental Exposure</b>                  |   |
| Release fraction to air from process (initial release prior to RMM):                  | 1,02E-03  |
| Release fraction to wastewater from process (initial release prior to RMM):           | 1,2E-07   |
| Release fraction to soil from process (initial release prior to RMM):                 | 0E+00   |
| <b>Technical conditions and measures at process level (source) to prevent release</b> |   |
| Common practices vary across sites thus conservative process release estimates used.  |   |
| <b>Conditions and Measures related to municipal sewage treatment plant</b>            |   |
| Estimated substance removal from wastewater via domestic sewage treatment (%)         | 91,9  |

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|   |           |
|---|-----------|
| Assumed domestic sewage treatment plant flow (m3/d)   | 2,000E+06 |
| <b>Conditions and Measures related to external treatment of waste for disposal</b>                        |           |
| External treatment and disposal of waste should comply with applicable local and/or regional regulations. |           |
| <b>Conditions and measures related to external recovery of waste</b>                                      |           |
| External recovery and recycling of waste should comply with applicable local and/or regional regulations. |           |

|   |                            |
|---|----------------------------|
| <b>SECTION 3</b>  | <b>EXPOSURE ESTIMATION</b> |
| <b>Section 3.1 - Health</b>   |                            |
| The Easy TRA tool has been used to estimate workplace exposures unless otherwise indicated. |                            |

|                                 |  |
|---------------------------------|--|
| <b>Section 3.2 -Environment</b> |  |
| Used Easy TRA model.            |  |

|   |  |
|---|--|
| <b>SECTION 4</b>  | <b>GUIDANCE TO CHECK COMPLIANCE WITH THE EXPOSURE SCENARIO</b> |
| <b>Section 4.1 - Health</b>   |  |
| Predicted exposures are not expected to exceed the DN(M)EL when the Risk Management Measures/Operational Conditions outlined in Section 2 are implemented.<br>Where other Risk Management Measures/Operational Conditions are adopted, then users should ensure that risks are managed to at least equivalent levels. |  |

|  |  |
|--|--|
| <b>Section 4.2 -Environment</b>  |  |
| Guidance is based on assumed operating conditions which may not be applicable to all sites; thus, scaling may be necessary to define appropriate site-specific risk management measures. |  |
| Required removal efficiency for wastewater can be achieved using onsite/offsite technologies, either alone or in combination.  |  |
| Required removal efficiency for air can be achieved using on-site technologies, either alone or in combination.  |  |
| Further details on scaling and control technologies are provided in SpERC factsheet ( <a href="http://cefic.org">http://cefic.org</a> ).   |  |

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### Exposure Scenario - Worker

|                         |   |
|-------------------------|---|
| <b>300000000710</b>     |   |
| <b>SECTION 1</b>        | <b>EXPOSURE SCENARIO TITLE</b>  |
| <b>Title</b>            | Batch suspension polymerisation of Polystyrene (HIPS and GPPS)  |
| <b>Use Descriptor</b>   | <b>Sector of Use:</b> SU3, SU12<br><b>Process Categories:</b> PROC2, PROC3, PROC8a, PROC8b, PROC9, PROC14, PROC15<br><b>Environmental Release Categories:</b> ERC6c   |
| <b>Scope of process</b> | Manufacture of polymers from monomers in continuous and batch processes. Including production, re-cycling and recovery, degassing, discharging, reactor maintenance and immediate polymer product formation (i.e. compounding, pelletisation, product off-gassing). |

|   |  |
|---|--|
| <b>SECTION 2</b>  | <b>OPERATIONAL CONDITIONS AND RISK MANAGEMENT MEASURES</b>   |
| <b>Section 2.1</b>  | <b>Control of Worker Exposure</b>  |
| <b>Product Characteristics</b>  |  |
| Physical form of product  | Liquid, vapour pressure 0.5 - 10 kPa at STP  |
| Concentration of the Substance in Mixture/Article   | Covers use of substance/product up to 100% (unless stated differently).  |
| <b>Frequency and Duration of Use</b>  |  |
| Covers daily exposures up to 8 hours (unless stated differently).   |  |
| <b>Other Operational Conditions affecting Exposure</b>  |  |
| Assumes a good basic standard of occupational hygiene is implemented.<br>Assumes use at not more than 20°C above ambient temperature (unless stated differently). |  |
| <b>Contributing Scenarios</b>   | <b>Risk Management Measures</b>  |
| General measures (eye irritants).   | Use suitable eye protection.<br>Avoid direct eye contact with product, also via contamination on hands.  |
| General measures (skin irritants).  | Avoid direct skin contact with product. Identify potential areas for indirect skin contact. Wear gloves (tested to EN374) if hand contact with substance likely. Clean up contamination/spills as soon as they occur. Wash off any skin contamination immediately. Provide basic employee training to prevent / minimise exposures and to report any skin problems that may develop. |
| Dedicated facility<br>Material transfers<br>Bulk closed unloading.<br>Bulk open unloading with sample collection<br>PROC8b  | Clear transfer lines prior to de-coupling.<br>Avoid carrying out activities involving exposure for more than 1 hour.<br>, or:<br>Operate activity away from sources of substance emission or   |

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|   |   |
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|   | release.<br>Ensure dedicated sample points are provided.  |
| Bulk product storagePROC2   | Store substance within a closed system.   |
| Material transfersPROC2   | Transfer via enclosed lines.  |
| Continuous processGeneral exposures (closed systems)with occasional controlled exposure.PROC2 | Handle substance within a closed system.  |
| Batch processGeneral exposures (closed systems)with occasional controlled exposure.PROC3      | Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour).   |
| Process samplingPROC8a  | Ensure dedicated sample points are provided.<br>Use a sampling system designed to control exposure.   |
| Laboratory activitiesPROC15   | No other specific measures identified.  |
| Extrusion and masterbatch-ingelevated temperature-PROC14                                      | Limit the substance content in the product to 5 %.<br>Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). |
| Operation of solids filtering equipmentPROC14   | Limit the substance content in the product to 5 %.<br>Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). |
| Centrifuging including dischargingPROC14  | Limit the substance content in the product to 5 %.<br>Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). |
| Drying and storagePROC14  | Limit the substance content in the product to 5 %.<br>Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). |
| Small package fillingPROC9  | Limit the substance content in the product to 5 %.<br>Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). |
| Equipment maintenance-PROC8b  | Drain down system prior to equipment opening or maintenance.<br>, or:<br>Avoid carrying out activities involving exposure for more than 1 hour.   |
| Bulk transfersPROC8b  | Limit the substance content in the product to 5 %.  |
| Material transfersDisposal of wastesPROC8b  | Use dedicated equipment.<br>Avoid carrying out activities involving exposure for more than 1 hour.  |

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|---|--|
| <b>Section 2.2</b>  | <b>Control of Environmental Exposure</b> |
| Substance is a unique structure.  |  |
| <b>Amounts Used</b>   |  |
| Fraction of EU tonnage used in region:  | 0,1                                      |
| Regional use tonnage (tonnes/year):   | 2,42E+06                                 |
| Fraction of Regional tonnage used locally:  | 0,6                                      |
| Annual site tonnage (tonnes/year):  | 1,45E+05                                 |
| Maximum daily site tonnage (kg/day):  | 4,83E+05                                 |
| <b>Frequency and Duration of Use</b>  |  |
| Emission Days (days/year):  | 300                                      |
| <b>Environmental factors not influenced by risk management</b>  |  |
| Local freshwater dilution factor:   | 10                                       |
| Local marine water dilution factor:   | 100                                      |
| <b>Other Operational Conditions affecting Environmental Exposure</b>                                      |  |
| Release fraction to air from process (initial release prior to RMM):                                      | 1,02E-03                                 |
| Release fraction to wastewater from process (initial release prior to RMM):                               | 1,2E-07                                  |
| Release fraction to soil from process (initial release prior to RMM):                                     | 0  |
| <b>Technical conditions and measures at process level (source) to prevent release</b>                     |  |
| Common practices vary across sites thus conservative process release estimates used.                      |  |
| <b>Organisational measures to prevent/limit release from site</b>   |  |
| Do not apply industrial sludge to natural soils.<br>Sludge should be incinerated, contained or reclaimed. |  |
| <b>Conditions and Measures related to municipal sewage treatment plant</b>                                |  |
| Estimated substance removal from wastewater via domestic sewage treatment (%)                             | 91,9                                     |
| Assumed domestic sewage treatment plant flow (m3/d)   | 2,000E+06                                |
| <b>Conditions and Measures related to external treatment of waste for disposal</b>                        |  |
| External treatment and disposal of waste should comply with applicable local and/or regional regulations. |  |
| <b>Conditions and measures related to external recovery of waste</b>                                      |  |
| External recovery and recycling of waste should comply with applicable local and/or regional regulations. |  |

|   |                            |
|---|----------------------------|
| <b>SECTION 3</b>  | <b>EXPOSURE ESTIMATION</b> |
| <b>Section 3.1 - Health</b>   |                            |
| The Easy TRA tool has been used to estimate workplace exposures unless otherwise indicated. |                            |

|                                 |
|---------------------------------|
| <b>Section 3.2 -Environment</b> |
| Used EUSES model.               |

|                             |  |
|-----------------------------|--|
| <b>SECTION 4</b>            | <b>GUIDANCE TO CHECK COMPLIANCE WITH THE EXPOSURE SCENARIO</b> |
| <b>Section 4.1 - Health</b> |  |



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Predicted exposures are not expected to exceed the DN(M)EL when the Risk Management Measures/Operational Conditions outlined in Section 2 are implemented. Where other Risk Management Measures/Operational Conditions are adopted, then users should ensure that risks are managed to at least equivalent levels.

### Section 4.2 -Environment

Guidance is based on assumed operating conditions which may not be applicable to all sites; thus, scaling may be necessary to define appropriate site-specific risk management measures.

Required removal efficiency for wastewater can be achieved using onsite/offsite technologies, either alone or in combination.

Required removal efficiency for air can be achieved using on-site technologies, either alone or in combination.

Further details on scaling and control technologies are provided in SpERC factsheet (<http://cefic.org>).

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### Exposure Scenario - Worker

|                         |   |
|-------------------------|---|
| <b>300000000717</b>     |   |
| <b>SECTION 1</b>        | <b>EXPOSURE SCENARIO TITLE</b>  |
| <b>Title</b>            | FRP manufacturing in an industrial setting, using UP/VE resins and/or formulated resins (gelcoat, bonding paste, putty etc.)  |
| <b>Use Descriptor</b>   | <b>Sector of Use:</b> SU3, SU12<br><b>Process Categories:</b> PROC3, PROC5, PROC7, PROC8b, PROC10, PROC13, PROC14, PROC15<br><b>Environmental Release Categories:</b> ERC6d   |
| <b>Scope of process</b> | Processing of formulated polymers including material transfers, additives handling (e.g. pigments, stabilisers, fillers, plasticisers, etc.), moulding, curing and forming activities, material re-works, storage and associated maintenance. |

| SECTION 2   |  | OPERATIONAL CONDITIONS AND RISK MANAGEMENT MEASURES  |  |
|---|--|--|--|
| Section 2.1   |  | Control of Worker Exposure   |  |
| Product Characteristics   |  |  |  |
| Physical form of product  |  | Liquid, vapour pressure 0.5 - 10 kPa at STP  |  |
| Concentration of the Substance in Mixture/Article   |  | Covers use of substance/product up to 100% (unless stated differently).,   |  |
| Frequency and Duration of Use   |  |  |  |
| Covers daily exposures up to 8 hours (unless stated differently).   |  |  |  |
| Other Operational Conditions affecting Exposure   |  |  |  |
| Assumes a good basic standard of occupational hygiene is implemented.<br>Assumes activities are at ambient temperature (unless stated differently). |  |  |  |
| Contributing Scenarios  |  | Risk Management Measures   |  |
| General measures (eye irritants).   |  | Use suitable eye protection.<br>Avoid direct eye contact with product, also via contamination on hands.  |  |
| General measures (skin irritants).  |  | Avoid direct skin contact with product. Identify potential areas for indirect skin contact. Wear gloves (tested to EN374) if hand contact with substance likely. Clean up contamination/spills as soon as they occur. Wash off any skin contamination immediately. Provide basic employee training to prevent / minimise exposures and to report any skin problems that may develop.<br>Other skin protection measures such as impervious suits and face shields may be required during high dispersion activities which are likely to lead to substantial aerosol release, e.g. spraying. |  |
| Rolling, BrushingRoller,  |  | Provide a good standard of general or controlled ventilation (5  |  |

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| spreader, flow applicationPROC10  | to 15 air changes per hour).<br>Use long handled brushes and rollers where possible.<br>Ensure the ventilation system is regularly maintained and tested.<br>Dispose of empty containers and wastes safely.<br>Wear suitable coveralls to prevent exposure to the skin.                                     |
| SprayingSpraying (automatic/robotic)PROC7   | Carry out in a vented booth or extracted enclosure.<br>Ensure the ventilation system is regularly maintained and tested.<br>Dispose of empty containers and wastes safely.<br>Wear suitable coveralls to prevent exposure to the skin.  |
| ManualSprayingPROC7   | Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour).<br>Use long handled tools where possible.<br>Carefully pour from containers.<br>Wear suitable coveralls to prevent exposure to the skin.<br>Wear a respirator conforming to EN140 with Type A filter or better. |
| Dipping, immersion and pouringRolling, BrushingRoller, spreader, flow applicationssmall scale-PROC10  | Limit the substance content in the product to 25 %.<br>Provide a good standard of general or controlled ventilation (5 to 15 air changes per hour).   |
| Dipping, immersion and pouringContinuous processPROC13  | Provide extraction ventilation at points where emissions occur.   |
| Casting operationsMixing operations (open systems)PROC5   | Limit the substance content in the product to 25 %.<br>Provide extraction ventilation at points where emissions occur.  |
| General exposures (closed systems)Mixing operations (closed systems)PROC5   | Handle substance within a predominantly closed system provided with extract ventilation.<br>Provide a good standard of general or controlled ventilation (5 to 15 air changes per hour).<br>Put lids on containers immediately after use.   |
| Automated process with (semi) closed systems.Use in contained batch processesPROC3  | Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour).<br>Put lids on containers immediately after use.  |
| Production or preparation of articles by tableting, compression, extrusion or pelletisationTreatment by heatingBatch processes at elevated temperaturesPROC14 | Limit the substance content in the product to 25 %.<br>Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour).<br>, or:<br>Provide the operation with a properly sited receiving hood.  |
| Material transfersPROC3   | Transfer via enclosed lines.<br>Provide a good standard of general ventilation (not less than   |

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|  | 3 to 5 air changes per hour).  |
| Drum/batch transfersPouring from small containersTransfer from/pouring from containersMixing operations (open systems)Preparation of material for applicationPROC5 | Use drum pumps or carefully pour from container.<br>Provide extraction ventilation at points where emissions occur.<br>Put lids on containers immediately after use.             |
| Laboratory activitiesPROC15  | No other specific measures identified.   |
| Disposal of wastesPROC8b   | Provide extraction ventilation at points where emissions occur.<br>Contain and dispose of waste according to local regulations.<br>Put lids on containers immediately after use. |
| <b>Section 2.2</b>   | <b>Control of Environmental Exposure</b>   |
| Substance is a unique structure.   |  |
| <b>Amounts Used</b>  |  |
| Fraction of EU tonnage used in region:   | 0,1  |
| Regional use tonnage (tonnes/year):  | 8,06E+05   |
| Fraction of Regional tonnage used locally:   | 0,6  |
| Annual site tonnage (tonnes/year):   | 4,8E+04  |
| Maximum daily site tonnage (kg/day):   | 1,61E+05   |
| <b>Frequency and Duration of Use</b>   |  |
| Emission Days (days/year):   | 300  |
| <b>Environmental factors not influenced by risk management</b>   |  |
| Local freshwater dilution factor:  | 10   |
| Local marine water dilution factor:  | 100  |
| <b>Other Operational Conditions affecting Environmental Exposure</b>   |  |
| Release fraction to air from process (initial release prior to RMM):   | 1,02E-03   |
| Release fraction to wastewater from process (initial release prior to RMM):  | 6,3E-06  |
| Release fraction to soil from process (initial release prior to RMM):  | 0E+00  |
| <b>Technical conditions and measures at process level (source) to prevent release</b>  |  |
| Common practices vary across sites thus conservative process release estimates used.   |  |
| <b>Organisational measures to prevent/limit release from site</b>  |  |
| Do not apply industrial sludge to natural soils.<br>Sludge should be incinerated, contained or reclaimed.  |  |
| <b>Conditions and Measures related to municipal sewage treatment plant</b>   |  |
| Estimated substance removal from wastewater via domestic sewage treatment (%)  | 91,9   |
| Assumed domestic sewage treatment plant flow (m3/d)  | 2,000E+06  |
| <b>Conditions and Measures related to external treatment of waste for disposal</b>   |  |
| This substance is consumed during use and no waste of substance is generated.  |  |
| <b>Conditions and measures related to external recovery of waste</b>   |  |
| This substance is consumed during use and no waste of substance is generated.  |  |

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| <b>SECTION 3</b>  | <b>EXPOSURE ESTIMATION</b>                                     |
| <b>Section 3.1 - Health</b>   |  |
| The Easy TRA tool has been used to estimate workplace exposures unless otherwise indicated.   |  |
| <b>Section 3.2 -Environment</b>   |  |
| Used Easy TRA model.  |  |
| <b>SECTION 4</b>  | <b>GUIDANCE TO CHECK COMPLIANCE WITH THE EXPOSURE SCENARIO</b> |
| <b>Section 4.1 - Health</b>   |  |
| Predicted exposures are not expected to exceed the DN(M)EL when the Risk Management Measures/Operational Conditions outlined in Section 2 are implemented.<br>Where other Risk Management Measures/Operational Conditions are adopted, then users should ensure that risks are managed to at least equivalent levels. |  |
| <b>Section 4.2 -Environment</b>   |  |
| Guidance is based on assumed operating conditions which may not be applicable to all sites; thus, scaling may be necessary to define appropriate site-specific risk management measures.  |  |
| Required removal efficiency for wastewater can be achieved using onsite/offsite technologies, either alone or in combination.   |  |
| Required removal efficiency for air can be achieved using on-site technologies, either alone or in combination.   |  |
| Further details on scaling and control technologies are provided in SpERC factsheet ( <a href="http://cefic.org">http://cefic.org</a> ).  |  |

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### Exposure Scenario - Worker

|                         |   |
|-------------------------|---|
| <b>300000000719</b>     |   |
| <b>SECTION 1</b>        | <b>EXPOSURE SCENARIO TITLE</b>  |
| <b>Title</b>            | FRP manufacturing in a professional setting, using UP/VE resins and/or formulated resins (gelcoat, bonding paste, putty etc.)   |
| <b>Use Descriptor</b>   | <b>Sector of Use:</b> SU22, SU12<br><b>Process Categories:</b> PROC3, PROC4, PROC5, PROC8a, PROC10, PROC11<br><b>Environmental Release Categories:</b> ERC8f  |
| <b>Scope of process</b> | Manufacture of polymers from monomers in continuous and batch processes. Including production, re-cycling and recovery, degassing, discharging, reactor maintenance and immediate polymer product formation (i.e. compounding, pelletisation, product off-gassing). |

| SECTION 2   | OPERATIONAL CONDITIONS AND RISK MANAGEMENT MEASURES  |  |
|---|--|--|
| Section 2.1   | Control of Worker Exposure   |  |
| Product Characteristics   |  |  |
| Physical form of product  | Liquid, vapour pressure 0.5 - 10 kPa at STP  |  |
| Concentration of the Substance in Mixture/Article   | Covers use of substance/product up to 100% (unless stated differently).,   |  |
| Frequency and Duration of Use   |  |  |
| Covers daily exposures up to 8 hours (unless stated differently).   |  |  |
| Other Operational Conditions affecting Exposure   |  |  |
| Assumes a good basic standard of occupational hygiene is implemented.<br>Assumes activities are at ambient temperature (unless stated differently). |  |  |
| Contributing Scenarios  | Risk Management Measures   |  |
| General measures (eye irritants).   | Use suitable eye protection.<br>Avoid direct eye contact with product, also via contamination on hands.  |  |
| General measures (skin irritants).  | Avoid direct skin contact with product. Identify potential areas for indirect skin contact. Wear gloves (tested to EN374) if hand contact with substance likely. Clean up contamination/spills as soon as they occur. Wash off any skin contamination immediately. Provide basic employee training to prevent / minimise exposures and to report any skin problems that may develop.<br>Other skin protection measures such as impervious suits and face shields may be required during high dispersion activities which are likely to lead to substantial aerosol release, e.g. spraying. |  |

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| Rolling, BrushingRoller, spreader, flow applicationPROC10                                   | Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour).<br>Use long handled brushes and rollers where possible.<br>Wear suitable gloves tested to EN374.<br>Wear a respirator conforming to EN140 with Type A filter or better.  |
| SprayingPROC11  | Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour).<br>Segregate the activity away from other operations.<br>Avoid carrying out activities involving exposure for more than 4 hours<br>Wear a full face respirator conforming to EN140 with Type A filter or better. |
| Dipping, immersion and pouringRolling, BrushingRoller, spreader, flow applicationPROC10     | Limit the substance content in the product to 25 %.<br>Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour).<br>Wear a respirator conforming to EN140 with Type A filter or better.  |
| Material transfersPouring from small containersPreparation of material for applicationPROC5 | Use drum pumps or carefully pour from container.<br>Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour).<br>Put lids on containers immediately after use.<br>Wear a respirator conforming to EN140 with Type A filter or better.                                      |
| Use in contained batch processesPROC3PROC4  | Wear a respirator conforming to EN140 with Type A filter or better.<br>, or:<br>Limit the substance content in the product to 25 %.  |
| Equipment maintenance-Maintenance of small itemsPROC8a                                      | Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour).<br>Avoid carrying out activities involving exposure for more than 1 hour.  |
| Disposal of wastesPROC8a  | Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour).<br>Dispose of empty containers and wastes safely.<br>Avoid carrying out activities involving exposure for more than 1 hour.  |
| <b>Section 2.2</b>  | <b>Control of Environmental Exposure</b>   |
| Substance is a unique structure.  |  |
| <b>Amounts Used</b>   |  |
| Fraction of EU tonnage used in region:  | 0,1  |
| Regional use tonnage (tonnes/year):   | 2,42E+06   |
| Fraction of Regional tonnage used locally:  | 0,6  |
| Annual site tonnage (tonnes/year):  | 1,45E+05   |
| Maximum daily site tonnage (kg/day):  | 4,83E+05   |

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| <b>Frequency and Duration of Use</b>  |          |
| Emission Days (days/year):  | 300      |
| <b>Environmental factors not influenced by risk management</b>  |          |
| Local freshwater dilution factor:   | 10       |
| Local marine water dilution factor:   | 100      |
| <b>Other Operational Conditions affecting Environmental Exposure</b>                                      |          |
| Release fraction to air from process (initial release prior to RMM):                                      | 1,02E-03 |
| Release fraction to wastewater from process (initial release prior to RMM):                               | 1,2E-07  |
| Release fraction to soil from process (initial release prior to RMM):                                     | 0E+00    |
| <b>Conditions and Measures related to municipal sewage treatment plant</b>                                |          |
| Estimated substance removal from wastewater via domestic sewage treatment (%)                             | 91,9     |
| Assumed domestic sewage treatment plant flow (m3/d)   | 2,0E+06  |
| <b>Conditions and Measures related to external treatment of waste for disposal</b>                        |          |
| External treatment and disposal of waste should comply with applicable local and/or regional regulations. |          |
| <b>Conditions and measures related to external recovery of waste</b>                                      |          |
| External recovery and recycling of waste should comply with applicable local and/or regional regulations. |          |

|   |                            |
|---|----------------------------|
| <b>SECTION 3</b>  | <b>EXPOSURE ESTIMATION</b> |
| <b>Section 3.1 - Health</b>   |                            |
| The Easy TRA tool has been used to estimate workplace exposures unless otherwise indicated. |                            |
| <b>Section 3.2 -Environment</b>   |                            |
| Used Easy TRA model.  |                            |

|   |  |
|---|--|
| <b>SECTION 4</b>  | <b>GUIDANCE TO CHECK COMPLIANCE WITH THE EXPOSURE SCENARIO</b> |
| <b>Section 4.1 - Health</b>   |  |
| Predicted exposures are not expected to exceed the DN(M)EL when the Risk Management Measures/Operational Conditions outlined in Section 2 are implemented.<br>Where other Risk Management Measures/Operational Conditions are adopted, then users should ensure that risks are managed to at least equivalent levels. |  |

|  |  |
|--|--|
| <b>Section 4.2 -Environment</b>  |  |
| Guidance is based on assumed operating conditions which may not be applicable to all sites; thus, scaling may be necessary to define appropriate site-specific risk management measures. |  |
| Required removal efficiency for wastewater can be achieved using onsite/offsite technologies, either alone or in combination.  |  |
| Required removal efficiency for air can be achieved using on-site technologies, either alone or in combination.  |  |
| Further details on scaling and control technologies are provided in SpERC factsheet  |  |



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(<http://cefic.org>).