

MATERIAL SAFETY DATA SHEET

(According to Regulation EC No 1907/2006 - REACH)

STYRENE

1. PRODUCT IDENTIFICATION

Company: REPSOL QUÍMICA S.A. Address: Paseo de la Castellana, 280 28046 MADRID Tel# +34 91 348 80 00 Fax# +34 91 348 94 94 e-mail address: SDSChemicals@repsol.com	Commercial name: STYRENE Chemical name: Styrene Synonyms: Vinylbenzene, phenylethylene, phenyl ethene.	Molecular formula: C ₈ H ₈	CAS #: 100-42-5
Emergency Telephone #: Puertollano: +34 926 41 95 00	EC (EINECS)#: 202-851-5	Annex I (Dir. 67/548/EEC)#: 601-026-00-0	

2. HAZARDS IDENTIFICATION

PHYSICAL / CHEMICAL	TOXICITY (SYMPTOMS)
Flammable and volatile liquid. Vapour/gas explosion hazard in contact with air.	Inhalation: Vapours may cause irritation of mucous membranes of the respiratory tract, nose and throat. Prolonged inhalation of vapours may cause respiratory tract obstruction (including pulmonary edema). High vapour concentrations cause headache, fatigue, nausea, central nervous system depression, dizziness, loss consciousness and even death due to respiratory centre paralysis. Ingestion/Aspiration: Harmful if swallowed. Symptoms are same as inhalation. Additional symptoms are severe irritation of mouth, throat and stomach. Contact skin/eyes: Contact with liquid may cause irritation. Prolonged and repeated contact may cause infection and dermatitis. . Splashes may cause irritation and slight injury of the corneal epithelium. General toxic effects: Harmful by inhalation. Irritating to eyes and skin.
Floats on water. It reacts violently with acids and peroxides.	
It polymerizes easily without an inhibitor.	
Flammable vapour is produced. Vapour explosion hazard indoors, outdoors or in sewers.	

3. COMPOSITION

General composition: Styrene.			
Dangerous components	Range %	Classification	S Phrases
Styrene	99.6 %	R10 Xn; R20 Xi; R36/38	S(2-)23

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4. FIRST-AID MEASURES

Inhalation: Remove the affected person to fresh air; keep warm and quiet. If breathing has stopped or it is difficult, give artificial respiration. Call immediately for medical attention.

Ingestion/Aspiration: Give nothing by mouth. Do not induce vomiting. Call for medical attention.

Contact skin/eyes: In case of contact with liquid product, wash skin area with plenty of warm water and soap. In contact with eyes, hold eyelids open and immediately flush with plenty of warm water for at least 15 minutes. Remove and isolate contaminated clothing and shoes at the site. Call medical attention.

General measures: Call for medical attention.

5. FIRE-FIGHTING MEASURES

Extinguishing agents: Dry chemicals powder, foam, CO₂, water spray. Sand and earth may be used for small fires only.

Non suitable extinguishing agents: Water applied directly may be ineffective due to dispersion of the material.

Combustion products: CO₂, H₂O; formaldehyde; CO (in defect of oxygen). Fire may produce irritating fumes and the gases are very acid.

Special measures: Move containers from fire area if you can do it without risk. Cool exposed containers to flames with water. Avoid ignition sources. Withdraw immediately in case of alarm. Consult and follow existing emergency standard procedures.

Special hazards: Flammable/combustible material. May be ignited by heat, sparks, flames or static discharge. Containers may explode in heat fire. Vapours are heavier than air and may travel to a source of ignition and flash back or reach explosive concentrations in enclosed spaces. At high temperatures polymerization may occur.

Protective equipment: Full protective clothing and self-contained breathing equipment (SCBA) in presence of high fumes concentration.

6. ACCIDENTAL RELEASE MEASURES

Environmental precautions: Prevent contamination of soil and water. Prevent from spreading or entering into drains, ditches or rivers by using sand, earth or other appropriate barriers. Shut off ignition sources; no flares, sparks, smoking or flames in hazard area.

Personal precautions: Keep unnecessary people away; isolate hazard area and deny entry. Do not smoke. Avoid prolonged contact with the product and vapours inhalation. Ventilate contaminated area thoroughly.

Cleanup methods: Chemical and physical treatment. Water spray may reduce vapour; but it may not prevent ignition in closed spaces.

Small spillages: Take up with vermiculite, dry sand or other non-combustible absorbent material and placed into containers for later disposal.

Large spillages: Dike far ahead of liquid spill for later disposal.

Personal protection: Wear suitable protective suit and respiratory protective mask with A type brown filter against organic vapours, solvents and built-in particulate filter NPF 400. Immediately remove any contaminated clothing and shoes to avoid flammability hazard.

7. HANDLING AND STORAGE

Handling:

General precautions: Wear appropriate protective clothing to avoid contact with the product and respiratory protective mask in presence of vapours. Avoid sparks, smoking or flames in hazard area. Do not handle damaged containers unless wearing appropriate personal protective equipment. The product has a marked tendency to build up static charge when transferred by pipelines, either liquid or pneumatic transport, therefore should be properly earthed.

Specific conditions: Mechanical ventilation should be used if necessary to maintain airborne levels of styrene at or below the permissible limit. In operations filling or handling containers, use appropriate impervious suits and respiratory protection in presence of vapours. Special procedures will be necessary during tank loading, cleaning or maintaining. Tanks must be empty before any inspection by trained personal.

Specific Use: Base chemical for the production of polystyrene, rubbers and resins.

Storage:

Temperature and decomposition products: Flammable vapours/gases.

Dangerous reactions: Flammable liquid. Take precautionary measures against static discharges polymerization run off hazard.

Storage conditions: The product should be stored in air-tight and product resistant containers, properly labelled and sealed, placed in cool and well-ventilated areas. For containers or container linings, use stainless steel, zinc silicate or epoxy resins. Keep at temperature not exceeding 25 °C. Protect containers against physical damage and fire. Outdoor or detached storage is preferable. Separate from oxidizing materials. For indoor storage, use standard cabinets prepared for flammable liquid. Keep away from direct sunlight and other sources of heat or ignition. In hot climates (tropical and subtropical areas), store in tank with temperature alarm system and supply tanks with adequate cooling systems. Centrifugal pumps must not be allowed to run with a closed discharge line, because this will cause polymerization in the pump.

Incompatible materials: Oxidizers, nitrile rubbers, catalysts for vinyl polymers; peroxides, strong acids, aluminium chloride, copper and copper alloys.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Personal protection:

Eye protection: Safety goggles or face shield to avoid splashes.

Respiratory protection: Protective mask against organic vapours and built-in particulate filter NPF 20 in the presence of vapours.

Skin protection: Neoprene or nitrile rubber gloves, safety shoes and chemical resistant clothes.

Other protective equipment: Showers and eye-washers in working area.

General precautions: Avoid prolonged contact and vapour inhalation. Contaminated clothing must be quickly wet to eliminate inflammation risk.

Specific hygiene measures: Do not breathe vapours. Keep away from food, drink and animal feedingstuffs.

Exposure controls: TLV/TWA (ACGIH);VLA-ED (INSHT): 20 ppm (85 mg/m³) (skin)

TLV/STEL (ACGIH); VLA-EC (INSHT): 40 ppm (170 mg/m³) (skin)

OSHA PEL: TWA 100 ppm; Ceiling 200 ppm; Peak 600 ppm/5 min./3hr

NIOSH REL-air: 10H TWA 50 ppm; STEL 100 ppm

IDLH: 700 ppm

MAK: 20 ppm

UK: OEL-TWA (COSHH):100 ppm(430 mg/m³). OEL-STEL:250ppm (1080mg/m³)

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance: Liquid.

pH: NP

Colour: Colourless.

Odour: Sweet.

Boiling point: 145 °C

Melting/Freezing point: -31°C

Flash point: 32 °C (Abel)

Autoignition temperature: 490°C

Explosive properties: Lower Explosive Limit: 1.1%
Upper Explosive Limit: 6.1%

Oxidizing properties: NP

Vapour pressure: 670 Pa at 20 °C

Density: (liq.) 0.906 g/cm³ at 20 °C

Surface tension: 34 mN/m at 19 °C

Viscosity: 0,76 mPa.s (at 20°C)

Vapour density: 3.6 (air=1)

Partition coefficient (n-octanol/water): log P_{OW}: 2.95

Water solubility: 0.29 Kg/m³

Solubility: Organic solvent: Ether, benzene.

Other data: Dynamic viscosity: 0.7 mPa.s at 25 °C

Odour threshold: 0.1 ppm

Heat of combustion: -1018.83 Kcal/mol at 25 °C

Critical temperature: 373 °C

Relative evaporation rate: 12.4 (ASTM D 3539, nBuAc=1)

Molecular mass: 104.15

Electrical conductivity: < 50 pS/m

10. STABILITY AND REACTIVITY

Stability: Styrene is stabilized by terbutylcatechol. If this is not present in adequate concentrations, styrene can polymerize. Styrene oxidises on contact with air and reacts violently with strong oxidising agents

Conditions to avoid: Exposure to heat, sparks, static electricity or flames. Styrene readily reacts with low concentrations of halogens in the presence of UV light to produce a potent lacrimator.

Materials to avoid: Oxidizers, halides, catalysts for vinyl polymers; peroxides, strong acids, aluminium chloride, copper and copper alloys.

Hazardous decomposition/combustion products: Flammable vapours/gases.

Polymerization risk: May occur if heated above 65 °C. May cause rupture of container.

Conditions to avoid: Metal salts, peroxides and strong acids, heat and light.

11. TOXICOLOGICAL INFORMATION

Routes of exposure: Contact with skin, eyes and inhalation. Ingestion is easy to prevent and not frequent.

Acute and chronic effects: Harmful by inhalation. Acute exposure to styrene may produce irritation of the respiratory tract. Prolonged and repeated exposures may cause adverse effects on health.

LC₅₀>5 mg/l (inhalation-rat)

LD₅₀> 2 g/Kg (oral-rat)

Irritation date: skin-rabbit: 500 mg open middle irritation.

Irritation date: eye-rabbit: 100 mg severe irritation.

Carcinogenicity: NP.

Reproductive toxicity: Not expected to be a reproductive toxicant.

Medical conditions which increase hazard to exposure: Respiratory deficiencies and dermatological problems.

12. ECOLOGICAL INFORMATION

Pollutant potential:

Persistence and degradability: Significant amounts of styrene may be released to the environment from emissions generated by its production, use and from automobile exhaust. Oxidises rapidly by photo-chemical reactions in air. Readily biodegradable meeting the 10 day window criterion.

Mobility/bioaccumulative potential: Floats on water and evaporate rapidly within a day from water or soil surfaces. If it enters soil, it will be mobile and may contaminate groundwater. Styrene is not expected to bioaccumulate or bioconcentrate in organisms and it does not present incidence in food webs.

Ecotoxicological effects: In view of the high rate of loss from solution, the product is unlikely to pose a significant hazard to aquatic life, although concentration greater than 0,25 ppm will cause tainting of seafood.

1 mg/l < EC₅₀ < 10 mg/l (*Daphnia magna*).

1 mg/l < EC₅₀ < 10 mg/l (*fish*).

1 mg/l < EC₅₀ < 10 mg/l (*bacteria*).

13. DISPOSAL CONSIDERATIONS

Disposal methods (surplus): Recover or recycle if possible. Otherwise: Incineration

Waste: Industrial processes or other uses.

Disposal: By atomizing in a suitable combustion chamber; absorbing in vermiculite, dry sand, earth or similar material; evaporation in a safe place. Styrene may be subjected to ultimate disposal by controlled incineration.

Handling: Labelled and sealed containers. The waste is a flammable liquid. Risk of explosion. Avoid heat, sparks, static electricity or open flames. Reduce contact with skin and inhalation of vapours.

Provisions: Companies which recover, dispose, store, transport or handle waste should comply with Dir. 91/156/EEC on waste or other local, national or community provisions.

14. TRANSPORT INFORMATION

Special precautions: Labelled flammable liquid. Store in cool well ventilated areas. Acceptable modes of transportation are air, rail, road and water (styrene monomer stabilised). Styrene monomer, uninhibited is forbidden for transport on passenger and cargo aircraft.

Additional information:

UN Number: 2055

ADR/RID: Class 3. Classification code: F1. Packaging group III

Hazard identification number: 39

IATA-DGR: Class 3. Packaging group III

Proper shipping name: STYRENE MONOMER, STABILIZED

IMDG: Class 3.3. Packaging/container group III.

15. REGULATORY INFORMATION

CLASSIFICATION

R10
Xn; R20
Xi; R36/38

LABELLING

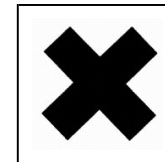
Symbols: Xn

Phrases R

R10: Flammable.
R20: Harmful by inhalation.
R36/38: Irritating to eyes and skin.

Phrases S

S2: Keep out of the reach of children.
S23: Do not breathe vapour/fumes



Other regulations:

16. OTHER INFORMATION

Data Bases consulted

EINECS: European Inventory of Existing Commercial Substances.
TSCA: Toxic Substances Control Act, US Environmental Protection Agency
HSDB: US National Library of Medicine.
RTECS: US Dept. of Health & Human Services

R phrases shown in the document:

Legislation consulted

Regulation (EC) no 1272/2008 of the European Parliament and of the Council of 16 December 2008 on classification, labelling and packaging of substances and mixtures (CLP).
Regulation (EC) No 1907/2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH).
Dir. 67/548/EEC about classification, labelling and packaging of dangerous substances (including amendments and adaptations in force).
Dir. 1999/45/EC about classification, labelling and packaging of dangerous preparations (including amendments and adaptations in force).
Dir. 91/689/EEC dangerous waste; Dir. 91/156/EEC waste management.
Royal Decree 363/95: Regulation about notification of new substances and classification, packaging and labelling of dangerous substances.
Royal Decree 255/2003: Regulation about classification, packaging and labelling of dangerous preparations.
European Agreement concerning the international carriage of dangerous goods by road (ADR).
Regulation on the international transport of dangerous goods on the railway. (RID)
International maritime code of dangerous goods. (IMDG)
International Air Transport Association (IATA) regulation pertaining to air shipment.

Glossary

CAS: Chemical Abstract Service
IARC: International Agency for Research on Cancer
ACGIH: American Conference of Governmental Industrial Hygienists.
TLV: Threshold Limit Value
TWA: Time Weighted Average
STEL: Short-term Exposure Level
REL: Recommendable Exposure Limit
PEL: Permissible Exposure Limit
INSHT: Instituto Nal. de Seguridad e Higiene en el Trabajo

VLA-ED: Valor Límite Ambiental – Exposición Diaria
VLA-EC: Valor Límite Ambiental – Exposición Corta
LD₅₀: Lethal Dose Medium
LC₅₀: Lethal Concentration Medium
EC₅₀: Effective Concentration Medium
IC₅₀: Inhibitory Concentration Medium
BOD: Biological Oxygen Demand.
NP: Not Pertinent
| : Changes from the last revision

The information given in this document has been compiled based on the best existing information sources, latest available knowledge and according to the current requirements on classification, packaging and labelling of hazardous substances. It does not imply the information is exhaustive or accurate in all cases. It is the user's responsibility to determine the validity of the information contained in this Material Safety Data Sheet to apply depending on the case.