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ISO 9001: 2015

MATERIAL SAFETY DATA SHEET

1. Identification

1.1 GHS Product identifier

Styrene, monomer, 99%

Code S 2645

2. Hazard identification

2.1 Classification of the substance or mixture

Flammable liquids, Category 3

Skin irritation, Category 2

Eye irritation, Category 2

Acute toxicity - Inhalation, Category 4

Specific target organ toxicity - repeated exposure, Category 1

Reproductive toxicity, Category 2

2.2 GHS label elements, including precautionary statements

Pictogram(s)



Signal word

Hazard statement(s)

Danger

H226 Flammable liquid and vapour

H315 Causes skin irritation

H319 Causes serious eye irritation

H332 Harmful if inhaled

H372 Causes damage to organs through prolonged or repeated exposure

H361d

Precautionary statement(s)

Prevention

P210 Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.

P233 Keep container tightly closed.

P240 Ground and bond container and receiving equipment.

P241 Use explosion-proof [electrical/ventilating/lighting/...] equipment.

P242 Use non-sparking tools.

P243 Take action to prevent static discharges.

P280 Wear protective gloves/protective clothing/eye protection/face protection.

P264 Wash ... thoroughly after handling.

P261 Avoid breathing dust/fume/gas/mist/vapours/spray.

P271 Use only outdoors or in a well-ventilated area.

P260 Do not breathe dust/fume/gas/mist/vapours/spray.

P270 Do not eat, drink or smoke when using this product.

P201 Obtain special instructions before use.

P202 Do not handle until all safety precautions have been read and understood.

Response

P303+P361+P353 IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water [or shower].

P370+P378 In case of fire: Use ... to extinguish.

P302+P352 IF ON SKIN: Wash with plenty of water/...

P321 Specific treatment (see ... on this label).

P332+P313 If skin irritation occurs: Get medical advice/attention.

P362+P364 Take off contaminated clothing and wash it before reuse.

P305+P351+P338 IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.

P337+P313 If eye irritation persists: Get medical advice/attention.

P304+P340 IF INHALED: Remove person to fresh air and keep comfortable for breathing.

P312 Call a POISON CENTER/doctor/2026 if you feel unwell.

P314 Get medical advice/attention if you feel unwell.

Storage

P308+P313 IF exposed or concerned: Get medical advice/ attention.

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

P405 Store locked up.

Disposal

P501 Dispose of contents/container to ...

2.3 Other hazards which do not result in classification
none

3. Composition/information on ingredients

3.1 Substances

Chemical name	Common names and synonyms	CAS number	EC number	Concentration
styrene	styrene	100-42-5	none	100%

4. First-aid measures

4.1 Description of necessary first-aid measures

General advice

Consult a physician. Show this safety data sheet to the doctor in attendance.

If inhaled

Fresh air, rest. Refer for medical attention.

In case of skin contact

Remove contaminated clothes. Rinse and then wash skin with water and soap.

In case of eye contact

First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.

If swallowed

Rinse mouth. Do NOT induce vomiting. Give one or two glasses of water to drink. Rest.

4.2 Most important symptoms/effects, acute and delayed

Moderate irritation of eyes and skin. High vapor concentrations cause dizziness, drunkenness, and anesthesia. (USCG, 1999)

Excerpt from ERG Guide 133 [Flammable Solids]: Fire may produce irritating and/or toxic gases. Contact may cause burns to skin and eyes. Contact with molten substance may cause severe burns to skin and eyes. Runoff from fire control may cause pollution. (ERG, 2016)

4.3 Indication of immediate medical attention and special treatment needed, if necessary

Immediate first aid: Ensure that adequate decontamination has been carried out. If patient is not breathing, start artificial respiration, preferably with a demand-valve resuscitator, bag-valve-mask device, or pocket mask, as trained. Perform CPR as necessary. Immediately flush contaminated eyes with gently flowing water. Do not induce vomiting. If vomiting occurs, lean patient forward or place on left side (head-down position, if possible) to maintain an open airway and prevent aspiration. Keep patient quiet and maintain normal body temperature. Obtain medical attention. /Aromatic hydrocarbons and related compounds/

5. Fire-fighting measures

5.1 Extinguishing media

Suitable extinguishing media

Use water spray to cool unopened containers.

5.2 Specific hazards arising from the chemical

Behavior in Fire: Vapor is heavier than air and may travel considerable distance to a source of ignition and flash back. At elevated temperatures such as in fire conditions, polymerization may take place which may lead to container explosion. (USCG, 1999)
Excerpt from ERG Guide 133 [Flammable Solids]: Flammable/combustible material. May be ignited by friction, heat, sparks or flames. Some may burn rapidly with flare-burning effect. Powders, dusts, shavings, borings, turnings or cuttings may explode or burn with explosive violence. Substance may be transported in a molten form at a temperature that may be above its flash point. May re-ignite after fire is extinguished. (ERG, 2016)

5.3 Special protective actions for fire-fighters

Wear self-contained breathing apparatus for firefighting if necessary.

6. Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. Avoid dust formation. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas. Avoid breathing dust. For personal protection see section 8.

6.2 Environmental precautions

Personal protection: particulate filter respirator adapted to the airborne concentration of the substance. Ventilation. Remove all ignition sources. Sweep spilled substance into covered suitable, labelled containers.

6.3 Methods and materials for containment and cleaning up

If styrene is spilled or leaked ... /in/ small quantities, absorb on paper towels. Evaporate in a safe place (such as a fume hood). Allow sufficient time for evaporating vapors to completely clear the hood ductwork. Burn the paper in a suitable location away from combustible materials. Large quantities can be collected and atomized in a suitable combustion chamber. Combustion may be improved by mixing with a more flammable liq.

7. Handling and storage

7.1 Precautions for safe handling

Avoid contact with skin and eyes. Avoid formation of dust and aerosols. Avoid exposure - obtain special instructions before use. Provide appropriate exhaust ventilation at places where dust is formed. For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

Fireproof. Separated from incompatible materials. See Chemical Dangers. Cool. Keep in the dark. Store only if stabilized. Store in an area without drain or sewer access. Must be inhibited during storage.

8. Exposure controls/personal protection

8.1 Control parameters

Occupational Exposure limit values

Recommended Exposure Limit: 15 Minute Short-Term Exposure Limit: 100 ppm (425 mg/cu m).

Recommended Exposure Limit: 10 Hour Time-Weighted Average: 50 ppm (215 mg/cu m).

Biological limit values

no data available

8.2 Appropriate engineering controls

Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

8.3 Individual protection measures, such as personal protective equipment (PPE)

Eye/face protection

Safety glasses with side-shields conforming to EN166. Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin protection

Wear impervious clothing. The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace. Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands. The selected protective gloves have to satisfy the specifications of EU Directive 89/686/EEC and the standard EN 374 derived from it.

Respiratory protection

Wear dust mask when handling large quantities.

Thermal hazards

no data available

9. Physical and chemical properties

Physical state

clear, colorless.

Colour

Colorless to yellowish, oily liquid

Odour

Extremely penetrating

Melting point/ freezing point

-31\u00b0C (lit.)

Boiling point or initial boiling point and boiling range

145\u00b0C

Flammability

Class IC Flammable Liquid: F.I.P. at or above 22.78\u00b0C and below 37.78\u00b0C. Combustible. Gives irritating or toxic fumes (or gases) in a fire.

Lower and upper explosion limit / flammability limit

Lower flammable limit: 0.9% by volume; Upper flammable limit: 6.8% by volume

Flash point

32\u00b0C (lit.)

Auto-ignition temperature

490\u00b0C (USCG, 1999)

Decomposition temperature

no data available

pH

no data available

Kinematic viscosity

0.696 cP at 25\u00b0C

Solubility

In water: 0.3 g/L (20 \u00b0C)

Partition coefficient n-octanol/water (log value)

log Kow = 2.95

Vapour pressure

12.4 mm Hg (37.7 \u00b0C)

Density and/or relative density

0.906

Relative vapour density

3.6 (vs air)

Particle characteristics

no data available

10. Stability and reactivity

10.1 Reactivity

no data available

10.2 Chemical stability

On exposure to light and air it slowly undergoes polymerization and oxidation with formation of peroxides.

10.3 Possibility of hazardous reactions

Flammable liquid. STYRENE MONOMER is a colorless, oily liquid, moderately toxic, flammable. A storage hazard above 32\u00b0C, involved in several industrial explosions caused by violent, exothermic polymerization [Bond, J., Loss Prev. Bull., 1985, (065), p. 25]. Polymerization becomes self-sustaining above 95\u00b0C [MCA SD-37, 1971]. Presence of an inhibitor lessens but does not eliminate the possibility of unwanted polymerization. Violent polymerization leading to explosion may be initiated by peroxides (e.g., di-tert-butyl peroxide, dibenzoyl peroxide), butyllithium, azoisobutyronitrile. Reacts violently with strong acids (sulfuric acid, oleum, chlorosulfonic acid), strong oxidizing agents [Lewis, 3rd ed., 1993, p. 1185]. Reacts with oxygen above 40\u00b0C to form explosive peroxide [Barnes, C. E. et al., J. Amer. Chem. Soc., 1950, 72, p. 210]. Oxidizes readily in air to form unstable peroxides that may explode spontaneously [Bretherick 1979 p.151-154, 164]. Mixing styrene in equal molar portions with any of the following substances in a closed container caused the temperature and pressure to increase: chlorosulfonic acid, oleum, and sulfuric acid [NFA 1991].

10.4 Conditions to avoid

no data available

10.5 Incompatible materials

Oxidizers, catalysts for vinyl polymers, peroxides, strong acids, aluminum chloride [Note: May polymerize if contaminated or subjected to heat. Usually contains an inhibitor such as tert-butylcatechol].

10.6 Hazardous decomposition products

When heated to decomposition it emits acrid smoke and irritating fumes.

11. Toxicological information

Acute toxicity

Oral: LD50 Rat oral, male and female 5000 mg/kg

Inhalation: LC50 Rat inhalation 24 g/cu m/4 hr

Dermal: no data available

Skin corrosion/irritation

no data available

Serious eye damage/irritation

no data available

Respiratory or skin sensitization

no data available

Germ cell mutagenicity

no data available

Carcinogenicity

NTP: Reasonably anticipated to be a human carcinogen

Reproductive toxicity

Human studies have not reported an increase in developmental effects in women who worked in the plastics industry, while an increased frequency of spontaneous abortions and a decreased frequency of births were reported in a study on the reproductive effects of styrene in humans. However, these studies are not conclusive, due to the lack of exposure data and confounding factors.

(2) Animal studies have not reported developmental or reproductive effects from inhalation exposure to styrene. Lung tumors have been observed in the offspring of orally exposed mice. (12)

STOT-single exposure

no data available

STOT-repeated exposure

no data available

Aspiration hazard

no data available

12. Ecological information

12.1 Toxicity

Toxicity to fish: LC50; Species: *Lepomis macrochirus* (Bluegill) length 3.8-6.4 cm, weight 1-2 g; Conditions: freshwater, static, 25°C, pH 7.5, hardness 20 mg/L CaCO₃, alkalinity 18 mg/L CaCO₃, dissolved oxygen 7.8 mg/L; Concentration: 25050 ug/L for 24 hr (95% confidence interval: 19030-33530 ug/L) /formulation

Toxicity to daphnia and other aquatic invertebrates: LC50; Species: *Daphnia magna* (Water Flea) age < or =24 hr; Conditions: freshwater, flow through, 20-21°C, pH 7.5-8.0, hardness 170-180 mg/L CaCO₃, alkalinity 110-120 mg/L CaCO₃, dissolved oxygen 5.8-8.4 mg/L; Concentration: 5000 ug/L for 24 hr (95% confidence interval: 3300-7400 ug/L) /99.929% purity

Toxicity to algae: EC50; Species: *Pseudokirchneriella subcapitata* (Green Algae) 1X10⁴ cells/mL; Conditions: freshwater, static, 24-25°C, pH 7.6-9.4; Concentration: 3900 ug/L for 24 hr (95% confidence interval: 220-66000 ug/L); Effect: decreased population abundance /99.929% purity

Toxicity to microorganisms: no data available

12.2 Persistence and degradability

AEROBIC: Styrene biodegraded 97 and 87% in 16 weeks in a landfill soil and sandy loam soil, respectively. Degradation was not detected in sterile soil(1). Styrene was biodegraded at all experimental concentrations in soil, but decreased with an increase in styrene concentration; 62% at 20 ug/kg to 16% at 1000 mg/kg(2). The rate of microbial transformation varied in different soils and was notably slower in an acid silt loam (pH 4.87)(2). Degradation of styrene of 2.3 to 4.3% per week and 3.8-12.0% per week in subsurface soil was shown with samples taken directly above and below aquifers from Pickett, OK and Fort Polk, LA, respectively; degradation in autoclave samples was not observed(3).

12.3 Bioaccumulative potential

A BCF of 13.5 for goldfish was determined for styrene(1). According to a classification scheme(2), this BCF suggests bioconcentration in aquatic organisms is low(SRC). Calculated biomagnification of styrene in water respiring organisms (zooplankton, forage and predatory fish) and air breathing organisms (reptile, amphibian, sea bird, marine mammal, terrestrial herbivore and carnivore, human) were all <1(3).

12.4 Mobility in soil

The log K_{oc} of styrene is reported to be 2.96(1). According to a classification scheme(2), this K_{oc} value suggests that styrene is expected to have low mobility in soil. More than 85% of styrene is sorbed in 78 hrs on samples from a sandy aquifer(3). Styrene is retained by particulates particularly in organic matter-rich soils(3). Of styrene that had been allowed to sorb for 3 days, 61.0 and 66.7% was desorbed in 16 days from soil and aquifer soils, respectively(4).

12.5 Other adverse effects

no data available

13. Disposal considerations

13.1 Disposal methods

Product

The material can be disposed of by removal to a licensed chemical destruction plant or by controlled incineration with flue gas scrubbing. Do not contaminate water, foodstuffs, feed or seed by storage or disposal. Do not discharge to sewer systems.

Contaminated packaging

Containers can be triply rinsed (or equivalent) and offered for recycling or reconditioning. Alternatively, the packaging can be punctured to make it unusable for other purposes and then be disposed of in a sanitary landfill. Controlled incineration with flue gas scrubbing is possible for combustible packaging materials.

14. Transport information

14.1 UN Number

ADR/RID: UN2055

IMDG: UN2055

IATA: UN2055

14.2UN Proper Shipping Name
ADR/RID: STYRENE MONOMER, STABILIZED

IMDG: STYRENE MONOMER, STABILIZED

IATA: STYRENE MONOMER, STABILIZED

14.3Transport hazard class(es)

ADR/RID: 3

IMDG: 3

IATA: 3

14.4Packing group, if applicable

ADR/RID: III

IMDG: III

IATA: III

14.5Environmental hazards

ADR/RID: no

IMDG: no

IATA: no

14.6Special precautions for user
no data available

14.7Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code

no data available

15.Regulatory information

15.1Safety, health and environmental regulations specific for the product in question

Chemical name	Common names and synonyms	CAS number	EC number
styrene	styrene	100-42-5	none
European Inventory of Existing Commercial Chemical Substances (EINECS)			Listed.
EC Inventory			Listed.
United States Toxic Substances Control Act (TSCA) Inventory			Listed.
China Catalog of Hazardous chemicals 2015			Listed.
New Zealand Inventory of Chemicals (NZIoC)			Listed.
Philippines Inventory of Chemicals and Chemical Substances (PICCS)			Listed.
Vietnam National Chemical Inventory			Listed.
Chinese Chemical Inventory of Existing Chemical Substances (China IECSC)			Listed.

Section 16: Other Information

This safety data sheet should be used in conjunction with technical sheets. It does not replace them. The information given is based on our knowledge of this product, at the time of publication. It is given in good faith. The attention of the user is drawn to the possible risks incurred by using the product for any other purpose other than that for which it was intended. This does not in any way excuse the user from knowing and applying all the regulations governing his activity. It is the sole responsibility of the user to take all precautions required in handling the product. The aim of the mandatory regulations mentioned is to help the user to fulfill his obligations regarding the use of hazardous products.