

Styrene Monomer Product Stewardship Summary

CAS number

100-42-5

Chemical formula

C₈H₈

What is styrene monomer?

Styrene monomer is an aromatic hydrocarbon, which, under normal conditions, is a clear, colourless, flammable liquid. The conventional method for producing styrene monomer is the alkylation of benzene with ethylene followed by dehydrogenation to produce styrene monomer. The notable exception to this is the process to co-produce styrene monomer and propylene oxide via the oxidation of propylene by ethylbenzene hydroperoxide, also known as the 'SMPO' process. Shell chemicals companies operate both manufacturing processes at locations around the globe.

How is styrene monomer used?

Styrene monomer is used to make styrene-based polymers. These, in turn, are used in the manufacture of plastic and rubber products, including polystyrene (PS), expandable polystyrene (EPS), acrylonitrile butadiene styrene (ABS), styrene-acrylonitrile, styrene butadiene rubber (SBR), unsaturated polyester resins, and styrene butadiene latices.

The majority of styrene monomer is used in the production of polystyrene. General purpose, or 'crystal' polystyrene, and high impact polystyrene are used in everyday items such as CD cases, drinks cups, food containers and refrigerator door liners. Expandable polystyrene, a light weight foam, is used in home insulation, as a packaging material, as padding inside motorcycle crash helmets and car interiors, in bridge construction, and to build film-set scenery.

Health, Safety and Environmental considerations

Styrene is a volatile liquid with low toxicity following brief exposure. Liquid styrene is a skin irritant, causing redness and local swelling and possibly some local tingling. It will cause irritation if splashed into the eyes.

If swallowed, vomiting should not be induced as it might enter and damage the lungs. Inhalation of high concentrations of styrene vapours for prolonged periods can cause drowsiness and should be avoided.

Most international agencies classify styrene as a non-carcinogen or as having low cancer potency. The International Agency for Research on Cancer (IARC) has concluded that there is insufficient evidence for carcinogenicity in humans and limited evidence in experimental animals

Regulatory bodies in the EU and the US have not classified styrene as a human carcinogen. In Canada, however, the regulatory system requires a cancer classification due to the IARC position

The American Congress of Governmental Hygienists' (ACGIH) Threshold Limit Value (TLV) is twenty parts per million (20 ppm). This is based on an eight-hour day or 40 hours per week.

In air, styrene is detectable by smell at 0.1 ppm. This is 200 times below the lowest acceptable workplace exposure level of 20 ppm.

Styrene is toxic to aquatic organisms. It is readily biodegradable and has a low potential to bio-accumulate.

Styrene is a flammable liquid. Spontaneous polymerisation (exothermic reaction) may occur, if the product is not properly stabilised with a polymerisation inhibitor. Styrene exposed to high temperatures can affect the efficiency of the inhibitor.

Storing and transporting styrene

Styrene must be stored in well-ventilated areas away from direct sunlight, ignition sources and other sources of heat. Styrene temperature should be monitored and controlled to prevent product temperatures greater than 30°C. Circulation capability is necessary to maintain appropriate oxygen and inhibitor levels. Nitrogen or inert gas blanketing is not acceptable. Styrene is stabilised with a certain amount of inhibitor to avoid spontaneous polymerisation.

Styrene is transported in the US and Canada primarily by rail car or barge. In Europe, styrene is transported over-land by truck, rail car, inland waterways and bulk marine. In the Asia-Pacific/Middle East, styrene is transported via ship, barge and truck.

It is recommended that transport and storage containers are either stainless steel or carbon steel, but not plastic, for incompatibility reasons.

Risk Characterization Summary

Risks associated with exposure to this product have been evaluated for the following "chain-of-commerce" activities: manufacture, storage, product transfer, transportation, and customers/markets. Due to health, safety and environmental considerations, it is only manufactured, stored and transported to customers in closed systems. Likewise, customers are limited to those who only use the product in closed systems as an intermediate for the manufacture of other chemicals. Proper equipment design and handling procedures maintain low risk from exposure to the product where the product is used as a chemical intermediate.

This product stewardship summary is intended to give general information about the chemical or categories of chemicals addressed. It is not intended to provide an in-depth discussion of health and safety information. Additional information is available through the chemical's applicable Material Safety Data Sheet, which should be consulted before use of the chemical. This product stewardship summary does not supplant or replace required regulatory and/or legal communication documents.