

# Difference Between Styrene and Polystyrene

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## Key Difference – Styrene vs Polystyrene

Styrene and polystyrene are two important [organic compounds](#) with a wide range of applications. The key difference between styrene and polystyrene is that **it is the polymerization of styrene that forms polystyrene, a synthetic thermoplastic elastomer**. Styrene is chemically called vinyl benzene and is among one of the oldest known vinyl compounds in the world. This [aromatic](#) compound was first isolated from certain natural resins in 1839. Later in the 1930s, chemists were able to produce polystyrene in commercial scale by addition [polymerization](#) of styrene [monomer](#) units. Polystyrene became one of the most widely used plastics, especially during the World War II. Even today, styrene and polystyrene play some important roles in the polymer industry owing to their characteristic physical and chemical properties.

## What is Styrene?

Styrene is chemically called vinyl benzene. The German chemist Edward Simon first isolated it in 1839 from natural resins including storax and dragon's blood (a resin obtained from the fruit of Malayan rattan palm). Until the late 1920s, styrene was not employed widely in industrial applications. A French chemist, M. Berthelot in 1851, first introduced the basis of present commercial production methods of styrene. According to his method, the styrene monomers are produced by passing [ethylene](#) and [benzene](#) through a red-hot tube or in short by [dehydration](#) of ethyl benzene. Styrene can be polymerized using solvent, bulk, emulsion, or suspension polymerization techniques with the presence of organic peroxides as [catalysts](#). Styrene is mainly used as a raw material for the production of polystyrene and styrene-butadiene rubber (SBR). Because of these two important products, the production of styrene-based polymers has become the world's third largest polymer production. First and second ranks are obtained by the production of ethylene and [PVC](#). Polystyrene is widely used as a packaging material. SBR is a cheap synthetic elastomer used extensively in tire manufacturing.

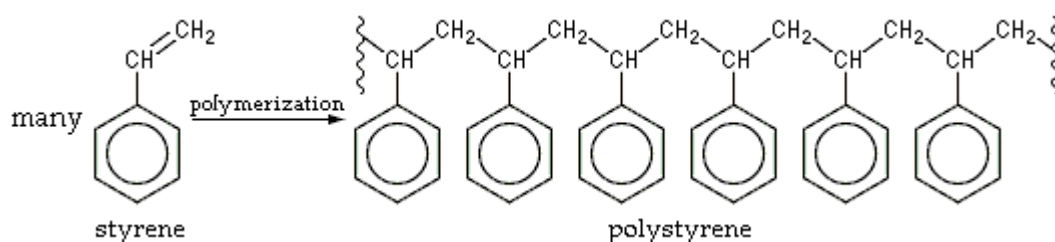


Figure 01: Polystyrene Formation

Copolymers of styrene-acrylonitrile are used to make machine house, automotive components, and battery casings. As styrene monomer contains benzene, exposure to high concentration of styrene monomer may cause respiratory and mucous membrane irritation. Prolong exposure to styrene may cause potential injuries in the nervous system and liver damages. Thus, precautions must be taken while loading, mixing, and heating operations of styrene.

## **What is Polystyrene?**

Polystyrene is an organic [thermoplastic elastomer](#) formed by the polymerization of styrene or vinyl benzene. It is a rigid, lightweight, amorphous elastomer with excellent electrical and moisture resistant properties. Moreover, it is hard, transparent and easily molded, unlike many other common thermoplastics. Physical properties of polystyrene can be altered by varying molecular mass distribution, processing methods and types of additives used during its production process.

There are many applications of polystyrene, including wall tiles, lenses, bottle caps, electrical parts, small jars, and display boxes. In addition, this polymer is widely used as an inexpensive food packing material. The filaments of polystyrene are used for brush bristles. Expanded polystyrene (EPS) or foamed polystyrene is made by heating polystyrene in the presence of a blowing agent and a volatile liquid such as propylene, butylene, or fluorocarbons. EPS is widely used in floatation devices owing to its low density. Moreover, it is widely applied as thermal insulation in refrigerators, cold storage rooms and between building walls. In addition, EPS has excellent shock absorption abilities. Thus, it is used as a lightweight packaging material, which saves shipping and breakage costs.

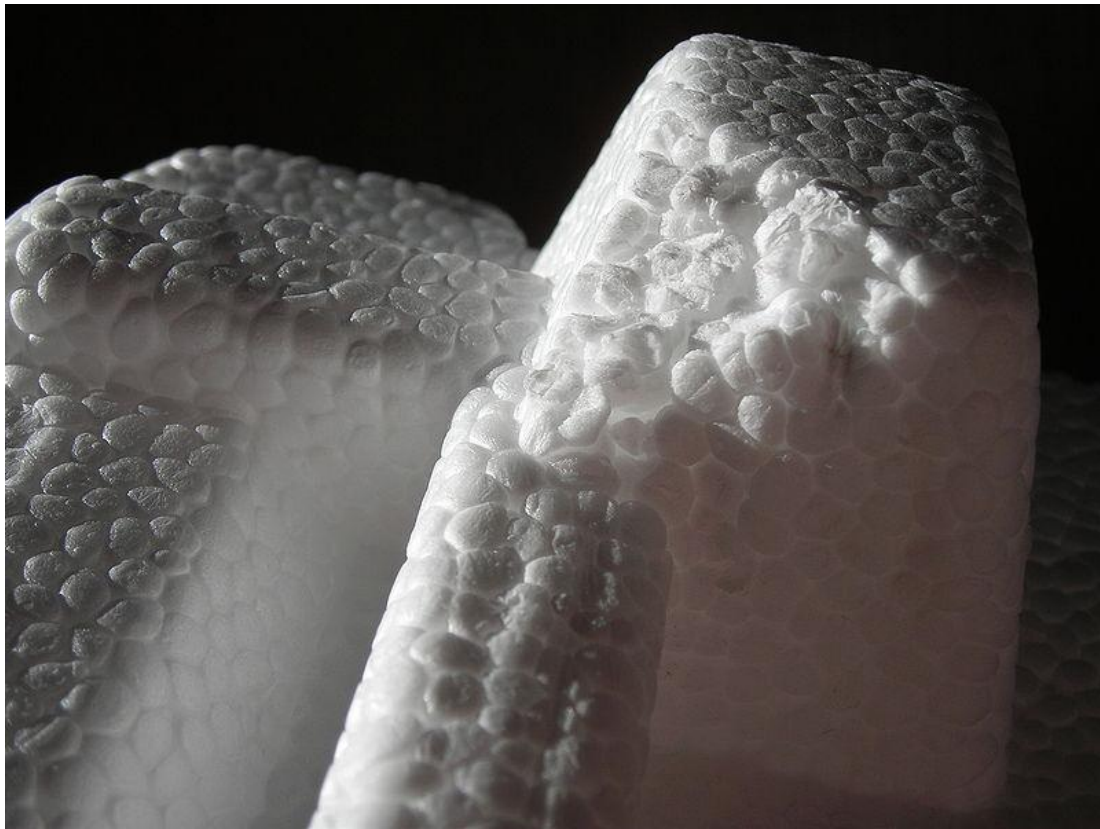


Figure 02: Polystyrene

## What is the difference between Styrene and Polystyrene?

<b>Styrene vs Polystyrene</b>	
Styrene is a vinyl aromatic hydrocarbon that acts as the monomer of polystyrene.	Polystyrene is an organic thermoplastic elastomer formed by the polymerization of styrene
<b>Production</b>	
Styrene is produced by dehydration of ethyl benzene.	Polystyrene is produced by polymerization of styrene.
<b>Applications</b>	
Styrene is used as raw material for the production of polystyrene, SBR and copolymer of styrene- acrylonitrile, and acrylonitrile-butadiene-styrene (ABS).	Polystyrene is used for wall tiles, lenses, bottle caps, electrical parts, small jars, display boxes, packaging material, insulating material, etc.

## Summary – Styrene vs Polystyrene

Styrene (vinyl benzene) is a vinyl aromatic hydrocarbon that acts as a monomer for the production of polystyrene by undergoing addition polymerization. Polystyrene is a lightweight, rigid, low-density thermoplastic elastomer with excellent insulation and moisture resistant properties. Styrene is mainly used to produce polystyrene, SBR and copolymers of styrene-acrylonitrile and ABS rubbers while polystyrene is widely used as a packaging and insulation material. This is the difference between Styrene and Polystyrene.

### References:

1. Sullivan, J. B., & Krieger, G. R. (Eds.). Clinical environmental health and toxic exposures. Lippincott Williams & Wilkins, 2001. Print.
2. Richardson, T. L., & Lokensgard, E. Industrial plastics: Theory and applications. Cengage Learning, 2004. Print.

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