



# Polystyrene

“Styrofoam”, Expanded polystyrene foam (EPS), Extruded polystyrene foam (XPS), Poly(phenylethene)

# LOMP

Lake Ontario MicroPlastics Center

## Production and Use:

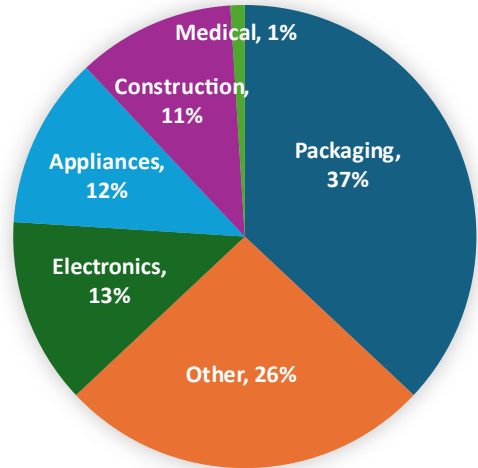
### Did you know?

Foam packing materials and disposable forks are made of the same type of plastic!

Polystyrene is **one of the most common plastics**.

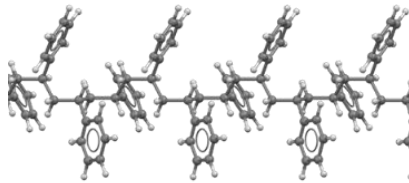
- identified with Resin Identification Code 6 (“#6 plastic”)
- commonly used for **packaging, building/construction materials, electrical** (insulation), and **consumer products**<sup>1</sup>
- **~25 million tons produced** and **~17 million tons of waste generated** globally each year<sup>2</sup>
- ~8% of global non-fiber plastic production<sup>2</sup>

Polystyrene Uses by Industry (2016)<sup>1</sup>



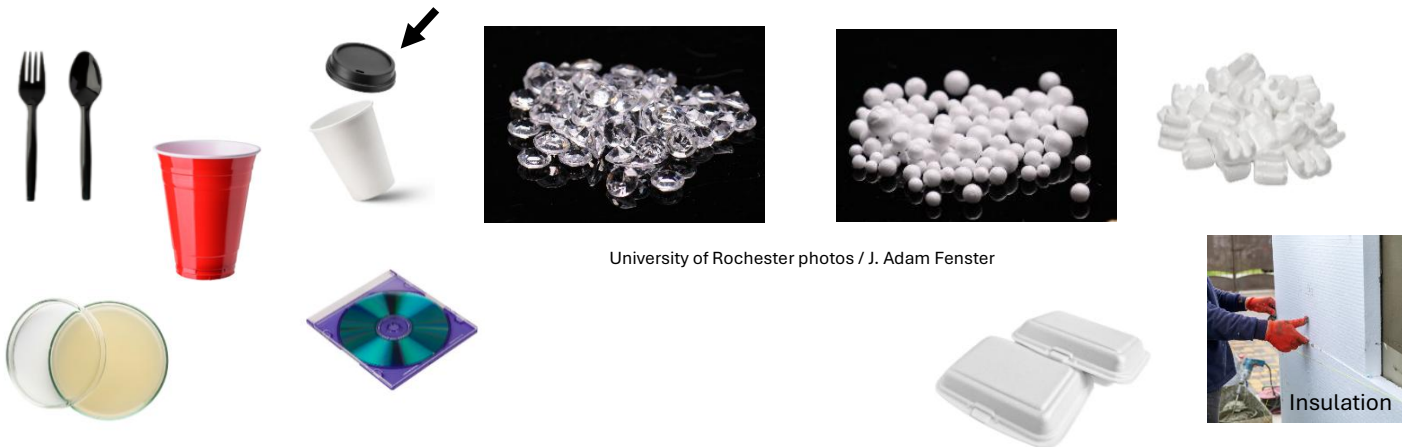
## Characteristics:<sup>3</sup>

- inexpensive
- lightweight
- can be molded

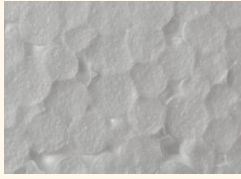


Because of their irregular shape, polystyrene molecules are arranged loosely (like a bowl of noodles). Light shines through the spaces between the molecules, making it translucent.

Polystyrene can be a **solid, brittle plastic** (left) or **expanded into foam** (right; often called **Styrofoam**).



University of Rochester photos / J. Adam Fenster



**Styrofoam up close:** polystyrene beads containing a liquid hydrocarbon (pentane) expand when heated. The expanded beads can be blown into molds and fused by steaming and then cooling them.<sup>1</sup> Air inside the expanded beads mean the resulting material does not conduct heat (is highly insulating).

## Waste:

Polystyrene recycling is very expensive. Just a small amount of the lightweight material takes up a lot of space.



Over 3 million tons of polystyrene waste was collected in the US in 2019<sup>4</sup> – the same weight as about **8 and a half Empire State Buildings**.

- only 1% was recycled<sup>4</sup>
- 91% ended up in the landfill and another 9% was incinerated<sup>4</sup>
- Made up 7% of the total plastic waste collected<sup>4</sup>



**Other polystyrene waste is not collected and may end up in the environment.**

Both solid and foam polystyrene items fragment easily. Because of their light weight, foam items are blown around by wind and are very hard to clean up.<sup>5</sup> Single-use polystyrene cups, plates, and utensils, along with pieces of polystyrene foam, are commonly found as litter in the environment.<sup>6</sup> Many types of polystyrene foam containers are banned in New York.<sup>7</sup>

## Researchers in Rochester are studying polystyrene

Researchers at the Lake Ontario MicroPlastics Center (LOMP) are studying how polystyrene microplastics interact with other pollutants, including heavy metals like nickel. Environmental conditions, other pollutants including organic pollutants like dioxin, and polymer type can affect microplastic toxicity in the environment and in the body. Uniform polystyrene microplastic spheres are commonly used in lab experiments like these.

Other LOMP researchers are working to create polystyrene particles that are more like those found in the environment and have known properties. These “aged” particles, made from sheets of rigid polystyrene, can be used to study the health effects of microplastics like those in the environment.



### Advancing microplastics research

Uniform microplastic spheres are easy for researchers to find and have known properties. As a result, these particles are commonly used in microplastics and health research. But microplastics in the environment are not uniform – they can be many different shapes and sizes. LOMP is working to create and use more diverse and environmentally relevant particles for future research.



Learn more at [LOMP.urmc.edu](https://LOMP.urmc.edu).

<sup>1</sup>The Essential Chemical Industry – Online. Poly(phenylethene) (Polystyrene). <sup>2</sup>Geyer et al. (2017) *Sci Adv* 3(7):e1700782. <sup>3</sup>International Association of Plastics Distribution. IAPD Thermoplastics Rectangle. <sup>4</sup>Milbrandt et al. (2022) *Resour Conserv Recycl* 183, 106363. <sup>5</sup>Turner (2020) *Environ Sci Technol* 54, 10411-10420. <sup>6</sup>Alliance for the Great Lakes Adopt a Beach: 20 years of Great Lakes Litter Data, 2024 report. <sup>7</sup>NYS Department of Environmental Conservation. Polystyrene Foam Ban.