

Polystyrene: A highly recyclable plastic

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Despite common assumptions that polystyrene is less recyclable than other polymers, polystyrene-based products can have multiple lives, explains Jens Kathmann.



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Polystyrene is used for a wide range of purposes, from food contact applications, healthcare applications, insulation to safety applications such as bicycle helmets.

However, there is a commonly-held misconception that polystyrene is less recyclable than other polymers.

In fact, it is highly recyclable, with a high capacity for circularity for two reasons.

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First, it is suitable for recycling using similar methods to other plastics, such as mechanical recycling and dissolution. Second, polystyrene can be recycled back to its original monomer - a unique property.

Using innovative chemical recycling processes, styrene can be retained in high yields and in 'virgin' purity.

Consequently, polystyrene-based products can have multiple lives, being re-used again and again in high-quality applications, including for food contact.

The industry has come together under a new organisation, Styrenics Circular Solutions (SCS), to accelerate circularity for styrenics by seeking a comprehensive approach to recycling polystyrene and EPS-based products.

“Polystyrene-based products can have multiple lives, being re-used again and again in high-quality applications”

SCS is engaging with the whole value chain to develop game-changing technologies.

We seek to build the partnerships required for large-scale polystyrene recycling, from converters, brand owners, waste management companies, recyclers to the authorities.

We want to increase waste collection and sorting, build close links between waste stream volumes of relevant quality and its high-tech recycling processes, as well as to build the market for the recycled material.

Our ultimate aim is to significantly increase circularity and improve recycling rates of styrenics.

The science supports us; polystyrene is a promising material for mechanical recycling, as its properties are largely stable even following multiple processing.

Another technology available is dissolution, an environmentally-friendly, low CO₂-consuming process for purifying (mixed) plastics by selectively breaking down one target polymer while the other polymers remain unaffected.

Our third technology is chemical recycling - also referred to as depolymerisation - of plastics, resulting in the formation of monomers that can be used as building blocks for new, virgin and ultimately food-quality polymers.

“With growing awareness, attitudes will change and help build wider support for our industry’s drive towards circularity”

Polystyrene is particularly suited for this approach. It has a so-called ‘ceiling temperature’ of approximately 350C, above which polystyrene can be cleaved into its styrene monomer.

Using these innovative chemical recycling technologies, styrene can be retained in high yields and in ‘virgin’ purity.

Consequently, this allows the repolymerising of styrene to the highest possible quality.

This truly circular chemical recycling supports polystyrene’s outstanding position as a highly-recyclable plastic.

We are specifically focused on implementing the dissolution and depolymerisation technologies, knowing that these will allow us to maximise circularity and recycling rates.

The resulting materials will be of sufficient quality to be suitable for food contact applications and will help us hit those recycling rates.

Our industry knows that there are challenges to be faced, not least the misconception that polystyrene is less recyclable than other materials.

There needs to be a greater awareness that not only can it be easily recycled but also that its intrinsic properties offer huge recycling opportunities and that the development of the recycling technology is already well advanced.

With growing awareness, attitudes will change and help build wider support for our industry’s drive towards circularity.

Another challenge is the need to improve collection, sorting and preparation of post-consumer waste to supply the recycling process.

This requires support from the public, policy makers, regional authorities and businesses at all points on the value chain.

We believe the investment will be fully rewarded.

In polystyrene, we have the opportunity to close the loop - full recycling back to the original monomer and virgin polystyrene is possible.

Our industry can be a crucial contributor in reaching the goal of at least 10 million tons of recycled plastic by 2025.

However, meeting this target will require seizing the opportunity that polystyrene brings as the material with a unique intrinsic capacity for close-loop recycling by deploying these new technologies.

The opportunity to achieve circularity with polystyrene is huge.

The industry is united, but we will need public and policy maker support in driving this forward for maximum impact.

About the author

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