A Sustainability Perspective on Styrenics

1. Introduction

As a consortium of organisations focused on the sustainable use and production of Styrene and Styrenic polymers, we recognize the importance and support the development of an international agreement addressing plastic pollution. Such an agreement should be based on sound science and its recommendations should enable a global shift towards a circular economy, while ensuring the protection of human health and the environment.

Our assessment of the current text of the Zero Draft suggests that there is room for greater emphasis on circular economy approaches. In particular, we take a critical stance against current proposals to develop a list of chemicals, group of chemicals, and polymers of concern. Polymer-specific measures which are not comprehensively justified and do not address the root cause of pollution are unlikely to yield the desired environmental benefits. On the contrary, they risk unintentionally increasing environmental damage and creating other unintended socio-economic impacts. Furthermore, existing Multilateral Environmental Agreements (MEAs) already address chemical substances and related environmental and health impacts. Most notable MEAs are the Basel, Rotterdam, and Stockholm (BRS) conventions which address hazardous waste and chemical management, as well as the Monreal Protocol. We, therefore, call against incorporating additional measures related to the limitation of substances and polymers within the new globally binding instrument. This serves to avoid duplication of efforts and potential conflicts, while ensuring legal clarity and consistency.

Instead, we advocate in favour of an approach that addresses plastic pollution taking into account national circumstances and priorities, and provides stakeholders at national, sub-national, and local levels with a harmonised methodological framework to identify key plastic leakage hotspots and drive sound actions to end plastic pollution[1]. Together with an application-specific decision tree approach, this can lead to prioritising cost-effective actions aimed to reduce plastic pollution.

2. Styrene: An Informed View

[1] United Nations Environment Programme (2020). National guidance for plastic pollution hotspotting and shaping action - Introduction report. Boucher J.,; M. Zgola, et al. United Nations Environment Programme. Nairobi, Kenya.

Styrene is the starting substance for the creation of a multitude of versatile plastics and rubbers where styrene itself is only present at very low residual levels. These materials have many beneficial properties, including strength, durability, light weight, safety, and energy efficiency. Styrene derivatives include: Polystyrene (PS), Expanded Polystyrene (EPS), Extruded Polystyrene (XPS), Acrylonitrile Butadiene Styrene (ABS), and Styrene Acrylonitrile Resin (SAN). These are used in a wide range of applications, from building insulation and construction to food and protective packaging, consumer electronics, medical devices, household appliances, and automotive components, to name some.

Polystyrene, in particular, is a very popular material for packaging in direct contact with food. PS is one of the best sortable plastics as its molecular structure can be easily identified. It can be recycled using several technology methods, maintaining high quality and safety standards over multiple recycling processes. Expanded Polystyrene, a highly versatile material consisting of 98% air, also provides a unique combination of qualities due to its excellent insulation and shock-absorbing properties, making it the material of choice for many insulating packaging and cushioning applications, including protective gear.

2.1 Styrene: Chemical Safety

Styrene-based polymers are used safely in the manufacture of hundreds of consumer products for different applications. Styrene as a starting substance has been studied extensively for health effects associated with occupational and environmental exposure. More specifically, a variety of studies examined the potential impact of Styrene exposure on workers' health, especially in historically high-exposure environments. Extensive research shows that Styrene dissipates rapidly in the air and disappears quickly from soils and surface waters and does not persist in the human body.

It is relevant to note that Styrene also occurs naturally at low levels in foods such as vegetables, fruits, nuts, beer, and spices and there is no cause for concern from exposure at these levels, similar to those found in commercially available products.

2.2 The Unique Recyclability of Styrenic Polymers

Styrenic polymers have significant environmental and recyclability advantages. They are designed for recycling and offer unequalled recycling performance due to their compatibility with different technologies.

Polystyrene is easily sortable and recyclable, perfectly suited for closed-loop food contact recycling over multiple cycles without loss of quality or value to the material. Several so-called “challenge tests” confirmed the outstanding cleaning efficiency of the mechanical recycling technology for PS to remove impurities from the use phase and waste streams. Purity levels of 99.9% and more of the PS recyclate were achieved[2].

Expanded Polystyrene is also easily sortable and 100% recyclable, with noteworthy recycling rates across the globe. EPS protective and insulated packaging is recycled at scale and in practice (above 30%) in at least 38 countries in 4 continents, covering a total population of 4.2 billion. Recent reports by Conversio and the European Commission’s Joint Research Centre (JRC) highlight the remarkable progress achieved in the recycling of PS and EPS.

The European PS and EPS chains have committed to further improve recyclability and recycling rates. As one among many actors, they have contributed to RecyClass adopting Design for Recycling (DfR) guidelines for PS and EPS containers. According to these guidelines, which are based on existing infrastructure, many common PS and EPS packaging formats can achieve class A = full compatibility.

A comprehensive list of initiatives aimed at recycling PS and EPS can be found here.

2.3 Microplastics and Plastic Pollution

Plastic pollution is a growing problem on a global scale and, in recent years, this has been linked to concerns for human health. Microplastics research is in its infancy. More knowledge is required on where and how many microplastics there are, their type and morphology and, importantly, the impact microplastics have on the environment and human health.

The Styrenics industry is collaborating with regulators and scientists to better understand how microplastics are formed, their impact, and to propose measures to help mitigate their release.

Microplastics are currently the focus of many research groups and there is a need to raise awareness on the complexity of the polymer chemistry involved, as well as its likely impact on the relevance

[2] As confirmed by so-called challenge tests using the super-cleaning technologies of NGR and Gneuss, performed by SCS in cooperation with the Fraunhofer Institut für Verfahrenstechnik und Verpackung IVV: https://styrenics-circular-solutions.com/styrenics-circular-solutions-demonstrates-mechanically-recycled-polystyrene-is-suitable-for-food-contact.html; https://styrenics-circular-solutions.com/styrenics-circular-solutions-shows-with-further-challenge-test-success-that-polystyrene-can-be-mechanically-recycled-for-food-contact.html

and reliability of research using commercially available microparticles. Polystyrene has been identified as the most frequently studied type of plastic for all types of lab-based studies. In particular, it stands out due to its wide commercial availability across various size ranges, as well as for the option for particle labelling for analytical purposes. It is, therefore, frequently employed in laboratory studies as a model particle to represent the behaviour of all polymers.

There are, however, significant differences between PS manufactured for analytical purposes and environmentally generated PS microplastics originating from various PS products in commerce. Notable differences include the shape, surface chemistry, chemical composition of the particles and presence of certain Intentionally Added Substances (IAS) added during the manufacturing of the polymer (e.g. processing aids and additives), as well as Non-Intentionally Added Substances (NIAS). There is, therefore, a well-understood gap between the polymer types used in laboratory studies and their respective environmental representativeness, which frequently results in inaccurate interpretations of study results.

3. Conclusions

We call upon the UNEP Secretariat and Negotiating Parties not to include in a globally binding treaty conclusions regarding supposedly problematic of unnecessary polymers based on not representative, possibly inaccurate and outdated estimates. Rather, informed decisions should be taken based on a transparent methodology, clear criteria, and accurate and reliable data.

About us:

EUMEPS is the association and voice of European Manufacturers of Expanded Polystyrene. Our members cover the entire EPS value chain from raw material suppliers to EPS converters and recyclers as well as supporting industries including machinery and additive suppliers. Members include individual companies as well as 23 European national associations. This unique representation of the entire value chain ensures that EUMEPS represents both large companies and small- and medium-sized converters and recyclers. Altogether our membership represents more than 1,000 companies, most of them small- and medium-sized enterprises (SMEs), and employs more than 80,000 people.

Styrenics, a product group of Plastics Europe. Plastics Europe is the pan-European association of plastic manufacturers with offices across Europe. For over 100 years, science and innovation have been the DNA that cuts across our industry. With close to 100 members producing over 90% of all polymers across Europe, we are the catalyst for the industry with a responsibility to openly engage with stakeholders and deliver solutions which are safe, circular and sustainable. We are committed to implementing long-lasting positive change.