

ABSolEU - Paving the way for an ABS recycling revolution in the EU

Authors
Nathanael Guigo[a], Apostolos Altiparmakis[a]

[a] Université Côte d'Azur, CNRS, UMR 7272 Institut de Chimie de Nice, EUR Spectrum, Nice, France

In the core of UN efforts for the fight against climate change is multilateral cooperation. This principle is enshrined also in the ABSolEU project, which is an initiative funded under the EU's Horizon Europe Programme. It is simultaneously a multilateral collaboration that aims to pave the way to circularity for the ubiquitous plastic ABS, found in durable products from toys and other consumer goods to automotive components, and therefore revolutionise the current state of the art of ABS recycling in Europe and beyond.

ABS is not a single-use plastic. On the contrary, in the world of plastics it can be considered as one of the most durable. ABS is a complex material made of three components:

- A = Acrylonitrile ▶ provides thermal and chemical stability
- B = Butadiene ▶ provides toughness and strength
- S = Styrene ▶ gives the glossy finish

ABS plastic is specifically designed with long-lasting products in mind and is therefore able to withstand long and intense use phases. The proportions of the components (A, B and S) can vary and are adapted according to the properties desired in the resulting ABS. For instance, the composition, the nature of additives and the processing will vary significantly between toys (e.g., Lego bricks), automotive parts and electronic equipment.

As a thermoplastic, ABS can in theory be fully recycled. But the fact that ABS can have different grades and compositions, due to altering the degree of each component, can make recycling difficult. Recycling efforts are moreover often hampered by the presence of additives and fillers. The uncertainty around the presence of such undesirable substances, as well as the difficulty in removing, them generates problems regarding the purity and quality of the resulting secondary plastics. This raises health and safety concerns that limit the reuse of secondary ABS plastics for certain applications. It would be problematic indeed if ABS wastes from old electric and electronic equipment (containing additives such as flame retardant) are recycled into ABS products for children's toys. In combination with the fact that recycled ABS, like many plastics, loses quality and performance over time, the end-of-life scenario for ABS products is in 85 % of cases landfill or incineration. Only a marginal quantity of ABS from consumer electronics and appliances is today collected, mechanically recycled and sold again for consumer applications. The quality of these streams is also difficult to control, due to the heterogeneous composition

of ABS resulting from the diversity of applications and grades applied to such products, and the concerns about harmful additives prevail.

The ABSolEU project is led by Université Côte d'Azur and in particular the Nice Institute of Chemistry, along with the contributions of GREDEG and CNRS. The consortium brings together 10 additional partners, namely LEGO, BIC, Volvo Cars, TRINSEO, TNO, RI.SE, GALOO Plastics, Swedish Institute of Standards, JOTNE and Prospex Institute. Thus, it is implemented by a robust consortium that spans the entire ABS value chain, as it comprises 3 global – and iconic – brand owners, 2 RTOs, an ABS-producing company, a recycler, a traceability solutions company, a standardization institute and a company specialised in stakeholder engagement.

With ABSolEU, the consortium is seeking to lay the first bricks of a sustainable future for ABS plastics. The overarching ambition of ABSolEU is to revolutionise the current state of the art of ABS recycling. Concretely, ABSolEU will realize this ambition through a dual approach of demonstrating technological innovations for ABS recycling, while establishing a supportive framework for the diffusion of the innovative efforts of the project, with the aim of improving methods and standards for characterisation, traceability, and quality assurance of rABS products. In particular, the ABSolEU project will develop and mature an innovative technology for the physical recycling of waste ABS, providing clean and safe recyclates that are free of additives and contaminants, i.e., ready to be reintroduced into the value chain for high performance products. In addition, project partners will develop new analytical methods for safety and quality assurance, raising awareness about the composition of ABS waste streams, and will provide the scaffolding to support the adoption of physical recycling for ABS and the uptake of ABS recyclates by industry and consumers. To this end, it is expected that by the end of the project they will be able to lay the first bricks of a sustainable future for ABS plastics in Europe and beyond.

The ambition of ABSolEU project is reflected in its six objectives. ABSolEU partners will work towards establishing conditions for a transition to a system where the value of ABS, as material and product, is retained throughout the product lifecycle, delivering economic and environmental benefits – thus paving the way to an increased share of recycled plastics in added value products.

The ABSolEU objectives are the following:

Engage with value chain stakeholders, citizens, and policy makers

- Develop and scale up a physical recycling technology capable of eliminating hazardous substances from the ABS waste stream
- Establish analytical methods to guarantee the safety and quality of ABS recyclates
- Explore and propose traceability systems for ABS products
- Diffuse innovation throughout the ABS value chain
- Promote a supportive framework for ABS recycling through standardisation
-

Finally, ABSolEU is in line with the 2030 Agenda for Sustainable Development, adopted by the UN Member States in 2015. In particular, the tasks and activities of the project aim to contribute directly to the following Sustainable Development Goals (SDGs):

SDG 9, by contributing to the development of resilient infrastructure of plastic production and reuse, promote inclusive and sustainable industrialization and foster innovation around plastic.

SDG12, by working for the development of innovative and sustainable consumption and production patterns for ABS plastics.

SDG13, by taking urgent action to combat climate change and its impacts through its methodology

for plastic waste management, treatment and recycling.
ABSolEU indirectly contributes to SDGs 4 and 17, as it will raise awareness among the academic and scientific communities about ABS plastic recycling, and the products generated within the project's timeline will constitute valuable educational materials that could be used by academic institutions and research centres in Europe and beyond, reinforcing education; at the same time it constitutes a global partnership that focuses on a multi-stakeholder approach and the promotion of sciences and technology.