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BASF and research partners collaborate to optimize mechanical recycling of plastics

- **Innovative measuring technologies and AI determine the composition of waste plastics in real time**
- **Improved quality of recycled plastics thanks to precise process steering and use of additives**
- **Higher recycling rates to strengthen circular economy**

BASF has teamed up with Endress+Hauser and TechnoCompound as well as the Universities of Bayreuth and Jena to study how the mechanical recycling of plastics can be improved. With funding from the German Federal Ministry of Education and Research (BMBF), the SpecReK project aims to reliably and precisely identify the composition of plastic waste during the recycling process and thus improve the quality of recycled plastics. This will be achieved by combining state-of-the-art measuring techniques with artificial intelligence (AI).

The researchers are using spectroscopic methods which interpret how the material interacts with light to gain information about the chemical structure of the recycled plastics. The project partners want to use this data to determine in real time during processing which plastic grades, additives and contaminants are contained in the material. In a subsequent step, an AI algorithm will recognize patterns in the measurement data and recommend which additional components should be added or how the recycling process should be adapted to improve the quality of the recycled plastic output.

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“We do not currently have the necessary analysis tools to determine during processing exactly which components are contained in the mechanically recycled plastics,” explained Dr. Bernhard von Vacano, head of the Plastics Circularity research program at BASF. This information is needed, however, to evaluate and improve the quality of waste plastics. “This will enable us to use more mechanically recycled plastics to produce high-quality products and to make recycling processes more efficient and sustainable,” said von Vacano.

Strengthening the circular economy for plastics

At present, most of the plastic waste that is sent for recycling is mechanically recycled. The waste is collected, sorted, crushed, cleaned and then melted. Depending on the input material and the degree of sorting, this melted material can contain different types of plastics, additives and contaminants. Therefore, the quality of the recycled output often varies and is not always sufficient to be transformed back into high-value plastic products.

“With the increasing demand for high-quality recycled materials, and given the current legal framework, it will be crucial to perfectly understand the material properties and composition of mechanically recycled plastic waste and to optimize the process. In this way, we will strengthen the circular economy,” von Vacano said.

In this joint project, BASF is cooperating with Endress+Hauser, TechnoCompound, the University of Bayreuth and Friedrich Schiller University Jena. The total project volume is €2.2 million, with two-thirds financed by BMBF funds from its quantum systems research program and one-third financed by the project partners.

Circular economy needs chemical and mechanical recycling

In cases where mechanical recycling of plastic waste is not technologically feasible or too complex, plastics can also be brought back into the material loop via chemical recycling. Both recycling processes – chemical and mechanical – are important for a functioning circular economy and can complement each other. That is why BASF is working to continuously improve both types of recycling.

More information about how BASF is exploring new ways to make the lifecycle of plastics more sustainable can be found here: Plastics Hub

About BASF

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