Federal Ministry of Education and Research

FONA Research for Sustainable Development BMBF

solvoPET – High-quality Raw Materials from Waste

Plastics in the Environment – Sources • Sinks • Solutions

Mixed materials of various plastics are often used for high-quality, high-performance packaging or technical applications. These include in particular composites with polyethylene terephthalate, known as PET. At present, such mixed PET waste cannot go through material recycling; it can only be energetically recycled and is thus lost for the production cycle. The joint research project solvoPET aims at improving this. Recycling unsorted PET waste plastics using a novel process should become possible, too. The secondary raw materials obtained have the quality of virgin material and can be used for any purpose.

Preserving Valuable Raw Materials

The most commonly used packaging plastic today is polyethylene terephthalate (PET). It has special technical properties such as a high gas tightness and can therefore be used in a variety of applications, e.g. for food packaging. At present, economic recycling of PET waste is not possible due to impurities such as colouring, added substances such as an oxygen-barrier (so-called scavanger materials) and compounds with other plastics (so-called multilayer films). These „impurities“ lead to discoloration or sticking and degrade the material properties. Extensively sorted PET waste plastics are thus lost for the production cycle. The same applies to PET waste from inland water bodies or from the oceans and, to a large extent, to the quantities of waste from technical PET applications such as strapping, braided hoses or shrink labels.

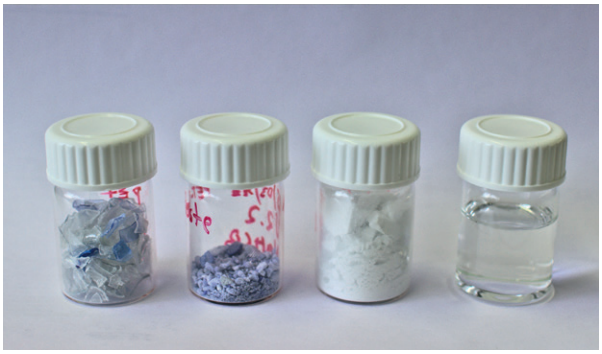
Political requirements meanwhile oblige plastic producers to high recycling quotas. For example, the EU Plastic Strategy of January 2018 states that all packaging plastics should be 100 percent recyclable by 2030. This is intended to promote the use of secondary raw materials. In order to achieve the recycling targets, existing recycling practices have to be changed. Likewise, more plastics such as PET or polyesters used in textiles should be recycled instead of being used to generate energy.

High-grade Raw Materials from Chemical Recycling

At present, mixed or contaminated plastic waste is mainly sent to mechanical treatment plants for material recycling. The clear identification and sorting of different types of plastics in these plants is only possible to some extent. As for composite materials, they do not work at all. The same applies to polyester fibres in textiles.

The solvoPET joint research project uses chemical reactions to treat such plastic waste. It aims at recycling mixed PET waste without costly presorting. The basis is the solvolysis process, which will be further developed (as part of the project). In this process, the plastic structures are broken up. The plastics disaggregate into their basic components: monoethylene glycol (MEG) and terephthalic acid (TPA). The recycled TPA and MEG have the quality of primary products and can therefore be reused for the production of new goods without restrictions.

Researchers expect the further development of the solvolysis process to offer significant added value from both an ecological and economic perspective as previously unused waste streams can be recycled. Raw materials obtained from recycled PET waste have the same quality as original goods.



From PET to its basic components terephthalic acid (TPA) and monoethylene glycol (MEG)

SOLVOPET®

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Pilot Plant for a Continuous Recycling Process

The project participants want to implement and test the basic process steps for the continuous solvolytic recycling of PET plastic waste in a pilot plant. In addition to the technical processes and plant components, they also evaluate the cost-effectiveness of the solvoPET process as part of a comprehensive life cycle analysis. The requirements for a scale-up to industrial level can be derived from the experience with the technical system.

Precipitation of terephthalic acid (TPA) from dissolved PET

Research Focus
Plastics in the Environment – Sources • Sinks • Solutions

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