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Chemical recycling of plastic waste

Plastics do have proven benefits during their use phase – for example preservation of food loss, lightweight construction of vehicles and building insulation. Plastic waste, however, and in particular plastic waste in the context of marine littering, is perceived as a major global challenge.

From plastic waste to new chemical products

Since mechanical recycling is limited because of an increase of residues in the material in each cycle, a team across BASF has taken up this challenge and developed the ChemCycling project. With chemical recycling, fossil resources for chemical production can be replaced with recycled material from plastic waste.

(01) ChemCycling – First Prototypes

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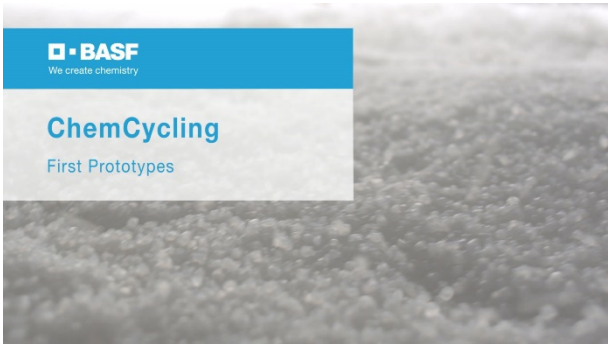

More and more companies from the plastics industry are working on improving the recyclability of plastics and thus helping to create a circular economy. One way that BASF is contributing is the ChemCycling project: At the end of 2018, the company first used pilot volumes of a pyrolysis oil derived from plastic waste as a feedstock in its own production.

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From plastic waste to new chemical products

The significant potential of chemical recycling was confirmed by the consulting firm McKinsey in a December 2018 study: If established recycling processes are combined with new ones such as chemical recycling, the experts believe that a 50% reuse and recycling rate for plastics worldwide can be reached by 2030 (today: 16%). The share of chemical recycling could then rise from 1% currently to around 17%, which is equivalent to recycling of around 74 million metric tons of plastic waste.

Transcript

Comment

BASF started a project in cooperation with partners in which chemically recycled plastic waste in form of pyrolysis oil can be used in production. Small quantities of really NEW chemical products have already been produced on the basis of recycled plastic waste. In these products, the recyclate proportion is mathematically assigned by the mass balance method. The products are currently being tested by customers. The examples show that chemical recycling is feasible despite some technical and regulatory challenges.

Together with customers the following prototypes were developed in tests within the ChemCycling project

Johannes Remmele, Südpack

"We are a composite film manufacturer. We supply the food industry - mainly the cheese industry. In the food industry today, you have to rely on films being high-tech. High-tech films consist of more than ten layers and are extremely thin. However, this packaging can be problematic because mechanical recycling does not actually produce good-quality plastic that can be recycled in the future. BASF has now embarked on a new path - and this will give us new granules that we can use for food - as virgin material."

Comment

The next stop for the high-tech films produced by Südpack using recycled materials is the Zott dairy in Mertingen, Germany. There, the ChemCycling project is in the test phase for the packaging of Zottarella, the trademark mozzarella by Zott.

Andreas Strunk, Genuss-Molkerei Zott

"Along the entire value chain, we are constantly examining where we can become even more sustainable and how we can meaningfully expand our sustainability standards. In addition, there is also a rethinking among consumers. Today, more than ever, they expect that high-quality, sustainably produced food such as our Zottarella are packed as resource friendly as possible. We

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have high quality and hygiene requirements for our packaging and its barrier function. It was therefore important to us to be part of this pilot project right from the beginning, to introduce our requirements and experience, and to participate in a functionally identical, but more environmentally friendly, solution. We are positive and hope that this project will be ready for series production."

Comment

Storopack is also creating something new from chemically recycled raw materials. More precisely from EPS - also known to many as polystyrene. The 96-hour box makes it possible to transport medicines within a precisely defined temperature range.

Thomas Thein, Storopack

"The Storopack 96 Hour Box is a pre-qualified system solution with which it is possible to transport different products at different temperatures. We also see it in the international and intercontinental transport of medicines and clinical studies. The highly regulated medical marketplaces high demands on quality and hygiene. With ChemCycling, there is no difference between EPS and ChemCycling products, which has also been proven by chemical analyses."

Comment

Cooling is also the topic here: BSH household appliances in Giengen, Germany. Several thousand refrigerators are produced here every day. Test amounts of the ChemCycling material is being used to produce prototypes at the BSH site in Giengen.

Michael Laudahn, BSH Household Appliances

"You can see that this screen, which I am holding up, is completely transparent and made of recycled materials. That's a great thing for the environment. For us as a refrigerator manufacturer, it is of course always important that the material has a food safety certification, because you put your food, your cheese, your sausages into such a refrigerator and it simply has to be flawless. And we are glad that with ChemCycling we are able to process this material."

Comment

Nevertheless, to move from the test phase to market maturity, different aspects still need to be clarified. For example, the technology for converting plastic waste into a raw material has to be further developed and adapted for large-scale use. And chemical recycling has to be recognized by legislators and consumers.

Stefanie Mohmeyer, BASF

"Chemical recycling is a new technology that of course has not yet been used on a large scale and is therefore not yet considered in the regulatory framework and laws. It is important that the mass

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balance method is also recognized for chemical recycling or for later products. The mass balance method is used to calculate how much recycled material the final product contains. This is already done with green electricity and has been quite well accepted by consumers."

Comment

The application examples show: Chemical recycling works. However, those involved must invest a lot of more work in this project. BASF and the partners in the value chain are working to supply BASF with high-quality pyrolysis oil for larger-scale production. In addition, a commitment from legislators to extend the definition of recycling is needed as well as an environmental assessment. In the end, it is up to the consumers to decide if this new recycling technology will be a success story.

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