



## NEWS RELEASE

### **Project on the plasma coating of reusable bottles is nominated for the German Raw Materials Efficiency Prize**

In the project "PECVD gas barrier coating of reusable PET bottles", which is funded by the DFG (German Research Foundation), IKV is working together with KHS Corpoplast GmbH on increasing the reusable content of plastic bottles.

Aachen, April 2020 – The German Raw Materials Efficiency Prize is awarded by the Federal Ministry for Economic Affairs and Energy (BMWi) for outstanding products, processes and research results, through which, thanks to new, intelligent processes, particularly efficient use can be made of raw materials. Under this aspect, a jury headed by the German Mineral Resources Agency (DERA) has nominated for the award the project PECVD gas barrier coating of reusable PET bottles, in which the working group for plasma and surface technology at IKV is carrying out joint research with project partner, KHS Corpoplast GmbH. The project is funded by the German Research Foundation (DFG) as part of the collaborative research centre SFB-TR87 as a so-called transfer project.

### **Development of a coating system capable of resisting washing processes for reusable PET bottles**

A successful circular economy for plastics aims to retain for as long as possible the value of the products in the cycle. The multiple use of products is thus the target. One example of this are the reusable PET bottles that, after use, are washed with caustic soda solution and refilled. In contrast to glass, however, PET is not gas-tight, which significantly reduces the shelf life of juices or carbonated beverages such as soft drinks or beer in PET bottles compared with glass bottles. Despite their many ecological advantages, the reusable PET content in the case of fruit juices in Germany was no higher than 0.5 % in 2018. In the field of reusable PET bottles, it is already state of the art to balance out this disadvantage of PET by applying an SiO<sub>x</sub> barrier coating by the plasma technology. These conventional SiO<sub>x</sub> coatings are, however, not resistant to the aggressive caustic soda in the washing process used for the returnable bottles. IKV and KHS Corpoplast GmbH have therefore developed a coating system capable of withstanding the washing process with NaOH. This has opened the way for more frequent reuse without having to dispense with effective protection of the contents.

### **From single-use to multi-use PET for improved resource efficiency**

The German deposit system for PET bottles distinguishes between single-use PET bottles and multi-use or returnable bottles. Single-use PET bottles are, after collection, shredded and prepared for recycling. This does not, however, represent a completely closed cycle, because only 30 % of the processed PET is used for the production of new PET single-use bottles. This is due among other things to the fact that PET can only be recycled a maximum of 10 times because the molecule chains are shortened during every processing operation, which, in turn, leads to a deterioration of the material properties. The remaining 70% is used among other things in the textile industry and can then no longer be recycled into bottles. In 2018, 72% of all non-alcoholic beverages in Germany were sold in single-use PET bottles.



This is equivalent to 16.4 billion single-use PET bottles or 394,000 t of newly produced PET in Germany per year\*.

Reusable PET bottles, on the other hand, are cleaned after use in a washing process with a strong NaOH solution, sterilised and subsequently refilled. At present, returnable PET bottles can pass through this cycle up to 20 times, which offers enormous potential for saving resources. If we assume that a reusable PET bottle performs the work of 15 single-use PET bottles, it would be possible, in the event of a complete changeover to multi-use, to save around 260,000 t of PET in Germany every year.

### **Minor extension of the production process offers fresh scope for reusable PET bottles**

Especially against the background of the present plastics packaging legislation, which targets a reusable quota of at least 70 %, this research project for the coating of returnable PET bottles can make a decisive contribution. The quality and storage life of the bottled contents remains at the customary level, because, in the same process step as the application of the barrier coat that lengthens the shelf life of carbonated drinks and fruit juices, a specially developed protective coating against aggressive caustic soda solution is applied by microwave-excited low pressure plasma. As a result, beverage producers and bottling companies can now fill any product without restriction into reusable PET bottles. This opens the way to fully exploiting the savings potential at the resource level.

IKV was delighted to learn about the nomination for the German Raw Materials Efficiency Prize, which honours among other things the Institute's commitment to the topic of circular economy. Which project finally wins the prize is to be announced on 21 October 2020, when the awards are made in Berlin.

The transfer project "PECVD gas barrier coating of reusable PET bottles" is funded by the German Research Foundation (DFG) within the framework of collaborative research centre SFB-TR87 "Pulsed high-power plasmas for the synthesis of nano-structured functional layers". Our thanks go to the DFG.

*\*Assuming that all the bottles are 0.5 litre PET bottles with a weight of 24 g.*

#### **About IKV**

IKV - the Institute for Plastics Processing at RWTH Aachen University, is Europe-wide the leading research and education institute engaged in the field of plastics processing enjoying outstanding reputation. More than 300 staff are employed in finding solutions to problems connected with processing, materials technology and part design in the plastics and rubber industries. IKV's close contacts with industry and science, together with its outstanding facilities, enable cutting-edge research in plastics technology and ensure that students benefit from a comprehensive, practically oriented course of study. Plastics engineering graduates from IKV are thus sought-after experts in industry. In organisational terms, IKV is divided up into the four specialist departments of Injection Moulding, Extrusion and Rubber Technology, Part Design and Materials Technology, and Composites and Polyurethane Technology. The institute also takes in the Centre for Analysis and Testing of Plastics, and the Training and Further Education department. IKV is run by an Association of Sponsors, which currently has a membership of about 300 plastics companies from all over the world. Univ.-Prof. Dr.-Ing. Christian Hopmann is



Head of the Institute and Managing Director of the Association of Sponsors. He also holds the Chair of Plastics Processing at the Faculty of Mechanical Engineering at RWTH Aachen University.

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The project is funded by the German Research Foundation (DFG) within the Collaborative Research Centre SFB-TR87 as a so-called transfer project and has now also been nominated for the German Raw Material Efficiency Award 2020.