

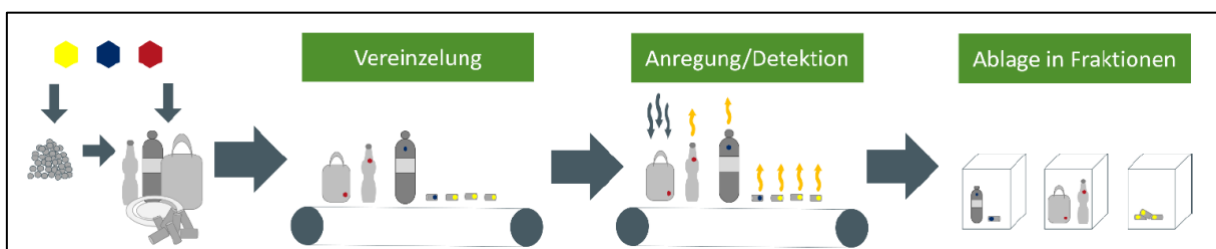
Press release from 18.03.2021

## Innovation for packaging sorting

The new BMBF research project Tasteful combines tracer-based sorting with object recognition and artificial intelligence (AI). Polysecure GmbH, HD Vision Systems GmbH, Karlsruhe Institute of Technology (KIT), Pforzheim University of Applied Sciences (HSPF) and the Fraunhofer Institute for Foundry, Composite and Processing Technology IGCV are developing the next technological step in tracer-based sorting.

For almost thirty years, Germany has been separating packaging, collecting it separately and recycling it to the highest possible quality. However, the Germans' pride in their globally exemplary dual system of packaging recycling has now given way to disillusionment: Despite decades of effort, not even half of the more than three million tons of plastic sales packaging in Germany is currently recycled; the rest is mostly incinerated. The proportion of recycled plastics used in the production of new plastic packaging in Germany is therefore only around 12%, and in Europe as low as 6% - from the point of view of many people, politicians and also researchers, this is far too low.

In its program "KMU innovativ - Ressourceneffizienz" (Innovative SMEs - Resource Efficiency), the German Federal Ministry of Research supports small and medium-sized enterprises whose innovative ideas contribute to reducing the burden on the environment and closing the loop. This includes the young technology company Polysecure GmbH from Freiburg. Polysecure develops fluorescent, inorganic markers (tracers) that can revolutionize packaging sorting and thus recycling.



*Schematic representation of Polysecure's tracer-based sorting process. 1) Marking of the packaging with fluorescent tracers; 2) Separation of the material stream; 3) Excitation and detection of the tracers; 4) Deposition according to the tracers or defined fractions and best possible recycling (Photo credit: Polysecure)*

Packaging waste can only be sorted by plastic type (PP, PE, PS, PET) according to the state of the art with sorting methods using reflection spectroscopy in the near infrared (NIR sorter), which prevents a renewed high-quality use. "Complete recycling only becomes possible by differentiating by other criteria, e.g. food applications such as yogurt pots versus non-food applications such as personal care products or even by manufacturer," said Dr. Frank Fuchs,

project coordinator. "Through our tracers, brands will be able to recover and reuse packaging materials of known quality and quantity in the future." In tracer-based sorting, plastic packaging is given a sorting code corresponding to its technical specification class by means of tracers. For this purpose, the inorganic tracer substances are either dispersed in the packaging material or applied to the packaging or label by conventional printing methods. When the tracers are suitably excited, they fluoresce and emit a characteristic fluorescence in each direction - the sorting code. This optical signature can be easily detected even in fast and uncontrolled moving, dirty and deformed packages. No other technology offers comparable reliability and efficiency for sorting waste.



*Example of different PET-based packaging fractions that could be differentiated and thus sorted by tracers (Photo credit: Pforzheim University)*

The aim of the research project "Tracer Based Sorting - Efficient and Flexible" (Tasteful) is to further increase the efficiency and practicability of TBS sorting technology. Sub-objectives of the project are the improvement of the excitation technology, the extension of the tracer and thus sorting code portfolio as well as the extension of the sorting technology by object recognition systems. In the long term, the combination of tracer detection and object recognition based on artificial intelligence (AI) will raise the reliable recognition of sorted goods to the highest and most economical level worldwide. "We are thus realizing an innovative leap for the circular economy, which will be able to sort better and more cost-

effectively in the future than with the insufficient current sorting technologies," explains Prof. Dr.-Ing. Jörg Woidasky of Pforzheim University.

Polysecure is pursuing this approach together with proven research partners in order to quickly provide application-ready solutions for sorting. For this purpose, the company HD Vision Systems from Heidelberg provides optical systems that have so far been used for industrial identification tasks in quality inspection and robot control. The company is adapting the inspection systems and processing neural networks specifically to the new application.

CEO and founder Dr. Christoph Garbe explains the special features of this inspection task: "Packaging materials usually have very complex optical properties, such as arbitrary deformations. With our light-field imaging, we can master this: our measurement system not only enables geometry measurement, but also the determination of optical surface properties."

Object recognition and tracer identification is tracked by the Fraunhofer Institute for Foundry, Composite and Processing Technology IGCV in Augsburg using artificial intelligence methods. The Karlsruhe Institute of Technology (KIT) is developing new tracer substances together with Polysecure, and Pforzheim University of Applied Sciences is conducting waste management studies and supporting the market entry of TBS technology. The results of the work will be combined in a demonstration plant at Polysecure's technical center in Freiburg, where extensive sorting tests for validation under real conditions are planned at the end of the project. The consortium's work will begin in February 2021 with a joint project meeting and is expected to last two years.

### **Information about the project**

The Tasteful consortium is conducting research under the BMBF funding measure "KMU-innovativ: Ressourceneffizienz und Klimaschutz". In addition to the company Polysecure GmbH (coordination), the company HD Vision Systems GmbH and the research institutions Fraunhofer Institute for Foundry, Composites and Processing Technology IGCV, Karlsruhe Institute of Technology (KIT/IMT) and Pforzheim University of Applied Sciences (IWWT) are working on the project. The project started on February 1, 2021, with an expected duration of two years.

For more information, visit: [www.hs-pforzheim.de/tasteful](http://www.hs-pforzheim.de/tasteful)

**GEFÖRDERT VOM**



**PROJEKTPARTNER**

