PRESS RELEASE

Fraunhofer at K 2022

Sustainable and efficient innovations for the plastics industry

At the world's largest trade fair for the plastics and rubber industry, 14 Fraunhofer units have adopted the "We know plastics" slogan and will be showcasing innovative, sustainable and efficient approaches, solutions and developments for plastics processing. From October 19 to 26, 2022, the topics of circular economy, digital transformation, climate protection and functionalization will take center stage at Booth SC01 in Hall 7.

Shortages of raw material, competition and the lack of skilled workers are among the challenges that the manufacturing industry is currently facing. Researchers are therefore working on energy-efficient and resource-efficient processes for the manufacturing of the future.

Circular economy: reusable transport packaging for food shipments

Circular economy represents the greatest field of action for the plastics and rubber industry. The circular economy of plastics concerns their entire life cycle — from product design, material selection and additives, the circular business model and traceability to added value for customers.

Using reusable transport packaging for B2C food shipping, the Fraunhofer Cluster of Excellence Circular Plastics Economy CCPE will showcase its research results and demonstrate solution approaches for circular products. The demonstrator "reusable transport box" combines the potential of circular plastic compounds with innovative manufacturing processes for component production. Newly developed PLA-based monomaterial approaches, bio-based foams with functional additives and odor-optimized recyclates open up promising design opportunities for the realization of circular product designs.

The digital transformation of production: measuring coating thicknesses on plastic

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Digital transformation has long since been a hot topic in the plastics industry. For the manufacturing industry with its large production systems, digital networking has been common practice for some time.

The Fraunhofer Institute for Industrial Mathematics ITWM in Kaiserslautern is developing terahertz systems that are used, among other things, to measure coating thicknesses in industrial environments. The measurement of coating thicknesses, e.g., of paintwork in the automotive industry, is an important part of quality control in production processes.
The cobot-based inspection system of Fraunhofer ITWM is suitable for inline inspection as well as for automated laboratory inspection tasks. In the latest version, the terahertz coating thickness measurement system is combined with a collaborative robot, or cobot for short, for simplified integration into the working environment.
In addition to coating thickness measurement on plastic, this system is also used for inline and offline coating thickness measurement of multilayer plastic products such as pipes, hoses or films.

Sustainable plastics solutions for climate protection

Climate protection is a major challenge of our time, which is why the plastics industry can — and must — play its part in fighting climate change with sustainable solutions.

The Laboratory for Technical Biopolymers (LTBP) at Fraunhofer IGB in Straubing develops plastics for a sustainable future. It covers the entire process chain from the synthesis of bio-based monomers and additives in the laboratory, through polymerizations in a miniplant, to plastics processing on a small scale. In addition to the functional properties of the materials, issues relating to recyclability or biodegradability are also taken into account with a view to cycle-oriented value creation. At the K trade fair, the LTBP will demonstrate its concept for utilizing residual materials from pulp production. These residual material streams, which are produced in large quantities, contain, among other things, the monoterpene (+)-3-carene, from which the Straubing researchers were able to produce new, 100 percent bio-based polyamides (Caramid-R®, Caramid-S®) with outstanding properties.

The functionalization of plastic components

Many industrial sectors are seeing an increase in the demands placed on the functionality of plastic components, such as the need to achieve even higher strengths while reducing weight.

The trend toward lightweight construction and increased functionality also leads to the need for combining different materials in lighting applications. In its Form-LIGHT project, the Fraunhofer Institute for Laser Technology ILT is focusing on developing a micro-moldable plastic/light metal hybrid material composite for a Class A surface. Using laser radiation on the surface, the researchers structure magnesium and aluminum

components and then functionalize the components through injection molding. In addition, they vaporize the reflector with a reflective layer. In doing so, they meet the requirements of LED technology by combining metallic die-cast components with good thermal conductivity and the high surface quality of injection molded components.

Sandwich composites made from continuous-fiber-reinforced face sheets and honeycomb core allow for maximum lightweight construction performance and minimal material usage in the production of large area structural parts. The TS-Moulding process developed and patented by the Fraunhofer Institute for Microstructure of Materials and Systems IMWS facilitates the production of complex-shaped, continuous-fiber-reinforced sandwich structures. In combination with thermoplastic injection molding or extrusion, these can then in turn be processed into ready-to-use structural parts. By combining these processes, fiber composite lightweight construction parts with thermoplastic matrix polymers can be custom-produced in high volumes and also be made available to the aerospace industry.

High-quality and stable components from a 3D printer require good adhesion between the individual polymer layers. Researchers at the Fraunhofer Institute for Surface Engineering and Thin Films IST are achieving this by combining extrusion-based 3D printing with atmospheric-pressure plasmas. The plasma treatment allows a targeted chemical modification of the printed surfaces and, consequently, an improvement of the adhesion forces. As a result of the enhanced interlaminar adhesion between the polymer layers, the tensile strength of the printed component perpendicular to the printing plane is increased. In addition, combinations of different polymers become possible — without the need for complex positive locking. Furthermore, the integrated plasma treatment facilitates subsequent processing steps, such as bonding or painting, and also enables the modification of internal surfaces of the printed component which are inaccessible at a later stage.

Come and discover these — and many more — Fraunhofer solutions for sustainable and efficient applications and developments as well as essential building blocks for the future of the plastics industry at Booth SC01 in Hall 7.

More information on the Fraunhofer-Gesellschaft exhibits at the K trade fair can be found here: https://www.fraunhofer.de/en/events/fraunhofer-at-trade-fairs/2022/k/exhibits-trade-fair-k-2022.html