



- 1 *Products and materials based on renewable resources.*
- 2 *2-component injection-molded demonstrator component made of PLA and PHBV.*
- 3 *PLA testing sample self-reinforced with continuous PLA fibers.*

### Fraunhofer Institute for Chemical Technology ICT

Joseph-von-Fraunhofer-Strasse 7  
76327 Pfinztal  
Germany

Contact  
Kevin Moser  
Phone +49 721 4640-533  
kevin.moser@ict.fraunhofer.de

[www.ict.fraunhofer.de](http://www.ict.fraunhofer.de)

## COMPOSITES BASED ON RENEWABLE RAW MATERIALS MATERIAL DEVELOPMENT OPENS NEW APPLICATION FIELDS

### Biopolymers for technical components

Over the past few years, biopolymers have attracted increasing attention and are in high demand, especially in the food and packaging industry. This growth is due both to economic factors, such as the rising prices and decreasing availability of raw materials, and the increasing competitiveness of biobased materials compared with common petroleum-based plastics.

There is currently a high demand for biopolymers based on renewable resources, for application in technical components or consumer goods. This can be met through continuous optimization of materials to overcome disadvantages such as a reduced impact resistance or a low heat deflection

temperature. Together with our partners, we develop formulations for the production of tailored biopolymer systems. This is not limited to the injection molding process. Formulations with a high spinnability, foamability and extrudability have been developed, and their application potential in the automobile and construction sector and the textile industry has been successfully demonstrated. Different combinations create the possibility of self-reinforced biocomposites or complete biobased sandwich structures.

A comprehensive selection of raw materials as well as adapted processing technologies for profile extrusion, injection molding and foam technology are central elements in material development for future products.



## Material development

In the area of material development, Fraunhofer ICT is equipped with a modern pilot plant and equipment that can be adapted to a broad spectrum of tasks. On the basis of long-standing experience, process design, material formulation and dosing technologies are individually optimized for specified polymers and/or fibers. Here the selection of a customized screw design is particularly important.

In most cases, the demands placed on materials made of biobased polymers (such as polylactic acid (PLA) and polyhydroxybutyrate (PHA) or polybutylene succinate (PBS)) and natural fibers are met by adding customized and application-specific additives.

## Processing

Our injection molding process is optimized to limit the amount of stress placed on the incorporated materials.

Beside customized screws and molds for conventional processing, a one-step direct processing plant is available. This enables higher fiber lengths and improved mechanical properties to be achieved.

Material samples can then be characterized in a cutting-edge testing laboratory equipped with mechanical, optical and thermal analysis methods. By this means the properties of the material can be verified directly in order to further optimize its development.

## Applications

Biocomposites have a wide range of applications. Beside conventional application fields in the medical and packaging sectors, modified natural-fiber composites can also be used for technical applications. We are happy to provide our customers with advice on application opportunities for this new generation of composites.

## Facilities and equipment

Various extruders with throughputs of 5 to 150 kg/h are available for development work, as well as numerous dosing technologies for solids, gases, liquids and fibers. Our high flexibility enables us to adjust our set-ups to individual and application-specific requirements, from material pre-treatment to the final product.

Furthermore, we provide our customers with the opportunity to produce samples and various demonstration parts using our injection molding machines with clamp forces up to 700 t. In particular for the processing of temperature-sensitive materials we can offer an injection-molding compounder for in-line compounding with immediate further processing, so that it is no longer necessary to cool, regranulate and re-melt the composite. This gentle material and fiber treatment enables higher fiber lengths to be maintained in the injection molding composite.

**4** PLA materials in different shapes, colors, and qualities, produced in the InnoREX project at Fraunhofer ICT.

**5** Materials based on renewable resources.