



1 Gas-loaded and pre-foamed biofoam particles.

## BIO-BASED FOAMS

**BIO-BASED PARTICLE FOAMS – EXTRUSION-FOAMED BIOPOLYMERS – ENVIRONMENTALLY-FRIENDLY ADDITIVATION – HALOGEN-FREE FLAME RETARDANCY**

### Fraunhofer Institute for Chemical Technology ICT

Joseph-von-Fraunhofer-Strasse 7  
76327 Pfinztal (Berghausen)  
Germany

#### Contact

Christoph Mack  
Phone +49 721 4640-721  
christoph.mack@ict.fraunhofer.de

Anja Dennard  
Phone +49 721 4640-259  
anja.dennard@ict.fraunhofer.de

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

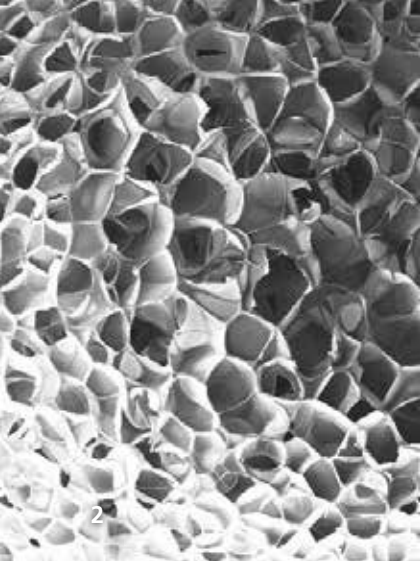
Biopolymers are becoming increasingly important to both industry and consumers. With regard to waste management, CO<sub>2</sub> balance and the conservation of petrochemical resources, increasing efforts are being made to replace standard plastics with bio-based polymers. Polymer foams are an important focus of research. Their good mechanical and insulation properties mean that they can be applied in various sectors.

#### Advantages of bio-based foams

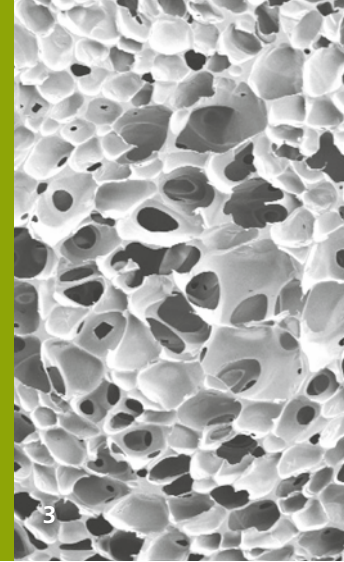
- Resource efficiency through the use of sustainable raw materials
- Reduction of waste due to biodegradability
- Cost savings, as lower quantities of materials are needed
- Processing can be carried out using conventional technologies
- Competitive advantage through innovation

#### Biopolymer foams

The advanced facilities available at the Fraunhofer ICT enable biopolymer processing in a complete product cycle, from a tailored compound to the final foamed product. Both bio-based extruded semi-finished products and particle foams can be produced on a foam extrusion line with underwater granulation, and on a Krauss Maffei Berstorff Schaumtandex laboratory line ZE 30/KE 60.



2



3



4

The further processing of complex molded parts with a defined density (30 - 200 kg/m<sup>3</sup>) is carried out using a laboratory molding machine (filling volume: 2 liters) and a steam chest molding machine from Erlenbach GmbH (clamping dimension: 570 x 670 mm).

### Material development and characterization of bio-based foams

Individual property profiles and biofoams tailored to specific applications can be produced on our comprehensive compounding line. The Fraunhofer ICT has extensive experience with environmentally-friendly additives and halogen-free flame retardancy.

Characterization includes:

- Rheology (melt strength, extensional viscosity)
- DSC, IR spectroscopy
- Mechanical values
- Thermal conductivity
- Cell structure analysis (light microscopy, REM)
- Flame retardancy test (UL 94, FMVSS 302, DIN 4102-1 (B2), DIN 4589, FAR 25.583 (F1, F2), Oxygen Index, EN 60695-2 (Glow Wire))

### Application range

The Fraunhofer ICT's objective in the development of biopolymer foams is to replace oil-based plastics with biopolymers. There are a variety of potential applications, including:

- Packaging industry
- Thermal insulation, particularly in the construction sector
- Utensils, such as handles, toys, or filters
- Automotive industry

### Our offer

- Material development for the production of tailored biofoams, for example cellulose-based polymers (CA, CAB, CP) or polylactide (PLA)
- Optimization of the technical property profile of biopolymers
- Additivation of biopolymers according to their application field, for example the addition of halogen-free flame retardancy, fillers and reinforcing materials
- Process development for the production of foamed elements such as extruded semi-finished products or particle foams
- Characterization of matrix materials and foams
- Tailored solutions

2 Cell structure of foamed CAB.

3 Cell structure of foamed PLA.

4 Wall element with cellulose-based foam core.