



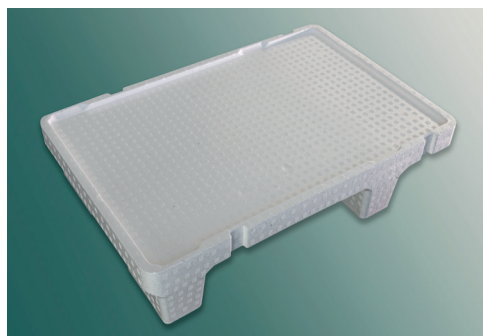
Bio-based foams

Bio-based particle foams – extrusion-foamed biopolymers – environmentally-friendly additivation – halogen-free flame retardancy

Biopolymers are becoming increasingly important to both industry and consumers. With regard to improved waste management, CO₂ 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



*Above:
Expandable and pre-foamed
biopolymer particle foams,
and components made from
these foams*

*Below:
PLA lightweight panel*

Biopolymer foams

The advanced facilities available at Fraunhofer ICT enable biopolymer processing within a closed processing chain, 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.

Further processing to complex molded components with defined densities (15–200 kg/m³) is carried out on a laboratory molding line (filling volume: 2 liters), an industrial steam chest molding machine (clamping dimension: 570 x 670 mm) from the company Erlenbach GmbH or a radio frequency molding machine from the company Kurtz.

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. Fraunhofer ICT has many years of experience with environmentally-friendly additives and halogen-free flame retardancy.

Characterization includes:

- Rheology (melt strength, extensional viscosity)
- DSC, IR spectroscopy
- Mechanical value tests
- 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

Fraunhofer ICT's objective in the development of biopolymer foams is to replace oil-based plastics with biopolymers.

These have a variety of potential applications, including:

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



PLA foams

Service portfolio

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

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