

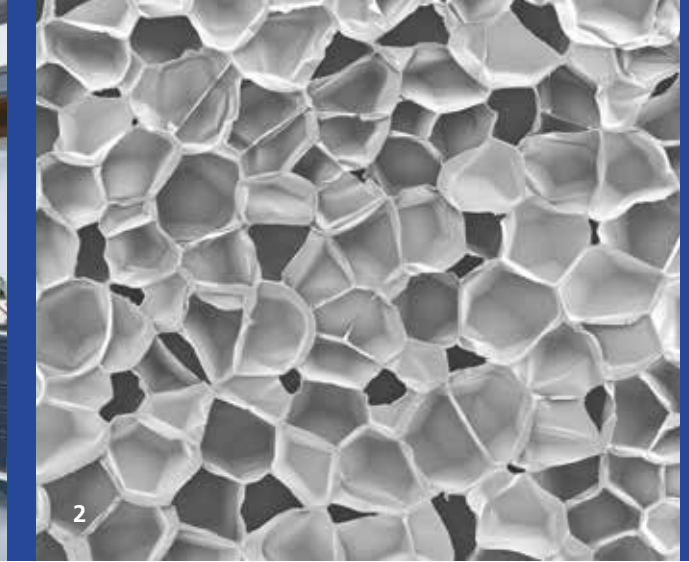


Fraunhofer
ICT

FRAUNHOFER INSTITUTE FOR CHEMICAL TECHNOLOGY ICT

FOAM TECHNOLOGIES





High-performance materials for lightweight construction, and their resource-efficient manufacturing, are important fields of development. Foamed materials make a significant contribution, and are finding increasing application in transport packaging, thermal insulation in buildings, and the automotive sector.

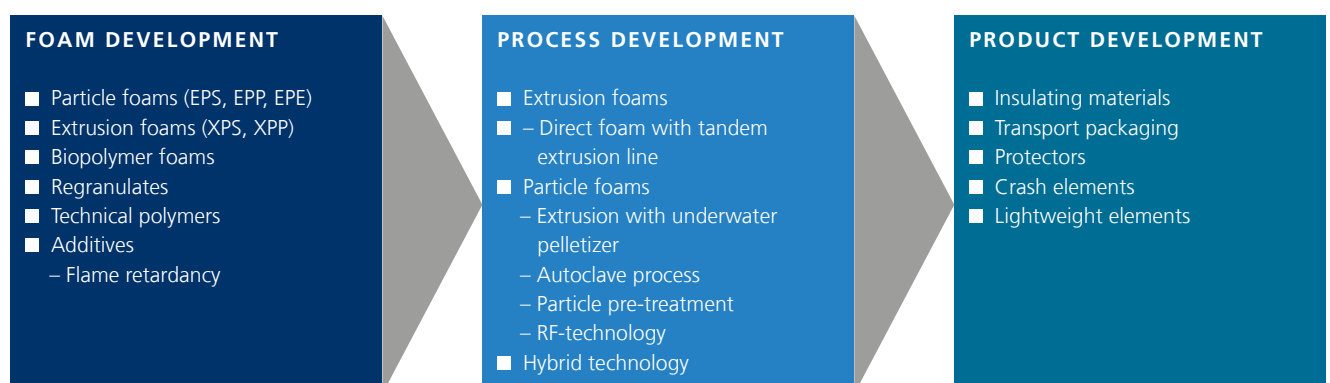
Our core research topics include the development of new foamed materials and thermoplastic foams with tailored properties. We also focus on innovative processes, including the optimization of existing systems and the production of foam compounds, significantly broadening the application field for these materials.

Using processing technologies across the entire process chain for foam development, foamed materials can be produced both as semi-finished products in a direct extrusion process and as particle foams in extrusion with underwater pelletizing. Beside conventional polymers such as polyethylene, polypropylene and polystyrene, biopolymers and technical polymers are also investigated.

Current research topics in the field of foam development include the extrusion manufacturing of foamable polymer compounds based on sustainable raw materials, and the targeted application of functional additives, for example environmentally-friendly flame retardants, or additives to improve the mechanical properties or temperature stability of the materials.

The key element in process development is the optimization of process configurations and the development of new processing concepts for the production of material compounds. In the processing of particle foams, emphasis is placed on reducing the material density during pre-foaming, and on optimizing component production.

Overview of the development chain for foam processing:





OUR OFFER

We offer our customers individual and market-oriented development services for foamed materials. Starting from basic investigations and feasibility studies, we optimize polymer foam materials and develop them up to technical implementation.

- Material development and optimization of the foam structure in the extrusion process
- Production of foamed semi-finished products in a Schaumtandex unit
- Development of foamed beads, or granules containing blowing agents via underwater pelletizer
- Investigation into the foaming of granules to form foamed particles in the laboratory pre-foamer
- Development of molds to process new material combinations
- Investigations into processing in steam chest molding machines
- Product development
- Characterization of materials and components, cell structure, density, melt strength, shear viscosity, thermal conductivity, mechanical properties
- Customized services

COVER PHOTOGRAPH:

Particle foam components.

1 *Particle foaming line (extrusion line for continuous particle foam manufacturing).*

2 *Foam morphology, high resolution SEM-microscopy*

3 *Schaumtandex extrusion line.*

4 *Steam chest molding machine.*

FACILITIES AND EQUIPMENT

Flexible and modern processing units are available in the Fraunhofer ICT's pilot plant for direct foam extrusion and for particle foam technologies:

- Extrusion line consisting of a twin-screw extruder (Leistritz TSE 27 MAXX), a melt pump and an underwater pelletizer (Gala); throughput 5-40 kg/h
- Schaumtandex laboratory unit (Berstorff ZE 30/KE 60) for the production of foamed semi-finished products up to 300 mm wide and 60 mm thick; throughput 30-60 kg/h
- Melt cooler for foam development and characterization
- Dosing station (high and low pressure) for hydrocarbons, nitrogen and carbon dioxide (Lewa, Maximator)
- Dosing equipment for granules, powders, liquids and nanoscale additives
- Autoclave for particle foam production
- Discontinuous pre-foamer 150 l/2.5 bar (overpressure) (Erlenbach)
- Laboratory steam chest molding machine (components: 200 x 200 x 50 mm³) (developed in-house)
- Freely programmable steam chest molding machine (clamping surface: 670 x 570 mm²) (Erlenbach)
- Radio-frequency molding for particle foam processing, as well as for high temperature thermoplastic materials
- Equipment for characterizing foams
 - mechanical and thermal testing
 - rheology (extensional rheology, melt rheology)
 - microscopy (light microscopy, scanning electron microscopy)
 - fire protection
 - temperature controlled hydrostatic pressure test bed

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