

1 4-Point bending test of thermo-plastic foam sandwich part.

2 SEM-image of the break surface of a fiber-reinforced thermoplastic.

MATERIAL CHARACTERIZATION AND FAILURE ANALYSIS

Fraunhofer Institute for Chemical Technology ICT

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

Contact

Susanne Lüssenheide
Phone +49 721 4640-717
susanne.luessenheide@ict.fraunhofer.de

www.ict.fraunhofer.de

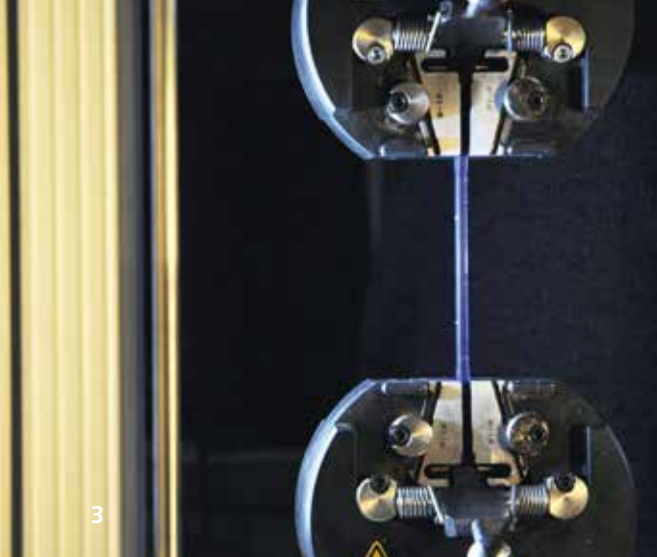
Plastics testing

The demands placed on polymer materials are continually increasing, and new formulations must be developed to meet them. Plastics testing provides important information to polymer producers, construction engineers, manufacturers and secondary producers, which enables them to evaluate materials and compare the quality of materials and finished parts on every level.

The material testing laboratory at Fraunhofer ICT is operated by an experienced and independent team, which has the laboratory and pilot facilities necessary to perform comprehensive tests on your products or materials. We generate material data for structure and process simulation and in the event of failure we offer a systematic analysis of its cause.

Mechanical testing methods

- Tensile test with measurement of the lateral contraction
- Flexural bending test, 3-point and 4-point
- Testing of interlaminar shear strength (e.g. ILSS, tensile shear test, shear-edge test)
- Compression test, e.g. of composite materials or polymer foams
- Impact strength/notched impact strength (Charpy) and puncture test
- Heat deflection temperature HDT
- Vicat softening point
- Bond strength tests (e.g. lap-shear test)
- Dynamic-mechanical analysis (DMA)
- Characterization of the deformation behavior of semi-finished products (e.g. tape material or organosheets)



Sample production

Test results can only be used to compare different materials when the sample production and preparation of the materials are identical. The standards for molding compound materials therefore contain details of the production process and processing conditions for the individual materials. In this field Fraunhofer ICT can offer the following production methods:

- Injection molding for thermoplastics and free-flowing thermosets
- Production of sheet material for the manufacturing of test samples by compression molding
- Mechanical separation processes and hot-wire cutting
- Conditioning of samples in climate chambers

Rheological testing

For the rheological characterization of polymer melts we offer the following tests:

- Shear viscosity (high pressure capillary viscosimeter)
- Elongational viscosity (Rheotens)
- Melt index test (MFR/MVR)

Complementary testing methods for plastics

In the material testing laboratory we offer the following complementary tests:

- Determination of fiber content (annealing residue or wet-chemical)
- Fiber length measurement (glass, carbon, natural fibers)
- Determination of residual monomer content for PA6/Caprolactam
- Determination of the moisture content of granulates
- Shore-hardness (Shore A and Shore D)
- Measurement of density (immersion method)
- Color measurement
- Contact angle measurement/determination of surface energy
- Thermal analysis (DSC, TGA, TG-MS)

Optical / Electron microscopy and preparation techniques

For structural investigations such as:

- Crystallinity of polymers
- Depiction of cavities/pores
- Fiber or particle distribution in polymers
- Mixtures of different polymers
- Detection of damage or processing defects such as microcracking
- Layer thickness measurement for surface coatings
- Polymer adhesion, for example to glass fibers

the following equipment is available: electron microscope (SEM) with element analysis (EDX), transmitted-light microscope, scanning reflected-light microscope, macroscope, rotation microtome, cryomicrotome, grinding and polishing machines to generate polished and thin sections.

Beside the plastics testing laboratory, Fraunhofer ICT offers a wide range of other testing methods in the following areas, and would be happy to provide you with more information: chromatography, electrical properties, high-speed films, calorimetry, crystal structure, particle characterization, spectroscopy, environmental simulations.

3 Determination of tensile properties according to DIN EN ISO 527.

4 Series extraction e.g. to determine residual monomer content.