Fraunhofer Pilotanlagenzentrum Polymere IAP und IWM

Fraunhofer Institut Werkstoffmechanik

Equipment for polymer testing at Fraunhofer IWM Halle and Fraunhofer PAZ Schkopau

Equipment for rheological measurements

- high pressure capillary rheometer (Rheotester 2000) with tubular and slit dies of different lengths and diameters for viscosity measurements of polymer melts and the determination of pvt-diagrams
- tensile rheometer (Rheotens) for determination of melt strength and tensile viscosity
- die swell measurement
- melt index tester (Meltflixer MT)
- rotational rheometer (RS 100) shear stress or shearing rate controlled (options: rotation and oscillation) for viscosity, storage modulus and loss modulus determination of polymer melts and fluids
- dilution viscosimeter (iv-measurement)

Equipment for physical and mechanical testing

- Karl-Fischer-Titrator (moisture determination)
- density determination (buoyancy-flotation method)
- electromechanical testing devices 1 kN, 10 kN and 50 kN with Controlled Test Chamber (-150 .. 350 °C), Macro, Clip-Gauge, DMS, 3D-measurement instrumentation, quasi-static and dynamic testing
- servo hydraulic testing devices 10 kN, 250 kN with Controlled Test Chamber (-150 .. 350 °C), Macros, Clip-Gauges, DMS, 3D-measurement instrumentation, quasi-static and dynamic testing
- servo hydraulic multipurpose test bay for multiaxial loads (up to 10 kN and 300 Hz)
- environmental chambers (rel. humidity 10 .. 90 %, -70 °C .. 200 °C)
- creep behavior testing, temperature controlled up to 80 °C (air environment) and 95 °C (selectable medium)
- pendulum impact testing device for notched or unnotched impact strength measurements (23 °C .. 40 °C)
- falling weight tester (-70 °C .. 150 °C, 1500 J, 24 m/s, tensile impact test and puncture impact testing
- laser-flash-method LFA 447 to determine the thermal diffusivity and thermal conductivity (RT up to 300 °C), solids and liquids measurable, orientation dependent measurements (e. g. longitudinal and transversal to fiber orientation)
- dynamic mechanical analysis (DMA) with compression, tensile and shearing loads (-150 °C .. 600 °C; 0 .. 200 Hz)
- HDT device for determination of Heat Deflection Temperature and Vicat softening temperature
- differential scanning calorimetry (DSC) for measurements of thermal enthalpy, phase transition temperatures and specific heat capacity
- testing devices for fracture mechanical measurements also with mixed mode loads (e. g. DCB, CTS, ENF, 4ENF, MMB, Richard)
- shore hardness tester (A/D)
- equipment for sample preparation (stamping, notching, cutting, milling)

3D deformation and strain measurement equipment

- laser Electronic Speckle Pattern Interferometry for high accurate 3D strain measurement of parts (maximum area up to 1m²) for static and dynamic (up to 40 kHz) loads
- optical gray scale correlation method for 3D strain measurement of surfaces (areas 1 cm² up to 1 m²) for quasi-static (4-camera-system) and high speed analysis (2-camera-system)
- laser extensometry (cross scanner, parallel scanner) for high precision strain measurements and control of strain-regulated experiments
- fringe projection technique for high precision shape detection (3D) of parts (usable for reverse engineering)
- online video extensometer for strain measurements

Microscopy and spectroscopy

- transmission electron microscope (STEM 200 kV, Philips CM 20) with Nanospot-EDX- and EELS-analyses
- high resolution field emission scanning electron microscope (JEOL JSM 6700, Hitachi S4500) with EDX-analysis and EBSD
- environmental scanning electron microscope (ESEM) for investigations in vacuum to 4000 Pa and in-situ deformation apparatus to 5 kN, hot and kryo stage,
- atomic force microscope (AFM 100 CP), contact and non-contact mode
- preparation technique: ultra-microtomy, ion-thinning, focused ion beam for target preparation
- infra-red spectroscopy (FTIR) and UV/VIS spectroscopy
- infra-red thermography with lock-in detection system for defect analysis

Mechanical simulation software

- finite element method (FEM): ANSYS, ABAQUS, CAD systems
- boundary element method (BEM): 2D and 3D with specific fracture mechanics post-processor-routines