

Concept

The purpose of the laboratory is the **processing of small polymer quantities** (gram scale) from the melt and solution into fibers, films, coatings and laminates. Other activities focus on fabrication of polymer blends and additive research by melt mixing.

For further materials characterization, the preparation of **test specimen** and the evaluation of their **mechanical properties** are performed routinely.

Research Contracts and Cooperations

The laboratory is used by the science and engineering faculties of the University. In particular members of the polymer chemistry, chemistry and materials science departments benefit from equipment and technical expertise.

The lab is also part of the **SFB 481 "Complex Macromolecules and Hybrid Systems"** and therefore involved in several projects dealing with the orientation and processing of materials.

Examples for **industrially supported research projects** are *"Self-reinforcement in PET-fibers"* (Hoechst/Celanese), *"Fabrication of organic effect pigments"* (BASF AG) and the *"Development of high temperature matrix materials"* (Fa. Dr. Busch GmbH).

Several local companies utilize the equipment and the know-how of the lab to their advantage. This is realized by the exchange of information, visits, small contracts and consultation.

Contact us

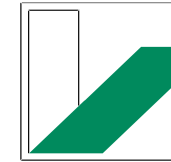
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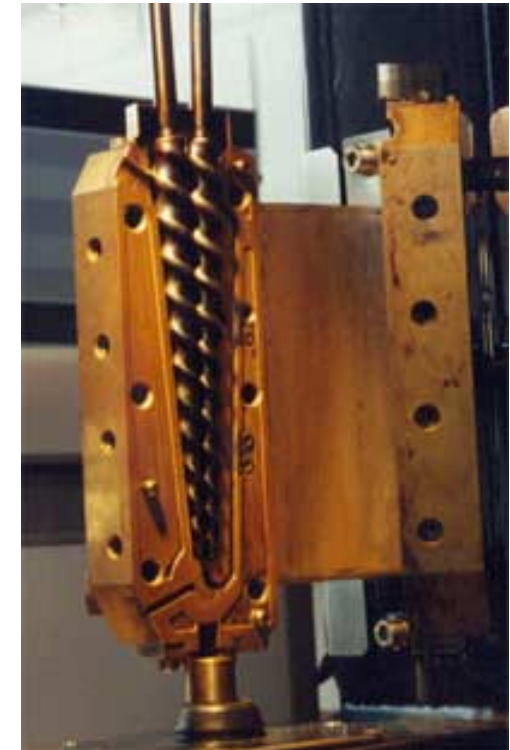
Technology Transfer

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Laboratory for Polymer Processing and Testing



9/01

The picture on the cover shows the twin-screw mixer built at the TU Eindhoven, the Netherlands. Two conical screws mix the components under high shear.

www.uni-bayreuth.de/departments/mci/polyprocess/

Processing Techniques and Equipment

A variety of equipment is available for different processing techniques, e.g. pre-treatment (grinding, drying), processing of polymers from solution and melt, compression molding, fabrication of orientation layers, and for post-treatment of materials (drawing, annealing).

Mixing and Grinding

MINIMIXER¹⁾ (TU Eindhoven, twin-screw mixer, max. 3 g, up to 350 °C)

ZM 100²⁾ (Retsch, ultra-high speed mill, for plastics, several sieve sizes, coolable)

A 10 (IKA, Grinder, coolable)

Orientation Layers

BUFFING MACHINE LCRM6⁵⁾ (Optron Systems, buffing of polymers, for LC-displays, RT)

TRIBOTRAK⁵⁾ (DACA Instr., orientating PTFE layers by *friction deposition*, up to 300 °C)

Thermal Post-Treatment

DRAWING RIGG³⁾ (UBT, fibers and films, continuously, up to 300 °C)

IMIDIZATION APP.³⁾ (UBT, curing of films under inert atm., up to 500 °C)

HIGH TEMP.- & VACUUM OVENS³⁾ (Oheraeus, Naberthem, Memmert, drying, annealing, up to 1100 °C)

Solution & Melt Processing: Films

MICROTRUDER⁵⁾ (Randcastle, 6.35 mm single screw extruder, film die, min. 8 g, up to 300 °C)

HOT PRESS¹⁾ (Carver Inc., compression molding, max. pressure 25 t, 500 °C)

SPIN-COATER²⁾ (Headway Res., max. Ø 12 cm, RT, for aggressive solvents)

DOCTOR BLADE MACHINE³⁾ (UBT, discontinuous mode, up to 280 °C)

DOCTOR BLADE MACHINE⁴⁾ (UBT, continuous mode, up to 200 °C)

ROLL-CASTING MACHINE⁵⁾ (for the orientation of block copolymers in solution, RT)

Solution & Melt Processing: Fibers

SOLUTION SPINNING LINE²⁾ (ETH Zürich/UBT), max. 8 ml, up to 120 °C)

MICROTRUDER¹⁾ (Randcastle, 6.35 mm single screw extruder, fiber die, min. 8 g, bis 350 °C)

RHEO MELTFLIXER¹⁾ (SWO, MFI measurements und capillary rheometer, max. 5 g, 350 °C)

Photo-Crosslinking

UV-CURING⁴⁾ (UV-Fusion UK, continuously, H&D-lamp, 1800 W)

Mechanical Testing and Sample Preparation

TENSILE TESTER²⁾ (Instron, up to 5kN load, HT- oven up to 500 °C)

DYNAMIC-MECH. THERMAL ANALYSIS²⁾ (Rheometrics/TA Instr., DMTA/TMA, -120 to 1000 °C)

POLARIZATION MICROSCOPE¹⁾ (Olympus, transmission and reflection)

SAMPLE PUNCHER¹⁾ (Coesfeld, several DIN-test specimen)

MINIATUR INJECTION MOLDING⁵⁾ (DACA Instr., 1- 3 g, several molds, up to 350 °C)

PISTON INJECTION MOLDING⁵⁾ (Ray-Ran UK, min. 20g, different mold geometries, up to 300 °C)

Further facilities in the Polymer Chemistry department:

GPC Lab

Rheology Lab

X-ray Diffraction (WAXS, SAXS, Reflection)

Electron Microscopy (TEM, FE-REM)

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1) Universität Bayreuth

2) Bayerisches Langfristprogramm "Neue Werkstoffe"

3) Fonds der Chemischen Industrie

4) BASF AG

5) DFG, SFB