Leibniz-Institut
für Polymerforschung
Dresden

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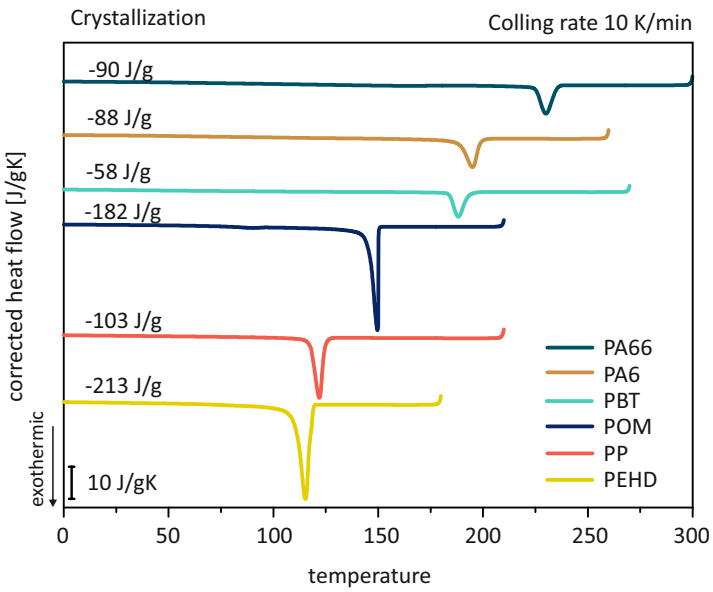
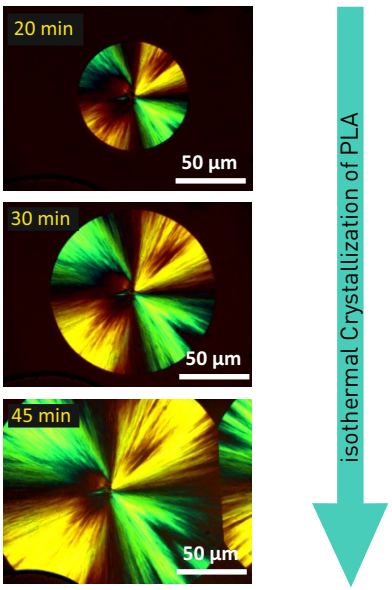
Injection Molding and Morphology

Thermal and microscopic investigation methods are of essential importance to determine the process-structure-property relationships of the raw materials and the injection molded components. At the Leibniz-Institut fuer Polymerforschung Dresden e.V. they are used for the investigation of crystallization processes, process-induced morphology, interface effects, phase morphology and micromechanical failure behavior. The further development of preparation methods and investigation methods (correlative methods) are challenges that need to be addressed.

Crystallization Processes

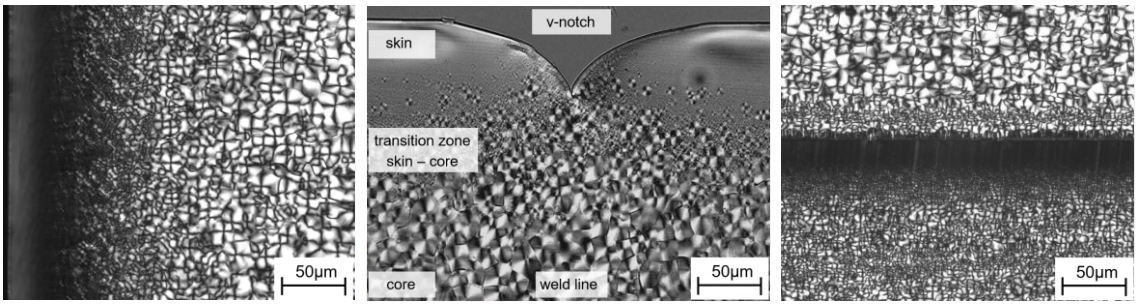


Crystallization curves of different semi-crystalline thermoplastics [1]. Method: Differential Scanning Calorimetry (DSC).



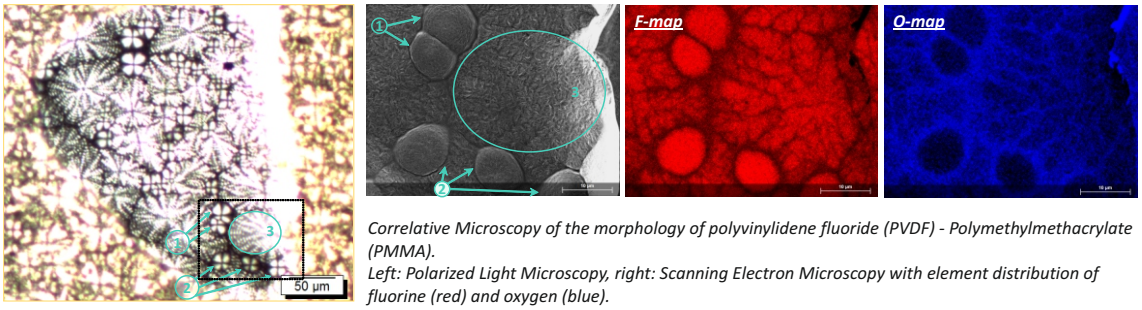
Isothermal spherulite growth of polylactide (PLA) [2]. Method: Thermal stage experiment on a light microscope with polarized light.

Process-Induced Morphology



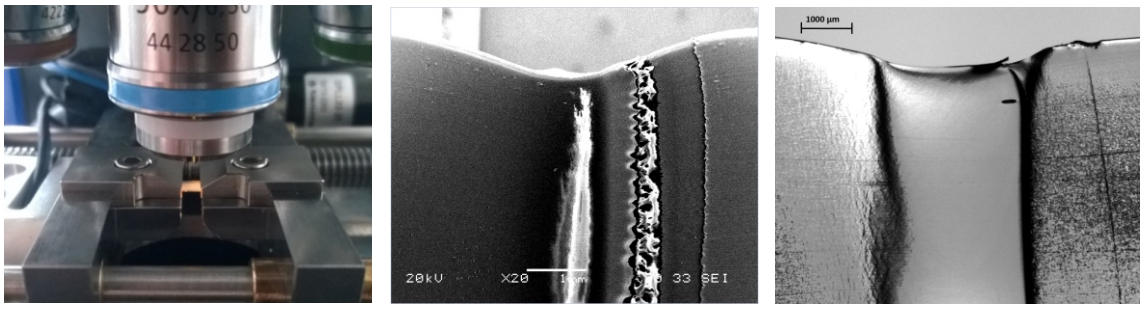
Injection molded polyamide interface under a polarized light microscope.
Left: skin area (standard injection molding), center: weld line, V-notch at the skin [3], right: cold interface (multi-component injection molding)

Phase Morphology



Correlative Microscopy of the morphology of polyvinylidene fluoride (PVDF) - Polymethylmethacrylate (PMMA).
Left: Polarized Light Microscopy, right: Scanning Electron Microscopy with element distribution of fluorine (red) and oxygen (blue).

Failure Behavior



Left: Thin-section tensile device in a polarized light microscope, center: PP / PP interface in tensile test, Scanning Electron Microscopy (SEM) [4] and necking in a tensile test on a thin section, Light Microscopy.

Contact

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Literature

1 Kuehnert, I., Schoenfeldt, A., Auf der Landwehr, M., New Insights into interfaces in injection molded parts, Proceedings ANTEC, Cincinnati, USA (2013)

2 Kuehnert, I., Berger, M., Zimmermann, M. Weld Line Behavior in Injection Molded Parts, Proceedings PPS31, Jeju Island, Korea (2015)

3 Spoerer, Y., Blanco, C., Zimmermann, M., Kuehnert, I, Morphology-property behavior of semi crystalline polymers in injection molded parts. AIP Conference Proceedings 2055 (2019)

4 Fischer, M., Ausias, G., Kuehnert, I. Investigation of interfacial behavior on injection molded parts. AIP Conference Proceedings 1713 (2016)

state as of: May 2021