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Structure Evolution and Gradients in Oriented Polymer Parts Studied by Scattering Methods Using Synchrotron Radiation. N. Stribeck, S.V. Roth, P. Bösecke, C. Schroer, A. Almendarez Camarillo, M. Kuhlmann, U. Nöchel, Dept. of Chemistry, Inst. TMC, Univ. of Hamburg, Hamburg, Germany.

In the field of semicrystalline polymer parts structure evolution during crystallization and melting as well as the spatial variation of nanoscale structure is studied. We develop and apply advanced Fourier-transform methods (multidimensional chord distribution function analysis (CDF), SAXS tomography) and investigate nanostructure evolution in-situ in order to understand its mechanisms. Our samples are commercial grades from different polymers (PE, PP, PVDF).

We focus on samples with fiber symmetry because we require complete reciprocal space data recorded fast. For the study of the interaction between nanostructure formation and crystallization a time-resolution of 1 s appears to be sufficient. Our data collected so far indicate that a dominant mechanism of quiescent polymer crystallization is a random crowding (random car parking process). SAXS tomography is demonstrated in a study of the inner structure of an injection moulded PE rod. The spatial resolution of 80 μm must be enhanced for the investigation of real fibers.

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