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SAXS/WAXS studies of flow-induced crystallization of poly(1-butene) in uniaxial extensional flow ERICA MCCREADY, WESLEY BURGHARDT, Northwestern University — We report studies of flow-induced crystallization of poly(1-butene) in uniaxial extensional flow. Flow was produced using an SER extensional flow fixture housed in a custom built convection oven designed to provide x-ray access for in situ studies of polymer structure using synchrotron x-ray scattering techniques. Samples were loaded into the SER fixture, heated well into the melt, and then cooled to a temperature at which quiescent crystallization would be prohibitively slow. A short interval of uniaxial extensional flow was then applied, after which simultaneous wide- and small-angle x-ray scattering (SAXS and WAXS) patterns were collected to study the phase transformation kinetics and morphology of the subsequent accelerated crystallization. The degree of crystallite orientation was generally found to decrease over the course of the crystallization. WAXS measurements yielded systematically higher degrees of crystallite orientation than SAXS. Both SAXS and WAXS gave generally consistent results for the extent of crystallization, although the SAXS invariant showed a decrease at long times that is not mirrored in the WAXS data. The impact of both deformation rate and total applied strain on the crystallization process were examined.

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