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Model-guided experimental design of flow-induced crystallization of poly(1-butene) under uniaxial extensional flow as measured by small angle x-ray scattering MU SUNG KWEON, WESLEY BURGHARDT, Northwestern University — A key assumption in most current flow-induced crystallization models is that flow-induced molecular orientation/stretching leads to enhanced nucleation rate, which in turn leads to accelerated crystallization kinetics. This underlying hypothesis was directly tested by subjecting poly(1-butene) to various extension rates and Hencky strains that resulted in similar number density of flow-induced nuclei, which was calculated from the degree of stretch during extensional flow and relaxation, as predicted by a simplified Rolie-Poly model. Uniaxial extensional flow was produced using an SER housed in a custom-built oven designed to facilitate *in situ* synchrotron x-ray experiments. Samples were first heated well into the melt, and then cooled to a crystallization temperature selected such that negligible quiescent crystallization would occur on reasonable time scales. A short burst of extensional flow was then applied, and crystallization as well as the degree of crystallite orientation were monitored using small-angle x-ray scattering. For experimental conditions that are expected to result in similar degree and kinetics of crystallization, SAXS invariants generally do not show agreement, while the degrees of orientation are in general agreement.

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