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In situ synchrotron studies of structure development during injection molding of liquid crystalline polymers STANLEY RENDON, WESLEY BURGHARDT, Northwestern University — As in all polymer materials, the effect of polymer processing on the underlying molecular structure has a profound effect on the properties of liquid crystalline polymer products. While in situ scattering techniques have proven powerful for studying complex polymer structure during comparatively simple shearing or channel flows, their application to processing flows has largely been limited to in situ x-ray scattering/diffraction studies of structure development during fiber spinning. Here we report a new experiment in which a lab-scale injection molding machine has been modified to allow real-time, in situ measurements of molecular orientation development and subsequent crystallization during injection molding. The experiment requires high x-ray energy to reduce absorption in the aluminum mold wall, and high flux and a fast area detectors to achieve the necessary resolution to track time-dependent changes in fluid structure during mold filling. Hence it is ideally suited to the capabilites of the Advanced Photon Source. We report measurements injection molding of a commercial liquid crystalline copolyester (Vectra A) as a function of position in the mold and various process variables.

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