Abstract Submitted
for the MAR09 Meeting of
The American Physical Society

In Situ X-ray Scattering Measurements and Polydomain Simulations of Molecular Orientation Development during Injection Molding of Liquid Crystalline Polymers JUN FANG, WESLEY BURGHARDT, Northwestern University, ROBERT BUBECK, Michigan Molecular Institute — We report on a coordinated experimental/computational study of injection molding of commercial thermotropic LCPs. In situ synchrotron x-ray scattering, combined with a customized injection molding apparatus, is used to track development of molecular orientation during the mold filling process for a commercial LCP, Vectra A950, in two simple plaque mold geometries: square and T-shaped. Use of high brilliance undulator radiation at the Advanced Photon Source, coupled with a high speed CCD detector provides sufficient time resolution (12 frames per second) to resolve the transient orientation dynamics during and following mold filling. In addition to in- situ scattering measurements, ex-situ 2-D wide angle X-ray scattering measurements are conducted on the same injection molded plaques. The experiments are complemented by process simulations performed using commercial mold filling software. A very close analogy between the Folgar-Tucker fiber orientation model and the Larson-Doi polydomain model for textured liquid crystalline polymers is exploited to allow for the first tests of Larson-Doi model predictions in injection molding processing.

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Date submitted: 21 Nov 2008 Electronic form version 1.4