

Abstract Submitted
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Morphological Evolution During Tensile Deformation in Semi-Crystalline Precise Functional Copolymers via Fitting of *In Situ* X-ray Scattering EDWARD B. TRIGG, L. ROBERT MIDDLETON, University of Pennsylvania, BRIAN S. AITKEN, University of Florida, JASON AZOULAY, DUSTIN MURTAGH, Sandia National Laboratories, KENNETH B. WAGENER, University of Florida, JOSEPH CORDARO, Sandia National Laboratories, KAREN I. WINEY, University of Pennsylvania — Morphological evolution during tensile deformation of semi-crystalline polymers is often described qualitatively. The layered crystal structures of precise copolymers, in which functional groups are bonded at precise intervals along the polymer backbone, allow for quantitative fitting of oriented X-ray scattering peaks to provide additional information. The crystallites in precise poly(ethylene-*co*-acrylic acid) align with the acid group layers' normal vector *parallel* to the tensile direction, while those in precise poly(ethylene-*co*-imidazolium bromide) align with the layers' normal vector *perpendicular* to the tensile direction. We present fits of *in situ* X-ray scattering during tensile deformation of semi-crystalline precise copolymers, to quantify the size, shape, and degree of orientation of the crystallites during the deformation process. Mathematical descriptions of the X-ray scattering in these two cases is explored, and a physical explanation for the difference in alignment direction is proposed.

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