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Wide- and Small-angle X-ray Scattering Study on Poly(ethylene furanoate): Crystal Structure and Time-resolved Experiment YIMIN MAO, Department of Materials Science and Engineering, University of Maryland, College Park/NCNR, NIST, ROBERT KRIEGEL, The Coca-Cola Company, DAVID BUCKNALL, Heriot Watt University/School of Materials Sciences and Engineering, Georgia Institute of Technology — A new type of bio-based polyester, poly(ethylene furanoate) (PEF), was studied using synchrotron wide- and small-angle X-ray scattering techniques (WAXS/SAXS). Crystal structure of PEF was semi-quantitatively determined by fiber diffraction method. A monoclinic cell, with a = 5.784 Å, b = 6.780 Å, c = 20.296 Å, and $\gamma = 103.3°$ was adopted, with two chains contained in one unit cell. Space group was $P2_1$; each repeating unit contained 2 monomers. Inter-chain staggering was identified based on extinction of diffraction peaks along meridian. Time-resolved study on uniaxial deformation was carried out by setting up a stretching unit at synchrotron X-ray scattering beamline, where WAXS/SAXS data were precisely mapped to stress-strain curve. Orientation of amorphous polymer chains was decoupled from that of crystals, which provides insights into deformation behavior at molecular level.

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