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Understanding the Dynamics of Magnetic Field Alignment for Rod-Coil Block Copolymers BRYAN MCCULLOCH, University of California - Berkeley, GIUSEPPE PORTALE, WIM BRAS, ESRF, DUBBLE CRG, ALEXANDER HEXEMER, Advanced Light Source, LBNL, RACHEL A. SEGALMAN, University of California - Berkeley — Alignment of semiconducting block copolymer nanostructures is crucial to optimize charge transport in these materials. Magnetic fields can act on the liquid crystalline conjugated polymers, inducing alignment in rod-coil block copolymers. By using a combination of small angle x-ray scattering (SAXS) and transmission electron microscopy (TEM) we have studied the magnetic field alignment of poly(alkoxy phenylene vinylene-b-isoprene) (PPV-PI) rod-coil block copolymers. In situ measurements have also shown the magnetic field leads to a stabilization of the ordered phase. Furthermore, there appear to be two distinct timescales for alignment: at short times the alignment of these materials is fast likely caused by preferential growth of aligned domains, and at long times alignment increases by the very slow process of defect annihilation. Further, there is an optimum temperature where the kinetics and thermodynamic driving forces for alignment are balanced, producing very highly aligned samples. Understanding the mechanisms by which alignment occurs has lead to knowledge helping to rationally optimize the magnetic alignment of rod-coil block copolymers.

Bryan McCulloch
University of California - Berkeley

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