

Abstract Submitted  
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**Dynamics of Magnetic Field Alignment of Block Copolymers by In-Situ SAXS**<sup>1</sup> CHINEDUM OSUJI, MANESH GOPINADHAN, PAWEL MAJEWSKI, Department of Chemical and Environmental Engineering, Yale University — The use of external fields to direct block copolymer self-assembly is well documented. Magnetic fields offer particular promise due to their space-pervasive nature and the ability to produce arbitrary alignments over truly macroscopic length scales in appropriate systems. We present here the results of in-situ SAXS studies performed using a custom superconducting magnet integrated with lab-scale x-ray scattering instruments. We consider the case of side-chain liquid crystalline diblock copolymers ordering under high magnetic fields. Despite the coincidence of the block copolymer order-disorder transition (ODT) and the LC clearing temperature in these weakly segregated materials, there is no measurable effect of the field on the ODT of the system, up to 6 T. This is in line with estimates based simply on the magnitudes of the relevant energy scales - the free energy of field interaction and the enthalpy of the isotropic-LC transition. We show that the alignment of the system is critically limited by the viscosity of the mesophase such that alignment can only be advanced by residence in a small temperature window near the ODT. This residence produces a weakly aligned system which thereafter transitions to a strongly aligned state on cooling even in the absence of the field.

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