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Magnetic field alignment of coil-coil diblock copolymers and blends via intrinsic chain anisotropy YEKATERINA ROKHLENKO, Yale Univ., PAWEL MAJEWSKI, Univ. of Warsaw, STEVEN LARSON, Univ. of Wisconsin-Madison, KEVIN YAGER, BNL, PADMA GOPALAN, Univ. of Wisconsin-Madison, APOSTOLOS AVGEROPOULOS, Univ. of Ioannina, EDWIN CHAN, NIST, CHINEDUM OSUJI, Yale Univ. — Magnetic fields can control alignment of self-assembled soft materials such as block copolymers provided there is a suitably large magnetic susceptibility anisotropy present in the system. Recent results have highlighted the existence of a non-trivial intrinsic anisotropy in coil-coil diblock copolymers, specifically in lamellar-forming PS-b-P4VP, which enables alignment at field strengths of a few tesla in systems lacking mesogenic components. Alignment is predicated on correlation in the orientation of end-end vectors implied by the localization of block junctions at the microdomain interface and is observed on cooling across the order-disorder transition in the presence of the field. For appropriate combinations of field strength and grain size, we can leverage intrinsic chain anisotropy to magnetically direct self-assembly of many non-mesogenic systems, including other coil-coil BCPs like PS-b-PDMS and PS-b-PMMA, blends of BCPs of disparate morphologies and MWs, and blends of BCPs with homopolymers. This is noteworthy as blends of PS-b-P4VP with PEO provide a route to form functional materials such as nanoporous films by dissolution of PEO, or aligned ion conduction materials. We survey these various systems using TEM and in-situ X-ray scattering to study the phase behavior and temperature-, time- and field- dependent dynamics of alignment.

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