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Magnetic Field Alignment of PS-P4VP: a Non-Liquid Crystalline Coil-Coil Block Copolymer YEKATERINA ROKHLENKO, KAI ZHANG, Yale University, STEVEN LARSON, PADMA GOPALAN, University of Wisconsin-Madison, COREY O'HERN, CHINEDUM OSUJI, Yale University — Magnetic fields provide the ability to control alignment of self-assembled soft materials such as block copolymers. Most prior work in this area has relied on the presence of ordered assemblies of anisotropic liquid crystalline species to ensure sufficient magnetic anisotropy to drive alignment. Recent experiments with poly(styrene-b-4-vinylpyridine), a non-liquid crystalline BCP, however, show field-induced alignment of a lamellar microstructure during cooling across the order-disorder transition. Using *in situ* x-ray scattering, we examine the roles of field strength and cooling rate on the alignment response of this low MW coil-coil BCP. Alignment is first observed at field strengths as low as 1 Tesla and improves markedly with both increasing field strength and slower cooling. We present a geometric argument to illustrate the origin of a finite, non-trivial magnetic susceptibility anisotropy for highly stretched surface-tethered polymer chains and corroborate this using coarse-grained molecular dynamics simulations. We rationalize the magnetic field response of the system in terms of the mobility afforded by the absence of entanglements, the intrinsic anisotropy resulting from the stretched polymer chains and sterically constrained conjugated rings, and the large grain size in these low molecular weight materials.

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