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Coupling mesodomain positional ordering to intra-domain orientational ordering in block copolymer assembly CHRISTOPHER BURKE, ABHIRAM REDDY, ISHAN PRASAD, GREGORY GRASON, UMass Amherst — Block copolymer (BCP) melts form a number of symmetric microphases, e.g. columnar or double gyroid phases. BCPs with a block composed of chiral monomers are observed to form bulk phases with broken chiral symmetry e.g. a phase of hexagonally ordered helical mesodomains. Other new structures may be possible, e.g. double gyroid with preferred chirality which has potential photonic applications. One approach to understanding chirality transfer from monomer to the bulk is to use self consistent field theory (SCFT) and incorporate an orientational order parameter with a preference for handed twist in chiral block segments, much like the texture of cholesteric liquid crystal. Polymer chains in achiral BCPs exhibit orientational ordering which couples to the microphase geometry; a spontaneous preference for ordering may have an effect on the geometry. The influence of a preference for chiral polar (vectorial) segment order has been studied to some extent, though the influence of coupling to chiral tensorial (nematic) order has not yet been developed. We present a computational approach using SCFT with vector and tensor order which employs well developed pseudo-spectral methods. Using this we explore how tensor order influences which structures form, and if it can promote chiral phases.

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