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Directed Assembly of block copolymers on topologically complex surfaces: A self-consistent field theoretic study XIANGGUI YE, BAMIN KHOMAMI, Department of Chemical and Biomolecular Engineering, University of Tennessee Knoxville — The self-assembly of a lamella-forming diblock copolymer guided by topological complexity, namely, substrates composed of trenches with different heights and widths via self-consistent field theoretic simulations has been studied. In general, when the substrate is neutral to both blocks of the copolymer, the perpendicular lamella morphology is obtained. However, natural substrate usually has a preferred affinity to one of the blocks, and parallel lamella morphology is often obtained. Tuning the substrate roughness has proven useful in creating the perpendicular lamellar morphology. To this end, it has been shown that the perpendicular lamellae vertical to the trench direction is preferred when the trench size is relatively large. However, the orientation of the highly sought after perpendicular lamellar morphology can be changed by manipulation of the trench size, i.e., when the trench size is comparable to the natural periodic spacing of diblock copolymer, the perpendicular lamellae parallel to the trench direction is the preferred morphology. Overall this study clearly demonstrates the impact of this class of simulations in rational design of morphologies in thin multi-component polymeric films with application to technologies such as ultra-high-density magnetic recording media, metal nanostructures for metamaterials and plasmonic circuits, and sensors.

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