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Diblock copolymer morphologies in ultra thin films under shear

MARCO PINNA, ANDREI ZVELINDOVSKY, University of Central Lancashire, XIAOHU GUO, Daresbury Laboratory, CHRISTINE STOKES, University of Central Lancashire — We demonstrate that the shear alignment and the shear-induced transitions in sphere-forming diblock copolymer single layer and bilayer films observed experimentally can be explained by cell dynamics simulation, a simple model with a Ginzburg-Landau Hamiltonian. In two layer films the spheres align in various arrangements, like (100) or (110) bcc plains, or transform to cylinders depending on the shear rate and the temperature. We present a nontrivial alignment mechanism of a single layer of spherical domains in shear via slug-like movement of transient cylindrical micelles. In addition, we clarify the formation of the perpendicular cylinders, found in the recent particle based simulation. We also present results on lamellae shearing in ultra-thin films.

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