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Sphere-Forming and Cylinder-Forming Block Copolymer Thin Films Aligned Under Oscillatory Shear ANDREW MARENCIC, RANULFO ALLEN, RICHARD REGISTER, Princeton University, PAUL CHAIKIN, New York University — Large-amplitude oscillatory shear has been shown to orient bulk block copolymers of spherical, cylindrical, or lamellar morphologies; however, no such experiments have been described for block copolymer thin films. Using oscillatory shear to orient microdomains would be advantageous in the creation of complex patterns especially in constrained geometries where simple shear is not possible. Here we demonstrate the ability to orient sphere-forming (trilayer) and cylinder-forming (monolayer) block copolymer thin films using oscillatory shear. The shearing field was applied to the film through a viscous fluid using a parallel-plate rheometer, allowing for continuous range of strain and shear rate. Real-space images were taken using atomic-force microscopy. As expected, a minimum strain within the film is required to induce ordering. We also observed that a larger stress is required to orient these thin films using oscillatory shear when compared to simple shear experiments. We also investigated how the ordering evolves with the number of cycles of shear applied to the film.

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