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Sphere-Forming and Cylinder-Forming Block Copolymer Thin Films Aligned Under Double Shear ANDREW MARENCIC, RICHARD REGISTER, Princeton University, PAUL CHAIKIN, New York University — Studies have shown that stress transmitted through a viscous layer to a sphere- or cylinder-forming block copolymer thin film can orient the microdomains in the direction of the imposed shear. For the creation of complex patterns, reorientation of these unidirectionally oriented films is necessary. Here we demonstrate the ability of shear to realign the microdomains along a second direction, as imaged by atomic-force microscopy. The results are in qualitative agreement with our previously proposed phenomenological model; however, the stress required for realignment is larger (factor of 2.7 for sphere-formers and factor of 1.2 for cylinder-formers) than the stress required to orient a film from the polygrain state. We also observed grain boundary generation within the transition region between alignment with the first shear direction and alignment with the second shear direction. No noticeable change in the dislocation density or its angular distribution was observed in the sphere-forming block copolymer thin films following the second shear.

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