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Shear alignment of standing block copolymer lamellae in thin films SASWATI PUJARI, MICHAEL KEATON, Princeton University, PAUL CHAIKIN, New York University, RICHARD REGISTER, Princeton University —
While thin films of cylinder-forming block copolymers (BCPs) can be effective templates for striped patterns (leading to parallel nanowires), a drawback is the modest aspect ratio of the final structures, because of limited etch contrast between the two polymer blocks. Using thin films of lamellar BCPs, with the lamellae standing perpendicular to the substrate, could yield structures with larger aspect ratio. To generate parallel stripes of controlled direction, the in-plane orientation needs to be guided while preserving the out-of-plane perpendicular orientation. In this study, we have produced thin films of standing lamellae of a polystyrene/polymethylmethacrylate BCP of thicknesses up to 1.5 times the domain spacing, by neutralizing the Si substrate with a random terpolymer brush layer. To date, films less than one domain spacing thick have been aligned by shear, while shearing thicker films causes the perpendicular lamellae to switch to parallel orientation. We are currently investigating the alignment as a function of stress, film thickness, terpolymer composition and domain spacing.

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