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Orienting Nanostructured Block Copolymer Thin Films via Entropy TING-YA LO, Department of Chemical Engineering, Nationsal Tsing Hua University, ASHKAN DEHGHAN, Department of Physics and Astronomy, McMaster University, PROKOPIOS GEORGOPANOS, APOSTOLOS AVGEROPOULOS, Department of Materials Science & Engineering, University of Ioannina, ANCHANG SHI, Department of Physics and Astronomy, McMaster University, RONGMING HO, Department of Chemical Engineering, Nationsal Tsing Hua University —
Controlling the orientation of nanostructured thin films of block copolymers (BCPs) is essential for next generation lithography using BCPs. According to conventional wisdom, the orientation of BCPs is mainly determined by molecular interactions (enthalpy-driven orientation). Here, we demonstrate that entropic effect can be used to control the orientation of BCP thin films. Specifically, the architecture of star-block copolymers consisting polystyrene (PS) and poly(dimethylsiloxane) (PDMS) blocks is used to regulate the entropic contribution to the self-assembled nanostructures. Our experimental and theoretical results unequivocally demonstrate that entropy-driven perpendicular orientation of BCP nanostructures can be induced by increasing the arm number of the star-block copolymers with the same volume fractions of PS and PDMS.

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