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Orienting Block Copolymer Thin Films via Entropy and Surface Plasma Treatment RONG-MING HO, KAI-YUAN LU, TING-YA LO, Natl Tsing Hua Univ, ASHKAN DEHGHAN, AN-CHANG SHI, McMaster University, GEORGOPANOS PROKOPIOS, APOSTOLOS AVGEROPOULOS, University of Ioannina — Controlling the orientation of nanostructured thin films of block copolymers (BCPs) is essential for next generation lithography. In the thin-film state, how to achieve the perpendicular orientation of the nanostructured microdomains remains challenging due to the interfacial effects from the air and also the substrate, especially for the blocks with silicon containing segments which usually have different surface energies, favoring parallel microdomain orientation. Here, we show that entropic effect can be used to control the orientation of BCP thin films. Specifically, we used the architecture of star-block copolymers consisting of polystyrene (PS) and poly(dimethylsiloxane) (PDMS) blocks to regulate the entropic contribution to the self-assembled nanostructures. Moreover, we aim to achieve the formation of perpendicular orientation from the air surface via surface plasma treatment to neutralize the interfacial energy difference. By combining the architecture effect (entropy effect) on BCP self-assembly and the surface plasma treatment (enthalpy effect), well-defined perpendicular PDMS microdomains in the PS-b-PDMS thin film can be formed from the bottom of non-neutral substrate and the top of the thin film surface, giving great potential for lithographic applications.

Rong-Ming Ho
Natl Tsing Hua Univ

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