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Pathway-engineered highly aligned block copolymer array using soft-shear laser zone annealing YOUNGWOO CHOO, Yale University, PAWEL MAJEWSKI, KEVIN YAGER, Brookhaven National Lab, CHINEDUM OSUJI, Yale University — Directed self-assembly (DSA) of block copolymers (BCPs) using soft-shear laser zone annealing (SS-LZA) was employed as a scalable and cost-effective method to fabricate highly ordered nanoscale templates. A systematic series of studies were conducted to elucidate the roles of surface neutrality and alignment pathway on the SS-LZA process. BCP thin films were prepared in a simple and rapid two-step non-equilibrium process that enables to engineer the alignment pathway of the block copolymers to achieve high unidirectional order of the BCP array. Cylinder-forming poly(styrene-b-methylmethacrylate) (PS-b-PMMA) thin films were deposited on non-preferential substrates followed by SS-LZA to align the cylinders parallel to the substrate. The resulting cylinders show high correlation length over large area (˜100 μm) with order parameter (S) ˜1. The films were then thermally annealed using rapid photothermal processor. After the post-annealing, we observe that the orientation of BCP microdomain shifts to perpendicular orientation while it maintains its lateral order. We explore the effect of SS-LZA on the revolution of correlation length and retention of the grain size after post-annealing process.

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