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Single- and Multilayered Nanostructures via Laser-Induced Block Copolymer Self-Assembly[1] PAWEL MAJEWSKI, KEVIN YAGER, ATIKUR RAHMAN, CHARLES BLACK, Brookhaven Natl Lab — We present a novel method of accelerated self-assembly of block copolymer thin films utilizing laser light, called Laser Zone Annealing (LZA). In our approach, steep temperature transients are induced in block copolymer films by rastering narrowly focused laser line over the light-absorbing substrate. Extremely steep temperature gradients accelerate the process of self-assembly by several orders-of-magnitude compared to conventional oven annealing, and, when coupled to photo-thermal shearing, lead to global alignment of block copolymer domains assessed by GISXAS diffraction studies and real-space SEM imaging. We demonstrate monolithic alignment of various block-copolymer thin films including PS-b-PMMA, PS-b-PEO, PS-b-P2VP, PS-b-PI and observe different responsiveness to the shearing rate depending on the characteristic relaxation timescale of the particular material. Subsequently, we use the aligned polymeric films as templates for synthesis of single- and multi-layered arrays of inorganic, metallic or semiconducting nanowires and nanomeshes and investigate their anisotropic electro-optical properties.

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