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Laser Zone Annealing - Accelerated Route to Self-Assembled Nanostructures¹ PAWEL MAJEWSKI, KEVIN YAGER, ATIKUR RAHMAN, CHARLES BLACK, Brookhaven National Laboratory — We present Laser Zone Annealing – a novel technique of accelerated self-assembly of block copolymer thin films utilizing laser light. In our approach, the laser beam, focused to a narrow line, is rastered across the polymer film coated on the light-absorbing substrate, inducing rapid and highly localized temperature transients in the film. By coupling our method with soft-shear, we demonstrate monolithic alignment of various cylinder-forming block copolymers over extremely short timescales. We utilize the aligned block copolymer films as templates for inorganic nanomaterials patterning. After delivery of inorganic precursors via aqueous or gaseous route, the polymer matrix is ashed leading to extremely well-ordered arrays of inorganic, metallic or semiconducting nanowires. Subsequently, we demonstrate how more complex nanostructures can be created with LZA including multilayered nanomeshes with symmetries beyond the conventional motifs accessible by native block copolymers. We investigate a perspective use of the inorganic arrays as transparent conductors or chemical sensors and characterize their anisotropic electro-optical properties.

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