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Fabrication of Three-Dimensional Nanostructures from Self-Assembling Block Copolymers on Two-Dimensional Chemically Patterned Templates with Mismatched Symmetry MARK STOYKOVICH, University of Wisconsin, KOSTAS DAOULAS, University of Goettingen, HARUN SOLAK, Paul Scherrer Institute, SANG-MIN PARK, YIORYOS PAPAKONSTANTOPOULOS, JUAN DE PABLO, University of Wisconsin, MARCUS MUELLER, University of Goettingen, PAUL NEALEY, University of Wisconsin — A combined experimental and theoretical approach is used to examine the direct fabrication of complex three-dimensional (3D) nanostructures by the self-assembly of block copolymer materials on two-dimensional templated surfaces. Here a lamella-forming ternary block copolymer – homopolymer blend is considered on periodically patterned substrates consisting of square arrays of spots. The blend follows the substrate pattern and forms a quadratically perforated lamella (QPL). At intermediate film thicknesses necks connect this QPL to the film surface, resulting in a bicontinuous morphology. For thicker films bicontinuous morphologies are observed that consist of a sequence of parallel lamellae with disordered perforations. The principal concept of this work extends beyond this initial demonstration and can be generalized to the fabrication of complex 3D structures that have potential applications in nanoelectronics, separation membranes, and catalysis.

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