

Abstract Submitted
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Square and Rectangular Arrays from Directed Assembly of Sphere-forming Diblock Copolymers in Thin Films SHENGXIANG JI, UMANG NAGPAL, WEN LIAO, JUAN DE PABLO, PAUL NEALEY, University of Wisconsin, Department of Chemical & Biological Engineering — Patterns of square and rectangular arrays with nanoscale dimensions are scientifically and technologically important. Fabrication of square array patterns in thin films has been demonstrated by directed assembly of cylinder-forming diblock copolymers on chemically patterned substrates, supramolecular assembly of diblock copolymers, and self-assembly of triblock terpolymers. However, a macroscopic area of square array patterns with long-range order has not been achieved, and the fabrication of rectangular arrays has not been reported so far. Here we report a facile approach for fabricating patterns of square and rectangular arrays by directing the assembly of sphere-forming diblock copolymers on chemically patterned substrates. On stripe patterns, a square arrangement of half spheres, corresponding to the (100) plane of the body-centred cubic (BCC) lattice, formed on film surfaces. When the underlying pattern periods mismatched with the copolymer period, the square pattern could be stretched (up to $\sim 60\%$) or compressed ($\sim 15\%$) to form rectangular arrays. Monte Carlo simulations have been further used to verify the experimental results and the 3-dimensional arrangements of spheres.

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