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A Modular and Hierarchical Supramolecular Block Copolymer Self-assembling Strategy Towards Square Arrays CHUANBING TANG, ERIN LENNON, MICHAEL DIMITRIOU, GLENN FREDRICKSON, EDWARD KRAMER, CRAIG HAWKER, Materials Research Laboratory, University of California, Santa Barbara — We present a modular and hierarchical self-assembling strategy for the generation of novel nanoscale patterns suitable for block copolymer lithography. Supramolecular block copolymers consisting of poly(ethylene oxide)-b-poly(styrene-r-4-hydroxystyrene) and poly(styrene-r-4-vinylpyridine)-b-poly(methyl methacrylate) diblock copolymer blends with hydrogen-bonding interactions between the polystyrene majority segments were prepared by living free radical polymerization. By combining supramolecular assembly of H-bonding phenolic and pyridyl units with controlled phase separation of diblock copolymers, highly ordered square arrays were obtained. The compositions of H-bonding components were critical for generating both long range order and for controlling the spatial arrangement of ordered arrays. The utilization of these materials as lithographic masks was successful and allowed transfer of the polymeric template with high fidelity to silicon oxide substrates, leading to a highly ordered array of 20 nm cylindrical pores with a spacing of 50 nm. This modular blending approach to block copolymer resists demonstrates a new and powerful strategy for the fabrication of unique patterns for nanolithographic applications.

Chuanbing Tang
Materials Research Laboratory, University of California, Santa Barbara

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