Sub-10 nm Patterns by Hierarchical Self-Assembly of Si-Containing Block Copolymers

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Block copolymers with a Si-containing block are particularly attractive due to their high etch contrast and high interaction parameter, which leads to a microphase-separation below 10 nm and a convenience for transfer of the pattern into other materials. I presented a hierarchical strategy for templating of small period PS-b-PDMS block copolymers using a topographical pattern formed from a larger period block copolymer which can itself be templated using features produced by electron-beam lithography. And, I show how patterns consisting of coexisting sub-10 nm spheres and cylinders and sphere patterns with a range of periods can be created using a combination of serial solvent anneal processes and electron-beam irradiation of selected areas of a film of PS-b-PDMS.
These techniques offer the possibility of forming a wide range of aperiodic pattern geometries and significantly extend the ability of block copolymer lithography to produce patterns essential for nanoscale device fabrication.