SELF-ASSEMBLY OF BLOCK COPOLYMERS ON LITHOGRAPHICALLY DEFINED NANOPATTERNED SUBSTRATES

Paul Nealey
Center for NanoTechnology (CNTech), 3731 Schneider Drive, Stoughton, WI 53589-3097
and
Dept. of Chemical Engineering, University of Wisconsin-Madison, Madison, WI 53706

Top-down approaches to fabrication such as advanced lithographic techniques are designed to meet severe processing constraints, but may be prohibitively capital intensive or may not offer sufficient control at the nanoscale. Inexpensive bottom-up approaches based on self-assembling materials such as colloidal particles and block copolymers often possess the required nanometer resolution, but the dimensions over which the self-assembled structures are defect-free limits potential applications. Tremendous promise exists for the development of hybrid technologies in which self-assembling materials are integrated into existing manufacturing processes to deliver molecular level control in parallel processes to meet exacting tolerances and margins, and placement of the structures, including registration and overlay, with nanometer precision. Here we demonstrate the integration of advanced lithography with the self-assembly of thin films of block copolymer to induce the epitaxial assembly of densely packed nanoscopic domains. The areas over which the patterns are defect free, oriented and registered with the underlying substrate are arbitrarily large, determined by the size and quality of the lithographically defined surface pattern rather than the inherent limitations of the self-assembly process.