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Numerical Simulations of Directed Self-Assembly in Diblock Copolymer Films using Zone Annealing and Templating Techniques
JOSEPH HILL, PAUL MILLETT, Univ of Arkansas-Fayetteville — Bulk fabrication of surface patterns with sub-20 nm feature sizes is tremendously desirable for many existing and emerging technologies. Directed self-assembly (DSA) of block copolymers (BCPs) has been a recently demonstrated approach to achieve such feature resolution over large-scale areas with minimal defect populations. Much work however remains to understand and optimize DSA methods in order to move this field forward. This talk will present results from large-scale numerical simulations of zone annealing and topological template processing of BCP films to achieve long-range orientational order. The simulations utilize a Time-Dependent Ginzburg-Landau model and parallel processing to elucidate relationships between thermal gradient velocities and domain orientations as well as defect densities. Additional simulations have been conducted to study to what degree orientational order can be further enhanced with both zone annealing and topological templating techniques. It is found that these two DSA methods do synergistically enhance long-range order with a particular relationship between thermal gradient velocity and topological template spacing.

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