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Implications of block polymer uniformity in confined self-assembly for lithographic applications

Abstract

The variety of applications for which self-organizing block polymers have been explored is staggering. It is continually exciting and impressive to witness the ingenuity embodied in the research in this lively field. One avenue that is seldom reported is the investigation of perfectly uniform block polymers, with dispersities < 1.01 . This is a natural extension of controlled or living polymerization techniques that lead to polymers with impressively uniform molecular makeup, albeit still far from the purities associated with traditional organic synthesis. Naturally, the preparation of highly uniform self-assembling systems provides ample practical challenges, and raises some questions – Is this endeavor worth the effort? What benefits may more uniformity deliver? Will the behavior of uniform block polymers deviate significantly from their more disperse counterparts? One example will be described that addresses these questions, in the context of the ever increasing demand for ultra-small features (< 10 nm) in high-throughput alternatives to conventional photo-lithography for the fabrication of next-generation integrated circuits and related information storage technology.