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Field-Based Simulations of Confined Block Copolymers

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This presentation will discuss field-theoretic simulation methods that can be used to analyze the self-assembly behavior of thin block copolymer films, including films that are laterally confined on a flat substrate and curved films on a spherical manifold. Our studies of lateral confinement have revealed strategies for epitaxially templating microdomain patterns with long-range in-plane order and minimal defects ("graphoepitaxy"), and methods for diversifying the set of stable 2D lattice structures. On the sphere, we have found defective ground state block copolymer morphologies that are analogous to spherical crystalline packings in other contexts, e.g. the Thompson problem and viruses. The methods and findings have applications in block copolymer lithography and in dispersion technology of polymer-stabilized nanoparticles and colloids.