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Discovering Complex Ordered Phases of Block Copolymers

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Block copolymers with their rich phase behavior and ordering transitions have become a paradigm for the study of structured soft materials. Understanding the structures and phase transitions in block copolymers has been one of the most active research areas in polymer science in the past two decades. One of the achievements is the self-consistent field theory (SCFT), which provides a powerful framework for the study of ordered phase of block copolymers. I will present a generic strategy to discover complex ordered phases of block copolymers within the SCFT framework. Specifically, a combination of real-space and reciprocal-space techniques is used to explore possible ordered phases in multiblock copolymer melts. These candidate phases can then be used to construct phase diagrams. Application of this strategy to linear and star ABC triblock copolymers has led to the discovery of a rich array of ordered phases.