David Morse
University of Minnesota and University of Goettingen

Correlations in Copolymers: Beyond the Self-Consistent Field Approximation

Current understanding of structure and correlations in both block copolymer melts and polymer mixtures is based primarily on a family theories that rely on some form of self-consistent field (SCF) description of interactions. Among these is the random-phase approximation (RPA) theory of correlations, which is based on the use of a SCF approximation to calculate the free energy cost of small composition fluctuations. Recent theoretical work is yielding a theory of corrections to the RPA description of both intra- and intermolecular correlations in such liquids that is both more systematic and demonstrably more accurate than earlier treatments. Work done in Strasbourg on corrections to the random-walk model of intra-molecular correlations in one-component liquids is the most mature and best verified part of this emerging theory. I will review related work on a systematic theory of corrections to the RPA theory for the structure factor S(k) in block copolymers, and will present simulations that were conducted to test the theory.