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The Packing of Soft Spheres

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The packing of spheres is an interesting problem in mathematics and physics with a long history dated back to the work of Kepler and Lord Kelvin. In recent years, intricate periodic and aperiodic spherical packing phases have emerged in a host of soft matter systems including supramolecular assemblies, surfactants and block copolymers, underscoring the universality of emergent order in condensed matter. In particular, the rich phase behavior of block copolymers provides an ideal model system to study the origin and stability of order phases in soft matter. Our recent study of block copolymer systems using the self-consistent field theory reveals that one key mechanism of forming complex spherical phases is the conformational asymmetry of the blocks. Furthermore, we have predicted that the segregation of different polymeric species in block copolymer blends provides another mechanism to stabilize spherical packing phases with very different sized-spherical domains. I will summarize recent progresses on this fascinating topic and discuss possible future research directions.

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