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Additive-driven assembly of block copolymers YING LIN, VIKRAM DAGA, ERIC ANDERSON, JAMES WATKINS, University of Massachusetts — One challenge to the formation of well ordered hybrid materials is the incorporation of nanoscale additives including metal, semiconductor and dielectric nanoparticles at high loadings while maintaining strong segregation. Here we describe the molecular and functional design of small molecule and nanoparticle additives that enhance phase segregation in their block copolymer host and enable high additive loadings. Our approach includes the use of hydrogen bond interactions between the functional groups on the additive or particle that serve as hydrogen bond donors and one segment of the block copolymer containing hydrogen bond acceptors. Further, the additives show strong selectively towards the targeted domains, leading to enhancements in contrast between properties of the phases. In addition to structural changes, we explore how large changes in the thermal and mechanical properties occur upon incorporation of the additives. Generalization of this additive-induced ordering strategy to various block copolymers will be discussed.

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