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Magnetic Nanoparticle Dispersion in HOMO and Block Copolymer Films RUSSELL COMPOSTO, University of Pennsylvania, KOHJI OHNO, VINCENT LADMIRAL, Kyoto University, GRANT SMITH, DMITRY BEDROV, University of Utah, CHEN XU, University of Pennsylvania — Self-assembly in polymer films containing nanoparticles (NPs) can result in novel structures with attractive properties that depend on NP functionality. Here, magnetic iron oxide NPs (5nm) are dispersed in both poly(methyl methacrylate) (PMMA) and lamella forming poly(styrene-b-methyl methacrylate) (PS-b-PMMA) films. The NPs are grafted with PMMA brushes ranging from 3k to 37k Da. Increasing brush length improves dispersion in PMMA in agreement with trends observed for potential of mean force between two nanoparticles as obtained from coarse-grained molecular dynamics simulations of equivalent systems. For the 3k brush, NPs disperse uniformly in PS-b-PMMA only at low loadings (1wt%), locate in the PMMA domains, and slow down the perpendicular to parallel morphology transition. At 10 wt%, the NPs form uniform sized aggregates ($\sim$22nm) and perturb the lamellar morphology. Increasing brush length leads to aggregation in the solution state and as a result large aggregates in the spin cast films. A correlation between the magnetic properties and aggregate size is observed.

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