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Structure of thin film brush-coated nanoparticle/homopolymer systems PETER GREEN, JENNY KIM, CHELSEA CHEN, Materials Science and Engineering, University of Michigan — Nanoparticles (NPs) are incorporated within polymer hosts in order to prepare nanocomposites with “tailored” properties. However, understanding and controlling particle aggregation, and the structure, in these polymer nanocomposites (PNCs) remains an important challenge. We examine the phase behavior of thin film mixtures of polystyrene (PS)-grafted gold nanoparticles with different polymer hosts: PS, polymethyl methacrylate (PMMA); tetramethyl bisphenol polycarbonate (TMPC) and poly[2-methoxy-5-(2-ethylhexyloxy)-1,4-phenylenevinylene] (MEH-PPV). We show that the phase behavior, and more importantly the nanoparticle distribution, is controlled by the enthalpic interaction parameter between the host chains and the grafted chains, the grafting density, g , the degrees of polymerization of the grafted chains and the host chains, N and P , respectively and the nanoparticle size, D . We illustrate conditions under which the entropic interactions have a more significant effect on the structure than the enthalpic interactions. Finally we illustrate conditions where the nanoparticles behave like “hard” spheres and conditions under which the mixture behaves like a linear chain/polymer micelle-like system.

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