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Polymer Brush Grafted Nanoparticles and Their Impact on the Morphology Evolution of Polymer Blend Films HYUN-JOONG CHUNG, University of Alberta, KOHJI OHNO, Kyoto University, RUSSELL J. COMPOSTO, University of Pennsylvania — We present an novel pathway to control the location of nanoparticles (NPs) in phase-separating polymer blend films containing poly(methyl methacrylate) (PMMA) and poly(styrene-ran-acrylonitrile) (SAN). Because hydrophobic polymer phases have a small interfacial energy, $\sim$1 mJ/m^2, subtle changes in the NP surface functionality can be used to guide NPs to either the interface between immiscible polymers or into one of the phases. Based on this idea, we designed a class of NPs grafted with PMMA brushes. These PMMA brushes were grown from the NP surface by atom transfer radical polymerization (ATRP), which results in chains terminated with chlorine atoms. The chain end can be substituted with protons (H) by dehalogenation. As a result, the NPs are strongly segregated at the interface when grafted PMMA chains are short (Mn=1.8K) and the end group is Cl, whereas NPs partition into PMMA-rich phase when chains are long (Mn=160K) and/or when chains are terminated with hydrogen. The Cl end groups and shorter chain length cause an increase in surface energy for the NPs. The increase in surface energy of short-chained NPs can be attributed to (i) an extended brush conformation (entropic) and/or (ii) a high density of "unfavorable" end groups (enthalpic). Finally, the impact of NPs on the morphological evolution of the polymer blend films will be discussed. Ref: H.-J.Chung et al., ACS Macro Lett. 1(1), 252-256 (2012).

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