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Using Polydispersity in Polymer Grafted Nanoparticles for Tuning Morphology in Polymer Nanocomposites TYLER MARTIN, ARTHI JAYARAMAN, Department of Chemical and Biological Engineering, University of Colorado at Boulder — Polymer nanocomposites, consisting of nanoscale additives in a polymer matrix, are used in many applications where high thermal and wear resistance is important e.g. automotive tires. To achieve uniform mechanical and thermal properties of the nanocomposite, the nanoparticles need to be well dispersed in the polymer matrix. One way to control the nanoparticle spatial organization in the polymer matrix is by grafting the nanoparticle surface with polymers that are chemically similar to the matrix polymer and tuning the effective interactions between the particles by simply tuning the grafting density, graft length, matrix length, particle size, filler concentration, and matrix density. In this study, we demonstrate that polydisperse polymer grafts can stabilize dispersions of polymer grafted nanoparticles in a polymer matrix in cases where monodisperse grafts would cause aggregation of particles. The change in the effective inter-particle interactions with increasing polydisersity is because of increased wetting of the grafted polymers by the matrix polymers. The implication that polydispersity can stabilize particle dispersions in matrix shows that it can be used as a design tool to program inter-particle interactions in a polymer matrix.

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