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**Dispersion-Aggregation and Wetting-Dewetting Phase Transitions in Mixtures of Polymer Grafted Nanoparticles and a Chemically Dissimilar Polymer Matrix** TYLER MARTIN, U Colorado, KATRINA MONGCOPA, U Houston, RANA ASHKAR, PAUL BUTLER, NIST, RAMANAN KRISHNAMOORTI, U Houston, ARTHI JAYARAMAN, U Delaware — Significant efforts have been focused towards controlling morphology of the nanoscale fillers and matrix polymer in polymer nanocomposites as the composite morphology is directly related to the macroscopic properties of that material. For nanocomposites with chemically identical graft and matrix polymers, it is well understood that the polymer grafted particle dispersion to aggregation transition is directly linked to and synonymous with wetting/dewetting of the graft and matrix polymer. Our recent work has focused on exploring composites with chemically different graft and matrix polymers, specifically those with attractive graft-matrix interactions that lead to a dispersed filler state at low temperature and aggregated filler state at high temperatures. We show, using coarse-grained molecular simulations, that the sharp phase transition from dispersed to aggregated states is distinct from the continuous wetting-dewetting transition. The onset of wetting to dewetting occurs at temperatures lower than the dispersion to aggregation transition, and dewetting continues at temperatures above the transition temperature in the aggregated state. Furthermore, the graft and matrix chain composition can be varied to tune the dispersion-aggregation transition temperature and the degree of wetting of the grafted layer. Experiments using SANS and SAXS of deuterated poly(styrene) grafted silica particles in a poly(vinyl methyl ether) matrix show remarkable agreement with our simulations.

Tyler Martin  
Univ of Colorado - Boulder

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