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Theory of Nanoparticle Interactions Mediated by Reversibly Binding Polymer Chains STEPHANIE TRITTSCHUH, GREGORY GRASON, University of Massachusetts Amherst — In stable polymer-nanoparticle composites, particles must be compatibilized with the polymer matrix to overcome entropically-driven, short-range depletion forces that drive particle aggregation. One strategy is to incorporate end-functional groups to polymers that reversibly bind to particle surfaces via donor- acceptor type interactions, such as hydrogen bonding. The addition of reversibly binding chain ends introduces a new length scale for the effective interaction between two particles due to the possibility of inter-particle bridging conformations available to chains at small particle-particle separations. We use self-consistent field theory to explore the effective pairwise particle potential in a melt of reversibly associating chains and examine how changing particle size, chain length and binding affinity shapes the free energy of interaction and alters higher-order inter-particle organization in nanocomposites.

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