

Abstract Submitted  
for the MAR06 Meeting of  
The American Physical Society

**Bridging, Steric Stabilization, Aggregation and Phase Separation in Polymer Nanocomposites** JUSTIN B. HOOPER, KENNETH S. SCHWEIZER, University of Illinois — The polymer reference interaction site model theory is employed to study the potential of mean force (PMF) between nano-sized spherical particles in a dense polymer melt. A simple monomer-filler attractive potential is used to probe the competition between packing entropy and interfacial enthalpic effects. As interfacial cohesion increases the nanoparticle organization varies from contact depletion aggregation, to well dispersed sterically stabilized behavior corresponding to a thermodynamically stable polymer coating, to tightly bridged particles. Near linear scaling of the PMF with particle/monomer size asymmetry ratio is found, and the spatial range of the interfacial attraction is crucial in determining particle organization. Spinodal demixing calculations suggest two types of phase separated states and a miscibility window. The latter is rapidly destroyed as particle size and/or interfacial attraction strength increase. The presence of bound polymer layers in miscible nanocomposites is predicted to result in microphase separation like features in the collective polymer structure factor.

Justin B. Hooper  
University of Illinois

Date submitted: 22 Nov 2005

Electronic form version 1.4