Abstract Submitted
for the MAR10 Meeting of
The American Physical Society

Anisotropic self-assembly of colloidal particles in polymer-colloid composites: A simulation study[1] MONOJOY GOSWAMI[2], BOBBY SUMPTER, Oak Ridge National Laboratory — The self-assembly of colloidal particles has potential applications in optical fibers, sensors and photovoltaic cells. In this work we have carried out stochastic molecular dynamics simulations of colloid-polymer composites in order to investigate the fundamental self-assembly processes of the particles, in an effort to design more optimal materials for the applications stated above. Results were obtained for spherical colloidal particles of different screening lengths dispersed in a polymer matrix at melt density. By tuning the screening length and interaction strengths between the colloid and polymer, self-assembly into structures that generate anisotropy in the composite material is demonstrated. This phenomenon in colloid-polymer mixtures is analogous to the previously observed self-assembly of grafted nanoparticles in polymer nanocomposites. Our results show a potentially easier way of producing anisotropic self-assembly in polymer-nanocomposites based on colloidal particles as fillers. We also discuss the dynamics of the polymer chains and colloidal particles for different screening lengths and polymer-filler interaction strengths.

[1]This work supported by the Office of Basic Energy Sciences, DOE, Contract No. DEAC05-00OR22725 with UT-Battelle, LLC at ORNL
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Date submitted: 01 Dec 2009 Electronic form version 1.4