

Abstract Submitted
for the MAR05 Meeting of
The American Physical Society

Bulk and Interfacial Behavior of Nanoparticle/Polymer Blends

A.L. FRISCHKNECHT, Sandia National Laboratories, R.S. KRISHNAN, A. TUTEJA, M.A. HOLMES, M.E. MACKAY, Michigan State University — We have investigated a model athermal system consisting of polystyrene (PS) nanoparticles (NPs) in PS melts. Neutron scattering shows that the chain dimensions expand in the presence of the NPs. We investigate this result theoretically using self-consistent PRISM theory, and also find an expansion in chain dimensions as a function of NP volume fraction. Recently it has been shown that nanoparticles can suppress dewetting in thin polymer films, a counterintuitive result since particles usually induce dewetting. Neutron reflectivity measurements have shown that the NPs phase separate to the surface, so one proposed mechanism for the inhibition of dewetting is that this segregation changes the surface energies. We calculate the density profiles for dilute NPs in polymer melts near a substrate using classical density functional theory, which shows that the NPs do indeed segregate to the surface. Sandia is a multiprogram laboratory operated by Sandia Corporation, a Lockheed Martin Company, for the United States Department of Energy's National Nuclear Security Administration under Contract DE- AC04-94AL85000.

Amalie L. Frischknecht
Sandia National Laboratories

Date submitted: 29 Nov 2004

Electronic form version 1.4