Abstract Submitted
for the MAR06 Meeting of
The American Physical Society

Wetting of polymer thin films with nanoparticles IGAL SZLEIFER, Purdue University — We theoretically study the ability of nanoparticles to induce wetting of polymer thin films on flat solid surfaces. Our studies show that there is an entropically driven attraction between the nanoparticles and the surface. The strength and range of the attraction depends upon the polymer melt molecular weight and the nanoparticles size. When the nanoparticles are mixed with the polymer melt and the film is put in contact with the surface, a very large number of nanoparticles adsorb on the surface, lowering the surface tension and enabling the wetting of the surface by the polymer melt. If the surface is modified with a grafted polymer layer of the same type as the polymer melt, nanoparticle adsorption on the surface is reduced for intermediate tethered polymers surface coverage. For high grafted surface coverage we predict a large adsorption of nanoparticle on the tip of the brush. As a result we find that nanoparticle induces wetting of polymer thin films on bare surfaces and on surfaces with grafted polymers at high surface coverage. These are the two regimes where experiments have shown that polymer thin films do not wet the surfaces. The predictions of the theory will be put in the context of available experimental observations.

Igal Szleifer
Purdue University

Date submitted: 29 Nov 2005 Electronic form version 1.4