Abstract Submitted
for the MAR13 Meeting of
The American Physical Society

Wetting of star-shaped macromolecules[1] EMMANOUIL GLYNOS, BRADLEY FRIEBERG, University of Michigan, GEORGIOS SAKELLARIOU, University of Athens, PETER GREEN, University of Michigan — We show that the equilibrium contact angles and line tensions of macroscopic droplets of star-shaped polystyrene (PS) macromolecules of functionality, f, and degree of polymerization per arm, Narm, on oxidized silicon substrates, may be as much as one and two orders of magnitude, respectively, smaller than their linear analogs, depending on f and Narm. The dewetting characteristics of the linear and star polymers also differ. Thin film of LPS and SPS dewet SiOx substrates due to destabilizing long-range intermolecular forces. However, while macroscopic droplets surrounded by droplets of nanoscale dimensions characterize the late-stage dewetting morphology of the LPS system, the macroscopic droplets of the SPS molecules reside on a stable layer of molecules adsorbed to the substrate. The thickness of the adsorbed layer depends on both f and Narm. We provide evidence that the wetting/dewetting characteristics of the SPS macromolecules are largely determined by the competition between interfacially attractive conformational entropic effects and steric repulsion effects, for molecules of sufficiently large f and small Narm.

[1]National Science Foundation (NSF), Division of Material Research, Polymer Program No. 0906425

Emmanouil Glynos
University of Michigan

Date submitted: 09 Nov 2012 Electronic form version 1.4