Abstract Submitted
for the MAR05 Meeting of
The American Physical Society

Phase Behavior of Poly(styrene-b-isoprene) Diblock Copolymers Loaded with γ-Fe_2O_3 Nanoparticles MOON JEONG PARK, School of Chemical Engineering, Seoul National University, JONGNAM PARK, TAEGHWAN HYEON, KOOKHEON CHAR — We investigate the effect of hard additives, i.e., magnetic nanoparticles, on the phase behavior of polystyrene-block- polyisoprene (PS-b-PI) diblock copolymers by varing the size of nanoparticles (6 nm and 14 nm). For the design of multicomponent materials with spatially defined order of different components, two PS-b-PI diblock copolymers showing lamellar (SI1) and cylindrical (SI2) morphologies are used as structure-directing matrices for the nanoparticle arrangement. Fine maghemite (γ-Fe_2O_3) particles with surfaces modified by oleic acid have been synthesized and two different solvents, hexane and toluene, were used to prepare film specimens by static casting. The interactions between mesophase-forming copolymers and nanoscopic particles can lead to highly organized hybrid materials. Notably, the morphology of such composites strongly depends on the preparation conditions as well as the characteristics of templating copolymers. The γ-Fe_2O_3 were selectively incorporated into the PI domains under hexane condition, while they were preferentially aggregated when toluene is used. Particularly, under toluene condition, we observed the well-defined body centered cubic structure for SI2 as well as the undulating lamellar morphology for SI1. The structural information obtained from X-ray scattering is in good agreement with the transmission electron microscopy images.

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Date submitted: 21 Mar 2013 Electronic form version 1.4