Abstract Submitted
for the MAR05 Meeting of
The American Physical Society

Spherical nanoparticle ordering in block copolymer systems JOHN PAPALIA, MARY GALVIN, University of Delaware — In recent years, nanoparticles and self-assembled systems have both been areas of extensive research. Our work combines the unique properties of both fields into a single system by investigating the ordering of nanoparticles in block copolymers (BCPs). Balazs et al. put forth an expansive set of theories which predict the behavior of hard nanoparticle inclusions in BCP systems. These composites combine the natural drive of the BCPs to self-assemble with the physical properties of the particles, yielding complex systems. Our goal is to methodically investigate the theories via model experimental systems. Silica (<22 nm) and gold (≤15 nm) particles have been incorporated into the styrene phase of a polystyrene-*b*-poly(ethylene-*co*-propylene) BCP. Parameters such as particle size, BCP molecular weight, and surfactant length and coverage are varied in a controlled fashion with their effects on particle ordering studied. Results show surfactant use is almost mandatory to provide the particles with the energetic advantage needed to integrate them into the BCPs. Integrated particles show definitive ordering within discrete BCP domains. Our current and future systems seek to further investigate these results and trends. The combination of these result sets, along with experimentation related to domain size, will aid the design of multi-size particle systems potentially suited for improved photonic devices or nano-scale waveguides.

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Date submitted: 04 Dec 2004 Electronic form version 1.4