Abstract Submitted
for the MAR07 Meeting of
The American Physical Society

In-situ Nanoparticles Direct Self-Assembly of Block Copolymer Thin Films. RANJAN DESHMUKH, University of Pennsylvania, GAVIN BUXTON, NIGEL CLARKE, University of Durham, UK, RUSSELL COMPOSTO, University of Pennsylvania — Nanocomposite films have been prepared by thermally decomposing the organometallic precursor, (1,1,1,5,5,5-hexafluoroacetylacetonato)silver(I), AgHFA, in block copolymer poly(styrene-b-methyl methacryalate), PS-b-PMMA films. The decomposition of AgHFA at 185 °C results in the in-situ formation of silver nanoparticles (Ag NP) distributed throughout the PS-b-PMMA films. RBS, AFM and TEM were used to study the depth profile of silver, evolution of the surface and internal block copolymer morphology for films containing 0, 2, 3.5 and 5-wt % Ag. The in-situ formed Ag NP segregate to the surface of the PS-b-PMMA films and influence the self-assembly process of the block copolymer and vice versa. The Ag NP selectively partition into the PMMA block of the perpendicular lamellae at the surface forming high-density 1D arrays at the surface. The Ag NP further retard the kinetics of flipping from the perpendicular to parallel lamellae morphology at the surface. As the Ag content is increased from 0 to 5-wt % the perpendicular lamellae morphology is completely pinned (i.e. metastable). We have also used cell dynamic simulation (CDS) method to capture the evolution of block copolymer morphology by varying the substrate-polymer interactions.

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Date submitted: 20 Nov 2006

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