Abstract Submitted
for the MAR07 Meeting of
The American Physical Society

Block Copolymer Templates for Structured Nanocomposites
RAFAL A. MICKIEWICZ, MIT, APOSTOLOS AVGEROPOULOS, University of Ioannina, EDWIN L. THOMAS, MIT — Polymer systems containing nanoscale fillers have recently been the focus of much research activity due to the promise of unique physical properties. Increasingly, the ability to precisely control the distribution and orientation of the inclusions has been emphasized. The self assembly of block copolymers into periodic ordered domains provides a means to precisely control the microstructure of the resulting material. The goal is to design tailored functional materials by using the block copolymer as a template for the nanoparticles and the overall composite microstructure. The detailed behavior and morphology of the composite depends on many factors such as block copolymer chemistry and architecture, nanoparticle size and surface chemistry, as well as processing parameters used during co-assembly. In this study we aim to present ways to tune the microstructure of the block copolymer matrix using blends of triblock and diblock copolymers. In addition we explore the effect of the size of the nanoparticles on the morphology of the resulting composite. The motivation is to acquire a basic understanding of, and ability to control the morphological behavior of the nanocomposite in order to facilitate the rational design of tailored functional materials. Applications range from magnetic storage media, to photovoltaics, sensors, and thin film optical and electronic materials.

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Date submitted: 20 Nov 2006 Electronic form version 1.4