Abstract Submitted
for the MAR07 Meeting of
The American Physical Society

**Particle Dynamics in Polymer/Metal Nanocomposite Thin Films on Nanometer Length Scales**[1] SURESH NARAYANAN, Argonne National Laboratory, DONG RYEOL LEE, Pohang Accelerator Laboratory, ALETA HAGMAN, Northwestern University and Argonne National Laboratory, XUEFA LI, Argonne National Laboratory, SUNIL SINHA, University of California, San Diego and Los Alamos National Laboratory, JIN WANG, Argonne National Laboratory — X-ray photon correlation spectroscopy was used in conjunction with resonance-enhanced grazing-incidence small-angle x-ray scattering to probe the particle dynamics and kinetics in gold/polystyrene nanocomposite thin films. Such enhanced coherent scattering enables, for the first time, to measure the particle dynamics at wavevectors up to 1 $nm^{-1}$ (or a few nm spatially), well in the regime where entanglement, confinement and particle interaction dominate the dynamics and kinetics. The dynamics at such length scales has been difficult, if not impossible to study, by any other probes. Measurements of the intermediate structure factor f(q,t) indicate a mechanism of particle motion very different from Brownian diffusion (governed by Stokes-Einstein equation). The measured dynamics is explained in terms of inter-particle and hydrodynamic interactions.

[1]This work and the use of Advanced Photon Source is supported by the US-DOE under contract No. W-31-109-Eng-38.

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Date submitted: 06 Nov 2006 Electronic form version 1.4