

X-Ray Photon Correlation Spectroscopy Study of the Dynamics of a Polymer Bilayer

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We have used x-ray photon correlation spectroscopy (XPCS) to measure the dynamics within a polymer bilayer. The bilayer was comprised of 100 nm polystyrene (PS) film on top of an 80 nm polybromostyrene (PBrS) film, supported on a silicon substrate. XPCS was performed on the surface diffuse scattering from both the PS-vacuum and PBrS/PS interfaces. In order to distinguish the two interfaces measurement were made at grazing incidence in each of two standing wave conditions; below the critical angle for the PS/vacuum interface and at a standing wave condition with a node at the PS/vacuum interface. In the first case the diffuse scattering was dominated by the PS/vacuum interface scattering, and in the second condition the scattering was dominated by the buried interface. Dynamics from the bottom interface show a single slow exponential relaxation mode. Dynamics from the top interface display both slow and a fast relaxation modes. The measured time correlation functions will be compared with the predictions of hydrodynamic theory. This work was supported by the U.S. National Science Foundation under grant DMR-0209542 and by the U.S. Department of Energy under grant BES-Materials Science, under contract W-31-109-ENG-38.