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Capillary waves at polymer/polymer interface studied by resonant soft x-ray reflectivity (RSoXR) C. WANG, T. ARAKI, B. WATTS, H. ADE, NCSU — Neutron reflectivity (NR) was previously used to study capillary waves at the PS/PMMA polymer/polymer interface. However, studies of thick films have been limited due to the small longitudinal coherence length of NR. Since RSoXR can study films up to micron thick and has much larger in-plane coherence length, it can be used to study capillary waves at polymer interfaces with relaxed thickness requirements. In addition, deuteration is not required for RSoXR and thus will eliminate the possible uncertainty induced by the isotope effect in the PS/PMMA system. The principles of RSoXR can also be extended to non-specular reflectivity, i.e. diffuse scattering, which probes the in-plane structure, offers a direct observation of the nature of the capillary wave spectra. The tunable sensitivity for selected interfaces using soft x-rays will allow the direct observation of a buried polymer/polymer interface. For the PS/PMMA bilayer, for example, there is strong reflection from the PS/PMMA interface at 281 eV, but almost no reflection from the PS/air interface. Hence, the diffuse scattering will be dominated by the structure function of PS/PMMA interface. In contrast, at 320 eV, the reflectivity is very high for the surface, and the diffuse scattering will be dominated by the contribution from the surface. Resonant diffuse scattering will thus lead to the direct observation of the capillary wave spectra at polymer/polymer interface.

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