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Resonant Soft X-ray Reflectivity of Polymer Thin Films CHENG WANG, TOHRU ARAKI, HARALD ADE, NC State University — Resonant Soft x-ray reflectivity [1], a new method for low Z materials that combines aspects of neutron reflectivity and x-ray reflectivity, is presented and its usefulness delineated. Resonant reflectivity provides enhanced and selective sensitivity to specific chemical moieties near the absorption edges of constituent elements and was demonstrated through the characterization of a bilayer polymer thin film. The relative reflectivity of a particular interface could be tuned by adjusting the incident photon energy. Using photons in the 270-320 eV energy range, measurements were performed on thin film bilayers of polystyrene on top of poly(methyl methacrylate). Large changes in reflectivity at an interface and the resulting interference in thin films and multilayers were observed as the complex index of refraction, n = 1-δ-iβ, changed rapidly as a function of photon energy. Through the use of specific energies, the sensitivity to the polymer-polymer or polymer-vacuum interface can be selectively enhanced. The resulting chemical specificity is analogous to using deuteration as a marker in neutron reflectivity, but without requiring special sample preparation. The interfacial width determined with resonant reflectivity is virtually identical to that measured previously by XR and NR confirming that RXR is an excellent, complementary tool for the study of low-Z material thin films. [1]C. Wang, T. Araki, and H. Ade, Appl. Phys. Lett. 87, 214109 (2005).

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