

Abstract Submitted
for the MAR17 Meeting of
The American Physical Society

Functional Group Depth Profiling with Resonant Soft X-ray Reflectivity DANIEL SUNDAY, EDWIN P. CHAN, SARA V. ORSKI, CHRIS M. STAFFORD, NIST - Natl Inst of Stds Tech — The distribution and concentration of functional groups in thin films can be difficult to characterize due to the small sample volume and limited methods with depth sensitivity beyond the film surface. Soft X-rays with energies in the vicinity of an atomic absorption edge are sensitive to specific chemical functionalities. In this contribution, we demonstrate how resonant soft x-ray reflectivity can be used to quantifying the distribution of specific functional groups in polyamide thin films, which have applications as water purification membranes. Using a layer-by-layer assembly system for the synthesis of the polyamide we can control the concentration of oxygen or nitrogen based functional groups within the thin film. Three different polyamide films were prepared with different precursor materials in order to control the functional group concentration in the film. The measurement was calibrated using a series of reference films composed of random copolymers with controlled copolymer compositions. The results of this measurement can be used to determine the cross-link density and residual hydroxyl group concentration, which can be related to the performance of the membrane.

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Date submitted: 10 Nov 2016

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