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**Interfacial Structure, Dynamics, and Transport of Polyelectrolyte Membrane Materials for Fuel Cells** CHRISTOPHER SOLES, K. PAGE, S. EASTMAN, S. KIM, S. KANG, National Institute of Standards and Technology; Polymers Division, J. DURA, NIST Center for Neutron Research, NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY; POLYMERS DIVISON TEAM, NIST CENTER FOR NEUTRON RESEARCH COLLABORATION — Polymer electrolyte membranes (PEM) fuel cells show promise for a wide range of applications both in the transportation sector and for stationary power production due to their high charge density and low operating temperatures. While the structure and transport of bulk PEMs have been studied extensively, little is known about these materials at interfaces and under confinement, as they exist within the membrane electrode assembly (MEA). Using neutron/ x-ray reflectivity and polarization-modulation infrared reflection-absorption spectroscopy, we have studied the polymer-substrate interfacial structure, swelling, and water transport as function of humidity, surface chemistry, and film thickness. The interfacial structure is highly dependent upon the substrate surface chemistry and the swelling/water diffusivity are suppressed when the PEM is confined to a thin film. This new information will enable researchers to more accurately model the performance of the MEA as current simulations typically rely on bulk property values to predict water and proton transport under these conditions.

Kirt Page
National Institute of Standards and Technology; Polymers Division

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