

Abstract Submitted  
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**Influence of Hydration Level on Polymer and Water Dynamics in Alkaline Anion Exchange Fuel Cell Membranes** JACOB TARVER, JENNY KIM, MADHU TYAGI, CHRISTOPHER SOLES, National Institute of Standards and Technology, TSUNG-HAN TSAI, BRYAN COUGHLIN, University of Massachusetts - Amherst — Triblock copolymers based on poly(chloromethylstyrene)-b-poly(ethylene)-b-poly(chloromethylstyrene) can be quaternized to different extents to yield anion exchange membranes for alkaline fuel cells. In the absence of moisture, these membranes demonstrate bilayer lamellar morphology. Upon high levels of hydration, however, in-situ small angle neutron scattering reveals the emergence of higher-order diffraction peaks. This phenomena has previously been observed in analogous diblock copolymer-based membranes and has been attributed to the induction of a multilayer lamellar morphology in which selective striping of water occurs in the center of the ion-rich domain. By conducting humidity-resolved quasielastic neutron scattering (QENS) measurements using deuterated water, we are able to isolate differences in the pico- to nanosecond timescale dynamics of the hydrogenated membrane upon hydration. QENS measurements in the presence of a hydrogenated water source subsequently permit deconvolution and isolation of the translational and rotational dynamics of water as a function of relative humidity, revealing spatial and temporal changes in polymer and water motion at high levels of hydration.

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