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Conductivity and Water Content in Asymmetrical Sulfonated Block Copolymers XIN WANG, NITASH P. BALSARA, KEITH M. BEERS, MOON J. PARK, Environmental Energy Technologies Division, Materials Sciences Division, LBNL and Dept of Chemical Engineering, University of California, Berkeley — We have determined the morphology, proton conductivity and water uptake of asymmetric sulfonated poly(styrene-*b*-methylbutylene) (PSS-PMB) membranes equilibrated with 98% relative humidity (RH) air. To our surprise we found that the conductivity of low molecular weight PSS-PMB samples decreased slowly and irreversibly when the temperature of the membrane (and air) was increased. In contrast, high molecular weight PSS-PMB samples with the same asymmetry decreased more rapidly in response to a temperature change. In addition the factor by which the conductivity decreased was significantly higher in the case of the low molecular weight PSS-PMB. This puzzle was resolved by in-situ small angle neutron scattering which enabled determination of the morphological response of the samples to changes in temperature at RH=98%. The morphology-conductivity relationship in the equilibrated state gives insight into factors that govern charge transport in these systems.

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