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Morphology and Water Uptake in Block Copolymer Electrolyte Membranes XI CHEN, Lawrence Berkeley National Laboratory, DAVID WONG, Industrial Technology Research Institute, Taiwan, SERGEY YAKOVLEV, ExxonMobil, KEITH BEERS, Exponent, NITASH BALSARA, University of California, Berkeley — Polymer electrolyte membranes (PEMs) consisting of proton-conducting hydrophilic channels and a mechanically-strong hydrophobic matrix are attractive due to their wide clean energy applications. In an effort to understand the fundamentals of proton transport in PEMs, we fabricated a series of non-porous and mesoporous sulfonated poly(styrene-b-ethylene-b-styrene) (S-SES) copolymer membranes. We examine the effects of porosity and humidity level on the morphology of S-SES membranes. The relationship between morphology and water uptake of the membranes at different humidity levels are established. We show that by controlling the porosity of the membranes, we are able to optimize the water uptake of the membranes at desired humidity levels to maximize proton conductivity. Furthermore, we show the in situ morphology change of the membranes from fully hydrated state to dry state in a drying experiment. Morphology and water content of the membranes as a function of time are examined.

Xi Chen
Lawrence Berkeley National Laboratory

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