Abstract Submitted
for the MAR14 Meeting of
The American Physical Society

Thermal-induced changes in Transport Properties of PFSA Ionomers[1] AHMET KUSOGLU, ADAM WEBER, Lawrence Berkeley National Laboratory — Perfluorosulfonic-acid ionomers are widely used as the solid-electrolyte in electrochemical energy applications due to their remarkable conductivity and chemical/mechanical stability. Driven by achieving even higher conductivities, it is of interest to increase ion-exchange capacities without deteriorating the mechanical stability. Heat-treatments are commonly employed to change the balance between chemical and mechanical properties, where the latter can be enhanced by annealing-induced crystallinity at the expense of reduced conductivity. In this talk, we focus on how the annealing time membrane undergoes results in non-monotonic changes in its nanostructure, crystallinity and ion conductivity. Hydrophilic domains and crystallinity of the annealed samples, studied by Small- and Wide-angle X-Ray scattering, are correlated to their swelling and conductivity. Our results suggest that the conductivity can be enhanced by optimizing the annealing procedure for the ionomer. However, over a long period of annealing, conductivity and crystallinity of the ionomer appear to decrease and increase, respectively, although by preserving the overall chemical/mechanical balance. Our findings provide new insights into the thermal treatments in altering the structure/function relationship of ionomers due to their non-equilibrium state.

[1]Funded by DOE EERE FCTO under contract number DE-AC02-05CH11231.

Adam Weber
Lawrence Berkeley National Laboratory

Date submitted: 15 Nov 2013 Electronic form version 1.4