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Synthesis and Physical Behavior of Model Polymer Electrolyte Membranes for Alkaline Fuel Cells RICK BEYER, SAMUEL PRICE, AARON JACKSON, CHRISTOPHER GOLD, Army Research Laboratory, YUESHENG YE, YOSSEF ELABD, Drexel University — Alkaline fuel cell (AFC) technology holds significant promise for portable power supplies because AFCs are very efficient at temperatures under 200 $^\circ$ C, but also because AFCs can use relatively inexpensive, non-noble metals (Ni, Fe, Co) as the catalyst material. Wide-spread use of the AFC has been prevented by the use of aqueous KOH liquid as the electrolyte, which is easily poisoned by the formation of K_2CO_3. Development of an semipermeable polymeric alkali anion exchange membrane (AEM) would significantly improve the usefulness of AFCs by eliminating carbonate poisoning and the engineering problems associate with a liquid electrolyte. We have been exploring model copolymers containing phosphonium cations as candidate materials for AEMs. Recent findings on the transport properties and stability of random copolymers of styrene and p-vinylbenzyl-trimethylphosphonium chloride will be presented, as well as ongoing efforts to study the effect of polymer morphology on transport and stability in ionomers based on both phosphonium and ammonium cations.

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