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A Cation-containing Polymer Anion Exchange Membrane based on Poly(norbornene) FREDERICK BEYER, SAMUEL PRICE, XIAOMING REN, ALICE SAVAGE, US Army Research Laboratory — Cation-containing polymers are being studied widely for use as anion exchange membranes (AEMs) in alkaline fuel cells (AFCs) because AEMs offer a number of potential benefits including allowing a solid state device and elimination of the carbonate poisoning problem. The successful AEM will combine high performance from several orthogonal properties, having robust mechanical strength even when wet, high hydroxide conductivity, and the high chemical stability required for long device lifetimes. In this study, we have synthesized a model cationic polymer that combines three of the key advantages of Nafion. The polymer backbone based on semicrystalline atactic poly(norbornene) offers good mechanical properties. A flexible, ether-based tether between the backbone and fixed cation charged species (quaternary ammonium) should provide the low-Tg, hydrophilic environment required to facilitate OH- transport. Finally, methyl groups have been added at the beta position relative to the quaternary ammonium cation to prevent Hoffman elimination, one mechanism by which AEMs are neutralized in a high pH environment. In this poster, we will present our findings on mechanical properties, morphology, charge transport, and chemical stability of this material.

Frederick Beyer
US Army Research Laboratory

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