

Toward Low-Cost Proton Exchange Membranes: Challenges and Commercial Opportunities

- G. Wnek (Virginia Commonwealth University), S. Ehrenberg, and J. Serpico (Dais-Analytic Corp.)

There continues to be a drive toward reducing the cost of fuel cell components in order to bring fuel cell technology into the hands of a broad range of consumers. Toward that end, we have worked since 1993 to develop hydrocarbon-based proton exchange membranes of low cost yet with the high proton conductivity associated with Nafion and related materials, and to define general design rules for such systems. We have identified two very promising candidates, a partially sulfonated, styrene-containing block copolymer^{1,2} and a partially sulfonated, styrene-ethylene pseudo-random copolymer.³ Both materials have high conductivities, the latter being in excess of 0.1 S/cm. We believe that in both cases a continuous conducting phase develops on hydration, and are presently attempting to understand the structural details. Effectively, these materials are hydrophobically associating hydrogels, and have promising applications outside of fuel cells that will be discussed.

References:

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