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Proton exchange membranes (PEM) designed to operate in a reduced humidity environment

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The 7th International Green Energy Conference & The 1st DNL Conference on Clean Energy Time May 28-30; Location Dalian Institute of Chemical Physics (DICP)

Keynote Speaker Information Form

Speaker's Name	Michael D. Guiver	Position	Principal Research Officer
Organization	¹ National Research Council Canada, ² Hanyang University		
Topic of Speech	Proton exchange membranes (PEM) designed to operate in a reduced humidity environment.		
Language	English	Time	
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Speaker's Biography (Brief profile within 200 words, such as education background, related working experience, published writings or delivered speeches, etc)	Michael D. Guiver is a Principal Research Officer at the National Research Council Canada (NRC), and a visiting professor at Hanyang University, Seoul, Korea. He obtained his B.Sc. from London University, and his M.Sc. and Ph.D. from Carleton University, Ottawa. He is an Editor for the <i>Journal of Membrane Science</i> and on the International Advisory Board of <i>Macromolecular Research</i> and the Editorial board of <i>Polymers</i> . He is known for his work on polysulfone modification by lithiation, polymer electrolyte membranes for fuel cell application, and the development of high free-volume intrinsically microporous ladder polymers for membrane gas separation.		
Speakers' Photo			

The 7th International Green Energy Conference & The 1st DNL Conference on Clean Energy

Hydrocarbon-based (HC) polymer electrolyte membrane (PEM) materials are sought as replacements for commercial perfluorosulfonic acid-type materials (PFSA) for reasons of cost reduction, potentially higher operating temperatures, and reduction in fuel crossover, but they face several challenges before they can be effectively used in fuel cell devices. Control of dimensional swelling is one important aspect to minimize dimensional mismatch at the membrane electrode assembly interface. For their use in automotive applications, where normal operating temperatures of 80 °C are exceeded, another challenge is that many HC-PEMs tend to show a marked decrease in conductivity in a reduced-humidity environment, resulting in a loss of fuel cell performance.

Speech Abstract

Our research is directed towards designing PEM materials for intermediate temperature PEMFC, which help to address some of the challenges discussed above. Polymeric structures having densely-populated sulfonic acid groups clustered in the conducting block allow self-organization of polymers into inter-connected hydrophilic proton-conducting embedded within hydrophobic domains. Our approach is the design of fully aromatic segmented polymers with high densities of conducting groups. Another polymer system that has shown superior conducting characteristics is comb-shaped copolymer architecture, but previous work has been restricted to styrene or aliphatic polymers, which have lower oxidative or thermal stability. For the first time, aromatic comb copolymers with hydrophilic poly(phenylene oxide)-type grafts are reported. These PEMs exhibit unusually low dimensional swelling in the planar direction and good proton conductivity under partially hydrated conditions, relative to other HC-PEMs. We have used similar methodology to make aromatic triblock PEMs, which also have favorable characteristics of good proton conductivity at low relative humidity.

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