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2021 WORLD FUEL CELL CONFERENCE

AUGUST 17-20, 2021 | WATERLOO, CANADA

Name	Michael D. Guiver
Affiliation	Tianjin University, China

Invited Plenary Lecture

Presentation Title	**Innovations in fuel cell membranes**
Abstract (Approximately 200 words)	We reported proton exchange membranes with well-defined proton channels running 'through-plane', which provide high proton conduction [*Nat. Commun*. 10 (2019) 842; *Energy Environ. Sci.* 13 (2020) 297-309]. The membrane channels exhibit microporosity, enabling them to retain water at elevated temperatures, allowing good PEMFC performance under low humidity and elevated temperature. We observed that the membranes exhibited unexpected and unusually good free radical oxidative stability as well as stable PEMFC performance. This derives from ferrocyanide units incorporated into the PEM structure. Developing this aspect further, we are now exploring practical ways to stabilize PEMs by incorporating ferrocyanide, as both proton conductors in their own right, and to stabilize membranes through ferrocyanide-ferricyanide redox couples. We have applied this to both perfluorocarbon and hydrocarbon-based PEMs, to enhance oxidative stability under low relative humidity. Currently, we are designing AEMs with aligned hydroxide-conducting channels, which appear to be robust and have promising properties.
Biographical Sketch (Approximately 200 words)	Dr. Michael Guiver obtained his BSc (London University) and MSc (Carleton University) in Chemistry, and his PhD in Polymer Chemistry from Carleton University in 1988. He served 12 years as an Editor for the *Journal of Membrane Science* (2009–2020). He previously served on ACS Editorial Boards, and is currently a member on the International Advisory Board of *Macromolecular Research* and on the Editorial Boards of *Polymers* and *Membranes*. He is a Fellow of the Royal Society of Chemistry and an ACS Poly Fellow. He spent most of his career at the National Research Council Canada, and left in 2014 as a principal research officer. In 2009-2013, he was a visiting professor at the Department of Energy Engineering, Hanyang University, Korea. In September 2014, he relocated to Tianjin University, China as a full-time National 1000-plan Foreign Expert Professor. He has published over 250 papers and his primary expertise is in polymer chemistry and design and his research interests are in polymeric membrane gas separations and ion-conducting membranes for fuel cells. He works on PEMs and AEMs, and is also investigating the simple stabilization of hydrocarbon-based membranes, allowing their practical use.

Fuel Cell Division

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