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2021 WORLD FUEL CELL CONFERENCE

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Name	Shuhui Sun
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Invited Keynote Lecture

Presentation Title	**Low-Pt and Pt-free Catalysts for Hydrogen Fuel Cells**
Abstract (Approximately 200 words)	Hydrogen (H_2) fuel cells hold promising applications in transportation and stationary, however, their widespread commercialization is greatly hindered by the high cost. Platinum (Pt) represents one of the largest cost components of a fuel cell, therefore, many R&D activities have been focusing on strategies that will increase the activity and utilization of platinum group metal (PGM) catalysts, and PGM-free catalysts for long-term applications. In this talk, I will present our work to address the main challenges of the catalysts via two approaches: low-Pt catalysts and Pt-free catalysts. On one hand, in collaboration with GM, we have developed various unique nanostructured Pt-based catalysts, including Pt nanowires, nanotubes, alloys and single atoms, as well as novel catalyst supports, to significantly increase the activity and stability of the Pt-based catalysts for ORR in fuel cells. Based on the major breakthroughs on Fe/N/C catalyst achieved by the Dodelet team at INRS (with the MEA activity and performance approaching that of Pt catalyst) [*Science 2009, Nature Commun 2011*], recently, in collaboration with Ballard Power Systems and Toyota, we have made significant progress on catalyst stability. Specifically in the following aspects: (i) identifying the active sites, (ii) understanding the fuel cell degradation mechanisms experimentally and theoretically, (iii) developing approaches to improving the stability of the Fe/N/C catalyst, such as pore size control, and fluorination, and (iv) catalyst layer and electrode optimization, such as catalyst hydrophobicity adjustment, Fe/N/C and ultra-low loading Pt/C hybrid catalyst.
Biographical Sketch (Approximately 200 words)	Dr. Shuhui Sun is a Full Professor at the Institut National de la Recherche Scientifique (INRS), center for Energy, Materials, and Telecommunications (Montreal, Canada), where he directs the Laboratory of Nanotechnology for Sustainable Energy. Dr. Sun is a member of the Royal Society of Canada's College of New Scholars, the Vice President of the International Academy of Electrochemical Energy Science (IAOEES), and the Executive Editor-in-Chief of Electrochemical Energy Reviews (Springer-Nature). He is among the world's top 2% scientists. Dr. Sun's research interests focus on developing functional materials for energy conversion and storage, including hydrogen fuel cells (low-Pt and Pt-free catalysts, ionomers), hydrogen generation, lithium batteries, and metal-air batteries. He has published over 220 peer-reviewed journal articles (e.g., Nature Communications, Energy & Environmental Science, Advanced Materials, Advanced Energy Materials, J. Am. Chem. Soc., Angew. Chem), with citations of over 12,000 times and an H index of 56. He has edited 3 books, published 14 book chapters, and holds several patents. His recent awards include the Canadian Catalysis Lectureship Award (2020), ECS-Toyota Young Investigator Fellow (2017), IUPAC Novel Materials Youth Prize (2017), member of Global Young Academy (2017), as well as Canada Governor General's Academic Gold Medal, etc.