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2021 WORLD FUEL CELL CONFERENCE

AUGUST 17-20, 2021 | WATERLOO, CANADA

Name	Jeff Gostick	
Affiliation	Department of Chemical Engineering University of Waterloo	
Invited Keynote Lecture		
Presentation Title	Pore-Scale Modeling of Electrode Processes	
Abstract (Approximately 200 words)	<p>The physical structure of electrodes plays a decisive role in their performance. Electrodes must be porous due to the necessity of simultaneous pore- and solid-phase transport. Unlike traditional porous materials (i.e. rock and soil) electrodes are manufactured, so their structure can be built to specifications, but the complexity of the physical phenomena occurring within presents a challenging design problem. Modeling the complex multiphysics with pore-scale resolution can provide valuable insights into the interplay between structure and transport limitations, but the computational cost of such models can be unreasonable. Pore network modeling provides an alternative means of capturing pore-scale processes but with a massive reduction in computational cost (1,000x or more). Recent work by our group has focused on building true multiphysics capabilities into a pore network modeling framework, to study electrodes for a variety of electrochemical devices. An overview of the pore network philosophy will be given as well as an explanation of extracting networks from tomographic images. Results from simulations of fuel cell catalyst layers will be presented, including addressing the impact of ionomer distribution and morphology, and the transport of oxygen within.</p>	
Biographical Sketch (Approximately 200 words)	<p>Jeff Gostick is an Associate Professor in Chemical Engineering at the University of Waterloo where he runs the Porous Materials Engineering & Analysis Lab. His research is centered around understanding the structure-performance relationship in electrodes found in hydrogen fuel cell, redox flow systems, zinc-air cells, Li-ion batteries, and super-capacitors. His group uses a combination experimental characterization, novel production methods, and advanced custom computational tools. He is the lead developer of the open source pore network modeling project OpenPNM (openpnm.org), as well a PoreSpy, a tool for porous media image analysis (porespy.org). Prof Gostick is a licensed professional engineer, has published over 70 journal articles, and was recently named an Emerging Leader by the Canadian Society for Chemical Engineering.</p>	



Fuel Cell Division



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