

Heat and Mass Transfer Considerations for Advancing Fuel cells and Electrolyzers

Prof. Aimy Bazylak

Canada Research Chair (Tier 1) in Clean Energy
Professor of Mechanical Engineering
University of Toronto, Canada

Date 6 January 2025 (Monday)
Time 4 – 5 pm
Venue Chen Kuan Cheng Forum (LTH),
(near Lifts 27-28), HKUST, ([Location](#))

Abstract

Hydrogen continues to gain traction as an energy carrier of the future, and fuel cells provide the ideal partner technology – using hydrogen fuel to produce on-demand, zero-emission power. However, there are still key challenges to commercializing fuel cells and electrolyzers for clean energy. In this talk, I will discuss our consideration of heat and mass transfer for several materials over a range of length scales, and how these considerations are important for informing next generation device development. I will discuss how our work from the flow field and gas diffusion layer have informed our approach to the catalyst coated membrane. I will then focus on X-ray techniques that provide high spatial and temporal resolution for examining experimental performance and materials characterization. I will discuss the advancement we are making in characterizing the spatio-chemical speciation of custom catalyst layers. Specifically, we probe the carbon, fluorine, and oxygen spectral K-edges on commercial catalyst layers using near-edge X-ray absorption fine structure spectroscopy (NEXAFS) in conjunction with scanning transmission X-ray microscopy (STXM) to provide a comprehensive two-dimensional map of the PEM fuel cell catalyst layer. I will discuss the structural characteristics of the CL, which will be highly valuable for informing the design of next generation PEM fuel cell catalyst layers.

About the Speaker



Prof. Aimy Bazylak is a Professor of Mechanical Engineering at the University of Toronto, where she is the Canada Research Chair (Tier 1) in Clean Energy and a Dorothy Killam Fellow. From 2015-2018 she served as the Director of the University of Toronto Institute for Sustainable Energy, and in 2021 she served as the Vice-Dean Undergraduate (Interim) for the Faculty of Applied Science and Engineering at the UofT. In 2022, she also served as the Director (Interim) of the Division of Engineering Science. In 2015, she was an Alexander Von Humboldt Fellow, and in 2023, she was a Helmholtz International Fellow. She currently leads a group of 18 graduate students and postdocs, and her research is focused on understanding multiphase and microscale transport processes involved in electrochemical energy technologies, such as polymer electrolyte membrane fuel cells, water electrolyzers, and carbon dioxide electrolyzers. She performs real-time imaging on these electrochemical energy conversion technologies using synchrotron X-ray radiography and neutron imaging.

All are Welcome