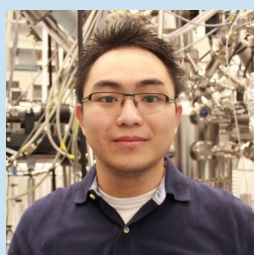


# Chemical Engineering Seminar Series

**Dr. Zhu (Clark) Chen**

Postdoctoral Researcher

**Northwestern University**



Thursday,  
February 6, 2020

350 Health & Human  
Development Building

10:50-11:50 a.m.

## **Establishing Structure-Activity Correlations in Oxygen Electrocatalysis**

### **Abstract**

Oxygen electrochemistry plays an essential role in many important electrochemical devices for energy conversion and storage, such as fuel cells, batteries, and electrolyzers. However, the efficiency of these devices is limited due to the sluggish kinetics associated with oxygen electrocatalysis, which prompted intense research efforts in developing efficient catalysts for oxygen electrochemistry. A grand challenge in catalyst development is to establish structure/composition—activity correlations that not only explain existing catalytic activity trends but also have predictive powers to enable rational catalyst design. In this talk, two types of oxygen electrocatalysts will be discussed (1) metal (oxy)hydroxides for the oxygen evolution reaction and (2) transition metal phthalocyanines for the oxygen reduction reaction. I will show how electron and vibrational spectroscopy can provide critical information leading to establishing structure-activity correlations, especially when implemented in situ and operando. Particularly, these analytical techniques have been instrumental in identifying the active structure motifs and the catalyst degradation mechanism for oxygen electrocatalysts.

### **Biosketch**

Clark received his Bachelor's degree in Nanotechnology Engineering and Masters in Chemical Engineering from the University of Waterloo in Canada. After getting his Master's degree, Clark received a prestigious NSERC postgraduate scholarship from the Canadian government and began his doctoral study in the Department of Chemical and Biological Engineering at Princeton University under the tutelage of Professor Bruce Koel. While at Princeton, Clark received the Maeder Fellowship, which is offered to only two graduate students every year. After getting his Ph.D. degree, Clark joined the Department of Chemistry at Northwestern University as a postdoctoral researcher working with the late Richard Van Duyne. Clark has published 14 first-author papers and co-authored another 8; he is also a co-inventor of a US patent on metal-air battery catalysts, which has been licensed recently. Clark has a broad research background, which spanned nanomaterials synthesis, vibrational and electron spectroscopy, scanning probe microscopy, and device integration. In this research seminar, Clark will talk about his work on understanding structure-activity correlations in oxygen electrocatalysts.