Chemical and Petroleum Engineering

SEMINAR NOTICE

Dr. Nirala Singh

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https://cheresearch.engin.umich.edu/singh/index.htm

Nirala Singh joined the faculty at Michigan in 2018 after completing a Washington Research Foundation Innovation Fellowship at the University of Washington and Pacific Northwest National Laboratory with Charlie Campbell and Johannes Lercher. He received his BS in Chemical Engineering from the University of Michigan and received his PhD in Chemical Engineering from the University of California Santa Barbara in 2015 working with Eric McFarland and Horia Metiu. Singh's lab uses experimental kinetics, adsorption models, and spectroscopy to understand electrocatalytic reactions for energy storage, sustainable chemical and fuel production, and wastewater remediation.

Electrocatalysis for Redox Flow Batteries and Renewable Fuels

Abstract

Finding economical, renewable, and environmentally friendly methods to supply energy is one of the major challenges of the future. Although there is more than sufficient energy in sunlight or wind to power the planet, capturing and storing this energy cheaply until it can be used is a major issue. Electrochemistry, and in particular, heterogeneous electrocatalysis, is particularly suited to address this challenge, and the principles of chemical engineering can play a major role in improving these electrocatalytic processes. In this talk, I will discuss the role of heterogeneous electrocatalysis in two examples of systems that can be used to store renewable energy, (i) redox flow batteries for electricity storage and (ii) electrocatalytic hydrogenation to store renewable energy in liquid hydrocarbons similar to existing transportation fuels. By improving the activity and selectivity of electrocatalysts, the efficiency and capital costs of these types of systems can be positively impacted. I will discuss our work on understanding the influence that surface intermediates have on activity, specifically for a negative carbon electrode of the vanadium redox flow battery and for the electrocatalytic hydrogenation of phenol on platinum group metals. I will show how employing traditional heterogeneous catalytic methods developed for gas-phase reactions and an important part of chemical engineering curriculum have led to a better understanding of these aqueous-phase reactions. I will show the experimental kinetic studies we have conducted, in situ spectroscopy to understand reactants, intermediates and products, and the kinetic models that allow us to understand electrocatalytic behavior, and will lead to future, further, improvements in electrocatalyst performance.

Tuesday, February 23rd | 1:00 – 1:45PM

Zoom Meeting: 998 8566 6254 | Passcode: 560824