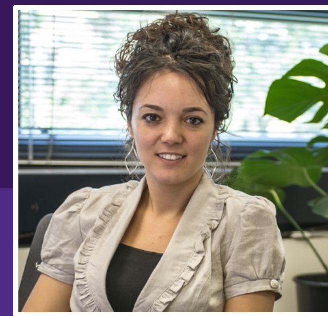
THE MATERIALS SCIENCE AND ENGINEERING DEPARTMENT FALL COLLOQUIUM SERIES PRESENTS:

Eranda Nikolla

Associate Professor, Chemical Engineering & Materials Science

Wayne State University



Controlling Oxygen Electrocatalysis using Nanostructured Mixed-Metal Oxides for Energy Storage/Generation

High CO2 emissions and rapid depletion of fossil fuel resources have become contemporary challenges. Efficient energy conversion and storage systems, such as fuel cells, electrolyzers, and metal-air batteries are at the forefront of sustainable energy conversion and storage to overcome some of these challenges. Oxygen electrocatalysis plays a key role in the performance of these systems. It mainly revolves around the catalysis of oxygen evolution during water splitting in the presence of electrons storing energy in chemical form in electrolyzers, and subsequent recombination of O2 with H2 to form water in fuel cells, generating electrical energy. The sluggish, complex chemistry of oxygen in these systems leads to large overpotential losses that significantly affect the overall efficiency. Therefore, design of cost-effective catalytic materials that improve oxygen electro-kinetics could significantly contribute toward overcoming some of the current energy challenges.

Non-stoichiometric mixed metal oxides with mixed ionic and electronic conducting properties, such as perovskites, double perovskites, and Ruddlesden-Popper oxides, present a promising group of electrocatalysts for oxygen electrocatalysis due to the versatility of the surface composition and fast oxygen conducting properties. While promising development of design principle for oxygen electrocatalysis has been hampered by the complexity of their structure. In this presentation, I will discuss our work in combining theoretical and experimental studies to develop structure-performance relations that can guide the identification of nonstoichiometric, mixed ionic-electronic conducting oxides for efficient oxygen electrocatalysis at low temperatures. I will also discuss our work where nanostructured non-stoichiometric mixed metal oxides are used for controlling oxygen reduction and evolution energetics in Li-O2 battery cathodes.

Eranda Nikolla is an Associate Professor in the Department of Chemical Engineering and Materials Science at Wayne State University. Her research interests lie in the development of heterogeneous catalysts and electrocatalysts for chemical conversion processes and electrochemical systems (i.e., fuel cells, electrolyzers) using a combination of experimental and theoretical techniques. Dr. Nikolla received her Ph.D. in Chemical Engineering from University of Michigan in 2009 working with Prof. Suljo Linic and Prof. Johannes Schwank in the area of solid-state electrocatalysis. She conducted a two-year postdoctoral work at California Institute of Technology with Prof. Mark E. Davis prior to joining Wayne State University. At Caltech, she developed expertise in synthesis and characterization of meso/microporous materials and functionalized surfaces. Dr. Nikolla is the recipient of a number of awards including the National Science Foundation CAREER Award, the Department of Energy CAREER Award, 2016 Camille Dreyfus Teacher-Scholar Award and the Young Scientist Award from the International Congress on Catalysis.

Tuesday, November 19 • 4 pm | Tech L211