Title: $Fe_xNi_{1-x}O_y$ Nanocatalysts for Alkaline Electrocatalysis and Reactive Water Treatment

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Abstract:

Sustainability in water treatment and energy conversion processes requires materials that are designed to be high-performance and durable yet cost-effective. Increasingly, there is a need for novel, advanced materials that are able to address current and future challenges in the fields of water and energy. These challenges include better removal of recalcitrant water contaminants and the development of technologies that use and convert energy more efficiently. There continues to be an opportunity to use nanostructured and nanosized particles to simultaneously address the need for improved selectivity, activity, and stability in reactive environments. Our research interests in this area focus on the development of bimetallic nanoparticles for electrocatalysis and reactive water treatment applications. We develop nanoparticle materials for specific electrochemical or chemical reactions through variation of bimetallic composition, morphological structure, extent of oxide/oxyhydroxide phases, and ligand concentration and molecular structure. We also work with carbon-based high surface area support materials and design nanoparticle-carbon composites. Recent work in the field of alkaline electrocatalysis has demonstrated that key bimetallic non-precious metal oxide/hydroxide compositions, including FeNi and FeCo, are some of the most active for reactions such as fuel oxidation and oxygen evolution during water electrolysis. In this seminar, I will discuss some of our on-going work on an iron-nickel oxide nanoparticle material (Figure 1) that demonstrates promising performance for both water electrolysis and removal of organic water contaminants. I will discuss how we synthesize our nanoparticles, how we control nanoparticle properties such as morphology and composition, and our understanding of how nanoparticle properties influence catalyst performance.

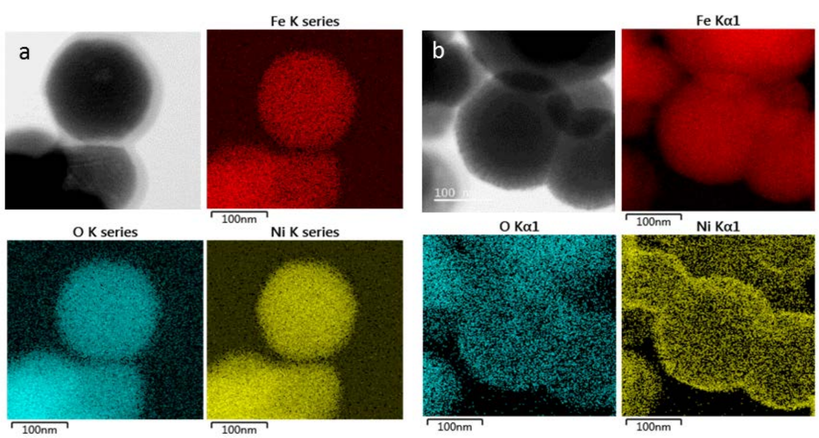

Figure 1. TEM & EDS images of (a) alloy and (b) core-shell FeNi nanoparticles developed for methanol electrooxidation and water electrolysis.

<u>Bio</u>: Lauren received her B.S. in Chemical Engineering from the University of Michigan, Ann Arbor, in 2001 and then spent several years working abroad in France and Switzerland. Subsequently, she worked in Boston for a pharmaceutical start-up company before attending graduate school at the University of Texas at Austin. She received her M.S. in Environmental Engineering in 2006 and her Ph.D. in Chemical Engineering in 2009, where she focused on understanding the precipitation of scaling salts during reverse osmosis membrane desalination. Lauren then held a National Research Council postdoctoral fellowship at the National Institute of Standards & Technology (NIST) from 2009 – 2011, with a focus on iron nanoparticle synthesis and characterization for water treatment applications. She continued at NIST as a staff scientist and led the Engineered Nanoparticle Systems Project for four years, before joining the faculty of the Ralph E. Martin Department of Chemical Engineering as an Assistant Professor in December 2015. Her research group is interested in the development and characterization of nanoparticles and nanostructured materials for water treatment, electrochemical energy conversion, and chemical conversion applications.