Revealing Active Surface Structures of Nanoscale Electrocatalysts by *ex-situ*/*in-situ* Transmission Electron Microscopy and Spectroelectrochemistry

Lin Gan
Division of Energy and Environment, Graduate School at Shenzhen, Tsinghua University, Shenzhen 518055, PR China

Abstract:

Understanding the structure-activity relations has been and continues to be one of the central tasks in developing high activity and stability nanoscale electrocatalysts for a wide range of energy conversion technologies such as fuel cells and water splitting. However, most electrocatalysts, at least their surface region, underwent a dramatic change under the electrocatalytic condition which generally features a harsh oxidative/reductive and/or acidic/basic corrosive environment, thus making a correct understanding of their active surface structures a nontrivial task. In this talk, we present our recent efforts in filling those knowledge gaps by using advanced ex-situ/in-situ transmission electron microscopy (TEM) complemented by in-situ spectroelectrochemistry such as FTIR and Raman. Two typical examples will be discussed: one is low-Pt alloy nanoparticles for oxygen reduction reaction in fuel cells, and the other is Ni-Fe based mixed metal oxides for oxygen evolution reaction in water splitting. The combined microscopy and spectroscopic techniques enable us a deeper understanding of the realistic active surface structures as well as their dynamic evolutions at nano/atomic scale during electrocatalysis.