

Peroxide and Oxygen Reduction On
Nanostructured Electrode Surfaces
Xiao Li, Jongwon Kim and Andrew
A. Gewirth

Department of Chemistry,
University of Illinois,
600 S. Mathews Avenue, Urbana, IL
61801

In the first part of this talk, we report on our efforts directed at establishing the mechanism of oxygen and peroxide reduction on bare Pt and on Au surfaces modified with order metal monolayers. By using a combination of spectroscopic, imaging, and x-ray scattering techniques combined with detailed calculations, we have shown that a crucial step involves the spontaneous cleavage of the O-O bond to form a mixed metal-hydroxide complex. This hydroxide complex is reduced during the electron transfer event, leading to the product water. The conditions necessary to induce this cleavage are now becoming understood.

In the second part of the talk, we utilize the insight developed from the mechanistic studies to synthesize new oxygen reduction catalysts developed from nanostructured ensembles of metal ions and polymer. Studies directed at stabilizing the metal ions in the polymeric matrix in acid solution at high potentials and at increasing the activity of the catalyst will be highlighted.