Research Areas

Electrochemical Materials & Devices
Energy

Research Interests

Our research is directed to the determination of reaction distributions on heterogeneous electrochemical surfaces. This has led to the investigations of oxide films on Ti, and we have reported the first in situ measurements of grazing incidence angle X-ray scattering and reflectivity of anodic oxide films in aqueous solutions. More recently we have developed microscopy techniques with which to study ‘precursor’ sites for localized breakdowns of the oxide films on aluminum and titanium metal surfaces. To obtain high resolution that approaches 10 nm, we have developed a novel microscope (f-NSOM) that enables more than five modes of scanning and functional mapping. This enables studies of reaction distributions in liquids or gases on electrochemically active surfaces. Corrosion, electrocatalysis, and intercalation reactions will be mapped in situ with the novel (f-NSOM) technique. Coupling microscopy with finite element modeling of electrochemical systems is a continuing interest in our group.

We also carry out research on the electrochemistry of fuel cells, and sol-gel processing of transition metal oxides and their electrochemical properties as intercalation hosts.

Selected Publications


