X-ray scattering studies of the electrochemical interface

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In this talk I will discuss the application of surface x-ray scattering to the *in-situ* study of metal electrode surfaces. By combining *in-situ* surface x-ray diffraction measurements with more traditional electrochemical techniques, it is possible to probe the influence of surface structure on the electrochemical reactivity. This functionality is generally termed "structure sensitivity". In the last decade, the *in-situ* surface x-ray diffraction technique has been a critical tool for determining the potential stability of specific surface structures in electrolyte *under* reaction conditions. On the other hand, the rotating ring disk electrode (RRDE) has been routinely used for determining the kinetics of electrochemical reactions on single crystal surfaces and evaluating the potential-dependent surface coverage by an adsorbed species. In combination with other techniques (e.g. FTIR, STM), the x-ray diffraction and RRDE methods have provided remarkable insight into the surface electrochemistry and the "structure sensitivity" of many important electrochemical processes [1].
In this talk I will highlight results obtained from single-crystal and bimetallic transition metal electrodes on which a variety of electrochemical reactions and structural phenomena have been studied. These include surface relaxation effects, surface reconstruction, metal deposition, oxide formation and the adsorption and oxidation of carbon monoxide. Recently, control of the sample/solution temperature has been incorporated into the x-ray electrochemical cell design. Some new results and possible future directions will be presented.

Reference

[1] - Structure Relationships in Electrochemical Reactions, C. A. Lucas and N. M. Markovic, 'The Encyclopaedia of Electrochemistry', Volume 2, Chapter 4, p295-p359 (Wiley-VCH, 2003).