# SYNCHROTRON X-RAY SCATTERING STUDIES OF SINGLE-CRYSTAL ELECTRODE SURFACES

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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, the x-ray diffraction and RRDE methods have provided remarkable insight into the surface electrochemistry and the "structure sensitivity" of many important electrochemical processes.

In this talk we will highlight some recent results obtained from single-crystal transition metal electrodes on which a variety of electrochemical reactions and structural phenomena have been studied. On pure transition metal surfaces, these include surface relaxation effects, surface reconstruction, metal deposition, oxide formation and the adsorption and oxidation of carbon monoxide [1]. The complementarity of the x-ray techniques with other *in-situ* probes, such as FTIR and AFM, will also be discussed [2]. Such combined studies have been extended to bimetallic electrode surfaces; produced either by the irreversible deposition of another metal species or by the use of bimetallic alloy electrodes [3]. Recent results for Pd/Pt and $Pt_3Sn$ will be presented.

[1] see, for example, C. A. Lucas, N. M. Markovic and P. N. Ross, Surf. Sci., 425, L381 (1999). N. M. Markovic, B. N. Grgur, C. A. Lucas and P. N. Ross, J. Phys. Chem. B, 103, 487 (1999).
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[3] see, for example, C. A. Lucas, N. M. Markovic, M. Ball, V. Stamenkovic and P. N. Ross, Surf. Sci., 479, 241 (2001), M. Ball, C. A. Lucas, N. M. Markovic, V. Stamenkovic and P. N. Ross, Surf. Sci., 518, 201 (2002).