Surface Science Studies of Fuel Cells Reactions on Model Electrocatalysts

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For over a decade now the ability to characterize atomic/molecular spatial structures and to monitor changes in the local symmetry of surface atoms in-situ under the reaction conditions has played an important part in our understanding of surface electrochemistry at metal-based interfaces. This progress has been influenced greatly by the development of in-situ surface sensitive probes and vibrational spectroscopes, which in combination with classical electrochemical methods have been used to find interrelationships between the microscopic surface structures of fcc metals (Pt, Ir, Pd, Au, Ag, Cu) and the macroscopic kinetic rates of the reactions.

In this paper we discuss resent developments in electrocatalysis on well-characterized Pt(hkl) and Au(hkl) single crystal surfaces and Pt(hkl)-Pd/Au(hkl)-Pd bimetallic surfaces. The microscopic structure of metal surfaces in an electrochemical environment has been studied by a combination of ex-situ low energy electron diffraction (LEED), Auger electron spectroscopy (AES) and low energy ion scattering (LEIS) and in-situ surface X-ray scattering (SXS) and Fourier transform infrared (FTIR) spectroscopy. The preponderance of electrocatalytic reaction discussed in this paper are those related to development of fuel cell technology *viz.* the oxygen reduction reaction, and oxidation of CO_b, and oxidation of H_2/CO mixtures.

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