Surface Chemical Reactions: 
From Simple Molecules to Metallo-Porphyrins

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Chemical reactions on surfaces can be followed in detail using X-ray photoelectron spectroscopy (XPS or ESCA). From the binding energies of the adsorbate and substrate core levels, detailed information not only on the chemical composition, chemical state (e.g. oxidation state) and adsorption sites, but also on the vibronic final state in the photoemission process itself can be derived. In this presentation, two different examples will be addressed. The first deals with the interaction of saturated and non-saturated hydrocarbon molecules with metal surfaces. From high resolution XP spectra, obtained at BESSY, detailed information on the adsorption, dissociation and the formation of new species can be derived. The vibrational fine structure of the XP spectra is analyzed in detail and can be used to identify various surface intermediates. The second example addresses the adsorption of metalloporphyrins on metal surfaces and their interaction with small molecules. In particular we focus on: (a) synthesis of metalloporphyrin monolayers by direct metatation of porphyrin monolayers, (b) analysis of the interaction between a coordinated metal atom in a porphyrin and a metal surface and (c) attachment of axial ligands on the central metal ion of the metalloporphyrin.


