**Combining Ambient Pressure X-ray Photoelectron Spectroscopy and Model Systems to Investigate Energy Related Problems**

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The development of Ambient Pressure X-ray Photoelectron Spectroscopy (AP-XPS) has provided the capability of photoelectron spectroscopy at pressures up to 5 Torr. This has made possible quantitative, chemically specific investigations of surfaces in equilibrium with realistic gas pressures for many systems of environmental and technological interest. In this talk I will present results for CO adsorption on a PtRu near surface alloy as a model system for investigating CO poisoning of fuel cell catalysts. Small amounts of CO, in the ppm concentration range, present in the $H_2$ fuel are known to poison the catalyst. The role of Ru is to increase the CO tolerance of the catalyst. We have used AP-XPS to investigate the adsorption of CO at 300 K on Ru(0001) and PtRu/Ru(0001) near surface alloys with varying Pt concentrations of 0.36 ML, 0.73 ML and 0.94 ML from ultra-high vacuum up to CO pressures of 0.04 Torr. We observe a smaller amount of CO adsorbed on Pt sites in the alloy surfaces than what has been observed on Pt(111) at all pressures up to 0.04 Torr. Further the fraction of Pt sites covered by CO on the 0.36 ML Pt and 0.73 ML Pt NSA surfaces are both similar but lower than on the 0.94 ML Pt NSA. This supports the concept of a decrease in the adsorption energy of CO on Pt sites in alloy surfaces compared to when it is pure. The fraction of Pt covered by CO at steady-state can be correlated with the binding energy of the Pt $4f_{7/2}$ core level. Lastly, I will discuss how these measurements may benefit by combining AP-XPS with SPEM and possibilities for AP-SPEM at the future NSLS-II.