

Composition of the liquid/vapor interface of aqueous salt solutions and the impact of organic surfactant layers

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X-ray photoelectron spectroscopy (XPS) provides quantitative information on the elemental composition of surfaces. We have used ambient pressure XPS at the Advanced Light Source to study the surface composition of aqueous salt solutions. In these experiments a differentially pumped electron extraction lens and electron energy analyzer allow us to obtain XPS spectra of samples that are in direct contact with vapor at pressures up to several torr. By working at temperatures slightly below room temperature this experimental capability allows us to obtain the XPS spectra (and thus the surface elemental composition) of salt solutions. Aqueous solutions of KCl, KBr, and KI all exhibit an excess of halide ion at the liquid/vapor interface. In contrast, when we carry out experiments in which an organic surfactant (butanol) is added to the system the ion distribution is observed to be uniform as a function of depth into the solution. I will also present preliminary results on our first use of ambient pressure XPS to follow a reaction at the liquid/vapor interface (the oxidation of iodide to iodate by ozone).