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Ions at interfaces and their spectroscopic consequences

PHILLIP GEISSLER, U.C. Berkeley

The affinity of relatively small ions for air-water interfaces challenges our basic understanding of the basic driving forces for solvation. Here I will show that this adsorption is a general phenomenon for ions in polar solvents. Its physical origin lies in a precarious and unexpected balance of strong nonlinear contributions. The statistics of solvent electric fields suggests a key role for interfacial fluctuations. I will also present an intuitive perspective on surface-specific vibrational spectroscopy, and discuss observable signatures for ion adsorption at aqueous interfaces.