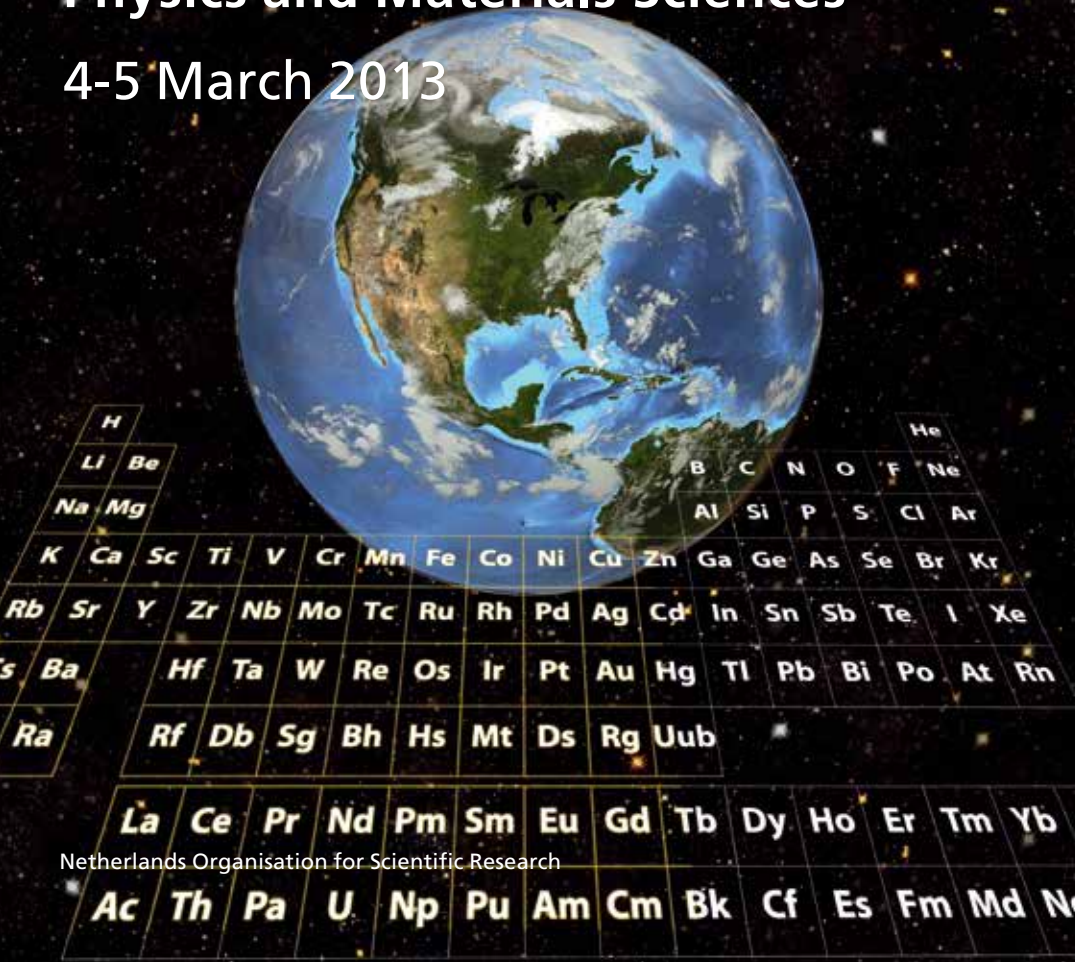
NWO CW Study group meeting

Chemistry in Relation to Physics and Materials Sciences

4-5 March 2013



Netherlands Organisation for Scientific Research

This results in an electric potential difference between the two phases, also known as the Donnan potential.
We present the first experimental evidence for the existence of a Donnan potential at the interface between these demixed aqueous polymer solutions. Using direct electrochemical measurements, we find Donnan potentials on the order of a few millivolts. This offers several exciting new prospects to control the interface electrostatically, for instance in the preparation of water-in-water Pickering emulsions.

High resolution AFM imaging of ion adsorption and charge distribution at heterogeneous solid-liquid interfaces

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The interfacial liquid does not behave like a bulk liquid, and often undergoes particular structural arrangements, depending on the local solid-liquid and liquid-liquid molecular interactions. However, experimental research remains challenging due to the lack of techniques offering sufficient resolution over inhomogeneous surfaces. Here we present a novel approach based on ultrahigh resolution Atomic Force Microscopy and spectroscopy in the dynamic mode. We explore in unprecedented detail the adsorption of ions at heterogeneous gibbsite-silica surfaces in contact with aqueous electrolytes of variable concentration. Dynamic force spectroscopy with a lateral resolution of ~10nm and atomic resolution imaging consistently reveal a preferential adsorption of divalent Mg2+ and Ca2+ as compared to monovalent Na+ and K+ cations including adsorption sites on the atomically flat mineral surfaces. We present an atomic model for the adsorption sites of the ions and compare the local surface charge to a surface speciation model based on the Poisson Boltzmann equation coupled to a representation of the surface in a basic Stern model.