Surface Potentials and Equilibrium at Mineral-Water Interfaces

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Frontiers in Geochemistry
Seminar Series

Presented by…

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Knowledge of the electrostatic potential distribution across mineral-water interfaces is important for understanding processes such as metal adsorption and dissolution and growth. Most present day information in this regard is based on measurements of colloidal mineral particles. However, model accuracy requires a more fundamental understanding of the relationship between the potential distribution and the arrangements of atoms at the surface. This talk centers on electrostatic potential measurements for single crystallographic terminations of single crystal minerals. The electrostatic potential at the inner surface plane within the electrical interfacial layer (surface potential Ψ_0) at these interfaces affects the state of charged surface species formed by interactions with potential determining ions (p.d.i) and is one of the main parameters characterizing the interface.

The single crystal surface potential (Ψ_0) can be measured by Ion Sensitive Field Effect Transistors (ISFET) and by more recently developed Single Crystal Electrode (SCrE) methods. Surface potentials measured in this way provide information on the potential determining ions (p.d.i.) and their state at the mineral surfaces. In addition to adsorption and electrokinetic data, surface potential data serve as supplementary information in evaluation of parameters describing the interfacial kinetics and equilibrium. For example, the slope of Ψ_0 as a function of the logarithm of the activity of p.d.i. is generally found to be lower with respect to the Nernst equation. Single crystal electrodes and a recently developed streaming potential technique enable characterization of individual crystal planes, and thus new experimental evaluation of theoretical concepts. The theoretical background for this line of research, construction of electrodes, and some experimental results will be presented.

More info?

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