Goldschmidt 2026 Abstract
https://doi.org/10.46427/gold2026.35922

The role of dissolved Al on mineral surface charge

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In this contribution, own and literature data from electrokinetic, batch uptake, and proton data for dissolved Al in the presence of surfaces are compiled in an attempt to relate charge reversal to available spectroscopic data. The systems encompass colloids, in particular silica, clay minerals, in particular montmorillonite, and single crystals, in particular Al oxide (sapphire). The macroscopic observation in particular for pure electrokinetic data on colloids cannot be unambiguously interpreted, since the high concentrations of Al sometimes applied may in principle result in the formation of hydrous Al oxide particles. These might adsorb on the sorbent or be present as separate colloids in the test suspension and contribute to changes in the observed electrophoretic mobility (apart from pure Al adsorption). The role of dissolution and re-adsorption of Al is also discussed.

The combination of wet-chemical methods to collect a wide range of data is favored over the easy electrokinetic experiments. However, it is far more advisable to combine them with tools, that allow direct access to the mechanism. We describe one procedure that allows simultaneous access to electrokinetic potential, Al uptake, and control of contributions from Al colloids to limit otherwise unavoidable ambiguities.