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Chemical Reactivity at Metal Oxide-Aqueous Solution Interfaces

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The chemical reactivity of metal oxide surfaces in contact with aqueous solutions, with respect to cations and anions, is controlled by the composition, structure, and charging properties of the surface, the dielectric properties of the bulk oxide, and the stability of the aqueous cation or anion complex versus its sorption complex. These points will be illustrated for selected cations, anions, and metal oxides using macroscopic uptake and EXAFS spectroscopy results, x-ray standing wave data, and crystal truncation rod diffraction data. The reactivity of metal oxide surfaces with respect to low molecular weight (LMW) carboxylic acids is also dependent on the types of ring structures formed between surface functional groups and the LMW organic molecules. These types of interactions will be illustrated using ATR-FTIR data and dissolution measurements as a function of pH for oxalate, maleate, phthalate, and pyromellitate interacting with boehmite (AlOOH).

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