Binding Dynamics of Carboxylate to Aluminum Oxide As Studied By Flow Adsorption Microcalorimetry: Effect of R-Group Chemistry

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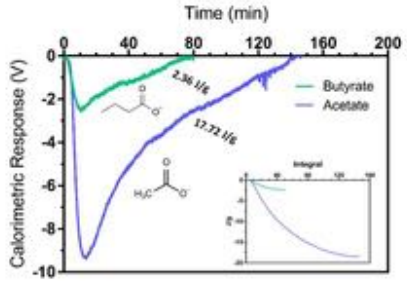
Organic-mineral interactions at the mineral-water interface are of interest to geoscientists due to their controlling effects upon trajectory and rate of biogeochemical reactions such as electron-transfer, mineral dissolution and precipitation, and degradation/stabilization of organic molecules at this interface.

Here, we used flow adsorption microcalorimetry (FAMC) to study the dynamics of carboxylates adsorbing to the surface of aluminum oxides. Specifically, we focused on the effect of the R-group attached to the carboxylic acid functional group on reaction dynamics.



Results are shown for an acetate and a butyrate Al-oxide model system. Heat of binding for acetate was 17.72 J/g Al-oxide while that for butyrate was 2.36 J/g reflecting stronger bonding strength onto Al-oxides for the shorter R-group in acetate (C2) versus the longer one in butyrate (C4). There was also indication, from the integral energies across time, for this shorter R group in acetate favoring faster binding onto Al-oxide than that of butyrate. The poster presentation will further discuss other configurations and chain length of R groups onto crystalline Al-oxides such as boehmite and gibbsite.