

# Effects of pH on cell surface properties and its interactions with metals

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Microbial activity plays an important role in weathering due to its ability to dissolve and precipitate minerals. Microbial activity and metal speciation is mainly controlled by pH. In order to understand how bacterial cell wall interacts with metals it is crucial to elucidate how bacteria surface composition is affected by pH and the presence of dissolved metals.

Variation of the characteristics of cell surface functional groups at different pH values and electrolyte composition was *in situ* monitored via acid-base potentiometric titrations and micro-FT-IR. Changes in bacterial functional groups from *Aquabacterium commune* and *Acidithiobacillus ferrooxidans* in the presence of silica, iron, copper and uranium and different pH values were also monitored. Presence of metals associated to the biomass fraction after the titration was determined by ICP-MS and XPS. Typical fingerprint spectra of the bacterial functional groups revealed the predominance of amine, phosphoryl and carbonyl associated to ester in the cell membrane. Functional groups determined by the different pKa values found from the titrations were comparable to those described by FT-IR. Speciation of metal in aqueous solution and bacterial biomass were performed under pH-stat titration conditions. It was demonstrated that by combining micro-FT-IR, pKa values, XPS and ICP-MS the speciation of metals and the role of functional groups associated to those metals could be established.