An ATR-FTIR study of silicate adsorption onto ferrihydrite.

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Attenuated total reflectance Fourier transfer infrared spectroscopy (ATR-FTIR) has been used to study the *in situ* adsorption of silicate from aqueous solution onto a ferrihydrite surface. Silicate adsorption onto iron oxides can involve either adsorption as a monomer (via Fe-O-Si linkages) or polymerisation (via Si-O-Si linkages), depending on the conditions. The asymmetric Si-O stretch is considered to occur at approximately 940 cm^{-1} for monomeric silicate while for polymerised silicates peaks are observed at higher wave numbers [1]. Therefore, by depositing ferrihydrite onto a ZnSe crystal contained in a flow cell, ATR-FTIR can differentiate between the presence of monomericly adsorbed and polymeric silicate. The figure below shows the ATR-FTIR spectra for silicate adsorbing onto ferrihydrite over time. Initially monomeric species predominate but as the surface coverage increases the degree of polymerisation increases such that after 120 min the polymer peak at 1006 cm^{-1} approximately equals that of the monomer peak at 940 cm^{-1}. After 23 h polymeric species are predominant.

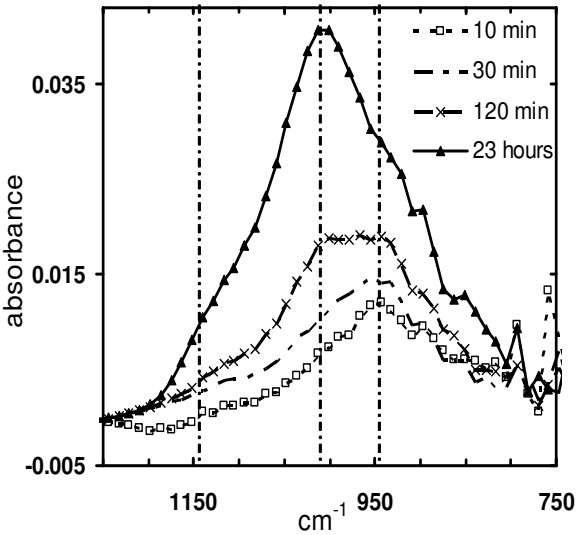

Figure One: ATR-FTIR spectra of silicate (20 ppm as SiO_2) adsorbing on ferrihydrite at pH 10.

References

[1] Carlson L. and Schwertmann U. (1981) *Geochim. Cosmochim. Acta* **45,** 421-425.