

Interfacial water components around nano-particles of silica as studied by Attenuated Total Reflectance Infrared (ATR-IR) spectroscopy

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Water around solid and ion surfaces, called as interfacial water, has been thought to have some structures and properties different from those of bulk and to influence various geochemical processes.

In order to understand such structure of interfacial water, we measured infrared spectra of interfacial water surrounding nano-particles of SiO₂ (diameter: about 12 nm) by attenuated total reflectance infrared (ATR-IR) spectroscopy. We corrected obtained raw spectra to absorption index *k* spectra and conducted curve fitting of OH stretching bands by four Gaussian components with varying hydrogen bond distance (Fig.1).

With increasing silica concentrations in water, relative percentages of the 3440 and 3250 cm⁻¹ components decreased, while those of the 3600 and 3120 cm⁻¹ components increased. The former components are considered to be bulk properties and the latter components can correspond to interfacial species.

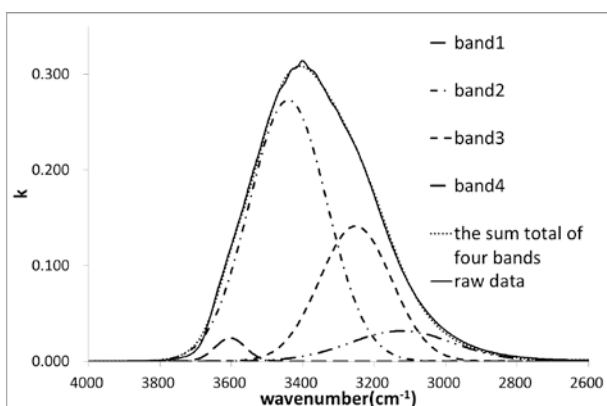


Fig.1. The fitting curves of OH stretching band of a silica colloid solution by four Gaussian components: band1 (centered at 3600 cm⁻¹), band2 (centered at 3440 cm⁻¹), band3 (centered at 3250 cm⁻¹), band4 (centered at 3120 cm⁻¹).