Effect of Fe(II) ions on the sorption of selenite onto chlorite

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It has been reported that Fe(II)-bearing minerals or Fe(II) ions can reduce oxoanionic selenite ($Se(IV)O_3^{2-}$) either to Se(0) or Se(-II) and then decrease the mobility of the selenite in subsurface environments [1, 2]. In this study the effect of Fe(II) ions on the sorption of selenite onto chlorite surfaces was investigated as a function of selenite concentration, Fe(II) concentration, and pH.

The sorption of Se(IV) onto chlorite surfaces followed the Langmuir isotherm regardless of the presence of Fe(II) ions. The Se(IV) sorption was enhanced at a pH > 6.5 when the Fe(II) concentration was higher than 5 ppm because of the increased sorption of Fe(II) onto chlorite surfaces. XANES (X-ray absorption near edge structure) spectra of the Se *K*-edge showed that most of the sorbed Se(IV) was reduced to Se(0) by Fe(II) sorbed on the chlorite surfaces, especially at pH > 9. The combined results of field emission scanning electron microscopy and X-ray diffraction also showed that elemental selenium and goethite were formed and precipitated on the chlorite surfaces during the sorption of selenite. Consequently it can be concluded that Se(IV) can be reduced to Se(0) in the presence of Fe(II) ions by the surface catalytic oxidation of Fe(II) into Fe(III) and formation of goethite at neutral and particularly alkaline conditions.

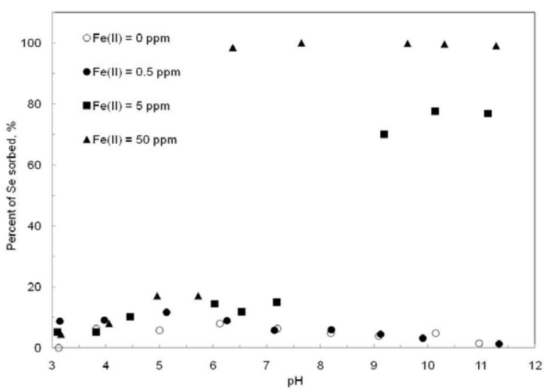

Figure 1: The sorption of Se(IV) onto chlorite surfaces as a function of pH at different concentrations of Fe(II) ions.

[1] Charlet *et al*. (2007), *Geochim. Cosmochim. Acta* **71**, 5731-5749. [2] Scheinost *et al*. (2008), *J. Contam. Hydrol.* **102**, 228-245.

Horizontal gene transfer in phylogenetically-distant taxa that induce the formation of modern wrinkle structures: Implications for the interpretation of Earth's earliest microbialites

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Wrinkle structures in rocks dating back to the Archean are commonly interpreted to represent the stabilizing influence of cyanobacteria on sediments because the trapping and binding of sediment by these phototrophic microbes is known to produce similar features in modern tidal flat settings [1]. Our observations of modern sediments show that, like cyanobacteria, chemolithotrophic taxa within the Beggiatoaceae can produce features that are reminiscent of those found in the ancient rock record. Despite similarities in cell morphology and division patterns, the Cyanobacteria and the Beggiatoaceae are generally considered to be phylogenetically-distant clades in rRNA-based phylogenies. However, our comparisons of *Beggiatoa* and cyanobacterial genomes show that these organisms share many genes that potentially code for phenotypic traits such as chemotaxis, filament formation, and the production of extracellular polymeric substances. Some of these genes may underlie the similar biostabilizing influences these organisms impart on sediments. Our analyses further suggest that at least some of these genes may have been acquired via horizontal gene transfer. The presence of multiple biostabilizing clades in the modern, as well as the potential for extensive horizontal gene transfer over 3.5 billion years of evolution, complicates the interpretation of ancient sedimentary features using solely morphological criteria.

[1] Noffke (2007) *Gondwana Research,* **11**, 336–342.

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