

## Fe(II) sorption onto different sites of clay mineral and its biooxidation activity

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Iron is an important redox-active element in clay minerals and Fe(II) can reside in structural octahedral site, edge site, and basal plane in phyllosilicate such as smectite. Using two types of smectite, iron-poor montmorillonite SWy-2 and iron-rich nontronite NAu-2, Fe(II) was adsorbed onto basal plane and edge-site when pH was < 4.5 and > 7, respectively [1]. An experiment was set up to couple oxidation of adsorbed Fe(II) with nitrate reduction catalyzed by metal oxidizing bacterium, *Pseudogulbenkiania* sp. strain 2002. Our results showed that for SWy-2 the edge-Fe(II) was more reactive than the basal-Fe(II) towards nitrate reduction, but the trend was not clear for NAu-2. Multiple lines of evidence including wet chemistry, X-ray diffraction, electron microscopy, and Mössbauer spectroscopy support the oxidation of edge-Fe(II) by octahedral Fe(III) in NAu-2, thus passivating its reactivity. Basal-Fe(II) should be more difficult to donate electrons to octahedral Fe(III) and should have remained as Fe(II). However, this electron transfer was unlikely to occur for iron-poor SWy-2, and as a result, the intrinsic reactivity of Fe(II) on edge site was similar to that on basal surface.

[1] Neumann, Anke, Tyler L. Olson, and Michelle M. Scherer. "Spectroscopic evidence for Fe (II)–Fe (III) electron transfer at clay mineral edge and basal sites." *Environmental science & technology* **47**.13 (2013): 6969-6977.