66 - Green rust formation from Fe(II) sorption to Al-bearing phyllosilicates with structural Fe impurities

Autumn N Starcher, *starcher@udel.edu, Wei Li, Donald L Sparks. Department of Plant and Soil Science, University of Delaware, Newark, Delaware 19716, United States*

Fe(II)-Al(III)-LDH phases were recently found to form from sorption of Fe(II) on γ-Al_2O_3 and could also form from reactions between Fe(II) and other Al-bearing minerals. Understanding the speciation and kinetics of Fe(II) sorption reactions with Al-bearing substrates is essential to fully understand Fe cycling in anoxic environments. The objective of the study was to examine sorption kinetics and products of Fe(II) on a pyrophyllite, an Al-bearing phyllosilicate, that contains structural Fe(III) impurities using X-ray absorption spectroscopy (XAS). Batch reactions were performed under strictly anoxic conditions between either 0.8 mM or 3 mM Fe and 10 g/L pyrophyllite at pH 7.5. XAS is a non-invasive technique to examine element-specific structural information for reactions between metals, such as Fe, and mineral substrates at the mineral-water interface and can distinguish between oxidation states of the various metals. The Fe K-edge χ data (Figure 1) show the formation of green rust as soon as 1 week of reaction time and suggest that the presence of structural Fe(III) impurities within the pyrophyllite have the potential to oxidize the Fe(II), resulting in the formation of a green rust, rather than a Fe(II)-Al(III)-LDH. This research is important in understanding and modeling Fe cycling in environmental systems and will further elucidate the role of reducing environments on biogeochemical Fe cycling and the effects on speciation and transport.

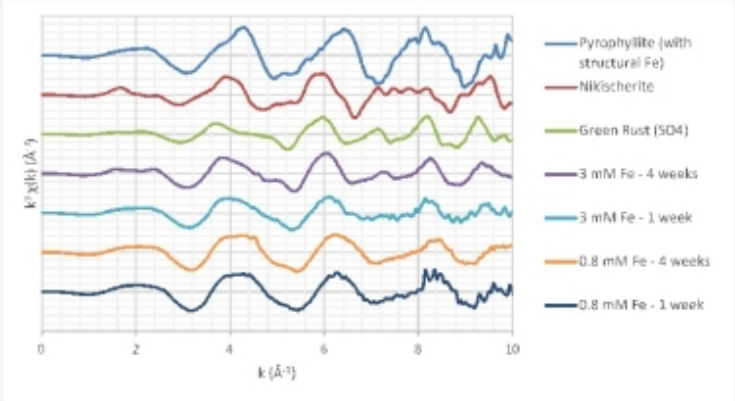

Figure 1: Fe K-edge χ data for sorption reactions of 3 mM Fe or 0.8 mM Fe with pyrophyllite for reaction times of 1 week and 4 weeks and the Fe standards pyrophyllite, nikischerite, and green rust (SO_4).

Monday, March 17, 2014 08:00 PM
Sci-Mix (08:00 PM - 10:00 PM)
Location: Dallas Convention Center
Room: Hall F

Close Window