# Effect of Iron-reducing Bacteria on Fe(II)-induced Phase Transformation of Lepidocrocite

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The direct interplay between aqueous Fe(II) and the structural Fe(III) in iron (hydr)oxide is the recently found important process of soil iron cycle. Previous studies focused on the chemical mechanism of Fe(II)-induced recrystallization of iron (hydr)oxide. Microorganism often coexists with iron (hydr)oxide in the soil environment, and has been reported to play an important role in the iron cycle process. However, the effect of microorganisms on the interplay between aqueous Fe(II) and the structural Fe(III) of iron (hydr)oxide, and the Fe(II)-induced phase transformation of iron (hydr)oxide remain unclear. In this study, we focus on the effect of iron-reducing bacteria, *S. oneidensis* MR-1, and herein the influencing mechanisms on the phase transformation of lepidocrocite induced by aqueous Fe(II). Enriched $^{57}$Fe isotope tracer studies demonstrated that 63.5% of structural Fe(III) atoms in lepidocrocite exchanged with Fe(II) in solution at pH 7.0 for 23 days. XRD characterization result show that lepidocrocite was transformed to goethite during the Fe(II)-induced reaction. In addition, when amended with active cells together with the Fe(II), lepidocrocite was reduced and the concentration of Fe(II) in solution increased quickly, which accordingly enhanced the rates of Fe atom exchange between aqueous Fe(II) and lepidocrocite. Lepidocrocite was transformed to magnetite, instead of goethite, during Fe(II)-induced reaction in this system. The inactive cells (pasteurized) posed different effects on the Fe(II)-induced phase transformation of lepidocrocite. 67.2% Fe atom exchange rate was obtained between aqueous Fe(II) and lepidocrocite and geothite was the transformation product of lepidocrocite, the same product in the system without microorganisms. The results indicate that inactive cells have weak effect on the Fe atom exchange rate between aqueous Fe(II) and the structural Fe(III), and no effect on phase transformaiton, in the Fe(II)-induced pahse transformation of lepidocrocite.