Influence of quinones and flavins (AQDS, RBF, FMN & FAD) on the recrystallization of lepidocrocite induced by aqueous Fe(II)

MANJIA CHEN[1], HUI TONG[1], CHENGSHUAI LIU[2*]

[1] Guangdong Key Laboratory of Integrated Agro-environmental Pollution Control and Management, Guangdong Institute of Eco-environmental Science & Technology, Guangzhou 510650, P. R. China

[2] State Key Laboratory of Environmental Geochemistry, Institute of Geochemistry, Chinese Academy of Sciences, Guiyang 550009, P. R. China

*correspondence: liuchengshuai@vip.gyig.ac.cn

The aqueous Fe(II) ($Fe(II)_{aq}$)-induced recrystallization of iron (hydr)oxide are the recently found important processes of soil iron cycle, and plays a critical role in the behavior of pollutants. Although the chemical mechanism of Fe(II)-induced iron (hydr)oxide recrystallization have been widely recognized, questions remain about the roles of biochemical reductants, such as quinones and flavins, in the recrystallization of iron (hydr)oxide induced by $Fe(II)_{aq}$. In the present study, we focus on the effect of biochemical reductants, including AQDS, RBF, FMN and FAD, on the phase transformation of lepidocrocite induced by $Fe(II)_{aq}$. Enriched ^{57}Fe isotope tracer studies demonstrate that both AQDS and RBF significantly enhanced the electron transfer and iron atom exchange between $Fe(II)_{aq}$ and lepidocrocite, while FMN and FAD had non-significant effect on the rate. XRD and SEM analysis results showed that lepidocrocite is transformed into goethite and magnetite with the addition of AQDS and FAD. However, lepidocrocite was only recrystallized as goethite with the addition of FMN and FAD. The findings in the present study suggest the important roles of quinones and flavins in the $Fe(II)_{aq}$-induced recrystallization of iron (hydr)oxides, which is critical for the iron biogeochemical cycle in soils.