The sulfate reducing microbial community succession under different electron transfer routes in schwertmannite transformation

YUFEI ZENG[1,2], CONG FAN[1,2], HAN WANG[1,2], CHULING GUO[1,2]*, GUINING LU[1,2], JOHN R. REINFELDER[3], ZHI DANG[1,2]*

[1] School of Environment and Energy, South China University of Technology, Guangzhou 510006, PR China (*correspondence: clguo@scut.edu.cn)

[2] The Key Lab of Pollution Control and Ecosystem Restoration in Industry Clusters, Ministry of Education,Guangzhou 510006, PR China

[3] Department of Environmental Sciences,Rutgers University, New Brunswick, New Jersey 08901, USA

Microorganisms can transfer electrons using exogenous or endogenous shuttle with extracellular minerals. Understanding the mechanism of microbial transformation of sulfate hydroxy minerals is of great interest, which plays an important role in controlling the behavior of toxic metals in the mining area. Here, we examined the adaptation of an enriched sulfate-reducing microbial community and the possible pathway of microbial electron transfer coupling with schwertmannite transformation occurred in AMD environment. Experiments were conducted to distinguish direct and indirect contact between microbial communities and the mineral with or without the addition of electron shuttles anthraquinone-2,6-disulfonate (AQDS). It was found that the growth of *Desulfovibrio* is stimulated in direct contact with the mineral, while different genera of the family *Enterobacteriaceae* dominated in the mineral isolated during 50 experimental days. The addition of AQDS had no obvious effect on direct contact group, but enhanced the electron transfer efficiency in indirect contact group. Further UV-sepctrum analysis indicated that some soluble organic compounds were generated by microbial community after the depletion of dissolved sulfate in indirect contact without AQDS. These compounds may be worked as exogenous shuttles. Vivianite was detected as the main product of schwertmannite transformation in both direct and indirect contact. These differences offered a new perspective into microbial community interaction with minerals, and helped us further understand the functional microorganism attended in electron transfer in AMD system.

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