Fungus-mediated heterogeneous catalysis reaction drives iron redox and biomineralization

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Introduction

Fungus-mineral interactions play essential roles in shaping the planet Earth. Unique to fungus, its long and thread-like hyphae (up to 1 mm long and 1–10 μm wide each) can extend hundreds of kilometers cumulatively in soils kg^{-1} in environments such as the rhizosphere. However, the mechanisms that govern this interactions remain enigmatic. In this work we employ cutting-edge techniques, including scanning transmission X-ray microscopy images and synchrotron radiation-based micro X-ray fluorescence and micro-FTIR spectromicroscopies to examine the interfacial processes of a model iron oxides (i.e., hematite) with a model fungal strain *Trichoderma guizhouense* NJAU 4742.

Discussion of Results

The most important result is that we provides the first unequivocal evidence demonstrating fungus-mediated heterogeneous catalysis being occurred at hypha-mineral interfaces. Given the versatility of superoxides as a redox reactant and the universal ability of fungi to produce extracellular superoxides, we think that our results constitute a significant step forward in understanding the fungus biomineralization of minerals in the environments.

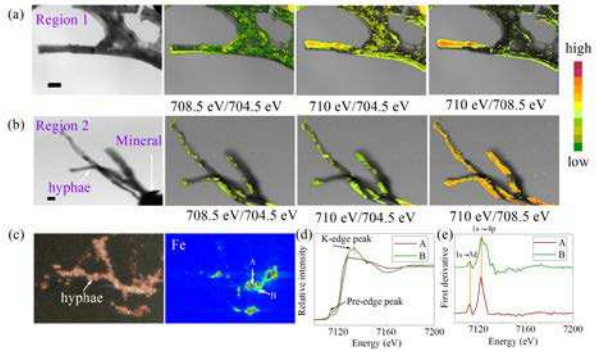

Figure 1. Dual-energy ratio-contrast images acquired near the Fe L3 edge (a-b) and micro-X-ray fluorescence (μ-XRF) spectromicroscopy (c) of the cultivated 66 h hypha-mineral samples.

Unpublished works