Do Iron(III) minerals protect neutrophilic iron(II)-oxidizing bacteria from UV radiation and/or desiccation?

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Fe(III) minerals absorb UV light effectively but most of them still transmit visible light, e.g. the Fe(III) oxy-hydroxide ferrihydrite ($Fe_{10}O_{14}(OH)_2$) [1]. Consequently, the encrustation of nitrate-reducing Fe(II)-oxidizing bacteria or the close association of photoferrotrophs with such Fe(III) minerals could serve as protection against UV light, which otherwise causes damage to the cells' DNA. Additionally, silicification of cells was hypothesized to be an effective protection against intermittent dehydration events [2]; this could be true in a similar fashion for iron mineral crusts. Thus, in this project we investigate whether iron biomineralization and close association of cells with Fe(III) minerals could serve as an UV light screen or/and a desiccation protection for Fe(II)-oxidizing bacteria.

After exposure to UV light or dehydration, the viability of Fe(II)-oxidizing cells is determined by quantifying colony forming units (CFUs), microscopic dead/live staining and iron oxidation/nitrate reduction rates. To quantify biological effects of UV radiation different cellular indicators of oxidative stress (lipid peroxidation, DNA strand breakage, protein oxidation, generation of reactive oxygen species) are used. By comparison of the viability of cells with or without UV/dehydration treatment we assess if Fe(III) minerals can protect Fe(II)-oxidizing bacteria from UV radiation or desiccation.

[1] Bishop, *et al* (2006) *International Journal of Astrobiology* **5**: 1 [2] Phoenix & Konhauser (2008) *Geobiology* **6**: 303-308