Mercury reduction by vivianite

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Mercury (Hg) is a toxic element of global environmental concern, released into the environment by human activities since the late 1700s. In aquatic/terrestrial systems, Hg can be converted by anaerobic microorganisms to mono-methylmercury (MeHg), a potent neurotoxin accumulated in the food web [1]. In iron-rich sediments where Hg is methylated, vivianite, a ferrous phosphate mineral, commonly occurs in immediate vicinity of organic remains. However, Fe^{II}-bearing minerals are recognized as Hg^{II} reducers such as magnetite [2] or green rusts [3]. The reduction of Hg^{II} to Hg^0 by vivianite ($Fe^{II}_3(PO_4)_2.8H_2O$) was investigated by fluctuating Hg/Fe ratios (0.1, 1, 100) at circumneutral pH under anoxic conditions to illuminate kinetic parameters and the nature Fe^{III}-bearing minerals formed. The ability of vivianite to reduce inorganic divalent Hg is of high importance to (i) unravel the interplay of Hg and Fe biogeochemical cycles, and to (ii) limit the production of MeHg in anoxic sediments by the formation of elemental Hg.

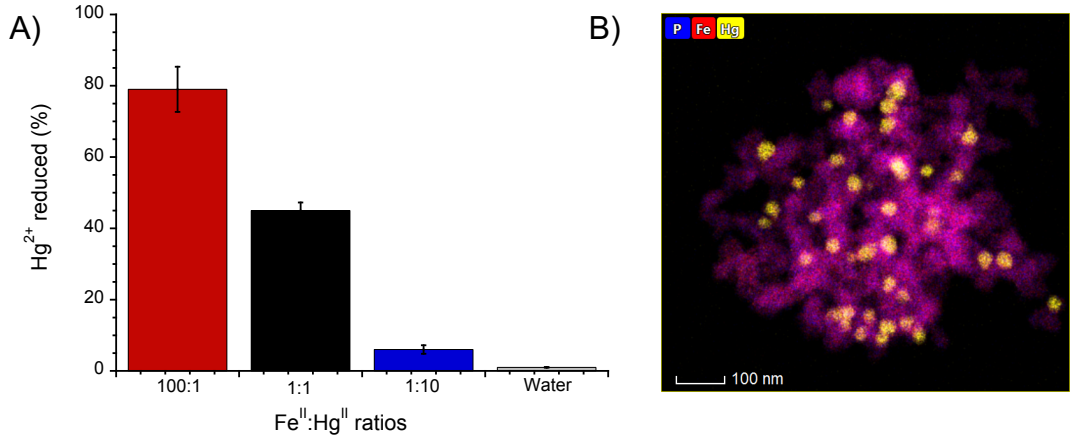

Figure 1. Percentage of inorganic divalent mercury (Hg^{2+}) reduced by vivanite with various Fe/Hg ratios (100:1, 1:1, 1:10); a control was done with water (A). Elemental distribution map of vivianite nanoparticles after mercury reduction (B).

REFERENCES

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