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Hydroxy-nitrite green rust: a new type of green rust formed as an intermediate reaction product

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The presence of high nitrite concentrations due to anthropogenic activities is an important water quality concern as nitrite is highly toxic to human and fauna. Nitrite toxicity is related to its transformation into carcinogenic N-nitroso compounds that are suspected to be responsible for some gastric cancers, and to its ability to convert the hemoglobin to methaemoglobin what is then unable to fix oxygen and to transport it to the tissues, resulting in hypoxia and the blue-baby syndrome [1]. To reduce the adverse effect of nitrite on human health, any process enhancing the transformation of nitrite ions to nitrogen gas is of interest for the remediation processes. This purpose can be achieved by using green rusts (GR) that are mixed iron(II-III) layered double hydroxides, commonly found in anoxic zones of natural environments. They play an important role in the geochemical redox cycling of iron and nitrogen, and can affect the speciation and mobility of many (in)organic contaminants. Here we investigate nitrite reduction by biogenic iron(II-III) hydroxycarbonate green rusts under anoxic conditions. Results reveal that biogenic GR are capable of reducing nitrite ions without ammonium production, suggesting the conversion of nitrite to nitrogen gaseous species. Moreover, the study provides evidence for the first time of the formation of a hydroxy-nitrite green rust as an intermediate reaction product prior to the fully oxidation of GR to ferric oxyhydroxides.

[1] Philips S., Laanbroek H. J. and Verstraete W. (2002). *Rev. Environ. Sci. Biotechnol.*, 1:115.