Reactivity of Chemically and Biologically Synthesized Green Rusts towards Anionic, Neutral, and Cationic Pollutants (NO_3^-, methylred, Hg^{2+})

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Green rusts (GR), Fe^{II}-Fe^{III} phases belonging to the fougèrite group, were first identified as an iron corrosion product before being discovered in natural environments such as hydromorphic soils, groundwater in granitic fractures, or ferruginous lakes [1]. GR can be synthezised abiotically or biotically and are composed of positively charged iron hydroxide layers separated by interlayers of anions such as carbonate. More stable (> 3 years) than their chemical counterparts, GR biominerals can be formed by planktonic cells (e.g. *Shewanella putrefaciens*) or by bacterial activities in natural biofilms (Fig. 1) [2]. Assuming that GR biominerals are close to those found in natural environments, it is therefore legitimate to compare the difference of reactivity between biotic and abiotic GR in function of the nature of the pollutant (anionic, neutral, cationic).

As well recognized in the literature, the presence of Fe^{II} in a solid state promotes the reducing capability of GR towards several metallic (e.g. Hg^{II}), organic (e.g. methylred) and inorganic (e.g. NO_3^-) contaminants [3, 4]. The difference of reactivity between chemically and biologically synthesized GR towards these contaminants suggests that environmental counterparts of GR could be involved in biogeochemical cycles of specific elements.

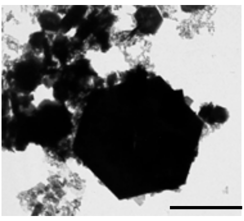

Figure 1: A green rust crystal produced during an incubation of an environmental biofilm (from a pond in Lorraine, France) under anoxic conditions.

[1] Ruby (2015) *Curr. Inor. Chem* **5**, 152-155. [2] Jorand *et al.* (2011) *Sci. Total Environ* **409**, 2586-2596. [3] Remy *et al.* (2015) *Water Res* **70**, 266-278. [4] Zegeye *et al.* (2014) *J. Phys. Chem. C* **118**, 5978-5987.