

Stimulation of the anaerobic oxidation of pyrite by activators at neutral pH in the presence of nitrate

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Denitrification coupled to pyrite oxidation is a major process that has been observed in many groundwater aquifers, although a direct reaction between nitrate and pyrite could not be detected [1, 2]. Our understanding of the mechanisms of this redox process is, however, still limited. Since Fe(III) is detected as a well-known oxidant for pyrite in the presence of oxygen even at neutral pH [3], we postulate that electron transfer is being mediated through this reaction also in the presence of nitrate as terminal electron acceptor. Microbial catalysis by bacteria, such as Fe(II) oxidizing or sulfide reducing bacteria, is considered to affect the denitrification and pyrite oxidation rates significantly. Therefore, bacteria are supposed to simulate the electron transfer from pyrite to nitrate.

The goal of the work is to understand the mechanism of the anaerobic oxidation of pyrite coupled to nitrate reduction in anoxic groundwater sediments. To this end batch experiments have been set up in which synthesized pyrite is exposed to nitrate-dependent Fe(II)-oxidizer strain BoFEN1 [4] testing the effect of Fe(II), Fe(III), and ferrihydrite as chemical activators. These batch experiments are separated into abiotic and biotic conditions to individually assess the pure chemical and microbial stimulation. First results from these experiments will be presented in this conference.

[1] Jorgensen *et al.* (2009) *Environmental Science & Technology* **43**(13): 4851-4857. [2] Schippers & Jorgensen (2001) *Geochimica Et Cosmochimica Acta* **65**(6): 915-922. [3] Peiffer & Stubert (1999) *Geochimica Et Cosmochimica Acta* **63**(19-20): 3171-3182. [4] Kappler *et al.* (2005) *Geobiology* **3**(4): 235-245.

Effect of soil sand on ¹³C CP-MAS NMR spectra quality

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Under semiarid climate condition such as Spain, soil consist of low organic matter concentrations therefore low organic compound effects on spectra quality and their organic fraction is often excluded from characterization by means of solid-state ¹³C NMR spectroscopy [1]. That's way quantitative interpretation of such spectra becomes difficult and sometimes impossible. The aim of this study is to compare the effects of soil sand on ¹³CP-MAS NMR spectra quality soil C mass balance in similar soil, in Albacete region, South-East Spain.

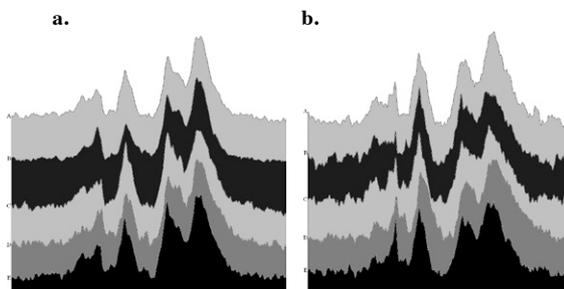


Figure 1. ¹³C NMR results a. with sand b. without sand.

The result presented (Figure 1) that there were significantly differences between O-Alkyl, Aromatic and Phenolic groups with removal sand from soil, but this treatment was not significantly effected on Alkyl, Methoxyl and Carboxyl groups in functional groups of organic matter.

Consequently the peaks of NMR spectra became more pronounced with removal of sand from the soil in Aromatic, Phenolic and Carboxyl groups of soil organic matter.

[1] Gonçalves *et al.* (2003) *Geoderma* **116** (2003) 373–392.