Mechanism of arsenic release from deltaic sediment during microbial sulfate reduction

THI HAI VAN PHAN[1], LAURENT CHARLET[1] AND RIZLAN BERNIER-LATMANI[2]

[1]Insitute of Earth Science, University of Grenoble, Grenoble, France, thi-hai-van.phan@ujf-grenoble.fr
[2]Ecole Polytechnique Federale de Lausanne, Lausanne, Switzerland, rizlan.bernier-latmani@epfl.ch

Sulfate reduction may lead to the formation of thiol groups (SH^-) and enhanced As sequestration cycle after cycle through the formation of arsenic sulfide mineral [1]. To find out this mechanism, the lab-scale experiments were performed using redox cycling bioreactors toward two main goals: (1) to investigate the As, Fe, S species generated by oscillating biogeochemical conditions and (2) to pinpoint the role of sulphate-reducing bacteria in the process. Extensive characterization of aqueous phase parameter such as Eh, pH, DOC, S, Fe and As species was performed using appropriate analytical methods. DNA was extracted from slurry samples, the 16S rRNA gene amplified by PCR and the amplicons sequenced to monitor changes in the composition of the microbial community and to probe for the presence of sulfate-reducing bacteria during the experimental cycles.

The reducing and oxidizing cycles are clearly identifiable from Eh and pH values. Sulfate reduction is detected within the reactor experiments. Total concentrations of As decreased during the oxic half-cycles and increased during the anoxic half-cycles. After three redox cycles, the concentration of total As decreased significantly.

[1] Couture, R.-M., Wallschläger, D., Rose, J., & Van Cappellen, P. (2013). Arsenic binding to organic and inorganic sulfur species during microbial sulfate reduction: a sediment flow-through reactor experiment. *Environmental Chemistry*, **10**(**4**), 285. doi:10.1071/EN13010