

## **Coupling oxvanions (Se, As) transformation with Fe and S cycling under redox oscillations**

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The cumulative effects of periodic redox cycling on the mobility, speciation and toxicity of As, Fe, Se and S from alluvial sediment and floodplain soil were investigated using a batch bioreactor system stimulating successive half-cycles of oxidizing and reducing conditions. The evidence shows that the mobility of these As and Se species strongly depends on the redox oscillations, sediment mineralogy, and initial speciation. Fe and As were mobilized first, whereas Se was precipitated under anoxic condition. While Fe and As were reversibly sequestered during the oxidizing half-cycles, the Se complexes remained in the solid phase [1]–[3]. Changes in As mobility, and cumulative changes in the substrate along redox cycles, were expected, due to the evolution of mineral assemblages. In the pyrite-rich sediment and in the absence of gypsum, Fe and As were mobilized under anoxic conditions and replenished at every oxic half-cycle. Along with remobilization, pyrite oxidation, lowering of the pH value, and apparent inhibition of microbial sulfate reduction were observed [2]. Conversely, in gypsum-rich sediment, As was sequestered by co-precipitation with Fe (oxyhydr)oxides and/or Fe oxyhydroxysulfate [2]. Under sulfate-reducing conditions, released As was likely immobilized via reduction of soluble As compounds (e.g., thioarsenic) with pyrite (FeS<sub>2</sub>) [3].

[1] Couture et al. (2015) *Environ. Sci. Technol.* **49**, 3015-3023

[2] Phan et al. (2018) *Geosci. Front.* 1-15

[3] Phan et al. (2019) *Sci. Total Environ.* **663**, 718-730