The effect of microbially mediated sulfate reduction on arsenic mobilization in the shallow aquifer

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Experimental Materials and Methods

To better understand the coupled Fe-S biogeochemical processes controlling the fate of As in shallow groundwater, microcosm incubation experiments were conducted by mixing 5 g sediments collected from Jianghan Plain, central Yangtze River Basin and 50 mL artificial groundwater. Dissolved As species (including thio-As), Fe(II), dsrB/arrA functional gene abundance, 16S rRNA gene sequences and iron mineral phase transformation were monitored during the incubation.

Figure 1: The temporal change of As/Fe/S species

Discussion of Results

On one hand, Sun et al. [1] suggested the sulfide can promote As release via reducing Fe (hydro)oxides indirectly and forming thio-As. On the other hand, Kocar et al. [2] illustrated sulfidogenesis can form Fe-sulfide minerals.

In the present study, As-loaded iron mineral phase transformation under sulfate reduction condition can cause the decoupling change of Fe/As in groundwater, which can contribute to the formation of high As and low Fe groundwater. SRB and FeRB play important roles as the main divers. The detection of thio-As provided new insight into the mechanism of As mobilization and transformation in aquifers.