

Effects of bacteria in lake sediments on arsenate adsorbed by iron (hydr)oxides

DEMING DONG*, XU JIANG, XIUYI HUA,
DAPENG LIANG AND ZHIYONG GUO

College of Environment and Resources, Jilin University, Changchun 130012, PR China
(*correspondence: dmdong@jlu.edu.cn)

Microorganisms participate in the biogeochemical recycle of As in lithosphere. It has been found that some bacteria can use organic carbon as source of energy, and meanwhile reduce Fe(III) and As(V) into Fe(II) and As(III). In this study, we investigated the effects of bacteria separated from natural sediment on the release of adsorbed As (arsenate) from ferrihydrite, goethite and hematite to water.

Taken ferrihydrite for example, no matter with or without the sediment bacteria, the release of As from the oxide into water was observed. However, this release of As in the systems with bacteria differed significantly from those without bacteria. Firstly, about 19 % more As was released in the systems with bacteria. Secondly and more importantly, in the systems with bacteria, the released As changed from As(V), which was originally adsorbed, to As(III) gradually, and after 14d, almost all As in water was As(III) (Figure 1). While in the systems without bacteria, As(III) was negligible. For Fe release, in the systems without bacteria, only very limited amount of Fe, which was Fe(III), was released, and Fe(II) in such systems was under detection limit. While in the systems with bacteria, much more Fe was released and was dominated by Fe(II). Fe(II) concentration in water in these systems increased in the first 6d and then remained almost constant. Fe(III) was also detected in water, and its concentration increased gradually during the experimental period, which should be mainly resulted from the reoxidation of the Fe(II). The behavior of As and Fe in the goethite and hematite systems was similar to the ferrihydrite systems. These results indicated the important role of sediment bacteria in affecting the behavior of adsorbed As.

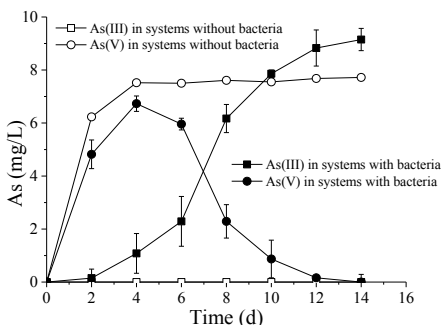


Figure 1: Concentration and speciation of As in water.