Arsenic Mobilization in Spent nZVI Waste Residue: Effect of *Pantoea* sp. IMH

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Nanoscale zero-valent iron (nZVI) is an effective arsenic (As) scavenger [1]. However, spent nZVI may pose much higher health risks than our initial thought in the presence of As-reducing bacteria [2]. Therefore, the motivation of this study was to explore the As redox transformation and release in spent nZVI waste residue in contact with *Pantoea* sp. IMH. IMH contains *ars*C genes, which involved in the As detoxification pathway [3]. Our incubation results showed that *Pantoea* sp. IMH reduced 100% of dissolved As(V), though the total released As (8.3%) was not enhanced by IMH. No significant difference (p=0.53) of dissolved iron concentrations between abiotic controls and inoculated samples was observed. In agreement with our incubation results, XANES analysis showed that nZVI was oxidized to Fe_3O_4 and Fe_2O_3 in incubation and control samples, and As(III) content in solids kept relatively unchanged (14.5-19%). Further As EXAFS shell-fitting observed the mixture of bidentate binuclear and mondentate mononuclear surface complexes as evidenced by the As-Fe atomic distances at 3.31 Å and 3.49 Å. Our XAS results suggested that IMH can not directly change the speciation and configuration of adsorbed As. The Mössbauer spectroscopic results agreed with our XANES analysis and further elucidated that two microstructure forms of magnetite existed in the abiotic control, whereas only one in the incubation sample. Our study implies that the arsenic-reducing bacteria with *ars*C genes control the As speciation in the aqueous phase, but not on the solids. Unlike our initial assumption, no substantial As release occurred in the presence of *ars*C gene owners.

[1] Fu *et al*. (2014) *J. Hazard. Mater*. **267**, 194-205. [2] Huang *et al*. (2011) *Environ. Sci. Technol*. **45**, 7701-7709. [3] Tian *et al*. (2015) *Environ. Sci. Technol*. **49**, 2140-2146.