

Characterising the reactivity of metallic iron in Fe⁰/As-rock/H₂O systems by long-term column experiments

C Noubactep*

Angewandte Geologie, Universität Göttingen, Goldschmidtstraße 3, D - 37077 Göttingen, Germany

Abstract

The intrinsic reactivity of 4 metallic iron materials (Fe⁰) was investigated in batch and column experiments. The Fe⁰ reactivity was characterised by the extent of aqueous fixation of *in-situ* leached arsenic (As). Air-homogenised batch experiments were conducted for 1 month with 10.0 g/l of an As-bearing rock (ore material) and 0.0 or 5.0 g/l of Fe⁰. Column experiments were performed for 2 and 3 months. Each dynamic experiment was made up of 2 glass columns in series. The first column contained 2.5 or 5.0 g of the ore material and the second column 0.0 or 5.0 g of a Fe⁰ material. Results showed no significant reactivity difference in batch studies for all 4 materials; ZVI2 was by far the most reactive material in column experiments. This observation was attributed to the relative kinetics of production of aqueous As and Fe species under the experimental conditions and their impact on the formation of a protective film on Fe⁰. Accordingly, no protective film could be built at the surface of the least reactive materials. The results corroborated the urgent need for unified experimental procedures to characterise Fe⁰ materials.

Keywords: Column study, intrinsic reactivity, ore mineral, water treatment, zerovalent iron