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Effect of Hydroquinone-induced Iron Reduction on the Stability of Fe(III)-As(V) Co-precipitate and Arsenic Mobilization

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Abstract

Long-term storage of Fe(III)-As(V) co-precipitate wastes derived from the industrial As removal process poses the risk of secondary arsenic pollution to the local environment. However, its stability in only iron-reducing environment remains unclear. The effect of iron reduction by hydroquinone (QH_2) on the stability of co-precipitate at Fe/As molar ratio of 5 was investigated in this study. The results showed that 16.5–93% of Fe(III) reduction in NaOH-neutralized co-precipitate caused 0.1–11% (0.1–8.5 mg·L^{-1}) As release and 0.9–46% (2.6–130 mg·L^{-1}) Fe(II) release at pH 4 and 6. Most of the As(V) and more than half of the Fe(II) generated by the reductive decomposition of Fe(III)-As(V) co-precipitate were retained in solid phases. Solid characterization and thermodynamic calculation indicated that amorphous $Fe_3(AsO4)_2$ was probably the major secondary mineral for As immobilization. At pH 8, 11–39% As and less than 4% Fe(II) were released into solution after 3.6–87% Fe(III) was reduced to Fe(II). Both amorphous $Fe_3(AsO_4)_2$ and Fe(II,III) (hydr)oxides