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Microcosm Study of the Effects of pH, Reductant and Sediment Type on Uranium Immobilization

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Abstract: *Uranium mining by in-situ recovery (ISR) involves injecting dissolved oxygen (DO) into the subsurface to oxidize and solubilize uranium minerals (e.g., uraninite), and then pumping the groundwater to the surface and removing the uranium by ion exchange. After ISR mining operations are completed, the groundwater must be restored to baseline conditions. One promising new technology for restoring groundwater at ISR sites is to inject chemical reductants that can stimulate growth of indigenous iron- and sulfate-reducing bacteria that can also reduce and immobilize uranium. Although numerous studies have validated the general feasibility of this approach, significant uncertainty remains about the effects of groundwater pH, reductant type (particularly organic versus inorganic), and sediment type (particularly pre- leaching versus post-leaching). In this study, a 2^3 experimental factorial design was used to assess the effects of pH, reductant type, and sediment type on uranium immobilization in 160-mL serum-bottle sediment microcosms. The experimental results showed that both reductant type and sediment type have statistically significant effects on uranium immobilization.*

Keywords: uranium immobilization

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