Microcosm Study to Evaluate Alternative Reduced Sulfur Compounds for Stimulating In-Situ Microbial Reduction and Immobilization of Uranium

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ABSTRACT

The purpose of this study is to evaluate the effectiveness of sodium dithionite (Na2S2O4) and sulfur dioxide (SO2) as alternative reductants for stimulating in-situ microbial reduction and immobilization of dissolved uranium. A factorial experimental design will be used to compare soluble uranium removal in microcosm bottles with different reductant type (dithionite versus sulfur dioxide), pH buffer (phosphate versuscarbonate), and adjusted to different initial pH (6.5 versus 8.5). The driving hypothesisfor this research is that weaker reductants like dithionite and sulfur dioxide may be more effective reductants for groundwater restoration at in-situ recovery (ISR) uranium mining sites than stronger reductants (e.g., Na2S) because they cannot reduce sulfate, but can reduce Fe^{3+} and U^{6+}. If this hypothesis is validated, using dithionite and/or sulfur dioxide as reductants for post-leached groundwater restoration should yield larger zones of influence surrounding injection wells because electron equivalents will not be ‘wasted’ in the production of sulfide.