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

Nebечи Osia¹, Dorina Murgulet², and Lee Clapp¹

¹Department of Environmental Engineering, Texas A&M University–Kingsville,
917 W. Ave. B, MSC 213, Kingsville, Texas 78363

²Department of Physical and Environmental Sciences, Texas A&M University–Corpus Christi,
6300 Ocean Dr., NRC 3103, Unit 5850, Corpus Christi, Texas 78412–5850

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ABSTRACT

The purpose of this study is to evaluate the effectiveness of sodium dithionite ($\text{Na}_2\text{S}_2\text{O}_4$) and sulfur dioxide (SO_2) 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 versus carbonate), and adjusted to different initial pH (6.5 versus 8.5). The driving hypothesis for 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., Na_2S) 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.

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