

## ZERO VALENT IRON AS A FILTER FOR WATER CONTAMINATED WITH URANIUM AND NITRATE

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The groundwater in Modesto, CA, has concerning levels of multiple contaminants, including uranium (U) and nitrate (NO<sub>3</sub><sup>-</sup>). Although no measured levels exceed EPA Drinking Water Standards, several approach the threshold of legal and/or health consequences, and thus their remediation is desirable. Zero valent iron (ZVI) is a promising filtration material, and it has been shown to chemically reduce both U(VI) and NO<sub>3</sub><sup>-</sup> in separate trials. However, no single-step filtration has been conducted on contaminated water with high levels of both. The purpose of this study was to assess the effectiveness of powdered ZVI as a filter for U and NO<sub>3</sub><sup>-</sup> in water. Three different ZVI powder formulations were tested, each with particle size 0.15 - 0.85 mm. All powders contained manganese impurities, with one also containing iron oxides and another including a small percentage of copper. An artificial surrogate based on groundwater monitoring data was used to test the effectiveness of the ZVI materials. The groundwater surrogate contained 100 ppb U, 100 ppb rhenium (Re) as a surrogate for Technitium-99 (<sup>99</sup>Tc), and 89 ppm NO<sub>3</sub><sup>-</sup>. In batch equilibration tests 200 mL of groundwater was reacted with 5 gm of each ZVI powder, with separate trials in oxic and anoxic environments. Results showed significant decrease across all contaminants for all formulations and environments over

the seven day equilibration, with one of the ZVI materials performing significantly better than the other two. U and NO<sub>3</sub><sup>-</sup> concentrations reached as low as less than 0.01 ppb and 4.4 ppm, respectively. Re concentrations reached less than 0.1 ppb. The results indicate that ZVI is a promising material for single-step treatment of multiple contaminants. Future work includes analysis of the used ZVI and assessing the ammonia content of filtered samples.



*Emily working in the Coy chamber.*