

Influence of Calcium Carbonate Chemistry on Inorganic Contaminant Natural Attenuation and Secondary Sources

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Background/Objectives. Calcium carbonate chemistry is important for many aquifer systems. Calcium carbonate precipitates can incorporate other elements or inorganic compounds and may, therefore, be important to consider in relation to natural attenuation processes and secondary sources. Inorganic oxyanion contaminants, such as chromate, are of concern at sites because they are typically mobile.

Approach/Activities. Sediment samples from contaminated source zones were collected and analyzed to evaluate chromate leaching characteristics and for chemical and microscopy analysis of chromate compounds. Additional samples were obtained from the unsaturated zone beneath former waste disposal sites with similar analyses conducted for chromate and I-129 contaminants. In addition, batch tests with no sediments were conducted, adding calcium-carbonate-forming solutions in the presence of chromate and iodate. In these tests analysis of the aqueous phase and precipitates formed were used to quantify formation of precipitates containing chromate and I-129 and their subsequent stability.

Results/Lessons Learned. While chromate is typically a mobile species, investigation of field samples from a contaminated site and synthesis of laboratory precipitates have demonstrated presence of chromate-containing precipitates that have slow leaching behavior. Similar field evidence and laboratory synthetic studies have shown this type of behavior for iodate, another oxyanion important at some radionuclide waste sites because of I-129 contamination. Quantification of how precipitates are formed and the stability of precipitates for these oxyanions in association with calcium carbonate provides information that can be used to support natural attenuation evaluation that accounts for attenuated transport caused by precipitation/dissolution reactions. This information is also important when applied to conditions near former waste disposal sites where precipitate formation may lead to accumulation of solid-phase contamination that acts as a continuing source.