**Characterizing and quantifying ureolytic activity in porous media**

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**ABSTRACT:** The ability to induce and control calcite precipitation in the subsurface has multiple applications, such as reducing transport of contaminants, modifying fluid flowpaths for resource recovery and management, and improving of the shear strength of soils. A specific example of an application for engineered calcite precipitation is the *in situ* sequestration of the radionuclide 90Sr by co-precipitation within calcite. In environments where calcite is stable (a common condition), 90Sr could be immobilized long enough for natural decay to mitigate the radiological hazard to groundwater. We have found that calcite precipitation and Sr co-precipitation can be accelerated by the activity of urea hydrolyzing microorganisms and that higher calcite precipitation rates can increase Sr partitioning. Recently we have been investigating induced calcite precipitation at the field scale. Data from multiple research sites suggest that the spatial distribution of urea hydrolyzing microorganisms in natural environments is heterogeneous, that attached microorganisms play a much greater role in ureolysis than planktonic organisms, and that general stimulation of the subsurface microbial community using a carbon source (molasses) can significantly increase ureolytic activity. Molecular biomarker analyses, biomass measurements, and specific ureolytic rate measurements using a radiotracer technique support these conclusions.