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Laboratory investigation of U (VI) incorporation into calcium carbonate minerals.

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Uranium migration in natural aqueous systems is an ongoing concern in environmental research. Sorption interactions with soil, sediment and rocks are important mechanisms for understanding the uranium mobility.

U/Th dating of calcium carbonate may be affected by uranium migration in the natural environment due to processes of solid phase distraction such as chemical and physical weathering, uranium input with creation of new materials, and uranium exchange processes.

Under standard environmental condition, uranium typically occurs in the hexavalent form as the mobile, aqueous uranyl ion (UO_2^{2+}) [Steele H. M., at all. 2002] . The thermodynamically stable valence of U in oxic groundwater, interacts strongly with solid phases, and these interactions mitigate the transport of U(VI) in the subsurface.

Depending on environmental condition, uranium forms carbonate complex such as $UO_2(CO_3)_2^{2-}$ [Dementeyv &Syromyatnikov, 1968] or $UO_2(CO_3)_3^{4-}$ [Giblin et al., 1981].

For carbonates recent evidence suggests that incorporation into the solid (co-precipitation) dominant uptake [Reeder R. J., at all. 2000].

We have conducted laboratory experiments of uranium uptake by aragonite and calcite samples using an artificial uranium isotope ^{232}U to understand the conditions of uranium incorporation processes. All experiments were conducted at room temperature under standard conditions. The uranium uptake by aragonite powder experiments were conducted at pH range between 6 and 11. These experiments show the strong pH dependence of uranium uptake with maximum at pH 7 (98%).

Also we have conducted the series of uranium experiments at pH 7 to study the influence of major seawater elements on uranium uptake, transport experiments, and kinetic of uranium uptake by aragonite. These experiments show that uranium uptake by powdered mineral is faster (less than 0.3 hour). The content of Mg^{2+} in solution mostly decreases the process of uranium incorporation.