

The Kinetics of Carbon Storage

Frontiers in Geochemistry Seminar Series

Presented by...

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Thermodynamic calculations suggest that the ultimate fate of CO₂ injected into the subsurface is its incorporation into carbonate rocks. The degree to which this actually happens depends greatly on the rates of both dissolution reactions, which release divalent metal cations into solution and precipitation reactions that combine injected CO₂ with divalent cations to form stable carbonate minerals. Although it is commonly believed that the overall rate of this process will be limited by the slow dissolution rates of silicate minerals, recent work shows that other than Ca-carbonates, such as calcite, few carbonate minerals precipitate readily at low temperatures; laboratory studies show that magnesite (MgCO₃) and dawsonite (NaAlCO₃(OH)₂) fail to precipitate at temperatures of ~100 and ~160°C, respectively. At such conditions, metals that could transform into carbonates are preferentially precipitated into clay minerals such as smectite. The key, therefore to creating stable carbon storage in carbonate minerals may be the identification of those catalysts that favor low temperature formation of these minerals and/or inhibit formation of secondary silicate minerals. Although these catalysts have yet to be identified insights can be obtained from mineral precipitation mechanisms which suggest that the rate timing step for these reactions is the breaking of the metal hydration shells in solution. Nevertheless, even in the absence of carbonate precipitation, silicate dissolution alone can stabilize injected CO₂ in the aqueous phase through addition of alkalinity and/or complexing agents.

More info:

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EMSL Auditorium

9:00 – 10:00 am

