

Fluid-rock interactions in the environment:
Thermodynamics, kinetics, and isotopes.

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In this talk I will give an overview of how experimental work over the past few years on fluid-mineral interaction in far from equilibrium and near-equilibrium conditions has led to a better understanding of the underlying mechanisms of dissolution and precipitation. Coupling between dissolution of one phase and precipitation of another is a common phenomenon in experiments as well as in nature and will be discussed from the general viewpoint of rate-determining steps in the overall reactions. The role of transient porosity generation and the implications to fluid transport through normally low permeability rocks will be emphasized. The factors governing element exchange will be discussed and applied to compositional and structural changes in minerals, a phenomenon commonly equated with “leaching” or “incongruent dissolution”. I will review some of the prevailing ideas on the mechanisms of isotope exchange and how the results of recent experiments question some of these ideas.