

## Theory of isotopic fractionation during mineral precipitation in aqueous solutions

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Isotope geochemistry has sound influence in the calibration of geological time scales, the reconstruction of past climates, or the fate of trace element at the earth surface. In view of a better description of isotopic fractionation during the precipitation of minerals in aqueous solutions, we propose a theory which treats it within a model of ideal solid-solution, including nucleation processes and size dependent growth [1,2]. Fractionation at equilibrium as well as kinetic fractionation are accounted for by differences in the end-members solubility products, frequencies of nucleation and growth constants. Such theory, which provides the time evolution of the solid and aqueous phases, the particle population, and the composition profiles inside the particles, goes well beyond previous models which relied on macroscopic rate equations. A first simplistic application will be given as a proof of concept.

[1] C. Noguera, B. Fritz, Y. Amal, A. Clément, *Chemical Geology* 269 (2010) 8999 “Simulation of the nucleation and growth of solid solutions in aqueous solutions”

[2] C. Noguera, B. Fritz, and A. Clément, *Chem. Geol.* 431, 20-35 (2016) “Kinetics of precipitation of non-ideal solid-solutions in a liquid environment”