

Implications of Elevated Sr Values in Microbial Mediated Dolomites

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Recent recognition of the importance of microbial mediation in the precipitation of modern dolomite implies that a reevaluation of classic dolomite formation models is necessary to advance our understanding of the processes involved in carbonate diagenesis. The influence of microorganisms and associated extracellular polymeric substances (EPS) has now been succinctly demonstrated to control dolomite nucleation in many unique modern environments. The application of cultural experiments has allowed for the calibration of specific geochemical proxies, such as the O isotope fractionation factor and Sr partition coefficient for dolomite. In particular, the Sr composition of ancient dolomite has been commonly used as indicator of the origin of the diagenetic fluid. Our biomediated experiments used to study the Sr partition coefficient for dolomite have revealed that microbial dolomite tends to have elevated Sr compositions (>2000 ppm) versus ancient dolomites (<200 ppm). We propose that ancient and Recent dolomite with high Sr concentrations are primary bacterial precipitates and are not the product of a secondary replacement of aragonite. Sr-rich dolomite suggests that the precipitation water had a greater salinity than normal seawater and a considerable sulfate concentration. We conclude that Sr may be an ideal indicator for the paleosalinity and paleotemperature of dolomite formation environments.