

# Constraints on dolomite as an archive of seawater sulfate from high- temperature dolomitization experiments

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Carbonate-associated sulfate (CAS) is often used as a proxy for the sulfate concentration and sulfur isotopic composition of seawater and has been used to reconstruct ancient ocean redox conditions and the sulfur cycle through time. Dolomite is a particularly valuable archive of CAS in the Proterozoic sedimentary record, where dolomite is abundant. However, previous efforts to interpret the CAS proxy in ancient dolomite have been challenged by the potential for these records to reflect diagenesis rather than the primary sulfate composition of seawater. Here, we present preliminary results from high-temperature, replacement dolomitization experiments that aim to determine partition coefficients and isotopic fractionation factors for CAS in dolomite. Aragonitic sediments were replaced (via dissolution-precipitation) by dolomite at temperatures of 170°C to 200°C in Mg-Ca-Cl solutions across a range of sulfate concentrations. Dolomite and anhydrite are precipitated in these high sulfate solutions, but their abundances vary systematically depending on the sulfate concentration, temperature, and initial Mg-to-Ca ratio of the fluid. Following these reactions, we determined the concentration of CAS in the product and compared these values to the concentration of sulfate in the fluid. As the study progresses, the reaction products will also be analyzed for  $\delta^{34}\text{S}$  to evaluate the fractionation of  $^{32}\text{S}$  and  $^{34}\text{S}$  during dolomitization. The results of this experimental study will bolster interpretations of the CAS proxy in dolomite throughout the geological record, thus improving our understanding of biogeochemical cycles and paleoenvironmental change during critical periods of Earth history.