



Laboratory determination of oxygen isotope fractionation of high Mg-calcite between 25 and 80°C

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High magnesium calcite (HMC) was synthesized from oversaturated solutions with respect to calcite at 25, 40, 60 and 80°C. A fractionated dissolution technique was applied, in order to remove any amorphous calcium carbonate (ACC) from synthesized Ca,Mg-carbonate. The occurrence of pure HMC (6-30% MgCO₃) allowed the effect of Mg²⁺ on the oxygen isotope fractionation to be estimated. The calculated oxygen isotope fractionation for the temperature range between 25 and 80°C, is expressed by an extended term to the calcite-water oxygen isotope fractionation relation of Kim and O'Neil, 1997 as:

$$1000 \ln \alpha = 18.03x - 32.42 + (0.6x^3 - 5.47x^2 + 16.78x - 17.21)C_{Mg}$$

where x is $10^3/T$ in Kelvin and C_{Mg} is the percentage of Mg²⁺ incorporated in the crystal lattice.

Inorganic formation of Mg-calcite with up to 25% MgCO₃ is observed in a number of marine and lacustrine environments. The above relationship provides additional information to existing thermodynamic calculations and isotope fractionation data derived from natural samples.