

Equilibrium fractionation of oxygen isotopes between inorganic rhodochrosite (MnCO₃) and water at low temperatures

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The oxygen-isotope fractionation between rhodochrosite (MnCO₃) and water at low temperature ranges has not been reported. For this study, pure rhodochrosite was precipitated in the laboratory from a Na-Mn²⁺-Cl-HCO₃ solution at two different temperatures (10 and 25°C). Before and after the precipitation, oxygen isotope composition and pH of the solution were monitored. After the precipitation, the purity of precipitated rhodochrosites was checked with an automated X-ray power diffractometer and its oxygen isotope composition was determined by the conventional H₃PO₄ method at 25°C. For the acid fractionation factor, the value reported for calcite (1.01025) was used.

The results of equilibrium experiments yielded a preliminary equation on the oxygen-isotope fractionation between rhodochrosite and water at low temperatures:

$$1000 \ln \alpha(\text{MnCO}_3\text{-H}_2\text{O}) = 17.18(10^3/T^{-1}) - 28.44$$

where α is the fractionation factor, and T is the temperature in kelvin.

Though a more precise acid fractionation factor should be obtained by additional experiments, our present data may provide a new insight for rhodochrosite found in lacustrine and marine sediments and in hydrothermal ore deposits.

주요어: Oxygen isotope fractionation, rhodochrosite and water

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