

Isotopic fractionation of zinc between calcite and solution: implication for Baishuitai travertine formation in SW China

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The Zn-isotope variations in carbonates are being developed as a proxy to track Zn sources in polluted environments [1] and to reconstruct paleo-environmental conditions [2, 3]. Previous studies have shown that Zn isotope compositions in carbonates can be affected by biological activity [2, 3], surface adsorption [4], besides source variations. However, little work has been done to evaluate what are dominant factors that control Zn isotope compositions of carbonate precipitating in natural environments.

In this study, the Zn isotope composition of carbonates and coexisting solution from an endogenic travertine-depositing stream in Baishuitai (Yunnan, SW China) is carefully examined. Along the stream, the $\delta^{66/64}\text{Zn}$ values of solutions and calcite vary from 0.65‰ to 1.45‰ and 0.71‰ to 1.76‰, respectively. The Zn isotope fractionation between calcite and coexisting aqueous solution ($\Delta^{66/64}\text{Zn}_{\text{calcite-solution}}$) shows a large variation ranging between -0.63 and +0.73‰, which is insensitive to temperature, alkalinity and pH of the solution, or deposition rate of carbonate crystals. Theoretical modeling suggests that several mechanisms might have affected Zn isotope fractionation during calcite growth in Baishuitai, including the closed-system Rayleigh fractional crystallization, sorption reaction at the carbonate-water interface, and Zn isotope variation due to various Zn sources. This work provides implications for how to use Zn isotope signatures in carbonates for tracking the source of pollution and reconstructing conditions of paleo-environments.

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[3] Kunzmann et al. (2012) *Geology*. 41, 27-30. [4] Dong et al. (2016) *Chem. Geol.* 447, 70-78.