Zinc, cadmium and sulfur isotope fractionation in the Jinding Zn-Pb sulfide deposit, SW China

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Stable isotopes of ore-related metals such as Zn and Cd have been demonstrated to be useful tools for tracing metal source as well as mineralization processes of Zn-Pb deposits[1]. Furthermore, both Zn and Cd are sensitive to organisms, and thus their isotopes may be utilized to evaluate the role of biogenic processes in formation of Zn-Pb deposits.

The Jinding Zn-Pb deposit, hosted by Cretaceous and Tertiary terrestrial rocks, is located in the Lanping Basin of southwest China with ore reserves of ~220 Mt grading 6.1% Zn and 1.3% Pb. This deposit has been well investigated in previous studies, and especially, studies of sulfur isotopes and sulfide's micro-textures show that biogenic processes play an important role in the formation of Jinding Zn-Pb deposit[2]. However, important questions remain to be answered regarding whether the microbes-involving process took place at the site of mineralization or in a distal area, as well as the specific role of biological activities during mineralization processes.

We present Zn, Cd and S isotope data for sphalerites from three representative ore blocks in Jinding (Beichang, Jiayashan and Nanchang). δ^{66}Zn values of all samples range from -0.69‰ to +0.51‰ (relative to JMC 3-0749L). The lowest δ^{66}Zn values are observed in the Nanchang ore block, and there is a systematic trend of increasing δ^{66}Zn values from south to north. The δ^{34}S (relative to VCDT) values of the same samples are almost below -10‰, indicating bacterial sulfate reduction, and δ^{34}S values show an inverse correlation with δ^{66}Zn values. In combination with the large Zn isotope fractionation observed in these sphalerites, we conclude that biological processes must have taken place at the site of mineralization to some degree and play an important role during formation of the Jinding Zn-Pb deposit.

[1]Wen, et al. (2016) *Sci. Rep.* **6**, 25273
[2]Xue, et al. (2015) *J. Asian Earth Sci.* **103**, 288-304