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Rb-Sr dating of sphalerite and S isotope of sulfides from Maoping Pb-Zn deposit, Southwest China, and their geological implications

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The Sichuan-Yunnan-Guizhou(SYG) metallogenic belt, located on the southwestern margin of the Yangtze Craton, is one of the most important areas for Pb-Zn resources in China. The sulfur sources and timing of the Pb-Zn deposits have long been debated. This research performed Rb-Sr isotopic dating for sphalerite and S isotope for sulfides from the typical Maoping Pb-Zn deposit, aiming to constrain the mineralization age and the sources of sulfur.

The Maoping Pb-Zn Deposit, hosted within the carbonates of the upper Devonian Zaige formation, lower Carboniferous Baizuo formation and upper Carboniferous Weining formation, and located between NS Xiaojiang fault and NW Yadu-Ziyun fault, is one of the large-scale lead-zinc deposits in the SYG metallogenic belt. The proven Pb-Zn metal resource is greater than 2.4Mt with Pb and Zn average grades of 5.75% and 15.8% respectively. Ore minerals consist mainly of sphalerite, galena, and pyrite. Gangue minerals are dominated by calcite, dolomite and quartz.

The results show that the Rb-Sr isotopic age of Maoping Pb-Zn deposit is 201.9±3.4Ma, with an initial $^{87}Sr/^{86}Sr$ ratio of 0.7106 and MSWD of 1.2. showing that the direct time and genesis relationship between the mineralization of Maoping Pb-Zn deposit and Indosinian Orogeny in late Triassic to early Jurassic. The isotopic age is broadly similar to Huize(222±14Ma), Paoma (200.1±4.0Ma) and Tianqiao(191.9±6.9Ma), so this paper considers these lead-zinc deposits formed simultaneously and the main mineralization in SYG region occurred at about 200Ma. The sulfide mineral samples from the Maoping Pb-Zn deposit yield overall symmetric and narrow δ34S distributions, showing that pyrite, sphalerite and galena have $\delta^{34}S_{V-CDT}$ values of 20.9‰ to 23.2‰ (average 21.6‰), 19.3‰ to 21.0‰ (average 20.2‰) and 14.7‰ to 17.2‰ (average 16.2‰) respectively, by which the total $\delta^{34}S(H_2S)$ of 19.7‰ to 22.0‰ for the ore-forming fluid is calculated. The S isotopic composition suggests that the reduced sulfur associated with Zn-Pb mineralization was most likely produced by thermochemical reduction of sulfates of gypsum in the evaporites of Sinian(δ^{34}S=27.7-28.9‰) and/or Cambrian(δ^{34}S=20.2-37.8‰ average 28.6‰) strata.

Based on the analysis above, the mineralization age of Maoping Pb-Zn deposit is 201.9±3.4 Ma, between late Triassic to early Jurassic. The sources of reduced sulfur associated with Zn-Pb mineralization was most likely came from thermochemical reduction of sulfates of gypsum in the evaporites of Sinian and/or Cambrian strata.