

Re-Os isotope systematics of sulfide from the Huize giant Zn-Pb-(Ag) deposit, Yunnan Province, SW China

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Apart from molybdenite, sulfides like pyrite, chalcopyrite, pyrrhotite, and arsenopyrite have been widely used for Re-Os geochronology. However, Re-Os isotope systematics of sphalerite are rarely involved.

Located in the west of the Yangtze Block, southwest China, the Huize giant carbonate-hosted Zn-Pb-(Ag) deposit is the most representative and studied deposit in the Sichuan-Yunnan-Guizhou (SYG) Pb-Zn metallogenic province, with total metal reserve of Pb and Zn exceeds 7.6 Mt. The deposit is characterized by high Zn+Pb grade of 30~50 wt.% and rich in Ag and dispersed elements. Sphalerites and pyrites are closely associated with each other within the primary sulfide ores.

In this study, 11 sphalerites, 10 coarse-grained pyrites, and 13 fine-grained pyrites in 12 primary sulfide ore samples from different mining elevations between 1261~1548 m in the Huize Zn-Pb deposit were analyzed. All the mineral separates have relative high and variable Re contents within rang of 3.47~588 ng/g. Common Os and radiogenic ^{187}Os contents are between 1.5~65.9 pg/g and 2.5~287 pg/g, yielding $^{187}\text{Re}/^{188}\text{Os}$ ratios of 2168~57402, which are typical low-level highly radiogenic (LLHR) sulfides.

The results show that concentrations of Re can vary severely within every single sample. The pyrites contain relatively higher rhenium than the associated sphalerites, and rhenium is more enriched in the fine-grained pyrites rather than the associated coarse-grained pyrites. For every single sample, the ^{187}Re - ^{187}Os model ages vary for different sulfide separates, but $\delta^{34}\text{S}$ is almost invariable. The scattered Re-Os isotopic data might result from the long-lasting hydrothermal evolvment, and the ^{187}Re and ^{187}Os isotopes might have not reached equilibration even when the isotopic system was enclosed. Moreover, both the microscopic observations and the in-situ LA-ICP-MS results of trace elements indicate that pyrites are multi-staged in the Huize Zn-Pb deposit. Thus, the large variation of the ^{187}Re - ^{187}Os model ages might result from the mixed isotope information recorded by Re-Os systematics in these sulfides.