

The Geochemical Characteristics of the Multi-Stage Hydrothermal Zircons of the Laowan Orogenic Gold Deposit, Middle Qinling-Dabie Orogenic Belt, China

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Laowan gold deposit, located at the middle of the Qinling-Dabie orogenic belt, is a large-scale (> 100t) gold deposit. The main ore-bearing strata are mesoproterozoic's plagioclase amphibolite. To research the characteristics of hydrothermal zircon and accurately constraints on mineralization events, in this study, we mainly used LA-ICP-MS to determine the trace elements and age of hydrothermal zircons in the quartzite vein of the main ore-forming stage. The results show that: (1) the zircon is light brown, translucent self and semi-self-granular, and in the Cathodoluminescence (CL) images, showing glowing darker and no obvious oscillatory zoning. The inclusion of H₂O-CO₂ two-phase fluid inclusions in zircon is consistent with the type of fluid inclusions in gold-bearing quartz veins. In the scanning electron microscope found abundant silver, quartz and a small number of Au in the zircon. These characteristics indicate that the zircon is hydrothermal zircon formed simultaneously with the gold-bearing quartz veins; (2) the trace element analysis by LA-ICP-MS showed that the Th / U ratio and Σ REE were ranged 0.0008- 0.97 and 102.5ppm -881.7ppm, respectively. In the rare earth distribution curve by standardization of chondrite meteorites, light rare earth loss, medium and heavy rare earth enrichment. The trace element characteristics of the hydrothermal zircon have a large difference from most of the hydrothermal zircons obtained by the other researcher. (3) The age of the hydrothermal zircon was ranged 325Ma ~ 417Ma by LA-ICP-MS. The peak concentration was 366Ma and 410Ma, and (4) Hydrothermal zircon of gold-bearing quartz vein recognizes the secondary mineralization of the Laowan gold deposit. Zhang Guan et al. obtained the Ar-Ar age of about 138 Ma from muscovite of the gold-bearing quartz vein, it representing the latest stage of mineralization events. Through comprehensive analysis, we hold that the Laowan gold deposit experienced at least three times of mineralization from the subduction of the ancient ocean to the Qinling Plateau to after the collision of the Yangtze Plate and the North China Plate.