

Scheelite and Zircon U-Pb Dating Reveals Two Discrete Gold Mineralization Events at the Zaozigou Deposit, West Qinling Orogen, China

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The Qinling Orogen hosts numerous gold deposits that were formed mostly in the period of 220 to 200 Ma, coincident with late collisional orogeny involving the South China and North China cratons. The Xiahe-Hezuo district in West Qinling is characterized by several world-class sediment-hosted gold deposits spatially related to intrusions. A few Cu-Au skarn deposits also developed in the district coevally with the sediment-hosted gold deposits. Available data revealed that districtwide gold mineralization spanned from ca. 246 to 211 Ma, but whether individual gold deposits formed from single or multiple mineralization events is unclear and lacks detailed geochronological studies. Here we present new dating results to show the Zaozigou deposit of the Xiahe-Hezuo district is a product of two separate gold deposition events.

The Zaozigou deposit (~110 t Au) is hosted in both Triassic clastic rocks and intermediate to felsic dikes, the latter emplaced from 250 to 230 Ma. The orebodies are controlled by well-developed faults. Several mineralization styles have been recognized, including gold-bearing arsenopyrite-pyrite disseminations in altered wall rocks, quartz-pyrrhotite-chalcopyrite veinlets, and quartz-stibnite-gold veins in sequence.

Two quartz diorite dikes, one containing dense arsenopyrite-pyrite disseminations and the other hosting inclusions of quartz-pyrrhotite-chalcopyrite veins, yield zircon U-Pb dates of 231.8 ± 1.0 and 232.28 ± 0.99 Ma, constraining the disseminated and veinlet mineralization at ~232 Ma. Scheelite grains from the quartz-stibnite veins have core-rim textures, with the core and rim showing contrasting colors in CL images and distinct compositions, with the rims containing REE contents and U/Pb ratios one order of magnitude higher than cores. The core and rim give rise to ICP-MS U-Pb ages of 230.1 ± 2.9 and 209.9 ± 2.7 Ma, respectively. The new zircon and scheelite U-Pb ages thus indicate two discrete mineralization events at ca. 232 and 210 Ma in the Zaozigou gold deposit.