

## **High-resolution SIMS U-Th-Pb geochronology of small-size (<5 $\mu\text{m}$ ) monazite: Constraints on the timing of Qiuling sediment-hosted gold deposit, South Qinling Orogen, central China**

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### **ABSTRACT**

Accurately determining the timing of hydrothermal mineralization for sediment-hosted disseminated gold (SHDG) deposits is difficult because of a lack of both suitable chronometers and in situ techniques with the required spatial resolution and precision. The lack of precise age determinations on gold deposits has hindered understanding of their genesis and relation to the geodynamic setting. The Qiuling-Jinlongshan deposit is a typical SHDG deposit located in the eastern South Qinling Orogen (SQO), with 109 t Au at an average grade of 6.17 g/t. Devonian and Carboniferous metasedimentary rocks host structurally controlled gold mineralization, which is associated with silica-carbonate alteration. Pyrite, arsenopyrite, and arsenian pyrite are major gold carriers, and gold also occurs as native gold grains and invisible gold in the sulfides. In this study, the well-defined hydrothermal overgrowth rims (~2  $\mu\text{m}$ ) of single monazite grains, associated with disseminated auriferous arsenian pyrite and arsenopyrite in low-grade metasedimentary rocks, yield U-Pb ages of  $239 \pm 13$  Ma ( $2\sigma$ ) by high spatial resolution secondary ion mass spectrometry (SIMS). The hydrothermal monazites are cogenetic to the primary gold mineralization where they are closely associated with gold-bearing sulfides. This new age implies that the early to middle Triassic mineralization event in the eastern SQO was related to the Triassic tectonic transition from compression to transpression in the Qinling Orogen after the closure of the Mianlue Ocean. This study highlights the 2- $\mu\text{m}$  high spatial resolution SIMS monazite U-Th-Pb dating method as a powerful tool for determining the timing of SHDG deposits worldwide. It is crucial to examine monazite textures and their link to hydrothermal alteration before carrying out the isotopic dating of monazite.

**Keywords:** Monazite overgrowth U-Th-Pb dating, SIMS, sediment-hosted gold deposits