

He and Ar isotopic constraints on the origin of ore-forming fluids of Wuziqilong Cu deposit, Fujian province, China

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Hellium and argon isotopes are useful for distinguishing crustal and mantle-derived fluids because the vast difference in isotopic ratios (a factor of 1000). The Wuziqilong Cu deposit in the Zijinshan ore field, Fujian province, southeastern China, is a transitional-type hydrothermal deposit with characteristics that are present in both typical epithermal and porphyry deposits in the region. The different types of deposits in the region are spatially, temporally and genetically related to the early-Cretaceous granodiorite and volcanic rocks. The associated felsic rocks are believed to have formed by mixing of mantle-derived magma with crustal materials. However, the role of crust and mantle materials during the Cu mineralization have not yet been established.

He and Ar isotopic compositions of the volatiles released from pyrite separates of the Wuziqilong Cu deposit reveal a mixture of mantle-derived fluid with meteoric water. The mantle-derived fluid may have exsolved from a felsic magma, which is believed to have formed by mixing of mantle-derived magma with crustal materials. However, the He and Ar isotopes show that the parental magmas may have derived from direct partial melting of mantle.