

新疆望峰金矿成矿流体的He、Ar同位素示踪

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作者	单位	E-mail
杨猛	大陆动力学国家重点实验室;西北大学地质学系	ym120585@163.com
王居里	大陆动力学国家重点实验室;西北大学地质学系	jlwang@nwu.edu.cn
王建其	大陆动力学国家重点实验室;西北大学地质学系	
党飞鹏	大陆动力学国家重点实验室;西北大学地质学系	

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中文摘要: 本文采用稀有气体同位素质谱方法,通过分析望峰金矿石中载金黄铁矿流体包裹体He、Ar同位素组成,对成矿流体进行示踪研究。结果显示,黄铁矿流体包裹体 $3\text{He}/4\text{He}$ 比值为 $0.00473\sim 0.01079\text{ Ra}$, $40\text{Ar}/36\text{Ar}$ 比值为 $301\sim 413$,具地壳放射性成因氦同位素组成和大气降水成因氦同位素组成,总体显示由大气降水改造而成的地壳流体特征。望峰金矿成矿流体中He同位素组成异常,是成矿前大气降水与高U、Th含量古老容矿围岩作用遭受放射性成因 4He 稀释、成矿时发生流体减压沸腾综合作用的结果,Ar同位素组成异常是成矿前大气降水下渗获取容矿围岩放射性成因 40Ar 的结果,成矿流体是大气降水深循环的产物。

中文关键词: [He,Ar同位素](#) [地壳流体](#) [大气降水深循环](#) [望峰金矿](#)

Helium and Argon Isotopic Tracing of Ore-forming Fluid from the Wangfeng Gold Deposit in Xinjiang

Abstract: The Wangfeng gold deposit is located in the Bingdaban ductile shear zone along the northern margin of Mid-Tianshan. Helium and Argon isotopic compositions of fluid inclusions in pyrite were analyzed to trace the source of ore-forming fluid by using an inert gas isotopic mass spectrometer after analyzing variables that may affect He-Ar original isotopic compositions of the ore-forming fluid. The analytical results indicate that $3\text{He}/4\text{He}$ ratio and $40\text{Ar}/36\text{Ar}$ ratio vary respectively from 0.00473 Ra to 0.01079 Ra and from 301 to 413, helium and argon isotopic compositions synthetically exhibit the crust-derivation of the ore-forming fluid, which was the product of the deep circulation of atmospheric water. Meanwhile, in contrast to typical crust-derived fluid, Wangfeng ore-forming fluid has higher 4He and 40Ar , resulting in lower $3\text{He}/4\text{He}$ and higher $40\text{Ar}/36\text{Ar}$ than typical He-Ar isotopic compositions of crust-derived fluid. An analysis of main country rocks and ore-forming fluid inclusions reveals that ore-hosting country rocks with high U, Th concentrations produced much more radiogenic 4He which reduced $3\text{He}/4\text{He}$ ratio in comparison with normal radiogenic He isotopic composition, that atmospheric water with atmosphere-derived He-Ar isotopic compositions subsided through brittle crannies and captured radiogenic He existing in country rocks, and that some radiogenic 40Ar was obtained synchronously, which reduced $3\text{He}/4\text{He}$ ratio preliminarily and raised $40\text{Ar}/36\text{Ar}$ ratio at the pre-mineralization stage. Then, ore-forming fluid boiled due to hydrothermal decompression at the ore-forming stage, which brought $3\text{He}/4\text{He}$ ratio down. In summary, the ore-forming fluid of the Wangfeng gold deposit was crust-derived and reformed during the process of fluid evolution.


keywords: [He-Ar isotopes](#) [crust-derived fluid](#) [deep circulation of atmospheric water](#) [Wangfeng gold deposit in Xinjiang](#)

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地址: 北京市西城区百万庄大街26号, 中国地质科学院东楼317室 邮编: 100037 电话: 010-68327396 E-mail: dqixub@126.com

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