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东天山白石泉镁铁-超镁铁杂岩体的Nd-Sr-Os同位素成分及其对岩浆演化的意义

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摘要:

本文报道东天山有铜镍硫化物矿化的白石泉镁铁-超镁铁杂岩体(分布在中天山地块北部)的微量元素和Nd-Sr-Os同位素成分,以探讨其地幔源区性质和壳幔相互作用过程。白石泉杂岩体的地球化学特征是富集大离子亲石元素和轻稀土元素,但亏损高场强元素。全岩Sr和Nd同位素初始比值变化较大,分别是 $(^{87}\text{Sr}/^{86}\text{Sr})_i=0.7032\sim 0.7066$ 和 $\epsilon_{\text{Nd}}(t)=5.6\sim -0.9$,两者呈反相关关系。全岩Os含量在 $80\times 10^{-12}\sim 29\times 10^{-12}$ 之间,富含放射性成因Os($^{187}\text{Os}/^{188}\text{Os}=0.295\sim 1.18$)。据此,得出结论:(1)白石泉杂岩体的母岩浆在上升侵位过程中,受到地壳物质的强烈混染,导致各岩石类型的Nd-Sr同位素成分变化很大和Os同位素成分富集放射性成因Os的特征,这与前人认为的白石泉岩体侵位过程中没有地壳混染作用的模式明显不同;(2)白石泉杂岩体的母岩浆来自被古生代俯冲带熔/流体交代过的年轻岩石圈地幔,这要求我们重新认识中天山前寒武地块的性质和规模。

英文摘要:

We report trace elements and Nd-Sr-Os isotopic data for the Baishiquan mafic-ultramafic complex that occurs in the East Tianshan Mountains (in the northern part of the Mid-Tianshan Precambrian block) and is accompanied by Cu-Ni deposits, to understand its mantle source characteristics and processes of mantle-crustal interaction. Geochemically, the complex is characterized by enrichment of LILEs and depletion of HFSEs. The whole-rock Sr-Nd isotopic compositions of the Baishiquan complex vary significantly, with $(^{87}\text{Sr}/^{86}\text{Sr})_i=0.7032\sim 0.7066$ and $\epsilon_{\text{Nd}}(t)=5.6\sim -0.9$, and the Nd-Sr isotopic ratios are negatively correlated. The complex shows very radiogenic Os isotopic compositions, with $(^{187}\text{Os}/^{188}\text{Os})_i=0.295\sim 1.18$ and $\text{Os}=80\times 10^{-12}\sim 29\times 10^{-12}$. Based on these data, we conclude that (1) the parent magma of the Baishiquan complex experienced significant crustal contamination during magma emplacement, as is revealed by the negatively correlated and significantly varied Nd and Sr isotopic compositions and the highly radiogenic Os isotopic compositions. This is different from a popular model that the Baishiquan complex received no crustal contamination during magma ascent; (2) the parent magma of the Baishiquan complex originated from a juvenile lithospheric mantle that was previously metasomatized by subduction zone fluids/melts in the Paleozoic. This requires reconsideration of the nature and distribution of the Mid-Tianshan Precambrian block.

关键词: [Nd-Sr-Os同位素](#) [镁铁-超镁铁质岩](#) [地壳混染](#) [东天山](#)

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