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北祁连西段小柳沟矿区花岗质岩石锆石U-Pb年代学、地球化学及成因研究

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摘要:

甘肃小柳沟钨钼(铜)矿是一个与花岗岩类有关的斑岩-矽卡岩-石英脉型矿床,小柳沟矿区内花岗质岩石类型主要为二长花岗岩和花岗闪长岩。本文对该岩体进行年代学、地球化学研究以约束其形成时代和岩石成因。LA-ICP-MS锆石U-Pb测年分别获得二长花岗岩与花岗闪长岩谐和年龄为 454.0 ± 2.0 Ma和 417.7 ± 1.7 Ma,属于加里东期岩浆活动的产物,并经历了海西期和燕山期岩浆热事件的改造。地球化学数据显示,小柳沟花岗质岩石具有高硅、富碱的特征,属于过铝质高钾钙碱性系列,富集Rb、Th、U、K、Pb,亏损Ba、Sr、Ti、P,具有明显Eu负异常,尤其是二长花岗岩显示强烈的负异常(δEu 为0.08~0.19),属于高分异I型花岗岩。锆石Hf同位素分析结果显示,二长花岗岩 $\epsilon_{\text{Hf}}(t)$ 为-4.45~4.04, $t_{\text{DM2}}=1176\sim 1714$ Ma,花岗闪长岩 $\epsilon_{\text{Hf}}(t)$ 为-4.18~4.43, $t_{\text{DM2}}=1124\sim 1670$ Ma,二者可能是由壳幔混合作用形成,其壳源区很可能来源于古元古代-中元古代古老地壳岩石,花岗闪长岩的源区相对较深,北大河岩群与朱龙关群可能是小柳沟钨矿的初始矿源层。综合研究表明,小柳沟钨钼矿床与二长花岗岩在时间、空间及成因上有密切关系。结合区域构造演化,认为小柳沟二长花岗岩应形成于俯冲背景下的活动大陆边缘环境,花岗闪长岩形成于碰撞造山环境。

英文摘要:

The Xiaoliugou W-Mo deposit in Gansu is a porphyry-skarn-quartz type deposit related to granitoids. Xiaoliugou granitoids are comprised of monzogranite and granodiorite. In this paper, zircon U-Pb dating and geochemistry of the Xiaoliugou granite are studied to constrain its geochronology and petrogenesis. Zircon LA-ICP-MS dating yields concordant ages of 454.0 ± 2.0 and 417.7 ± 1.7 Ma respectively indicating that the two plutons were formed at Caledonian, later affected by Hercynian and Yanshanian magmatic-thermal event. Geochemical data shows that, Xiaoliugou granite is silica enriched in composition with high content of alkali. It's a peraluminous granite and belongs to the high-K calc-alkaline series, enriched in Rb, Th, U, K, Pb, depleted in Ba, Sr, Ti, P with strong negative abnormal of Eu, especially, the monzogranite has intensely negative Eu abnormality ($\delta\text{Eu}=0.08\sim 0.19$) and should be ascribed to highly fractionated I-type granite. The Hf isotope shows that the $\epsilon_{\text{Hf}}(t)$ value of the monzogranite range from -4.45 to 4.04, with t_{DM2} ages between 1176 Ma and 1714 Ma, while the $\epsilon_{\text{Hf}}(t)$ value of the granodiorite range from -4.18 to 4.43, with t_{DM2} ages between 1124 Ma and 1670 Ma, indicating that the Xiaoliugou granitoids were most likely generated by mixing of a depleted mantle-derived and an induced crustal-melted felsic magma in the deep crust. We suggested that the source region of granite were likely from the Paleoproterozoic-Mesoproterozoic ancient crustal rocks and the granodiorite is relatively deeper than monzogranite, the ore-forming metals such as tungsten in the deposit may have likely derived from the Beidahe Group and the Zhulongguan Group. Comprehensive studies indicate that Xiaoliugou W-Mo deposit has a closely temporal relationship with the monzogranite. Combine with the tectonic evolution of the North Qilian, we speculate the monzogranite was generated in a continental arc tectonic setting triggered by slab subduction, the granodiorite probably have been generated in syn-collision setting.

关键词: [锆石U-Pb年龄](#) [地球化学](#) [岩石成因](#) [小柳沟岩体](#) [北祁连](#)

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