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云南保山核桃坪铅锌矿成矿年龄及动力学背景分析

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摘要:

保山地块成矿作用主要形成了铁铜铅锌银汞锡稀有金属的热液矿床, 核桃坪铅锌矿为保山地块中一个重要的典型矿床, 矿床赋存在寒武系碳酸盐岩地层中, 矿化类型包括矽卡岩型富铜矿体、矽卡岩型磁铁矿体和矽卡岩型-热液脉型铜铅锌多金属矿体, 估计铅锌储量大于100万吨、潜在铜资源量大于100万吨。矿区有矽卡岩及大量辉绿岩脉出露, 外围有多期花岗岩岩体、岩株产出。经人工分选出核桃坪铅锌矿矿石中的闪锌矿、黄铜矿、黄铁矿及与矿石矿物密切共生的纯净石英共10件单矿物样品, 采用Rb-Sr同位素定年分析, 获得等时线年龄 116.1 ± 3.9 Ma、矿石硫化物铪同位素组成初值0.71185。同时, 我们对保山地块内部出露的志本山花岗岩体和柯街岩体进行了锆石U-Pb年龄及Hf同位素组成分析。志本山花岗岩、柯街花岗岩均为高钾过铝质花岗岩, 锆石U-Pb年龄分析获得成岩年龄分别为 126.7 ± 1.6 Ma和 93 ± 13 Ma。同位素年龄测定的结果揭示成矿作用与地块内燕山晚期岩浆活动时期一致, 并与中特提斯班公湖-怒江洋的闭合时代大致相当。志本山、柯街花岗岩锆石的 $\epsilon_{\text{Hf}}(i)$ 值变化范围分别为-3~-8和-0.7~-4, 亏损地幔模式年龄值分别在1.5 Ga和1.3 Ga左右, 指示岩浆来源于中元古代地壳物质的深熔作用, 与俯冲作用无关。花岗岩的地球化学组成表明其与变质杂砂岩熔出的熔体相当, 分析认为岩浆源区为中、下地壳变质杂砂岩, 岩浆活动形成于碰撞造山带后造山的拉张构造背景, 地壳缩短加厚基础上的剪切拉张导致地壳发生深熔作用。地壳深熔成因的过铝质花岗岩、岩石圈伸展有关的辉绿岩、矽卡岩型-岩浆热液型矿床构成了保山地块早白垩世成矿作用中相关联的地质体组合、是中特提斯怒江洋闭合过程中碰撞造山作用的响应, 核桃坪铅锌矿为三江特提斯复合造山成矿系统中一种重要的成矿作用类型。

英文摘要:

Baoshan block hosts a range of Fe, Cu, Pb, Zn, Ag, Hg, Sn deposits. The Hetaoping Pb-Zn-Cu deposit is a typical one hosted in Paleozoic carbonites. The mineralization types include Cu-rich skarn copper, skarn magnetite, hydrothermal Pb-Zn deposit. The deposit has at least 1×10^6 t of Zn and Pb metal as well as potential 1×10^6 t of Cu metal evaluated by exploration department. Skarns and gabbroic dykes are common in this district, but silicic intrusions and stocks occur outside the mine. 10 sulfide mineral separates including sphalerite, chalcopyrite, pyrite, and paragenetic related quartz were separated by hand picking. Rb-Sr analyzes yield isochron age of 116.1 ± 3.9 Ma and an initial $^{87}\text{Sr}/^{86}\text{Sr}$ of 0.71185. In addition, we have analyzed zircon U-Pb and Hf isotope for Zhibenshan and Kejie granite in Baoshan block by LA-ICPMS. The analyzes yield ages of 126.7 ± 1.6 Ma and 93 ± 13 Ma, respectively. It suggests a temporal relationship of the mineralization to the local silicic magmatism in Late-Yanshanian and contemporaneous with closure of the Bangong-Lujiang Paleo-ocean. Zhibenshan and Kejie granites are high-K and peraluminous. Hf isotope analyzes reveals the zircons of the Zhibenshan granite have $\epsilon_{\text{Hf}}(i)$ between -3 and -8, $t_{\text{DM2}}(\text{Hf})$ values between 1.4 and 1.6 Ga, while the Kejie granite zircons have $\epsilon_{\text{Hf}}(i)$ between -0.7 and -4, and $t_{\text{DM2}}(\text{Hf})$ values between 1.2 and 1.4 Ga. It suggests that the granites are related to the crustal anatexis of the Proterozoic basement, instead of melting of juvenile subduction material in Late-Yanshanian. Together with the composition of the granites which are most likely to be the derived melts of metagreywackes, it can be concluded that the silicic magmatism is related to melting of metagreywacke which induced by lithospheric stretching in thickened continental orogenic belt. Peraluminous granites related with crustal anatexis, gabbro dykes related with lithospheric stretching and skarn-magmatic hydrothermal deposits constitute a geological association in the Early-Cretaceous mineralization in Baoshan block. It is responsible to the closure of the Meso-Tethys "Lujiang" ocean. The Hetaoping Pb-Zn deposit is an important mineralization type in the complex Sanjiang orogenic setting.

关键词: [保山地块](#) [核桃坪铅锌矿](#) [燕山晚期花岗岩](#) [锆石U-Pb年龄](#) [Hf同位素](#)

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