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保山地块漕涧花岗伟晶岩地球化学、锆石U-Pb年代学及其地质意义

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摘要:

本文对出露于保山地块北部漕涧地区的花岗伟晶岩脉进行了全岩元素地球化学、锆石U-Pb年代学和Hf同位素组成研究,旨在揭示与紧邻的漕涧花岗岩体间的成因关系及其形成环境。伟晶岩样品表现出高硅($\text{SiO}_2=73.02\%\sim 75.35\%$)、富碱($\text{K}_2\text{O}+\text{Na}_2\text{O}=9.10\%\sim 10.79\%$)、过铝质($\text{A/CNK}=1.05\sim 1.13$)特征,在 $\text{SiO}_2\text{-K}_2\text{O}$ 岩石判别图解上属钾玄岩系列;微量元素原始地幔标准化配分曲线上,花岗伟晶岩显示清晰的Rb、U、Ta和Pb正异常,Ba、Sr、Ti、Th和Nb负异常;稀土元素含量很低,总量 $3.99\times 10^{-6}\sim 17.29\times 10^{-6}$,稀土元素球粒陨石标准化配分曲线表现为轻稀土富集型,具有明显的正Eu异常($\delta\text{Eu}=2.92\sim 14.7$)。锆石形态学与原位稀土元素组成显示:锆石颗粒粗大(颗粒长约 $150\sim 400\mu\text{m}$),阴极发光强度较弱,内部为海绵状结构,边部发育韵律环带;锆石Th/U比值低,主要介于 $0.004\sim 0.009$,重稀土元素富集。通过图解 $(\text{Sm}/\text{La})_{\text{N}}\text{-La}$ 和 $\text{Ce}/\text{Ce}^*(\text{Sm}/\text{La})_{\text{N}}$,判断锆石具有岩浆锆石与热液锆石过渡的特征。2件样品单颗粒锆石U-Pb年龄变化于 $85\sim 54\text{Ma}$,测点位于锆石边部韵律环带发育的微区所得出的谐和年龄分别为 $73.44\pm 1.0\text{Ma}$ ($\text{MSWD}=1.03$)和 $67.12\pm 1.60\text{Ma}$ ($\text{MSWD}=4.2$);其余测点的谐和年龄为 $61\sim 57\text{Ma}$ 。花岗伟晶岩脉中锆石 $\epsilon_{\text{Hf}}(t)$ 值分布范围为 $-10.1\sim -4.7$ (集中于 $-6.7\sim -5.7$),分布较为集中,对应的Hf同位素地壳模式年龄 t_{DM}^{C} 为 $1260\sim 1565\text{Ma}$ (集中于 $1310\sim 1360\text{Ma}$)。这些地化特征综合表明漕涧花岗伟晶岩脉与花岗岩体有着亲缘关系,共系保山地块先存加厚地壳元古代基底物质的减压熔融的产物,其形成于新特提斯洋俯冲末期至随后发生的印度欧亚大陆碰撞初期的构造背景下。

英文摘要:

To explore the genetic relationship between granitic pegmatites and granites from Caojian area in the northern Baoshan block, and the tectonic setting, this paper presents the bulk geochemistry, zircon U-Pb dating and Hf isotopic composition of the granitic pegmatites. These samples are characterized by high silica ($\text{SiO}_2=73.02\%\sim 75.35\%$), alkali-rich ($\text{K}_2\text{O}+\text{Na}_2\text{O}=9.10\%\sim 10.79\%$), peraluminous ($\text{A/CNK}=1.05\sim 1.13$) and shoshonitic. Granitic pegmatites are distinctively enriched in Rb, U, Ta and Pb, but depleted in Ba, Sr, Ti, Th and Nb. They have lower rare-elements contents ($\sum\text{REE}=3.99\times 10^{-6}\sim 17.29\times 10^{-6}$), and show light REE enriched characters in the chondrite-normalized REE patterns, with obvious positive Eu anomalies ($\delta\text{Eu}=2.92\sim 14.7$). Zircon morphology and in situ trace element composition suggest that: Zircon grains varied in size from 150 to 400 μm , dark brown and opaque; CL images display oscillatory zoning rim and spongy texture in the center of zircons, with weak cathodoluminescence (CL); lower Th/U ratios in the range of 0.004 to 0.009 and enriched in heavy rare-elements. All $^{206}\text{Pb}/^{238}\text{U}$ ages varied from 84 Ma to 54Ma, and those spots from the rims with clear oscillatory zoning, yield concordant age of $73.44\pm 1.0\text{Ma}$ ($\text{MSWD}=1.03$) and $67.12\pm 1.60\text{Ma}$ ($\text{MSWD}=4.2$) respectively. Other spots yielding concordant ages of 61Ma to 57Ma. Their zircons have concentrated negative $\epsilon_{\text{Hf}}(t)$ values ($-6.7\sim -5.7$) and Hf isotopic crust model ages ($t_{\text{DM}}^{\text{C}}=1260\sim 1565\text{Ma}$). These geochemical characteristics of granitic pegmatites suggest that, pegmatites and granites from Caojian area have genetic relationship, they produced by the remelting of the Proterozoic basement materials within the Baoshan block via the regional extension of the previously thickened continental crust, and formed in the late subduction stage of Neo-Tethys ocean to subsequent earlier stage of the collision between the India-Asia continent.

关键词: 花岗伟晶岩 地球化学 锆石微量元素 锆石U-Pb年代学 锆石Hf同位素 保山地块

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