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西藏青草山斑岩铜金矿含矿斑岩锆石U-Pb年代学、微量元素地球化学及地质意义

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摘要：

西藏青草山斑岩铜金矿是班公湖-怒江缝合带北侧、羌塘地块南缘新发现的具有超大型远景的斑岩型铜金矿床。本文首次对青草山含矿花岗岩闪长斑岩的锆石进行了 LA-ICPMS U-Pb年代学和微量元素地球化学研究,通过对含矿斑岩中锆石的13个点的U-Pb定年,得出锆石$^{206}Pb/^{238}U$加权平均年龄为114.60±1.20Ma (MSWD=1.07),此年龄与同样分布于该带上的多不杂斑岩铜矿含矿斑岩成岩年龄、波龙斑岩铜矿成矿年龄基本一致。应用锆石Ti温度计,计算出含矿斑岩中绝大部分锆石的结晶温度小于700℃,如此低的结晶温度指示含矿斑岩岩浆来源于水近饱和条件下发生的部分熔融。通过对锆石微量元素的详细研究,得出青草山含矿斑岩形成于活动大陆边缘的陆缘弧环境,这与前人研究得出的多不杂斑岩铜矿的形成构造背景一致。相近的成岩成矿年龄和一致的形成构造背景揭示以多不杂、青草山、波龙斑岩铜(金)矿床为主要组成的班公湖-怒江斑岩铜矿带的客观存在。依据青草山斑岩铜金矿和多不杂斑岩铜矿的含矿斑岩和同期火山岩的地球化学特征,并结合已有弧环境斑岩铜矿的经典成矿模型,本文提出班公湖-怒江斑岩铜矿带形成的动力学机制,即在早白垩世,班公湖-怒江洋壳向北俯冲,大洋板片向下俯冲到一定深度时,发生大规模脱水作用,释放的流体交代上覆地幔楔,诱发其部分熔融,产生的富含成矿物质的岩浆向上运移,在浅部地壳发育成与成矿相关的岩浆房,部分岩浆上升直接喷出地表,形成下白垩统美日切错组火山岩,部分浅成-超浅成侵位成斑岩体及斑岩型矿床,随着岩浆的多点多期次侵位,最终形成班公湖-怒江斑岩铜矿带。

英文摘要：

The Qingcaoshan porphyry Cu-Au deposit, located in the southern Qiangtang Terrane, southern to northern Bangongco belt, is a newly discovered porphyry Cu-Au deposit, having tremendous potential. Zircon U-Pb geochronology and trace element geochemistry of the ore-bearing granodiorite porphyry in the Qingcaoshan is studied first time in this article. Based on the LA-ICPMS U-Pb geochronological investigation of 13 zircon grains in ore-bearing porphyry, the weighted average of $^{206}Pb/^{208}U$ age of 114.60±1.20Ma (MSWD=0.33) was attained. The age is consistent with the age of ore-bearing porphyry in the Duobuza porphyry Cu deposit and the metallogenic age of the Bolong porphyry Cu deposit, which also located in this belt. Using zircon Ti thermometer, the forming temperature of zircons was calculated and most of them less than 700℃. Such a low crystallization temperature indicates that porphyry magma derived from rocks that experienced melting under near-water saturated conditions. The trace element geochemical investigation of zircons show that the Qingcaoshan porphyry Cu-Au deposit formed in continental arc, and that is consistent with the forming setting of the Duobuza porphyry Cu deposit from the predecessors' study. Similar diagenetic or metallogenic age and the same tectonic setting indicate that Bangongco porphyry copper belt exist objectively, which is mainly composed of the Qingcaoshan porphyry Cu-Au deposit, the Duobuza porphyry Cu deposit and the Bolong porphyry Cu deposit. Based on the geochemical characteristics of contemporaneous volcanic rocks in the Qingcaoshan and the Duobuza deposit and combined with the classical metallogenic model of porphyry copper deposits in arc settings, we proposed the geodynamic mechanism of Bangongco porphyry copper belt. In the early cretaceous, Bangongco oceanic crust is subducting northward. When subducted down to a proper depth, mass dehydration effect occurred in oceanic plate and it caused partial melting of mantle wedge. The magma enriched in Cu and other components, which produced by the partial melting migrate upward and develop into a magma chamber related to mineralization in shallow crust. Some of them erupt and form Meiriqiecuo Formation volcanic rocks. Particular part of them emplace in hypabyssal-ultra shallow crust and form porphyritic plutons or porphyry deposits. With the magma emplaced in the different time and place, finally Bangongco porphyry copper belt is formed.

关键词：LA-ICPMS U-Pb定年 锆石微量元素 锆石Ti温度计 青草山 班公湖-怒江斑岩铜矿带

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