

广西大黎铜钼矿石英二长(斑)岩年代学、地球化学特征及其地质意义

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中文摘要: 大黎石英二长(斑)岩岩体出露于广西壮族自治区大瑶山地区藤县大黎镇南部一带, LA-ICP-MS测得石英二长岩和石英二长斑岩的U-Pb年龄分别为 (102.8 ± 0.9) Ma和 (101.7 ± 1.2) Ma。岩体SiO₂含量为60.09%~62.91%, Na₂O和CaO的含量分别为2.90%~3.08%, 3.32%~4.35%, A/CNK=0.83~0.93, 均小于1.0, 100Fe³⁺/(Fe³⁺+Fe²⁺)的值为37.76~42.93, 里特曼指数σ变化范围为2.94~3.07, 属于钙碱性、准铝质花岗岩系列。稀土元素总体显示轻稀土元素富集, 轻、重稀土元素分馏明显, 总体呈具有弱Eu异常右倾的稀土配分模式。微量元素总体显示相对富集Rb、Th、U、K、La、Ce、Pb等大离子亲石元素, 亏损Nb、Ta、P、Ti等高场强元素。综合分析表明, 大黎石英二长(斑)岩为壳幔混合源型花岗岩; 结合区域构造演化历史, 认为大黎石英二长(斑)岩是燕山晚期早白垩世晚期后碰撞阶段张性构造环境的产物, 与印度板块在该时期北移所引起的古太平洋板块高角度俯冲所导致的弧后拉张有关。通过论述区域构造演化, 探讨该岩体的基本属性、成因、形成环境, 分析了有利成矿条件: ①I型石英二长(斑)岩为有利的成矿母岩; ②矿区具有相对较高的Cu、Mo、Pb、Sn成矿元素背景值; ③研究区的深大断裂和井字形断裂系统是控矿的有利地质构造。推测本矿区斑岩型铜钼矿的成矿年龄与成岩年龄基本一致, 为100 Ma左右的早白垩世晚期。

中文关键词: 石英二长(斑)岩 大黎铜钼矿 大瑶山 LA-ICP-MS 锆石U-Pb年龄

Chronology and Geochemical Characteristics of Quartz Monzonite (Porphyry) in the Dali Copper-Molybdenum Deposit and Its Geological Significance


Abstract: Dali quartz monzonite (porphyry) body lies at southern Dali Town of Tengxian County in Guangxi. LA-ICP-MS U-Pb isotopic dating of zircons separated from the quartz monzonite and the quartz monzonite porphyry yields average ²⁰⁶Pb/²³⁸U ages of (102.8 ± 0.9) Ma and (101.7 ± 1.2) Ma, respectively. The results of geochemical study indicate that SiO₂ values are in the range of 60.09%-62.91%, Na₂O and CaO are in the range of 2.90%-3.08% and 3.32%-4.35%, A/CNK=0.83-0.93, being all lower than 1.0. 100Fe³⁺/(Fe³⁺+Fe²⁺) ratios are in the range of 37.76-42.93, and the Rittmann index of quartz monzonite (porphyry) varies from 2.94 to 3.07, suggesting a calc-alkaline and metaluminous nature. Geochemical characteristics of rare earth elements are Σ REE=(254.74?301.06) × 10⁻⁶, Σ LREE=(234.35?279.38) × 10⁻⁶, Σ HREE=(20.39?21.68) × 10⁻⁶, LREE/HREE=11.49?12.89, (La/Yb)_N=11.51?16.28, δ Eu=0.61-0.90, and δ Ce=0.99?1.08. The rock has moderate REE concentration, showing a pattern of relative enrichment of LREE. The chondrite-normalized REE patterns demonstrate right-oblique linear REE patterns with weak negative Eu anomaly and significant fractionation between LREE and HREE. On the whole, trace elements show relative enrichment of large ion lithophile elements Rb, Th, U, K, La, Ce, Pb and depletion of high field strength elements Nb, Ta, Sr, P, Ti. It is also shown that the I-type quartz monzonite (porphyry) was derived from the crust-mantle mixed source. Combined with regional tectonic evolution, the authors hold that Dali quartz monzonite (porphyry) was the product of a tensile tectonic environment at the late Yanshanian post-collisional stage of the late Early Cretaceous period. The rock was formed due to back-arc extension related to high angle subduction of the paleo-Pacific plate caused by northward movement of the Indian plate. Through discussing the regional tectonic evolution and exploring the basic properties, causes and tectonic environment of the rocks, the authors analyzed the favorable conditions of mineralization and inferred the porphyry copper-molybdenum mineralization age. The main favorable ore-forming conditions lie in the following three aspects: ①I-type quartz monzonite (porphyry) is a good parent rock for mineralization; ②The ore district has relatively high background values of Cu, Mo, Pb, Sn ore-forming elements; ③Deep fault and #-shaped fault system of the study area constitute a favorable ore-controlling tectonic background. A comprehensive analysis shows that the ore-forming age of the Dali copper-molybdenum deposit should be late Early Cretaceous, consistent with the diagenetic age of about 100 Ma.

keywords: quartz monzonite (porphyry) Dali copper-molybdenum deposit Dayaoshan LA-ICP-MS U-Pb dating

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