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福建紫金山矿田二庙沟铜(金)矿区英安玢岩的成因及其成矿意义

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摘要：

二庙沟铜金矿床位于福建省西南部的紫金山矿田内，与紫金山铜金矿床发育有相似的矿化蚀变类型，二者矿化均围绕着中酸性次火山岩分布，与英安玢岩以及隐爆角砾岩关系密切，这表明二者在矿床成因上存在亲缘性。二庙沟与紫金山铜金矿床同属高硫型浅成低温热液矿床，明显不同于罗卜岭斑岩铜钼矿床以及悦洋低硫型热液银矿床。二庙沟铜金矿床矿化与英安玢岩关系密切。本文运用激光剥蚀电感耦合等离子质谱仪（LA-ICP-MS）对二庙沟英安玢岩中锆石进行了U-Pb年龄测定，获得了108.3±1.5Ma （n=7，MSWD=1.3）和105.7±1.5Ma （n=17，MSWD=1.8）的形成年龄。该年龄与此前已报道的紫金山铜金矿床内发育的英安玢岩的年龄相一致，进一步表明两者为同一期岩浆活动的产物，而且紫金山矿田内与矿化有关的大规模火山活动的时间为早白垩世。二庙沟英安玢岩具有高硅，富钾的特点，属弱过铝质岩系。该岩石还具有LILEs、LREE相对富集，Nb、Ta、P、Ti等高场强元素相对亏损，无铕异常，明显的轻重稀土分异以及高Sr/Y、La/Yb的特点。岩石的锶同位素初始比值I_{Sr}为0.712698~0.713174，$\varepsilon_{Nd}(t)$值为-6.26~-4.94，锆石的$\varepsilon_{Hf}(t)$值为-4.52~1.66。微量元素以及同位素特征表明二庙沟英安玢岩类似于埃达克质岩石，主要由富集地幔起源的基性岩浆与下地壳部分熔融形成的酸性岩浆发生岩浆混合作用而形成，所对应的地球动力学背景为受古太平洋板块俯冲影响而导致的弧后伸展。富集地幔熔融形成的高f_{O_2}、富H_2O基性岩浆是成矿物质的主要来源。其与下地壳部分熔融产生的岩浆发生混合改变了岩浆的含水性和氧化还原状态，在高压环境下发生岩浆分异形成类埃达克质岩浆，上升到上地壳形成二庙沟铜金矿床。

英文摘要：

The Ermiaogou Cu-Au deposit is located within the Zijinshan ore field in southwestern Fujian Province. This deposit has similar styles of mineralization and alteration with the Zijinshan Cu-Au deposit. Mineralization was surrounded by acidic subvolcanic and closely related to porphyritic dacites and breccias, which suggested that both deposits may share similar genesis. Both the Ermiaogou Cu-Au deposit and the Zijinshan Cu-Au deposit belong to high-sulfidation epithermal low temperature hydrothermal deposits, which are significantly different from the Luoboling porphyry Cu-Mo deposit and the Yueyang low-sulfidation epithermal low temperature hydrothermal deposit. The Ermiaogou porphyritic dacites are closely related to the Cu-Au mineralization within the deposit. Our new precise zircon U-Pb dating results reveal that the Ermiaogou porphyritic dacite was emplaced in the Early Cretaceous (106~108Ma), which are similar to those of porphyritic dacite in the Zijinshan deposit. These results suggest that both deposits were resulted from the same period of magmatism and the large-scale volcanic-intrusive activity related to mineralization in the Cretaceous. Geochemically, the Ermiaogou porphyritic dacite shows high Si and K contents and weakly peraluminous. The rocks are enriched in LILEs and LREE; depleted in Nb, Ta, P, Ti; no/weak negative Eu; and characterized by strongly fractionated REE pattern and high Sr/Y and La/Yb ratios. It also exhibits low initial $^{87}Sr/^{86}Sr$ ratios (0.712698 to 0.713174), moderate $\varepsilon_{Nd}(t)$ (-6.26 to -4.94) and high zircon $\varepsilon_{Hf}(t)$ (-4.52 to 1.66) values. Interpretation of the elemental and isotopic data suggests that the Ermiaogou porphyritic dacite has some affinities with the adakite, and was most likely generated via a process including mixing of enriched mantle-derived mafic magmas and induced felsic magmas formed by partial melting of lower crust materials under a back-arc extensional environment that may have caused by the subduction of the Paleo-Pacific plate. Enriched mantle-derived melts have high oxygen fugacities and high H_2O content, thus potentially are major sources for Cu-Au metals. Mafic magmas derived from enriched mantle can change their hydrous and redox state by mixing with crust-derived melts, and led to generate adakitic magma by magmatic differentiation under high pressure, which may further result in the relevant Cu-Au mineralization at Ermiaogou.

关键词：地球化学 岩浆混合作用 英安玢岩 二庙沟 紫金山矿田

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