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长江中下游贵池李湾铜多金属矿区岩浆岩年代学及Hf同位素地球化学研究

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摘要：

李湾铜多金属矿位于长江中下游成矿带安庆-贵池矿集区,与矿区岩浆岩有密切的成因联系,是一个典型的矽卡岩型矿床。该区侵入岩主要由钾长花岗岩、闪长岩等组成,总体上具有较高的总碱(K_2O+Na_2O)和K_2O含量,低MgO、TiO_2和P_2O_5含量,富集大离子亲石元素(Rb、Th、U)和高场强元素(Zr、Hf、Nb和Y),亏损Ba、P、Ti,轻稀土富集、亏损重稀土等地球化学特征。通过对闪长岩和钾长花岗岩锆石U-Pb年代学研究表明,前者形成于123.4±2.4Ma,后者形成于122.6±1.3Ma,这与长江中下游125±5Ma岩浆活动及成矿事件一致。两者的锆石稀土元素配分均显示典型的轻稀土亏损、重稀土富集,Ce正异常、Eu负异常特征。前者相对后者锆石的Ce^{4+}/Ce^{3+}要高,其均值为345,显示其具有相对较高的氧逸度;锆石Ti温度计计算显示两者形成温度大体一致,为703~748℃范围内。同时钾长花岗岩锆石均具有均一的Hf同位素组成,$\varepsilon_{Hf}(t)$均值为-4.7,二阶段模式年龄为1118~1356Ma,较高的$\varepsilon_{Hf}(t)$值,指示源区可能有地幔物质的贡献。结合区域地质背景,我们认为该区闪长岩可能是板块后撤过程中残留的洋壳与地幔物质的混合,而附近的钾长花岗岩则是陆壳部分熔融与地幔混溶的结果,两者均位于太平洋板块125Ma前后俯冲后撤形成的拉张背景中。

英文摘要：

The Liwan Cu-polymetal deposit is located in Anqing-Guichi ore-cluster area, the Middle-Lower Yangtze River metallogenic belt. The regional intrusion is mainly composed of potassium-feldspar granite and diorite. The diorite stock is close to the poly-metal mineralization which is concealed underground. The main metallogenic type is contact metasomatic skarn type. Overall, the Liwan intrusion has high total K_2O+Na_2O contents, low MgO, TiO_2 and P_2O_5 contents, enrichments of large ion lithophile elements (Rb, Th, U), high field strength elements (Zr and Hf, Nb and Y) and light rare earths, depletion in Ba, P, Ti and heavy rare earths. Zircon U-Pb chronology of diorite samples show that intrusion formed in 123.4±2.4Ma, potassium feldspar granite formed in 122.6±1.3Ma, reflecting the multiphase characteristics of igneous activity in the Liwan area, these ages are similar to those igneous rocks along the middle-lower Yangtze river around 125Ma events with A-type granite magmatism and mineralization. All rare earth element distribution patterns of zircon show a typical light rare earth depletion, heavy rare earth enrichment, characteristics of Ce positive anomaly and Eu negative anomaly. Lattice stress model calculation shows relative basaltic diorite andesitic porphyrite and potassium long granite zircon Ce^{4+}/Ce^{3+} is higher, the mean value of 345, reflecting that it had formed in a relatively high oxygen fugacity environment. Thermometer by zircon Ti calculation shows that the formation of temperature is in the range of 703~748℃. Meanwhile, potassium-felspar granite has uniform Hf isotopic compositions of zircon with average of $\varepsilon_{Hf}(t)$ -4.7, t_{DM2} ranging from 1118~1356Ma. The fact that Liwan potassium-feldspar granite has relatively high $\varepsilon_{Hf}(t)$ values and younger model ages, suggesting the importance of mantle material in the magma source. The inherited zircons in the samples from Liwan basaltic andesitic porphyrite suggest that Palaeoproterozoic basement (2156Ma) was involved with the generation of Liwan magma. Conjectured from regional geological background, we believe that both the Liwan stock and skarn ore deposit may be formed in tensional function due to plate retreat during subduction of the Pacific plate at about 125Ma, which is partial melting of residual material products of miscibility with continental-oceanic crust and mantle.

关键词：铜多金属矿 李湾 锆石U-Pb定年 Hf同位素 长江中下游成矿带 太平洋板块俯冲

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