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华北陆块南缘中生代合峪花岗岩的地球化学特征与成因

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摘要：

合峪花岗岩基位于华北陆块南缘外方山地区,为豫西地区燕山期最大的岩基,出露总面积达784km^2,有多期侵入的特点,可划分为6个单元。主要岩石类型为黑云母二长花岗岩。LA-ICP-MS锆石U-Pb年龄资料表明,合峪花岗岩基侵位时间为148.2~135.3Ma。合峪花岗岩基的SiO_2=67.16%~75.43%,Al_2O_3=13.29%~15.92%,MgO=0.26%~1.12%,K_2O+Na_2O>8%,Na_2O/K_2O=0.88~1.43,属于高钾钙碱性系列,ACNK=0.94~1.09,为准铝质-弱过铝质花岗岩。岩体轻稀土富集、重稀土亏损($(La/Yb)_N$=14.5×10^{-6}~49.9×10^{-6},平均值27.2×10^{-6}),Sr含量变化较大(102×10^{-6}~848×10^{-6},平均290×10^{-6}),Y、Yb含量低(Y=3.21×10^{-6}~17.3×10^{-6};Yb=0.43×10^{-6}~2.16×10^{-6}),Eu弱亏损(δEu=0.57~0.89),反映熔体发生过长石分离结晶作用,源岩部分熔融生成熔体时残留相组合中没有或很少有长石的存在。合峪花岗岩基 I_{Sr}=0.7071~0.7090,$\varepsilon_{Sr}(t)$=40.8~65.9,$\varepsilon_{Nd}(t)$=-16.4~-11.2,其t_{DM2}为1.85~2.27Ga;锆石的$\varepsilon_{Hf}(t)$主要集中于-25.39~-5.25之间,t_{DM2}年龄介于1301~2846Ma。同位素数据显示合峪花岗岩基的源岩主要为南秦岭及扬子地块结晶基底,还混有少量熊耳群及太华群的物质。综合区域地质演化,认为合峪花岗岩基形成于秦岭造山带中生代陆内俯冲,岩石圈增厚,幔源岩浆上涌底侵导致下地壳部分熔融形成。

英文摘要：

Heyu batholith in Waifang Mountain, Henan Province, located in the southern margin of the North China block. It is a multi-stage intrusion with a total area of outcrop up to 784km^2. Heyu batholith mainly consists of biotitic monzogranite and can be subdivided into 6 units. LA-ICP-MS zircon U-Pb dating of the Heyu batholith porphyry gives concordant ages of 148.2~135.3Ma. SiO_2, Al_2O_3 and MgO contents are 67.16%~75.43%, 13.29%~15.92% and 0.26%~1.12%, respectively. Heyu batholith is high K calc-alkaline and metaluminous-peraluminous, with K_2O+Na_2O>8.0%, Na_2O/K_2O=0.82~1.43, ACNK=0.94~1.09. The rocks are relatively enriched in LREE and depleted in HFSE ($(La/Yb)_N$=14.5×10^{-6}~49.9×10^{-6}, average 27.2×10^{-6}). Variable Sr content comparing with typical adakite (102×10^{-6}~848×10^{-6}, average 290×10^{-6}) and low Y and Yb contents (Y=3.21×10^{-6}~17.3×10^{-6}; Yb=0.43×10^{-6}~2.16×10^{-6}), and slightly negative Eu anomaly (δEu=0.57~0.89) suggest that the fractional crystallization of the magma is obvious and a feldspar residual in the source is unlikely. The initial I_{Sr} ratio range from 0.7071 to 0.7090, and the $\varepsilon_{Sr}(t)$ value is 40.8~65.9. Negative $\varepsilon_{Nd}(t)$ value (-16.4~-11.2) with old t_{DM2} ages of 1.85~2.27Ga and negative $\varepsilon_{Hf}(t)$ values (-25.39~-5.25) with old t_{DM2} age of 1301~2846Ma suggest that the batholith was probably formed by partial melting of the south Qinling and Yangtze crystalline basement with the participation of Xiong'er Group and Taihua Group. In combination with the regional tectonic evolution, we suggested that the crust in the study area was thickened in early stage of intra-continental subduction of the Qinling orogenic belt intra-continent collision during Mesozoic, and the mantle-derived magma upwelling, and thereby the Heyu batholith formed in the southern margin of the North China Block.

关键词：华北陆块南缘 合峪花岗岩基 锆石U-Pb年龄 Sr-Nd-Hf同位素 成因机制

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