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五台杂岩晚太古代花岗质岩石中斜长角闪岩包体的年代学和地球化学研究

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摘要：

华北克拉通中部造山带被认为是由东西部陆块碰撞而产生的陆陆碰撞带，而恒山-五台-阜平地区位于中部造山带的中部，是该地区最大也是最具代表性的基底岩石剖面。总体上，五台杂岩可以分为变质表壳岩和花岗质岩体两大类，前者又被划分为五台群和滹沱群，而后者可划分为2560~2520Ma侵位的强烈变形的闪长岩-英云闪长岩-奥长花岗岩-花岗闪长岩系列、2176~2084Ma侵位的弱变形的斑状正长-钾质花岗岩以及约1810Ma侵位的未变形的A型花岗岩。在晚太古代花岗岩中普遍发育有斜长角闪岩包体，它们在露头上不连续分布，呈绿色到黑色，强烈拉伸成扁条状或透镜状，直径一般在几米到十几米之间。根据地球化学特征恢复它们的原岩为拉斑玄武岩。锆石U-Pb定年结果表明它们的结晶时代为2.7Ga，变质时代为1.85Ga。全岩$\varepsilon_{Nd}(t)$值为-3.1~+3.5，亏损地幔模式年龄为2.83~3.65Ga。原始地幔均一化蛛网图解上，斜长角闪岩具有明显的Nb、Ta和Ti的负异常，而在球粒陨石均一化稀土元素配分图解中它们具有轻稀土弱富集[$(La/Yb)_N$=1.36~3.52]以及重稀土平坦[$(Gd/Yb)_N$=0.94~1.38]的特征。地球化学以及同位素特征表明它们很可能来自于受到俯冲板片流体改造的轻度富集地幔中尖晶石二辉橄榄岩的部分熔融。更重要地，这些斜长角闪岩包体的锆石U-Pb年龄与全岩Nd亏损地幔模式年龄相似，都为27~28亿年左右，这说明在华北克拉通中部造山带很可能存在过大量的27亿年左右的新生地壳岩石，它们代表了一期重要的地壳生长事件。

英文摘要：

The Trans-North China Orogen (TNCO) is considered to be a continent-continent belt, along which the Eastern Block and Western Block collided. The Hengshan-Wutai-Fuping belt is located in the middle segment of the TNCO and is the largest and lithologically representative basement exposure. The Wutai Complex can be divided into supracrustal rocks and granitoids. The former has been subdivided into the Wutai and Hutuo groups and the latter have been subdivided into the 2560~2520Ma strongly deformed diorite-tonalite-trondhjemite-granodiorite suits, the 2176~2084Ma weakly deformed porphyritic syenogranites and the ~1810Ma undeformed A-type granites. Amphibolites occur as lenticular or elliptical enclaves in the Wutai granitoids, outcrops of which vary in sizes from several meters to several tens of meters and in color from green to black. Geochemical features indicate that their protoliths are igneous and similar to tholeiite. Zircon U-Pb dating results suggest that their protoliths crystallized at ~2.7Ga and are metamorphosed at ~1.85Ga. Their whole-rock $\varepsilon_{Nd}(t)$ values are -3.1 to +3.5 and t_{DM} ages are 2.83Ga to 3.65Ga. In the primitive mantle-normalized spider diagram, they are characterized by Nb, Ta and Ti negative anomalies. On the other way, in the chondrite-normalized REE diagram, they exhibit slightly LREE enrichment [$(La/Yb)_N$=1.36~3.52] and flat HREE [$(Gd/Yb)_N$=0.94~1.38]. Geochemical and isotopic results suggest that their protoliths may have formed by partial melting of spinel-bearing lherzolites from a slightly enriched mantle, which had been metasomatized by subduction-related fluids. More importantly, similarities of the zircon U-Pb age and t_{DM} ages of 2.7~2.8Ga indicate an important crustal growth event in the North China Craton.

关键词：五台杂岩 斜长角闪岩包体 锆石U-Pb定年 地球化学 华北克拉通

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