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Geochronology and geochemistry of the Dajishan granitic pluton and its relation to tungsten mineralization in Jiangxi Province, South China

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The Jiangxi region, S. China, is the most important tungsten metallogenic province of the world. The Dajishan W mine, near the city of Quannan in south Jiangxi, is one of the largest deposits in the region. Tungsten mineralization is related to the Dajishan Granitic Complex (DGC), a multi-intrusion pluton exposed over an area of about 20 km^2. It is comprised of at least two distinct units: (i) a main early phase of medium- to coarse-grained porphyritic biotite adamellite (Wuliting Unit) and (ii) a later phase of medium- to fine-grained aplitic leucogranite. The majority of W ore at Dajishan is obtained from hypogene wolframite-quartz veins hosted in Cambrian epimetamorphic rocks and diorite dykes adjacent to the DGC. In contrast, the aplitic leucogranites host disseminated W-Ta (Nb, Be) mineralization. Geochronology and geochemistry investigations were undertaken to determine their metallogenic affinities.

Zircon ELA-ICP-MS dating of the Wuliting Unit show a range of ages between 217~253 Ma, with 12 concordant grains yielding an age of 237.5 ± 4.8 Ma (MSWD = 6.2). The whole-rock Rb-Sr isochron age of the late stage aplitic leucogranite is 159±5 Ma (Sun et al., 1989). Initial $\varepsilon_{Nd}(t)$ values of –10.42 for the Wuliting adamellite and –10.29 for the aplitic leucogranite imply that they were produced by partial melting of ancient crustal rocks. The geochemical differences between them are best explained by crystal fractionation processes. The seemingly large age discrepancy between the mineralized intrusive bodies and the associated W mineralization is the subject of continuing investigation.

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Petrogenesis of Early-Jurassic syenite-granite complex in Nanling Range, South China

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In the eastern Nanling Range there is an assemblage of Early-Jurassic syenites-granites. A representative example is the Pitou-Tabei complex, composed of syenite and syenogranite with an area of about 400 km^2. The syenogranite in the complex is referred to as the Pitou pluton, which is the major part of the complex. The syenite in the complex is named the Tabei pluton, occupying about 12 km^2.

U-Pb zircon dating yields ages of 188.6±2.2 Ma for the Tabei pluton and 186.3±1.1 Ma for the Pitou pluton. The Tabei syenite is characterized by relatively low SiO_2 content (62.40%-68.75%), high alkalis (K_2O+Na_2O = 10.56%-11.96%), low percent K_2O/Na_2O ratios (0.56-0.93), metalumious character (A/CNK = 0.80-1.00), enrichment in LILE (Rb, Ba, K) and HFSE (Th, U, Nb, Ta, Zr, and so on), weakly negative to positive Eu anomalies (δEu = 0.63-1.82), relatively low $(^{87}Sr/^{86}Sr)_i$ (0.70412-0.70543), and relatively high $\varepsilon_{Nd}(t)$ (3.14-3.52). The Pitou syenogranite is characterized by high silica (SiO_2 = 71.06%-76.28%), relatively low alkalis (K_2O+Na_2O = 8.10%-9.80%), high percent K_2O/Na_2O ratios (1.22-1.94), metalumious character (A/CNK = 0.94-1.07), enrichment in Rb, Th (U) and K, depletion in Ba, Nb, Ta, Sr, P, Zr and Ti, high ΣREE (averaging: 451.03 μg/g), strong negative Eu anomalies (δEu = 0.27-0.33), relatively high $(^{87}Sr/^{86}Sr)_i$ (0.70805-0.70912), and relatively low ε_{Nd} (t) (-5.35 to -6.29).

The Tabei syenite and Pitou syenogranite both have the characteristics of A-type granites. The former is considered to be from the asthenospheric mantle, and the latter was the product of the lower crust-syenite magma mixture. They both were probably formed in an intra-block rifting setting, and related to the upwelling of the asthenosphere.

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