Indosinian magmatism and rare metal mineralization in East Tianshan orogenic belt: An example study of Jingerquan Li-Be-Nb-Ta pegmatite deposit

Siyu LIU[1], Rui WANG[1]*, Heejin JEON[2]

[1]State Key Laboratory of Geological Processes and Mineral Resources, and Institute of Earth Sciences, China University of Geosciences, Beijing 100083, China (*correspondence: rw@cugb.edu.cn)

[2]Swedish Museum of Natural History, Stockholm SE-10405, Sweden

In Eastern Tianshan region, a large number of granites and granitic pegmatites intruded into Carbonaceous volcanic-sedimentary strata [1] and triggered a sequence of Cu-Au-Fe and rare-metal mineralization [2]. The Jingerquan Li-Be-Nb-Ta deposit is the largest pegmatite deposit in this region [3]. However, its mineralization age and petrogenesis is not well constrained. Two magmatic suites of Li-bearing granitoid group (Class I) and Li-poor gabbroic group (Class II) have been recognized in Jingerquan region. We have conducted two monazite SIMS U-Pb dating from Class I, which gave 246.0±2.0 Ma and 252.9±1.9 Ma, respectively [4]. These mineralization ages are in good agreement with Class II crystallization ages of 247.6±1.2 Ma to 250.7±2.5 Ma [4].

Class I rocks are rich in Si, Al, Na, K, calc-alkaline to high-K calc-alkaline series, and poor in Ca, P, Fe, and Mg, with A/CNK ≥ 1.1, which are similar to S-type peraluminous granites. They are characterized by Rb, Ta, Nb, Hf enrichments, significant Ti, Ba, Sr depletions, significant Eu anomalies (δEu=0.01–0.20) and "tetrad effect". Class II rocks are calc-alkaline rocks that are rich in Ca, Al, and P and poor in Si, K, with A/ CNK < 1. They are characterized by Ba, Sr enrichments, Th, Nb, Ta depletions, no significant Eu anomalies (δEu = 0.97–1.40), positive εHf(t) values (12.0–15.2) and juvenile T_{DM} (279–411 Ma).

In the intraplate extensional setting, the mantle magmas represented by ClassII basaltic magmas intraplated into the crust and induced partial melting of the middle and upper crust to produce Class I S-type granitic magmas. After that, the granitic magmas underwent continuous differential evolution and volatile enrichment, and finally formed Li-Be-Nb-Ta mineralized granitic pegmatite. The future Li-Be-Nb-Ta exploration should focus on Eastern Tianshan region where Indosinian magmas similar to Class I are widespread.

[1] Li et al. (2002) North western Geology 35, 41–64. [2] Han et al. (2018) Acta Petrologica Sinica 34, 1914–1932. [3] Chen et al. (2006) Mineral Deposits 25, 470–476. [4] Liu et al. (2020) OGR 116, 103265.