SEG 2017 Conference

Geochemistry of leucogranites and their relationship with Mo mineralization at the Zhunsujihua molybdenum deposit, Inner Mongolia, China

Fei Huang*, Xiaojun Zhang, Wenhao Liu, Chunliang Yao, Ying Qin, and Zhen Peng

China University of Geosciences, Wuhan, Hubei Province, China, *e-mail, 137211630@qq.com

The Zhunsujihua deposit, located in the Erlian-Dongwuqi metallogenic belt of the eastern segment of the Central Asian Orogenic Belt, is a porphyry Mo-polymetallic deposit associated with Paleozoic intermediate-acid intrusive rocks. There are mainly three types of intrusive rocks in the deposit area: granodiorite, dioritic porphyrite, and leucogranite. Previous studies were mainly focused on the relationship between the granodiorite and mineralization, but few workers have noticed the leucogranite.

Field geological investigations indicated that the granodiorite was intruded by the leucogranite dikes with disseminated and veinlet molybdenite mineralization. A new LA-ICP-MS zircon U-Pb date of 300.3±3.4 Ma for the leucogranite is consistent with an existing zircon U-Pb age of 298.2±3.1 Ma for granodiorite. These two ages are also consistent with our Re-Os model age of 301.9±4.3 Ma and a previously reported Re-Os isochron age of 298.1±3.6 Ma. Geochemical analyses of the leucogranite show an average of 76.89 wt.% SiO_2, 6.0 wt.% K_2O,. 2.94 wt.% Na_2O, and A/CNK and A/NK average ratios of 1.0 and 1.09, respectively, which suggest that the leucogranite is weakly peraluminous and belongs to the high-K calc-alkaline series in a SiO_2-K_2O diagram. The enrichment in large ion lithophile elements (K, Rb, and Ba) and light rare earth elements, depletion in high field-strength elements (Nb, P, and Ti), and negative Eu anomalies ($\delta Eu = 0.13 \sim 0.58$) indicate the leucogranite was probably formed in a subduction setting. The whole rock $\delta^{34}S$ values of the leucogranite average 5.3‰, which is close to that of the granodiorite (7.4‰), molybdenite (6.7‰), and hydrothermal pyrite (6.5‰). This implies the same source for sulfur in the intrusive rocks and the sulfides in the Zhunsujihua Mo deposit. Combined with the intrusive contact of leucogranite with granodiorite, as well as the disseminated and veinlet molybdenite mineralization occurring in the leucogranite, we infer that the leucogranite originated from the same source as the ore-forming hydrothermal fluids. The leucogranite and the hydrothermal fluids were products of fractional crystallization and fluid separation from a deep magma chamber, whereas the granodiorite was emplaced earlier and provided space and a host for the mineralization.