

## **Two stages of lithium enrichment in a magmatic-hydrothermal system: evidence from in-situ elemental and boron-isotope variations in micas**

ZHAOGE HAO AND XIAOWEI LI

China University of Geosciences, Beijing

Presenting Author: 993815899@qq.com

Peraluminous granites and pegmatites host diverse rare-metal elements such as Li, Be, Rb, Cs, Nb, Ta, Sn and W. However, the mechanism of rare-metal enrichment efficiency from the magmatic to magmatic-hydrothermal transition stages remain controversial. Here, we present a detailed textural, in-situ elemental, and in-situ B isotopic investigation of different types of micas from Shaliuquan rare-metal pegmatites and genetically related granites in the Qianji Massif, Northern margin of the Qaidam Basin.

The Shaliuquan pegmatites exhibit characteristic lithological zonation, and they can be divided into three units from bottom to top: Li-mica pegmatite, quartz-muscovite pegmatite and muscovite-microcline pegmatite, near which one coeval muscovite-tourmaline granitic intrusion occurs. According to mineralogical characteristic of micas, we identified two different crystallization environments (magmatic vs. magmatic-hydrothermal). The micas from the Li-mica pegmatite typically exhibit compositional zoning. In comparison with cores, the rims show marked enrichment of rare metal (e.g. Li, Be, Rb, Cs, Nb and Ta) and F, and depletion of B. The K/Rb and Nb/Ta ratios decrease gradually from cores to rims, indicative of fractional crystallization during the magmatic stage. By contrast, the micas in quartz-muscovite pegmatite can be divided into larger primary muscovite, and smaller secondary muscovite. In comparison with primary muscovite, the secondary muscovite displays obvious enrichment of Li, Be, B, Rb, Cs and F, which is probably due to fluid exsolution during the magmatic-hydrothermal stage.

Based on petrography and geochemical variations, integrated with Rayleigh fractionation modeling and B isotopes of micas, we present that the micas from Shaliuquan pegmatites probably record two main stages of rare-metal enrichment. Stage I marks the end of purely magmatic environment. Rare-metal elements are mainly enriched in residual melt by fractional crystallization from a silicic magma parent. Stage II records a gradual transition of crystallization from a peraluminous granitic to an aqueous alkaline fluid-rich environment.

Our study, for the first time, demonstrates that the first Li enrichment during the late stage of magmatic evolution is obvious prevailing as evidenced by increasing by tens of times, whereas the second Li enrichment during the fluid exsolution stage is also operative but decreased by an order of magnitude.