

Oriented triphylite rods in apatite from an LCT pegmatite in the Stankuvatske Li-ore deposit, Ukraine: Implications for Li mobility

SERGI KURYLO^{1,*}, IGOR BROSKA², AND GIERÉ RETO³

¹Earth Science Institute, Slovak Academy of Sciences, Ďumbierska 1, 974 11 Banská Bystrica, Slovakia

²Earth Science Institute, Slovak Academy of Sciences, Dúbravská cesta 9, 840 05 Bratislava, Slovakia

³Department of Earth and Environmental Science, University of Pennsylvania, Philadelphia, Pennsylvania 19104, U.S.A.

ABSTRACT

This paper reports the first finding of oriented triphylite ($\text{LiFe}^{2+}\text{PO}_4$) rods in fluorapatite. This observation was made in the contact zone between a metamorphosed rare-element pegmatite and its amphibolite wall rock at the Stankuvatske Li-ore deposit in the Ukrainian Shield. This contact zone consists of an exocontact, in which hornblende was altered to biotite, and an endocontact, which comprises four parallel mineral zones (aplitic, apatite, triphylite, and transitional).

The needle-shaped triphylite inclusions were observed in greenish-blue apatite within the apatite zone. They are oriented parallel to structural nanochannels along the *c*-axis in apatite and were formed due to the infiltration of Li-rich, pegmatite-derived fluids into the apatite zone. Small amounts of pyrite, U-Th-rich and Fe-rich phases, as well as small mono-phase fluid inclusions of CO_2 , CO, and N_2 are associated with the oriented triphylite inclusions and record the character of fluid.

The exo- and endocontacts were formed as a result of interaction between metasomatic fluids derived from the pegmatite (enriched in K, Na, Li, Rb, F, P, and Mn) with the host amphibolite. At the contact, the amphibolite was altered into the biotite zone during the first metasomatic stage; alteration of hornblende and plagioclase released Ca, Fe, and Mg toward the pegmatite, where these elements reacted with P, Li, and Mn to produce the apatite and triphylite zones during the second metasomatic stage. Acting like a geochemical barrier, the apatite zone in the endocontact inhibited the further escape of Li from the pegmatite, which now is a Li-ore deposit. The metasomatic processes observed in the Stankuvatske Li-ore deposit represent an example of apatite and triphylite formation at the contact between a pegmatite and a metabasite, which has metallogenetic implications.

Keywords: Contact zone, apatite, triphylite, triphylite rods, fluid interaction, Ukrainian Shield