

## **Origin and internal evolution of the Li-F-Be-B-P-bearing Pinilla de Fermoselle pegmatite (Central Iberian Zone, Zamora, Spain)**

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### **ABSTRACT**

The Li-F-Be-B-P bearing Pinilla de Fermoselle (PF) pegmatite occurs in the apical part of a leucogranite body. It shows a clear non-symmetrical vertical zoning from the contact with the leucogranite to a contact with the metamorphic country rocks. The pegmatitic facies evolve upward from (1) the undifferentiated Lower Border Zone (LBZ), with quartz, feldspars, muscovite, biotite, and black tourmaline, through (2) the Intermediate Zone (IZ), with quartz, muscovite, zinnwaldite, black tourmaline, and Fe-Mn phosphates, to (3) the highly evolved Upper Border Zone (UBZ), with quartz, albite, lepidolite, zinnwaldite, elbaite, and beryl. The composition of the pegmatite-forming minerals suggests that a residual melt become progressively enriched in F and Li until the crystallization of the apical UBZ, whereas P partitions in the melt only until the intermediate levels of differentiation attained in the IZ. Chemical variations in the mica and tourmaline as well as in the feldspar and Fe-Mn phosphate minerals are consistent with an internal evolution by crystal fractionation processes. A plausible model for the crystallization of the PF pegmatite involves a rapid, in situ, bottom-up crystallization from significantly undercooled liquids. The lack of metasomatic effects in the metamorphic host-rock and the estimated P content of the initial leucogranite melt suggest that the PF pegmatite mainly crystallized under closed system conditions.