

Lithium mineralizations in the Barroso-Alvão pegmatite field (northern Portugal)

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The presence of the three anhydrous Li-aluminosilicates (spodumene, petalite and eucryptite) at the thin section scale is not a common feature. Such assemblage occurs in some pegmatite-aplite dykes from northern Portugal. In general, petalite is the first Li-aluminosilicate to crystallize but is often subsequently transformed, according to the stoichiometric conversion $\text{petalite} = \text{spodumene} + 2 \text{ quartz (squi)}$, as the consequence of cooling. This is not the case for our studied examples. The magmatic paragenesis is assumed to be albite + potash feldspar + quartz (minor) + muscovite (accessory) + spodumene (with a highly irregular distribution). Petalite follows after spodumene through a sudden and sharp drop in confining pressure, from lithostatic to hydrostatic (possibly contemporaneous with late Hercynian deformation episode associated with the uplift of the chain) which generates a separate hydrous fluid phase. It seems likely that petalite precipitates directly from that fluid. Therefore, the subsolidus history of the pegmatite body begins with the widespread but variable metasomatic replacement of the former Li-aluminosilicates, marginally or along cracks, mostly by albite, muscovite and/or potash feldspar and by late eucryptite (selectively from petalite), together with numerous complex phosphates.

In conclusion, the pressure and temperature path suggested for the evolution of these Portuguese Li-rich pegmatite-aplite bodies appears atypical with regard to most of the descriptions in the literature. Here, spodumene remains metastable against petalite, contrary to what is generally encountered elsewhere.