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Metasomatic aureoles of highly mobile elements related to evolved granitic aplite-pegmatites from Fregeneda–Almendra (Spain–Portugal)

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Granitic pegmatites represent an important source of numerous critical raw materials, and subsequently, the exploration of new deposits has become a crucial objective in the energy transition towards green technologies. Systematic studies of geochemical aureoles related to late-Variscan Lithium-Cesium-Tantalum (LCT) pegmatites at the Fregeneda–Almendra Pegmatite Field (Central Iberian Zone; Iberian Massif), have provided valuable information to consider in mineral exploration. Due to the relative homogeneity of host psammitic and pelitic metasediments (SiO_2/Al_2O_3 of 2.57–5.59 wt.%, and $Fe_2O_3^t/K_2O$ values of 0.24 to 4.19 wt.%), it has been possible to establish an ideal composition for the country rocks to assess the chemical behavior of some key elements associated to the studied LCT pegmatites.

The performed geochemical modelling (based on Gresens' (1967) equation) shows that the intrusion of evolved aplite-pegmatites (Li-mica- and spodumene-bearing) produced an enrichment in the host rocks of several elements defined as highly mobile (F, B, Li, Rb, Cs, Sn, Be and Tl) in comparison with the determined immobile elements (Si, Al and Ti). Calculated gains and losses of such highly mobile elements display exponential decreasing trends according to the distance from the pegmatitic dyke, with Li and Cs reaching furthest from the dykes (first evidence of anomalous contents starting at distances of 4–5 times the thickness of the dyke). In terms of mineral exploration, the extent of such aureoles associated with potentially economically interesting dykes may be traceable by different small-footprint exploration tools as remote sensing, X-Ray Fluorescence, or Laser-Induced Breakdown Spectroscopy (LIBS).

Gresens, R. L. (1967). Composition–volume relationships of metasomatism. Chemical Geology 2, 47–55.

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