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On the link between granites and pegmatites: the case study of the Li-rich mineralization from Castillejo de Dos Casas (Salamanca, Spain)

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In the Castillejo de Dos Casas area (C2C) (Central Iberian Zone) different granitic (Villar de Ciervo granite) and pegmatitic units of Variscan age occur intruded into the Neoproterozoic-Cambrian metasediments of the Schist Greywacke Complex (SGC). These units include: (1) biotite-rich porphyritic granite; (2) two-mica granite; (3) muscovite ± tourmaline ± phosphates-rich, leucogranites; (4) barren to Li-rich aplite-pegmatite cupola; and, (5) Li-rich aplite-pegmatite dykes. Except (1), all these units are highly peraluminous (A/CNK in the range of 1.18-2.23), Ca-poor (0.09-0.87 wt% CaO), and P-rich (0.29-3.11 wt% P_2O_5). Units (4) and (5) are heterogeneous, showing different mineral associations. The most common consists of a fine-grained matrix of quartz, plagioclase and Li-mica, where coarser feldspar crystals grow perpendicularly to the contacts, and topaz, montebrasite, Fe-Mn-phosphates, petalite, elbaite, cassiterite and Nb-Ta oxides are accessory. A layered texture is also locally observed.

The origin of pegmatitic melts is somehow controversial. For decades they have been considered the residual portions originated by the fractional crystallization of granitic magmas (e.g. London, 2008). However, lately the anatectic model, which proposes that pegmatitic melts originate directly by low degrees of partial melting, is gaining more followers among pegmatite researchers (e.g. Simmons et al., 2016).

In the case of C2C, the aplite-pegmatite cupola is located over the two-mica granite and close to the leucogranitic units, whereas the aplite-pegmatite dykes intrude concordantly into the SGC materials, over and close to the granitic/pegmatitic cupola. These spatial relationships strongly suggest the existence of a petrogenetic link between granitic and pegmatitic units. Whole-rock data show a gradual decrease in the Ca, Fe, Mg, Ti, Ba, Y and REE contents and K/Rb ratio with fractionation, from units (1) to (5), parallel to an increase in Al, Mn, P, Li, F, Rb, Cs, Sn, Nb and Ta. Similarly, chemical composition of main mineral phases shows gradual changes from the less evolved unit (1) to the most fractionated one (5). A continuum is observed for micas, with a progressive Li, F, Rb and Cs increase, parallel to a K/Rb decrease. Alkali feldspars show a gradual decrease of the K/Rb ratio for K-feldspar and of Ca for plagioclase; whereas tourmaline becomes Li-richer and Fe-poorer from (3) to (5) (it has not been identified in units (1) and (2)). Therefore, taking into account the spatial relationships of the 5 units, as well as their chemistry at whole-rock and

mineral scales, the most feasible origin for the pegmatitic melts in the C2C area corresponds to the fractionation of a parental granitic melt that well could correspond to the unit (1) of the Villar de Ciervo granite, and that would evolve through the units (2), (3) and (4), up to the most fractionated unit (5) of the Li-rich aplite-pegmatite dykes.

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