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Geochemistry of granitic aplite-pegmatite sills and petrogenetic links with granites, Guarda-Belmonte area, central Portugal

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Granitic amblygonite-subtype and lepidolite-subtype, aplite-pegmatite sills intruded a biotite>muscovite granite (G1). Two other biotite>muscovite granites (G2 and G3) and a muscovite>biotite granite (G4) crop out in the area. Variation diagrams for major and trace elements of the Variscan rocks show fractionation trends for a) G1 and G4; b) G2, G3 and aplite-pegmatite sills. The two series are confirmed by the two trends defined by major elements of primary muscovite. The sills also contain Li-bearing muscovite, which has higher Mn, Li, F and paragonite contents and lower Al^{VI} content than primary muscovite from G2, G3 and sills. All sills have pure albite and P_2O_5 content of K-feldspar and plagioclase increases in the series G2, G3 and sills. Beryl occurs in all sills, but lepidolite and a nearly pure petalite only occur in lepidolite-subtype sills, which are the most evolved sills. Primary topaz and amblygonite have a similar composition in all sills. Aplite-pegmatite sills contain cassiterite, which shows sequences of alternating darker and lighter zones. The former are richer in (Nb + Ta + Fe + Mn) than the latter. Manganocolumbite is common in all sills, but ferrocolumbite only appears in amblygonite-subtype sills and manganotantalite in lepidolite-subtype sills. The sills richest in Li contain reversely-zoned crystals with a homogeneous microlite core and a heterogeneous uranmicrolite rim. Least squares analysis of major elements shows that granite G3 and amblygonite-subtype and lepidolite-subtype aplite-pegmatite sills can be derived from granite G2 magma by fractional crystallization of quartz,

plagioclase, K-feldspar, biotite and ilmenite. Modelling of trace elements shows good results for Sr, but magmatic fluids controlled the Rb and Ba contents of the aplite-pegmatite sills and probably also their Li, F, Sn and Ta contents and crystallization of lepidolite, cassiterite and Nb–Ta oxide mineral assemblage. Schorl from the lepidolite-subtype sills that cut granite G1 has higher Mg/(Mg + Fe) than schorl from metasomatised granite at sill walls and resulted from the mixing of magmatic fluids carrying B and some Fe with a meteoric fluid that has interacted with the host granite G1 and carried Fe and Mg. Schorl and dravite, respectively from metasomatised granite and micaschist at sill walls, were also formed from the mixing processes.

Key-words: granites, aplite-pegmatite sills, feldspars, micas, Sn- and Li-enrichments.