Geochemistry of granitic aplite-pegmatite veins and sills and their minerals from Pega – Sabugal, Central Portugal

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ABSTRACT

Beryl-bearing aplite-pegmatite veins and sills and lepidolite-bearing aplite-pegmatite sills from Pega intruded a Variscan biotite>muscovite granite. Variation diagrams of major and trace elements of host granite and beryl-bearing aplite-pegmatite veins and sills show fractionation trends. The lepidolite-bearing aplite-pegmatite sills are highly differentiated. Ba decreases and P increases from K-feldspar of host granite to K-feldspar of aplite-pegmatite veins and sills. Ca of plagioclase decreases from host granite to albite of aplite-pegmatites. The host granite is the parental granite for aplite-pegmatites.

Keywords: rare-element aplite-pegmatites, micas, feldspars, parental granite, columbite-tantalite.

GEOLGY AND PETROGRAPHY

The Pega (Sabugal) area is located within the Central Iberian Zone of the Iberian Massif, one of the largest segments of the European Hercynian fold belt. Aplite-pegmatite veins and sills from Pega crop out in a region dominated by syn-D3 Variscan granites, which intruded the Cambrian schist-metagraywacke complex (Fig. 1). Very coarse-grained porphyritic biotite>moscovite granite (G1), medium-grained muscovite>biotite granite (G6) and medium- to coarse-grained muscovite>biotite granite (G7) define a series of magmatic differentiation, while fine- to medium-grained porphyritic biotite>moscovite granite (G2) and coarse-grained porphyritic biotite>moscovite granite (G3) define another series. The medium-grained porphyritic biotite>moscovite granite (G4) and the medium-grained slightly porphyritic two-mica (moscovite>biotite) granite (G5) correspond to two distinct magmatic pulses (Silva et al., 2003). Aplite-pegmatite veins and sills from Pega intruded coarse-grained porphyritic biotite>moscovite granite (G3). Subvertical to inclined beryl-bearing aplite-

-porphyritic veins and sills trending E-W to ENE-WSW, from 10 cm to 15 m thick and up to 700 m long predominate. Some subhorizontal beryl-bearing aplite-

-porphyritic veins and sills trending N10°E, 20°SE were also found in this area (Fig. 1). These aplite-pegmatite veins and sills contain quartz, perthitic orthoclase and microcline,
albite, muscovite, beryl, ferrocolombite, ferrotantalite, Fe-Mn phosphate minerals and rare siderophyllite, zinnwaldite, tourmaline and cassiterite. In general, these veins and sills produced, on the host granite G3, a metasomatic zone, 15 cm thick, containing zinnwaldite. Rare lepidolite-bearing aplitic-pegmatite sills from 10 to 30 cm thick and up to 20 m long also intruded granite G3 and crop out to the south of the vein field at higher topographic levels than beryl-bearing aplitic-pegmatite veins and sills. They contain quartz, albite, potash feldspar (mainly orthoclase), lepidolite, topaz, manganocolumbite, manganotantalite, cassiterite, monzodiaspore and Sr-phosphate mineral. These sills produced, on the host granite G3, a thin metasomatic zone of 10 cm thickness, containing more zinnwaldite and Li than the metasomatic zone due to beryl-bearing aplitic-pegmatite veins and sills.

**GEOCHEMISTRY**

The granites G2 and G3 and aplitic-pegmatite veins and sills from Pega are peraluminous, with A/CNK ratio of 1.13-1.35 in granites and 1.07-1.65 in veins and sills. The beryl-bearing aplitic-pegmatite veins and sills have higher SiO₂, Rb, F, Sn, Li contents and lower TiO₂, total FeO, MgO, CaO, Sr, Zr, Y, Th and Ba contents than the host granite G3. Granites G2 and G3 and beryl-bearing aplitic-pegmatite veins and sills define fractionation trends for major and trace elements (Fig. 2).

The lepidolite-bearing aplitic-pegmatite sills have higher Al₂O₃, MnO, P₂O₅, F, Li, Sn, Rb, Sr and Nb contents and lower SiO₂, CaO, FeO and MgO contents than beryl-bearing aplitic-pegmatite veins and sills. δ¹⁸O increases from granite G2 to granite G3 and is similar or higher in veins and sills than in the host granite G3.

**GEOCHEMISTRY OF MINERALS**

Albite (An₈₂) from aplitic-pegmatite veins and sills has lower Ca content than the phenocrist and matrix albite-oligoclase of host granite G3. The Ba content of potash feldspar from aplices and pegmatites is extremely low. The average P₂O₅ content of potash-feldspar increases from host granite to aplitic-pegmatite veins and sills, which can be explained by fractionation (Neiva, 1998). Siderophyllite from beryl-bearing aplitic-pegmatite veins and sills has higher Si, Al, Mn, F, Fe³⁺/(Fe²⁺+Mg) contents and lower Mg and Ti contents than Fe³⁺-biotite from host granite G3. Primary muscovite from beryl-bearing aplitic-pegmatite veins and sills has higher Fe and F and lower Ti and Mg contents than primary muscovite from host granite G3. Columbite-tantalite crystals from beryl-bearing aplitic-pegmatite veins and sills show a fractionation trend from ferrocolombite to ferrotantalite. In lepidolite-bearing sills, there is a fractionation trend from manganocolumbite to manganotantalite, both with Mn/(Mn+Fe)>0.9.

**CONCLUSIONS**

Beryl-bearing aplitic-pegmatite veins and sills from Pega correspond to the beryl-columbite-phosphate subtype of beryl type, while lepidolite-bearing aplitic-pegmatite sills correspond to the lepidolite subtype of complex type, all belonging to the REL-Li subclass of rare-element pegmatites (Cerny & Ercit, 2005). Variation diagrams of major and trace elements of granitic rocks and compositions of feldspars and micas and whole-rock δ¹⁸O values suggest that the host granite G3 is the parental granite for the Pega aplitic-pegmatite vein field.

**REFERENCES CITED**

