

Petrogenesis of the Hercynian biotite granite and its microgranular enclaves from Lavadores, northern Portugal

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The medium to coarse-grained porphyritic biotite granite (314 ± 11 Ma) is metaluminous to peraluminous, ranging from calc-alkaline enriched in potassium to subalkaline. $(^{87}\text{Sr}/^{86}\text{Sr})_0$ of 0.70442 ± 0.00001 indicates a mantelic origin.

Abundant microgranular enclaves are scattered all over the pluton; some of them form a swarm. They have ellipsoidal to lobate shape and contain xenocrysts. Some contacts between enclaves and host granite are regular, others are lobate, crenulate and cusped. Enclaves of diorite, quartz diorite, monzodiorite, quartz monzodiorite, tonalite, granodiorite, quartz syenite and quartz syenite with alkali feldspars were found. They are metaluminous, with some shonshonitic characteristics such as high P, Rb, Ba, F, REE, LREE. Some are ultrapotassic with $\text{K}_2\text{O} > 3\%$ and $\text{MgO} > 3\%$ and similar to vaugnerites. SiO_2 , TiO_2 , total FeO, MgO, CaO, P_2O_5 and V of enclaves and host granite define linear trends. REE patterns of enclaves and host granite are not subparallel. $(^{87}\text{Sr}/^{86}\text{Sr})_0$ increases and $\epsilon_{\text{Nd}}(\text{T})$ decreases from enclaves to host granite. Mineral compositions of enclaves and host granite are similar.

Enclaves are hybrid and resulted from mingling/mixing of the host granite magma with potassic basic magmas from the enriched mantle. Enclaves crystallized at $(804-717)^\circ\text{C}$ and $(3.9-2.3)$ kb. Host granite crystallized at 750°C and 2.6 kb.