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Abstract title

CRUST- AND MANTLE-LIKE SR-ND ISOTOPE SIGNATURES OF VARISCAN GRANITES IN IBERIA: WHAT ABOUT THEIR PETROGENESIS?

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Abstract

Large volumes of granitoids were emplaced in the Central Iberian Zone during late-Variscan times: (1) syn-orogenic granites (320-300 Ma), controlled by the last ductile deformation phase (D3); (2) late- to post-orogenic granites (299-290 Ma) related to the brittle deformation phase D4. Available chemical and Sr-Nd isotopic data reveal that these two groups are characterised by contrasting magmatic affinities, as well as contrasting isotope compositions. Syn-orogenic granites belong to calc-alkaline (CA), Mg-K subalkaline (Mg-K SA) and aluminopotassic (AK) associations with 'crust-like' isotope signatures (Sri>0.706, eNd<-4.4). In contrast, late- to post-orogenic granites are predominantly of Fe-K subalkaline (Fe-K SA) affinity with 'mantle-like' isotope compositions (Sri=0.703 to 0.707, eNd=-1.0 to -2.5).

The syn-orogenic group is largely heterogeneous. It includes, from the more to the less enriched isotope compositions: (i) highly peraluminous AK granites with Sri>0.711 and eNd<-7.0; (ii) moderately peraluminous AK granites with Sri=0.709 to 0.711 and eNd=-5.6 to -6.8; (iii) slightly peraluminous CA and Mg-K SA granites with Sri=0.706 to 0.709 and eNd=-4.4 to -6.2. For AK granites an origin by partial melting of a heterogeneous crust is proposed. CA and Mg-K SA frequently occur in composite plutons, associated with coeval gabbro-norite to granodiorite bodies and AK granites of sub-group (ii). Both granitoids and basic-intermediate rocks show evidence of mixing/mingling phenomena. We assume that CA and Mg-K SA hybrid granites were generated by MFC processes involving coeval mantle- and crust-derived liquids. The mantle-derived melts, represented by

shoshonitic gabbros, were derived from an enriched and homogeneous source (Sri=0.705, eNd=-2).

We propose that Fe-K SA granites are essentially the products of mantle input, followed by some mantle-crust interaction. It must be noted that the mantle component would have a less enriched isotopic signature than the mantle-derived melts involved in the genesis of syn-orogenic hybrid granitoids.

Various interacting factors related to the nature of the protoliths, as well as the physical and chemical conditions of melting, may account for the above cited compositional/petrogenetic contrast. Changes in the melting conditions were probably related to changes in tectonics which occurred at late-Variscan times (ca. 300 Ma), from a compressive tectonic regime to extensional processes, large-scale uplift and thinning.

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