Geophysical Research Abstracts,
Vol. 11, EGU2009-13319, 2009
EGU General Assembly 2009

Variscan calc-alkaline plutonism in Iberia (Northern Portugal): petrogenesis and distribution in space and time

P. Simões (1,2) and G. Dias (1,2)

(1) University of Minho, Earth Sciences, Braga, Portugal (pimenta@dct.uminho.pt; graciete@dct.uminho.pt), (2) Centro de Geologia da Universidade do Porto

Variscan granitic plutons with different signatures are largely represented in Northern Portugal. They were mainly emplaced at the post-collisional stage of the Variscan orogeny, during the last ductile deformation phase D3 and post-D3 times (320 - 290 Ma). Calc-alkaline syn-D3 granitic plutons are spatially associated with major NW-SE shear zones and distributed along them, mainly the Vigo-Régua, Laza-Rebordelo and Vivero-Ifanes shear zones. A synthesis on available geological, geochronological and geochemical data from six representative plutons related to the Vigo-Régua and Vivero-Ifanes lineations will be presented. They are composed by biotite-rich granodiorites-monzogranites with a porphyritic medium-grained texture and mafic microgranular enclaves. In some plutons the main granitic rocks are associated with minor bodies of amphibole- and biotite-dominant quartz-monzodiorites, as well as biotite-dominant granodiorites and biotite granodiorites. Abundant mingling phenomena occur. U-Pb zircon and monazite geochronological data reveal a narrow range of ages between 313 and 321 Ma for the studied granitoids, considered as the emplacement age of syn-D3 plutonism in the Variscan Central Iberian Zone (CIZ).

High contents in Ba (720-2181 ppm) and REE (La = 77-167 ppm), as well as highly fractionated REE patterns (LaN /YbN) = 32-78) and moderate negative Eu anomalies (Eu/Eu* = 0.52-0.72), are distinctive features of these calc-alkaline to aluminopotassic granites. The SiO2 content ranges from 62 to 70% and biotites are aluminous (Altotal = 3.01-3.54 apfu) and Fe-rich (XMg = 0.36-0.47). Isotopic data reveal initial 87Sr/86Sr ratios (Sri) of 0.7072 to 0.7107 and Nd of -4.39 to -6.28 for the granites. Associated mafic rocks have isotopic compositions in the following range: Sri = 0.7064 to 0.7080 and Nd = -3.29 to -4.31. The isotopic signatures of granites related to the Vigo-Régua shear zone are progressively more evolved from SE to NW.

Several evidences indicate interaction between coeval and contrasting magmas: (i) association with coeval mafic stocks and/or mafic microgranular enclaves; (ii) mingling evidences like the presence of net-veining structures, K-feldspar xenocrysts and disequilibrium textures (such as, quartz ‘ocelli’ surrounded by a reaction rim of biotite or amphibole and irregular cores of plagioclase with dendritic and more calcic rims); (iii) biotite compositional evolutions which cross-cut the granitic typological fields from the calc-alkaline to the aluminopotassic one; (iv) mixing curves in the Nd vs. Sri and Sri vs. 1/Sr diagrams.

In conclusion, field, petrological and isotopic data support the hypothesis of an interaction between coeval felsic and mafic magmas, the calc-alkaline granites being hybrid rocks. The more evolved Sr-Nd isotopic compositions indicate an important contribution of crustal components in the magmas, probably from felsic metaigneous sources in the lower crust. A mantle-derived component should be considered, which imply a significant input of juvenile magma in Variscan syn-D3 times (321 – 313 Ma), controlled by major NW-SE shear zones in the CIZ, thus contributing to a relevant growth event together with crustal recycling processes.