Geophysical Research Abstracts
Vol. 14, EGU2012-3430-1, 2012
EGU General Assembly 2012

New geochemical and isotopic constraints on the genesis of the Oliveira Azeméis granitoid melts (Porto-Tomar Shear Zone, Iberian Variscan Chain, Central-Western Portugal)

J.F. Santos (1), M.H. Mendes (1), A.C. Gonçalves (1), and P. Moita (2)

(1) Geobiotec, Departamento de Geociências, Universidade de Aveiro, Portugal (jfsantos@ua.pt), (2) Centro de Geofísica, Departamento de Geociências, Universidade de Évora, Portugal

The Porto-Tomar Shear Zone (PTSZ) is a very important tectonic structure that separates, in central-western Portugal, two of the major tectonic units of the Iberian Variscan Chain: the Ossa-Morena Zone, to the west, and the Central Iberian Zone, to the east. The Oliveira de Azeméis area lies in the northern sector of the PTZC and it is characterized by the occurrence of strongly deformed granitoids. Country rocks are dominantly pelitic metasediments which, according to recent geological mapping (Pereira et al., 2007), belong to the Precambrian Lourosa Formation and the Ordovician São João de Ver Formation. Using Rb-Sr whole-rock isotopic data, Pinto (1979) proposed an age of 379±12 Ma for the Oliveira de Azeméis granitoids.

In this work, new results were obtained on these granitoids in the area between the villages of Travanca and Curval, especially in the Sacramento quarry. In this critical outcrop, strongly deformed two-mica granite (displaying S-C structures, with dextral NNW-SSE shear planes) pass into diatexites and metatexites with garnet, cordierite and sillimanite-bearing melanosomes. Leucosomes seem to have mainly granitic s.s. compositions, but cm-thick bands of leucotonalite were also found.

Major element geochemistry of granite samples shows the following ranges: 71.4% $\leq$ SiO_2 $\leq$ 74.2%; 0.74% $\leq$Fe2O$_3$t $\leq$ 2.48%; 0.35% $\leq$ MgO $\leq$ 0.60%; 0.49% $\leq$ CaO $\leq$ 1.32%; 2.90% $\leq$ Na2O $\leq$ 3.11%; 4.70% $\leq$ K2O $\leq$ 5.47%; 1.17 $\leq$ ASI $\leq$ 1.36. Trace element data reveal a strong fractionation between highly incompatible LILE and less incompatible HFSE (248 $\leq$ PM normalized Rb/Y $\leq$ 671) and between LREE and HREE (18.6 $\leq$ PM normalized La/Lu $\leq$ 54.7). These features, in particular the peraluminous composition, the high K contents and the distinct rare-earth fractionation suggest that the Oliveira de Azeméis granites are mostly the result of partial melting of metasediments with a large pelitic component and that garnet is a likely residual phase.

Isotope geochemistry data show that the previously reported isochron should not correspond to a true age since the 87Sr/86Sr(380Ma) obtained in the granite samples analysed in the present work are very low, varying from 0.6978 to 0.7063, with an average value of 0.7023, which are unrealistic in S-type granitic melts. Probably, the ∼380 Ma date is the consequence of mixing of different melt source components in the samples used in its calculation. Using the granite whole-rock samples collected in this work, a 328±28 Ma errorchron (MSWD=4.0; initial 87Sr/86Sr=0,7106±0.0045) is now obtained.

Assuming a typical syn-tectonic Variscan age of 320 Ma for the studied granites, 87Sr/86Sr and εNd range from 0.7100 to 0.7133 and from -6.5 to -7.9, respectively. A micaschist sample collected in this area displays 87Sr/86Sr(320Ma) = 0.7146 and εNd(320Ma) = -9.2. Therefore, the Sr and Nd isotope composition agrees with the clearly dominance of a melt component derived by anatexis of a metapelitic source.

Two samples of a garnet-bearing (and comparatively zircon-rich) diatexite show 87Sr/86Sr(320Ma) values (0.7120 and 0.7102) similar to those found in granites, but have higher εNd(320Ma): -2.0 and -1.6. This may be explained by either (a) the involvement of a different source in the genesis of this diatexite or (b) the occurrence of Nd isotope disequilibrium during the melting process, with the preservation of high 143Nd/144Nd ratios in refractory phases such as garnet and/or zircon.

A Rb-Sr wr-feldspar-biotite-muscovite isochron of 301.2±5.6 Ma (MSWD=0.42; initial 87Sr/86Sr=0,71516±0.00074) in a granite sample is interpreted as recording the final stage of the operation of the shear zone, which was accompanied by mica recrystallization.

Funding: projects Petrochron (PTDC/CTE-GIX/112561/2009) and Geobiotec (PEst-C/CTE/UI4035/2011).

References

Pereira E. et allia (2007) – Carta Geológica 1/50000 de Oliveira de Azeméis. INETI, Lisboa.
Pinto M.S. (1979) – PhD Thesis. Univ. Leeds