



AMS studies in Portuguese variscan granites

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A large volume of Variscan granitic rocks outcrop in Central Iberian Zone which are well documented concerning geological mapping, petrography and geochemistry but whose magnetic characteristics and fabric remain unknown. In this study we summarize the available AMS data from approximately 644 sampling stations (5152 samples) on different massifs of Variscan Portuguese granites.

Despite their different geological, petrographic and geochemical characteristics, magnetic susceptibility (K) values obtained for the majority of the studied granites range from 15 to 300×10^{-6} SI. The dominant paramagnetic behaviour of the granite bodies reflects the presence of ilmenite as the main iron oxide. This feature indicates the reduced conditions involved in the granite melt formation during the Variscan orogeny. The two-mica granites show K values ranging between 15 to 70×10^{-6} SI which are lower than values displayed by the biotite-rich facies scattered within the interval of 70 and 300×10^{-6} SI. The magnetite-bearing granites are scarce but represented in Lavadores, Gerês and Manteigas. Even so, only the Lavadores body could be considered as a true magnetite-type granite ($K > 3.0 \times 10^{-3}$ SI) in face of its K , comprised between 1550 and 19303×10^{-6} SI.

Magnetic anisotropy can be used as a "marker" for the deformation experienced by granite mushes during their crustal emplacement and further cooling. Magnetic anisotropy can thus be correlated with the finite deformation of a rock, as record by mineral fabrics. Post-tectonic granites, such as those from Vila Pouca de Aguiar, Pedras Salgadas, Caria, Vila da Ponte, Chaves and Lamas de Olo, have a magnetic anisotropy $< 2.5\%$ which corresponds to a deformation hardly visible to the naked eye. Nevertheless, at microscopic scale, these granites display almost ubiquitous magmatic to submagmatic microstructures (rare wavy extinction in quartz, erratic subgrain boundaries in quartz and, eventually, folded or kinked biotites). For the two syntectonic mica granites, granites from Porto or Gralheira, the magnetic anisotropy ranges between 5% and 6%, showing high to medium temperature solid-state deformation microstructures (like square-shaped quartz subgrains, recrystallized quartz grains, coupled by kinked biotites and bands of quartz surrounded by mica flakes). In the late to post-tectonic granite bodies, such as those from Castro Daire, Valpaços, Castelo Branco, Mangualde-Trancoso or Serra da Estrela, the magnetic anisotropy falls within the 2.5% and 5% range. The magnetic anisotropy of the Lavadores granite is always higher than 10%. This feature, however, reflects the presence of rough alignments of magnetite co-existent with magmatic to submagmatic microstructures.

The shape parameter T is quite variable; however, the average values, for all the massifs, are always higher than zero, suggesting the presence of oblate AMS ellipsoids due to the magnetocrystalline anisotropy of biotite.

The values of magnetic susceptibility and magnetic anisotropy allowed a petrophysical characterization of the paramagnetic Variscan granites as was proposed by Sant'Ovaia & Noronha (2005).