Compositional trends in tourmalines from granites and quartz-tourmaline rocks from the Penamacor-Monsanto pluton (Eastern Central Portugal)

I. Ribeiro da Costa¹,², I.M. Antunes³, F. Guimarães⁴, J.M. Farinha Ramos⁵, C. Recio⁶, F.J.A.S. Barriga¹,², C. Mourão²*

¹ Departamento de Geologia, Faculdade de Ciências da Universidade de Lisboa, Portugal, isabelrc@fc.ul.pt, fbarriga@fc.ul.pt
² CREMINER/LARSyS (Lab.Assoc.), Portugal, Farinha.Ramos@ineti.pt, ccmourao@fc.ul.pt (*presenting author)
³ Escola Superior Agrária, Instituto Politécnico de Castelo Branco, Portugal, imantunes@ipcb.pt
⁴ LNEG: Laboratório Nacional de Energia e Geologia (S. Mamede de Infesta), Portugal, fernanda.guimaraes@lneg.pt
⁵ Servicio General de Isótopos Estables, Facultad de Ciencias de la Universidad de Salamanca, Spain, crecio@usal.es

Abstract

Peraluminous two-mica granites are predominant in the late-Hercynian Penamacor-Monsanto pluton [1], intrusive into a massive schist-greywacke sequence, and most marginal granites contain tourmaline, hinting at late-magmatic boron-metasomatism. This is further supported by occurrences of quartz (± mica) -tourmaline rocks along the narrow contact aureole. Tourmaline colour and colour zoning patterns are related to Ti abundance and Fe/Mg ratios, according to X-ray mapping. Notwithstanding ubiquitous late crystallization of euhedral to subhedral tourmaline in the marginal granites, textural and X-ray compositional evidence suggest that some tourmaline may nucleate on biotite and eventually replace it. Given their high proportion of X-site vacancies (58 to 78%), tourmalines from marginal granites are classified as foitites and those in the quartz-tourmaline rocks as foitites and Mg-foitites. Schorl-type substitution predominates over elbaite-type substitution, especially in granite tourmalines, which tend to be richer in Fe²⁺ and Al (± Mn) and poorer in Mg and Na (± Ca, Cr, V, Ti) than tourmalines from quartz-tourmaline rocks. In spite of their chemical differences, both tourmaline populations seem to bear a close genetic relationship, as evidenced in the (Fe+Mn)/(Fe+Mn+Mg) vs. Al(AI+Mg+Li) linear trend, strongly suggesting that the same late-magmatic, B-enriched aqueous fluid was involved in their genesis.

Analytical and isotopic work currently in progress will soon add to these preliminary results on the Penamacor-Monsanto tourmalines.

We acknowledge financial support of PTDC/CTE-GIX/116204/2009.


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