

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

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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 (\pm 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 (\pm Mn) and poorer in Mg and Na (\pm 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/(Al+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.

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[1] Neiva, A.M.R & Costa Campos, T.F. (1993) *Mem. Not. Publ. Mus. Lab. Mineral. Geol. Univ. Coimbra* **116**, 21-47.

An integrated study with benthocosms on the impact of different functional groups of macrofauna on benthic N-processes in coastal sediments of the St. Lawrence Estuary

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Previous studies in the Laurentian Channel revealed that 2/3 of the dissolved oxygen depletion of bottom water is caused by changes in ocean circulation patterns in the northwestern Atlantic [1]. Nevertheless, elevated organic matter fluxes to the seafloor, from eutrophication due to enhanced fertilizer use in the watershed, could also increase locally the bottom water and sedimentary oxygen demand. The aim of this study was to improve the knowledge of the N budget in the coastal environments of the St Lawrence Estuary in order to better evaluate system's capacity to buffer anthropogenic N loading. Some studies showed that macrofauna of these coastal environments have an impact on benthic biogeochemical fluxes. Develop the understanding on complex interactions between sediment and benthos requires the use of innovative approaches because fauna activity and patchy distribution of organic matter introduce another level of complexity and initiate a heterogenic pattern of microzones. In this perspective, a closed-circulation, water jacket-insulated laboratory basins, called benthocosms, were used to preserve sediment mesocosms of 0.16 m² surface area, with controlled conditions of salinity and temperature. 5 different treatments were set up to specify the impact of different functional groups of macrofauna on nitrification, denitrification, anammox. A treatment without fauna was compared to a treatment with biodiffusers (*Mya arenaria* and *Macoma balthica*) and to a treatment with biodiffusers + gallery-diffusers (*Nereis virens*). Additional treatments were amended with NH₄⁺ to mimic NH₄⁺ excretion by organisms or with allylthiourea to inhibit nitrification by sediment bacteria. Fluxes of O₂, NO₃⁻, NO₂⁻, NH₄⁺ have been determined by incubations. O₂ profiles were realised with microelectrodes and the vertical distributions of NO₃⁻, NO₂⁻, NH₄⁺ were measured on porewater extracted by centrifugation. Isotope Pairing Technique was used to determine denitrification, anammox rates.

[1] Gilbert et al. (2005) *Limnology and Oceanography* **50(50)**, 1654-1666. [2] Michaud et al. (2005) *Journal of Experimental Marine Biology and Ecology* **326**, 77-88. [3] Michaud et al. (2009) *Journal of Marine Research* **67**, 43-70.