MAGMATIC AND POST-MAGMATIC TEXTURES OF REE-RICH ACCESSORY MINERALS IN GRANITES AND GREISENS FROM THE A-TYPE GRACIOSA PROVINCE, SE-BRAZIL

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ABSTRACT: The textural study of accessory minerals is a major tool to understand the magmatic and post-magmatic processes involved in the evolution of granitic melts. We report a detailed textural and mineralogical (optical microscopy, SEM/EDS) examination of the accessory mineral assemblages of representative samples from the Mandira and Guaraú massif granites, which are relevant occurrences to study the hydrothermal overprint related to the Neoproterozoic (*ca.* 580 Ma) post-collisional A-type Graciosa Province (S-SE Brazil). The selected samples are representive of metaluminous to moderately peraluminous biotite(±calcic-amphibole)-bearing syenogranites, peralkaline hypersolvus sodic and/or sodic-calcic amphibole-bearing alkali-feldspars granites, and quartz-mica greisens. The primary (magmatic) accessory minerals in granitic rocks are allanite, astrophyllite, apatite, chevkinite, fluorite, gagarinite, ilmenite, magnetite, Nb-bearing minerals, titanite and zircon, while allanite, astrophyllite, bastnäsite, ilmenite, monazite, fluocalciobritholithe, fluoyttrocerite, stilpnomelane, thorite, xenotime and zircon occur as hydrothermal phases. On the other hand, the accessory assemblage of greisens is characterized by bastnäsite, cassiterite, chalcopyrite, columbite-tantalite, fluorite, ilmenorutile, galena, monazite, sphalerite, xenotime and zircon. Our focus is on REE-rich allanite, chevkinite, monazite, xenotime and zircon minerals, which record the main textural transformations and compositional variations during the hydrothermal activity. Allanite in metaluminous granites usually show magmatic oscillatory zoning as well as irregular, patchy zoning patterns reflecting post-magmatic alterations; it is commonly overgrown by epidote and stilpnomelane. In contrast, post-magmatic allanite is restricted to the peralkaline granites where crystals are strongly altered displaying abrupt and sharp contacts, micro-cracks and metamictic zones; it also include aggregates of either fluocalciobritholite, fluoyttrocerite or Fe-Ti oxides. Chevkinite occur only in the peralkaline granites, it generally shows distinct brighter and darker domains that indicate replacement and altered textures; some crystals have tiny zircon inclusions, corroded margins and occur partly to fully replaced by secondary minerals mainly bastnäsite, stilpnomelane and ilmenite. Magmatic zircon is an abundant phase in syenogranitic rocks and forms two main textural types. The first type usually appears as inclusions in ferromagnesian minerals, crystals commonly includes apatite and display weak oscillatory zoning, sometimes with embayed margins which are often filled etiher by apatite or ilmenite intergrowths suggesting co-crystallization process. The second type is represented by individual crystals along the groundmass that generally show irregular domains with magmatic core (partly altered), partially disolved rims and convolute zoning. This zircon type in often characterized by strong radiation damage that could be a response to the increase of Hf around their margins. Conversely, post-magmatic zircon is more common in peralkaline granites and greisens, it forms large crystals with strongly developed replacement domains, spongy textures and recrystallized abrupt metamictic rims. The crystals are commonly associated with monazite, REE-fluorides, thorite and xenotime.

Finally, monazite and xenotime are characterized by irregular grains that usually occur either as inclusions, exsolutions or intergrowths around zircon rims, sometimes overgrown with REE-fluorides in mafic agreggates.

KEYWORDS: REE-rich accessory minerals, metamictic transformations, A-type granites and greisens