

Zr-rich minerals in syenites from the Central Igneous Complex of Boa Vista Island (Cape Verde)

CECILIA PÉREZ-SOBA¹, CARLOS VILLASECA^{2,3}, DAVID OREJANA² AND MARÍA GARCÍA-RODRÍGUEZ²

¹Dpt. Mineralogía y Petrología (Universidad Complutense Madrid)

²Dpto. Mineralogy and Petrology (Complutense University of Madrid)

³Instituto de Geociencias IGEO (UCM, CSIC)

The Cape Verde archipelago lies above a hot-spot located beneath a 120 km thick oceanic lithosphere since Miocene. The Boa Vista Island stands out for having the most felsic central igneous complex of the archipelago, reaching 50% of the total island surface. In this work, we study six syenite intrusions, which are scarce in the oceanic context. Three main syenite groups are distinguished, without clear compositional relationships among them: biotite (Bt) syenites (peraluminous), clinopyroxene (Cpx) syenites (metaluminous) and nepheline (Ne) syenites (broadly peralkaline). This last group lacks (Cl, OH)⁻-Na-Ca-rich Zr-silicates typical of agpaitic rocks (eudialyte-group minerals, EGM, e.g., [1]), but it has rare zircon and scarce titanite, typical of miaskitic rocks.

The composition of some mafic minerals in Ne- and Cpx-syenites highlights for reaching exceptional ZrO₂ contents: 11.08 wt% in titanite from Cpx-syenites, and in Ne-syenites, 18.34 wt% in augite aegirine/aegirine, 22.48 wt% in lāvenite and 0.59 wt% in sodium amphibole (katophorite and magnesioarfvedsonite). Only in Bt-syenites is Zr hosted mainly in zircon. Although some zircon crystals appear in all groups, it is only clearly magmatic in Bt-syenites.

Zr solubility is high in peralkaline melts, and it concentrates in residual fractions until the formation of Zr-rich complex minerals [2]. The early precipitation of zircon (appearing included in biotite) in the peraluminous Bt-syenites (Zr = 1017-2096 ppm in whole-rock) avoids the crystallization of other Zr-rich minerals. In the other two syenite groups, of higher alkalinity, the Zr content is relatively low both in Cpx-syenites (201-463 ppm) and Ne-syenites (445-651 ppm). Moreover, these rocks show extremely low Cl⁻ and OH⁻ contents (F⁻ is the main anion in amphibole, biotite and apatite), and clinopyroxene replaces amphibole in Ne-syenites, suggesting low *a*H₂O. Indeed, Ne-syenites shows relatively more oxidizing conditions than Cpx-syenites. These conditions would inhibit the crystallization of typical tracers of agpaitic rocks (i.e., EGM) in the more peralkaline melts, supporting the incorporation of Zr in augite-aegirine (Na-Fe³⁺-rich) of Ne-syenites, and in titanite of Cpx-syenites.

[1] Sørensen H, 1997. *Mineralogical Magazine* 61, 485-498.

[2] Watson, E.B. 1979. *Contributions to Mineralogy and Petrology* 10, 407-419.