

TEXTURE AND COMPOSITION OF THE CRYSTAL CARGO IN ULTRABASIC DIKES FROM SERRA DO MAR ALKALINE PROVINCE, SE BRAZIL

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ABSTRACT: Two ultrabasic compositions with potassic-affinity of the Serra do Mar Alkaline Province dike swarm were mineralogically and petrographically detailed to identify crystal populations and to have a better understanding of the magmatic system. The major and minor mineral compositions were determined by FE-EPMA, which are linked with textural features using BSE images. The samples correspond to a basanite ($Mg\#=72= Mg/(Mg+Fe^T)$, molar) and a tephrite ($Mg\#=58$), which are close-to-primary magmas and enriched in LILE and HFSE relative to primitive mantle. Both samples are porphyritic with a fined-grained groundmass of clinopyroxene, Fe-Ti oxides, feldspar, and apatite. However, these samples show mineralogical differences between them, where the basanite has olivine as macrocrystals and alkali-feldspar in the matrix whereas the tephrite (olivine-free) has clinopyroxene and plagioclase, respectively. Olivine shows a wide range of forsterite contents (Fo: from 90 to 85) and minor elements (Ni: from 3000 to 1000 ppm and Mn: from 1000 to 2000 ppm). Also, they are characterized by their lower Ca content (>280 ppm). The primitive olivine is subhedral and compatible with mantle olivine whereas the euhedral crystals are less magnesian and they are in chemical equilibrium with the groundmass. The clinopyroxene shows variable composition as well as textural and zoning patterns. They are diopside ($Mg\#=90$) to ferroan diopside ($65 \leq Mg\# \leq 80$) with low acmite content ($Na < 0.05$ a.p.f.u), but the macrocrystals have lower Ti/Al^T ratio (0.18) than the crystals in the groundmass (0.21 for tephrite and 0.30 for basanite). The diopside shows anhedral cores and their composition is compatible with lithospheric mantle clinopyroxene, while ferroan diopside with subhedral cores is more associated with lower crust. On the other side, feldspars occur in the groundmass as euhedral crystals with slightly zoning patterns. Alkali-feldspar corresponds chemically to Ca-Na-sanidine and plagioclase is labradorite-bytownite. Based on our mineral-scale study, primitive macrocrystal cargoes comprise xenocrysts, while the other more evolved are antecrysts that crystallized in earlier events from progenitor magma. In both cases only rims are in geochemical equilibrium with the alkaline magma. These results suggest the complexity of the magmatic processes during the evolution of the province and are the key to understanding them, in which magmas and their crystal cargo come from variable depths.

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