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TRACE ELEMENT COMPOSITION OF MAFIC CUMULUS MINERALS AS CLUES TO THE PARENTAL MAGMA COMPOSITION AND MANTLE SOURCE MINERALOGY OF THE JUQUIÁ ALKALINE-CARBONATITE COMPLEX, SE BRAZIL

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Major and trace element analyses of relict cores of cumulus minerals (olivine and clinopyroxene) from primitive rocks of the Juquiá mafic-ultramafic alkaline-carbonatite complex (Early Cretaceous) in the Ponta Grossa Arch alkaline province, southeastern Brazil, are used to calculate the equilibrium melt compositions. Olivine relict cores are compositionally restricted to the Fo83-74 interval, and show significant concentrations of Mn (2220-3001 ppm), Ni (1188-2327 ppm), Ca (175-649 ppm), Co (169-215 ppm), Zn (115-215 ppm), Ti (55-305 ppm), Cr (4-320 ppm) and P (30-154 ppm). Clinopyroxene relict cores are basically represented by diopside, with minor amounts of hedenbergite and tschermakite components. Important trace elements in the mineral consist of Ni (195-339 ppm), V (100-319 ppm), Sr (84-260 ppm), Zr (12-163 ppm), Sc (49-76 ppm), P (16-118 ppm), Zn (15-48 ppm) and Co (25-43 ppm). The REE concentration is variable, from 28 to 240 ppm, being the light elements more abundant, particularly Ce (up to 83 ppm).

The melt compositions in equilibrium with clinopyroxene cores from different samples suggest that distinct basanite magma batches have played a role in the formation of the Juquiá cumulate rocks. Some of these calculated liquids have quite similar compositions to the nearby lamprophyre dikes. The CaO/Al_2O_3 ratios (>0.8) from the lamprophyre dikes and the incompatible element ratios from the calculated liquids (e.g., high La/Zr, high Sr/Sm, low Ti/Eu) points to a previous carbonatite metasomatic event in the source. This event could lead to the formation of clinopyroxene-rich veins accompanied by K-bearing phases (amphibole and/or phlogopite) in a peridotite mantle. These veins also should have titanates, as suggested by the low abundances of Nb, Ta and Ti in the calculated liquids. The relatively high $(La/Yb)_N$ for the calculated liquids could also be attributed to the presence of residual garnet in the source. Non-modal mantle batch-melting models suggest that the differences found for the calculated liquids of this occurrence represent a mixing between high degrees of partial melting of metasomatic veins and low-degrees of partial melting of a garnet lherzolite source.

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