

Crustal contamination recorded by zoned plagioclase in primitive Karoo flood basalts, Mozambique

M.A. AALTONEN^{1*}, A.V. LUTTINEN² AND S.T. TURUNEN²

¹Dept. Geosciences and Geography, P.O. Box 64, 00014 University of Helsinki, Finland (*correspondence: milla.aaltonen@helsinki.fi)

²Finnish Museum of Natural History, P.O. Box 44, 00014 University of Helsinki, Finland

A series of picritic and basaltic lavas from the Luenha River, Mozambique, may represent an important parental magma type of the Jurassic (ca. 182 Ma) Karoo flood basalt province, but the uncertain origin (alteration, contamination, or source heterogeneity) of notably variable initial $^{87}\text{Sr}/^{86}\text{Sr}$ complicates characterization of the primary magma compositions [1].

We have examined the origin of the Luenha picrites using plagioclase phenocrysts as tracers of magma chamber processes. We used a cold-CL microscope and electron microprobe for mapping of compositional zonation in plagioclase phenocrysts in six lava flows, and a LA-MC-ICPMS for in situ measurements of $^{87}\text{Sr}/^{86}\text{Sr}$ in the phenocrysts and the bulk groundmass. The anorthite content of plagioclase cores (n = 65) is within An_{90-62} and core to rim variations reveal normal-, oscillatory-, and reverse zoning. The initial $^{87}\text{Sr}/^{86}\text{Sr}$ values of plagioclase phenocrysts are mainly less radiogenic (cores 0.70511–0.70671, n = 10; rims 0.70539–0.70709, n = 11) than the previously determined whole-rock ratios (0.70690–0.71019) [1] of the same lavas. Analyses of the bulk groundmass yielded similar results as the whole-rock data (0.70660–0.71061, n = 12).

The Sr isotopic compositions do not correlate with indications of secondary alteration. We ascribe variable $^{87}\text{Sr}/^{86}\text{Sr}$ in plagioclase phenocryst cores and rims and the groundmass to progressive contamination of fairly uniform parental magmas in the crustal magma plumbing system. Comparison between individual phenocrysts shows chemical and isotopic variations that most likely relate to convection or replenishment, or both. The plagioclase cores systematically have more radiogenic $^{87}\text{Sr}/^{86}\text{Sr}$ than the whole-rock compositions of an uncontaminated plagioclase phenocryst-free picrite lava (0.70410) [1], which suggests that crustal contamination began just before the onset of plagioclase crystallization.

[1] Turunen (2015) *Unpubl. MSc thesis Univ. Helsinki*, 85 p.