

Messages from the magma chamber: plutonic cumulate xenoliths from Cape Verde islands.

HILARY DOWNES^{1,2} AND KRIS PALUBICKI^{1,2}

¹Birkbeck University of London

²Natural History Museum

Plutonic xenoliths are abundant in silica-undersaturated highly alkaline lavas of the Cape Verde islands. They are magmatic cumulates, ranging from ultramafic compositions to feldspathoid-rich varieties with amphibole and biotite. The ultramafic xenoliths are composed of different proportions of olivine and clinopyroxene, with minor amounts of Cr-spinel, Ti-magnetite, mica and apatite, and are entirely free of orthopyroxene. Many are cross-cut by veins of either clinopyroxene or phlogopite (occasionally both). Although some xenoliths have experienced deformation, others retain clear cumulate textures, with minor fresh interstitial glass which varies from basanite to phonolitic in composition. The ultramafic xenoliths range from pure dunite (olivine $\pm$ Cr-spinel) through wehrlite (olivine $>$ clinopyroxene + Cr-spinel/Ti-magnetite), to olivine clinopyroxenite (clinopyroxene + Cr-spinel/Ti-magnetite $>$ olivine) to pure clinopyroxenite (clinopyroxene + Ti-magnetite). More evolved xenoliths contain clinopyroxene + amphibole + titanite + apatite + feldspathoids $\pm$ biotite. The order of crystallisation is identical to the three stages of fractionation deduced for the magmatic evolution of the basanitic-foiiditic magmas in the island of Fogo, Cape Verdes, as indicated by their phenocryst assemblages (Rolfe-Betts et al., 2024). REE distribution coefficients for clinopyroxene have been calculated from LA-ICP-MS data for phenocrysts and host lavas. When applied to the trace element analyses of clinopyroxenes in the ultramafic xenoliths, they indicate that the xenoliths crystallised from magmas similar those of the alkali basaltic lavas. We therefore conclude that these xenoliths were derived from a semi-crystallised magma mush formed from magmas similar to their host lavas in magma reservoirs within the volcanic edifices, and are an important link between plutonic and volcanic processes.

Rolfe-Betts, B., Day, S.J., Downes, H., Millar, I. and Palubicki, K., 2024. Compositional variations in shield-stage volcanism in Fogo, Cape Verde islands. *Journal of Volcanology and Geothermal Research*, 446, p.107996.