Origin of patchy zoning in clinopyroxenes from plutonic xenoliths of Isparta (Gölcük)

EFE AKKAŞ[1*], LUTFIYE AKIN[1] AND H. EVREN ÇUBUKÇU[1]

[1]Hacettepe University, Department of Geological Engineering, 06800 Beytepe, Ankara, Turkey (*correspondence: akkasefe@hacettepe.edu.tr) (lutfiye_akin@hacettepe.edu.tr, ecubukcu@hacettepe.edu.tr)

Patchy zoned clinopyroxenes have been observed in ultramafic-felsic plutonic xenoliths (pyroxenites, diorites, monzonites, syenites) in to the potassic-ultrapotassic volcanic units (ignimbrites, hydrovolcanics) of Gölcük volcano (Isparta, Turkey). Patchy zones have been characterized by irregular, diffusive/sharply bounded, compositionally discrete zones which have been observed as bright and dark areas in backscattered electron (BSE) view of SEM. Generally bright (Fe-rich) patches have surrounded darker (Mg-rich), irregular and resorbed cores of the crystals.

EPMA results revealed that the dark zones have lower $Al^{[IV]}$ (<0.15 p.f.u.) and higher Ca (up to 0.9 p.f.u.) with high Mg# (80-96). On the other hand, the bright patches have been characterized by higher Fe^{+2} (c. 0.35 p.f.u.), Na (c. 0.1 p.f.u.) and broad range Mg# (32-83) with high $Al^{[IV]}$/ $Al^{[VI]}$ ratios (up to 2.1). Low $Al^{[IV]}$ and high Mg# values indicate that dark patches have crystallized from primitive magma under considerable higher pressure conditions (c.11±2.0 kbar) [1, 2]. Higher Fe^{+2}, Na and $Al^{[IV]}/Al^{[VI]}$ contents of bright patches point out that their crystallization have been controlled by lower pressure conditions (c.9±0.6 kbar) [3, 4]. Clinopyroxene thermobarometry from amphibole and plagioclase bearing series (xenoliths and volcanics) have demonstrated a wide range of pressure conditions between pyroxenites (11.7±1.0 kbar) and volcanics (2.9-5.7±2.2 kbar). These results have showed that patchy zoned clinopyroxenes have been affected by decompression and also re-equilibriation processes during the ascend of magma from sub-continental depths (c.36 km).

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