1.2.P08

Li, Be and B in dacitic rocks from Nea Kameni, Santorini, Greece

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Nea Kameni is the larger of two intracaldera islands built by the historic eruptions of Santorini, the most active volcanic centre of the Quaternary Hellenic Arc in the continental Aegean microplate [1,2]. Subaerial lavas of these islands are uniformly dacitic [3,4] and were erupted from 197 BC to AD 1950. In this study, 6 dacite samples from selected sites were investigated by EMPA and SIMS to recognise magma chamber processes.

Plagioclase phenocrysts (An_{63-40}) have variable concentrations of Li, Be and B, hardly correlating with An content. Li values are 6.5-9.8 µg/g at the rims, reaching to 23.4 µg/g in the core of strongly zoned grains. The abundances of Be and B are 0.23–0.97 and B 0.08–0.60 µg/g, respectively. The compositions of plagioclase rims and surrounding glassy to microcrystalline matrix yield apparent partition coefficients ($D^{pl/melt}$) of 0.19-0.33 (Li), 0.27-0.37 (Be) and 0.006-0.04 (B).

Clinopyroxene phenocrysts (Mg# = 72-68) display a core-to-rim increase in Li with values of about 2.5 µg/g in the core, and a maximum of 13.7 µg/g Li at the rim. Be and B show no systematic variation, both with concentrations of 0.13-0.21 µg/g. Apparent cpx-rim/melt partition coefficients for Li vary from 0.07 to 0.41 and those for Be and B are c. 0.06 and 0.008, respectively.

Orthopyroxene phenocrysts (Mg# = 66-58) are of two populations: Type-1 crystals with flat to slightly concave upward Li zonation patterns having c. 1.7 µg/g Li in the core and 2.1-2.7 µg/g Li at their rims. Type-2 phenocrysts show a core-to-rim decrease in Li having up to 15.6 µg/g Li in the core and c. 6.5 µg/g Li at the rim. Orthopyroxenes do not show systematic variations in Be and B. Apparent opx-rim/melt partition coefficients for Li are 0.07 for type-1 and 0.16 for type-2 crystals. Partition coefficients for Be and B are c. 0.015 and 0.007, respectively.

One *olivine* phenocryst (Mg# = 66-77) shows a zonation in Li with 1.3-1.8 µg/g in the core to 5.7 µg/g at the rim. Likewise, Be and B concentrations increase from 0.001 to 0.006 µg/g and from 0.05 to 0.110 µg/g, respectively. Olivine rim/matrix partition coefficients are 0.06-0.14 (Li), 0.002 (Be) and 0.003-0.004 (B).

References

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1.2.P09

O and He constraints on the source of Cenozoic primitive magmas in West Antarctica

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Cenozoic volcanism in West Antarctica (Marie Byrd Land and Ross Sea) has been attributed to: (1) the occurrence of upwelling plume(s) thinning the lithosphere, (2) the reactivation of pre-existing translithospheric faults, which promoted local decompression melting of a veined and enriched mantle.

In the frame of previous determinations of radiogenic isotope ratios measured on primitive lavas (Miocene-Recent) from northern Victoria Land (0.70283-0.70335 $^{87}Sr/^{86}Sr_{whole-rock}$, 0.51287-0.51298 $^{143}Nd/^{144}Nd_{whole-rock}$, 19.3-19.7 $^{206}Pb-^{204}Pb_{whole-rock}$), this study documents O and He isotopic compositions of olivine phenocrysts separated from the same set of near-primary magmas. Oxygen isotope ratios vary within the range $\delta^{18}O$ = 4.92 to 5.53‰. Helium isotope ratios vary from R/Ra = 2.3 to 7.2 (where R is the $^{3}He/^{4}He$ ratio and Ra the atmospheric ratio). The heterogeneous range observed in $\delta^{18}O$ and the positive correlation with $Fo_{olivine}$(% mol.) suggest that a low $\delta^{18}O$ component was added during olivine crystallisation over a limited T range (1300-1200°C) at mantle depth. $^{3}He/^{4}He$ determinations do not show any evidence of a deep mantle component, being R/Ra even lower than the MORB.

In these primitive lavas, major and trace element distributions are typical of Oceanic Island Basalts (OIB), with prominent K and Pb negative anomalies, while Sr, Nd and Pb isotopes suggest an HIMU signature.

On the other hand new data from O and He do not reflect the occurrence of a deep mantle component, but rather a source placed in an upper mantle domain, variously enriched by metasomatising asthenospheric melts.