# Nd-Sr-Pb Isotopic Geochemistry and Rb-Sr age for Late Cretaeous volcanic rocks in King George Island, Antarctica

YIN-XI WANG[1,2], HUI-MING LI[1], NIN-XI ZHAO[2], JIE-DONG YANG[1] AND YAN-BIN SHEN[3]

[1]Center of Modern Analysis, State Key Laboratory of Mineral Deposit Research, Nanjing University,Nanjing 21009, P.R. China (yxwang@nju.edu.cn)

[2]School of Geographic and Oceanographic Sciences, Nanjing University, 210093, China

[3]Nanjing Institute of Geology and Palaeontology, Academia Sinica, Nanjing 210008, China

## Introduction and Analytical Method

The samples used in this study were all collected from the Half Three Point Formation of the Fildes Peninsula, King Geoge Island, Antarctica and were attributed to the Upper Cretaceous formation. Analysis of Nd, Sr and Pb isotope compositions were performed on an automated multi-channel mass spectrometer VG 354 at Center of Modern Analysis, Nanjing University. $^{87}Sr/^{86}Sr$ = 0.710224±6 (2σ) for NBS987 standard. $^{43}Nd/^{144}Nd$ = 0.512465±6 (2σ) for BCR-1 standard. NBS981Pb:$^{206}Pb/^{204}Pb$=16.939±0.006,$^{207}Pb/^{204}Pb$=15.489±0.0 09 $^{208}Pb/^{204}$ Pb=36.698±0.029(n=20).

## Discussion of Results and Conclusion

Fitting together of Rb-Sr isochron dating of the tuffite samples measured result: t=71.33±0.3Ma, $^{87}Sr/^{86}Sr$ = 0.70314±10 (2σ). Thus, the age date is reliable, which indicate the stratigraphic age of the volcanic sedimentary rock from the Half Three Point Formation, coinciding with that of date indicated spore pollen [1]. It is further proved that the activity of the volcanic eruption in Fields Peninsula began at least in the Late Cretaceous and not in the Tertiary age. With $\varepsilon_{Nd}$ (t) of +5.53 ~ 6.15, $(^{87}Sr/^{86}Sr)_i$ of 0.703139 ~ 0.703148, $(^{206}Pb/^{204}Pb)_i$ of 18.028 ~ 18.316, $(^{207}Pb/^{204}Pb)_i$ of 15.329 ~ 15.462 and $(^{208}Pb/^{204}Pb)_i$ of 37.091 ~ 37.612, the tuffites are comparable in Nd, Sr and Pb isotopes to the basalt of the Lower and Middle Carboniferous Qijiaojing formation [2] and some mid mid oceanic ridge basalt ratio, and these matters were chielfly derived from the depleted mantle.

## References

[1] Shen Yan-Bin. 1991. *For the sixth international symposium*, ed. by Japan National PR Ins.

[2] Wang Yinxi,, *et al*. 2006. *Acta Petrologica Sinica.* **22**(5):1215-1224

# Putting diffusive Re-Equilibration to work: Determination of entrapment pressures of olivine-hosted melt inclusions

ZHENGRONG WANG, GLENN GAETANI AND NOBU SHIMIZU

Woods Hole Oceanographic Institution (zwang@whoi.edu; ggaetani@whoi.edu; nshimizu@whoi.edu)

Silicate melts entrapped in olivine phenocrysts provide snapshots of melt generation, transport and mixing processes. The range of compositional and isotopic variability they preserve far exceeds that in erupted lavas, demonstrating partial melting is near-fractional and the upper mantle is heterogeneous. However, the conditions at which these diverse melts are aggregated to produce basaltic lavas remain an open question. Here we present a new method for determining the entrapment pressures of olivine-hosted melt inclusions and, thereby, constrain the conditions at which mantle melts aggregate prior to eruption. Application of this approach to melt inclusions from the Western Reykjanes Peninsula indicates that they formed at pressures of 2-4 kbars.

Entrapment pressures are determined by first heating inclusion-bearing olivines at the estimated liquidus temperature of the host lava for several days to produce local equilibrium between the inclusion and adjacent crystal. The major element composition of structurally intact inclusions and the adjacent olivine are then determined by electron microprobe. These compositions and the furnace temperature are used to solve for pressure using a new model for the partitioning of Fe and Mg between olivine and silicate melt, calibrated using both new experiments and those from the literature.

This approach has been applied to olivine-hosted melt inclusions from a picritic lava erupted on the Western Reykjanes Peninsula of Iceland. These inclusions have $K_2O/TiO_2$ ratios of 0.1405±0.0003 to 0.2545±0.0014, demonstrating that each represents a distinct melt, and that all are different from the host lava ($K_2O/TiO_2$ = 0.024). Our calculations indicate that these inclusions were entrapped at pressures of 2-4 kbar, so that aggregation of these diverse melts was a late-stage process that occurred at crustal conditions.