Evolution of recent trachytes from Sete Cidades volcano, São Miguel, Azores

E. CONTE* AND E. WIDOM

Dept. of Geology, Miami University, Oxford, OH 45056, USA (*correspondence: conteer@muohio.edu)

Sete Cidades volcano, on the island of São Miguel, Azores has produced 12 intracaldera, trachytic eruptions (Sete A-L) in the last 5, 000 years [1]. The petrogenetic evolution of the volcano over its ~200 ka lifetime has been studied from a broad perspective, but the processes and timescales occurring in the magmatic system over the last 5, 000 years are largely unexplored. Fogo volcano, a neighbouring trachytic stratovolcano, also has produced abundant trachytic eruptions over the past 5, 000 years. Early work suggested that these eruptions could have resulted from a single, evolving trachytic magma body [2], but more recent geochemical and isotopic studies of the individual deposits argue instead that injection of multiple batches of magma, followed by variable degrees of fractional crystallization (FC) and assimilation fractional crystallization (AFC) were the governing processes [3, 4]. Our research focuses on the petrogenetic processes responsible for the Sete A-L eruptions, including the rates at which FC, AFC and magma injection occur within the Sete Cidades magma chamber. Major and trace element analyses of whole-rock trachyte pumices from the Sete A-L deposits show limited major element variation (63% SiO_2), but ~2-fold variations of highly incompatible elements (e.g. Zr = 730-1240 ppm) and ~200-fold variations of compatible elements (e.g. Sr =.04-8 ppm), consistent with extensive sanidine fractionation. However, trace element abundances do not show progressive changes from Sete A to L, indicating that the trachytes did not result from a single evolving magma body, but rather from injection of multiple batches of magma followed by variable degrees of fractional crystallization.

[1] Booth *et al.* (1978) *Roy. Soc. Lon* **288**, 271–319. [2] Storey (1981) *Cont. Min. Pet* **78**, 423–432. [3] Snyder *et al.* (2007) *Chem. Geol.* **239**, 138–155. [4] Snyder *et al.* (2004) J. Petrol. **45**, 723–738.

Cosmic-ray exposure history of pallasite metal

D.L. COOK[1,2]*, G.F. HERZOG[2], L. HUBER[3] AND I. LEYA[3]

[1]Univ. Oxford, Oxford, OX1 3PR UK (*correspondence: davec@earth.ox.ac.uk)
[2]Rutgers Univ., Piscataway, NJ 08854, USA
[3]Physik. Inst., CH 3012 Bern, Switzerland

Most previously determined cosmic-ray exposure ages of pallasites are based solely on noble gas measurements [1]. Such ages suffer from ambiguous shielding corrections and uncertain production rates. Following on our earlier work [2], we report ^{26}Al concentrations in pallasite metal and cosmic-ray exposure ages based on ^{36}Cl- ^{36}Ar systematics.

Large metal pieces (≈ 1 g) free from silicate inclusions were sawn from whole rock samples. The metal was polished with SiC to remove any surface corrosion. Next, interior pieces were sawn to give samples of ≈ 45 mg. After the addition of Al, Be, Ca, and Cl carriers, the metal chips were digested in 1 M HNO_3 at room temperature. The elements of interest were separated using a combination of precipitations and ion exchange chromatography and the radionuclides were measured by AMS at PrimeLab (Purdue University). Separate metal chips (≈ 100 mg) were sawn for noble gas measurements (Univ. of Bern).

To date, 11 samples from 10 pallasites have been analyzed for both radionuclides and noble gases. The mean ^{26}Al activity of 2 ± 1 (1-σ) is approximately half the value (3 to 4 dpm/kg) in iron meteorites and chondrite metal [3]. This result is consistent with our earlier findings for ^{10}Be and ^{36}Cl activities [2] and confirms heavy shielding in pallasites. A mean ^{10}Be activity of ≈ 2 dpm/kg suggests a minimum radius and depth of 40 cm. Cosmic-ray exposure ages based on ^{36}Cl-^{36}Ar for main group pallasites range from ≈ 5 to ≈ 153 Ma. There are two potential age clusters with a hiatus between ≈ 45 and ≈ 85 Ma. Eagle Station is distinct from the main group with a much older age of 388 ± 74 Ma. Analysis of two additional samples, and a replicate of Brenham, are in progress as are measurements of ^{41}Ca; the latter will help to constrain the terrestrial ages.

[1] Herzog (2004) *Treatise Geochem.* ***1***, 347–380. [2] Cook *et al.* (2009) *MAPS Suppl* **44**, 5331. [3] Vogt *et al.* (1990) *Rev. Geophys. Res.* **28**, 255–275.