

LUNAR VOLCANISM DURING THE ERASTOTHENIAN II: NWA 479

Fernandes, V. A.^{1,2,3} and Burgess, R.²; ¹Univ. Coimbra, Portugal; ²Univ. Manchester, UK; ³Univ. College London, UK (veraaferrandes@yahoo.com);

NWA 479 is paired with NWA 032 [1] and both were found in the Sahara Desert on the Morocco/Algeria border in 2000 and 1999. While the petrology of NWA 479 has not been published, Fagan et al [2] reported a comprehensive chemical and petrologic study of NWA 032. NWA 032/479 is an unbrecciated mare basalt containing phenocrysts of olivine, pyroxene, and chromite in a matrix of radiating pyroxene and feldspar crystals. The olivine phenocrysts make up ~12 vol% of the meteorite and are up to 300 μm in size and the pyroxene phenocrysts comprise ~5 vol%. Accessory phases include ilmenite, troilite, and trace Fe-metal. High-silica glass is present in abundant shock veins that permeate the meteorite crystals [2]. Shock pressures greater than 25 GPa are indicated by the presence of melt veins, maskelynitized feldspar, and mosaicism in olivine crystals [2]. Terrestrial weathering caused only minor alteration seen as reddish to orange colouration due to the presence of ferric oxide or oxyhydroxide. The bulk composition of NWA 032 does not overlap that of any known mare basalts, but is similar to Apollo 15 olivine basalt, and the olivine phenocrysts abundance is similar to that in Apollo 12 olivine basalts [2]. It shows low-Ti and lower MgO composition, and higher olivine phenocryst abundance than other mare basalt samples.

The Ar-Ar spectrum for NWA 479 (Fig.1) completely overlaps that of NWA 032. There is evidence for a disturbance event occurring at ~1.96Ga. Argon released between 400-750°C shows increasing apparent ages reaching a maximum of 3.208 ± 0.012 Ga. Following the interpretation of Ar data for NWA032 [3], the age spectrum of NWA 479 shows evidence of ³⁹Ar-recoil. On this basis a total age of 2.734 ± 0.01 Ga (2σ error) is calculated over the intermediate and high-temperature steps comprising ~90% K-release. This age is indistinguishable from the weighted mean age obtained from three samples of NWA 032 2.779 ± 0.028 [3]. An age of ~2.8 Ga is within the range of the second lunar volcanism peak, e.g. Erastothian flows within the Mare Imbrium or Mare Serenitatis [4,5], and its chemical composition indicates possible source areas in the Imbrim Basin (chemical maps by [6,7]). The CRE-age is 275 ± 4 Ma, which is slightly higher than that obtained for NWA032 (212 ± 11 Ma, [3]) suggesting a relative position of NWA 479 closer to the lunar surface.

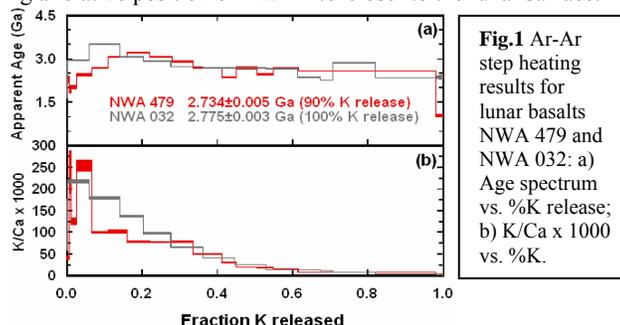


Fig.1 Ar-Ar step heating results for lunar basalts NWA 479 and NWA 032: a) Age spectrum vs. %K release; b) K/Ca x 1000 vs. %K.

Refs.: [1] Met Bull. 85 (2001) MAPS 36, A293-A32. [2] Fagan et al. (2002) 37, 371-394. [3] Fernandes, Burgess and Turner (2003) MAPS 38, 555-564. [4] Hiesinger et al. (2000) JGR 105, 29,239-29,275. [5] Hiesinger et al. (2003) JGR, 108, 5065. [6] Elphic et al. (2002) JGR 107 (E4), 8-1, 10.1029/2000JE001460. [7] Gillis et al (2004) GCA 68, No. 18, pp. 3791-3805.