CHEMICAL SIGNATURES IN BULK ELEMENT COMPOSITION FOR NORTHWEST AFRICA 2977

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Introduction: Northwest Africa (NWA) 2977 is an olivine gabbro cumulate which is composed of olivine, augite, and plagioclase with minor amounts of Ba-K feldspar, chromite, ilmenite, and merrillite [1]. It is reported that the Sm-Nd age of NWA 2977 is 3.10 ± 0.05 Ga, and this meteorite has KREEP-like trace element ratios [2]. Furthermore, it is reported that this meteorite is texturally and mineralogically equivalent to the olivine gabbro clasts as found in NWA 773 and NWA 2700, and these meteorites are paired with NWA 2977 [e.g. 3]. The Sm-Nd age of the olivine gabbro clasts in NWA 773 is 2.993 ± 0.032 Ga [4]. The olivine gabbro clasts in NWA 773 also have rare earth element (REE) abundance pattern similar to those of KREEP, but at lower concentrations [5, 6]. However, the bulk chemical composition of NWA 2977 has not been reported yet. Here we analyze major, minor and trace element compositions of NWA 2977 and compare the data with those of the olivine gabbro clasts in NWA 773.

Sample and Analytical Methods: A 382 mg lump specimen of NWA 2977 was used in this study. We performed bulk chemical analyses for NWA 2977 using neutron-induced prompt gamma-ray analysis and instrumental neutron activation analysis.

Results and Discussion: NWA 2977 has mafic element-rich and magnesian composition (FeO = 17.8 ± 0.1 %, MgO = 27.9 ± 1.7 %, Mg# = 73.6 ± 5.7 (Errors are due to counting statistics (1σ)). As for the composition of mafic elements, NWA 2977 is similar to the NWA 773 clasts, although NWA 2977 is slightly more magnesian than the NWA 773 clasts (Mg# = 68.9-71.5) [5, 6]. The plagiophile element contents in NWA 2977 (e.g. Al_2O_3 = 2.79 ± 0.04 %), are apparently lower than those in the NWA 773 clasts (e.g. Al_2O_3 = 3.8-5.3 %) [5, 6]. In addition, the Th content in NWA 2977 (0.53 ppm) is about three times less than that in the NWA 773 clasts (1.58 ppm) [5], although NWA 2977 also has a KREEP-like REE abundance pattern. These results indicate that the contents of plagioclases and KREEP components in NWA 2977 are lower than those in the NWA773 clasts.

The difference between chemical composition of NWA 2977 and that of the NWA 773 clasts indicates that KREEP-like materials and/or feldspathic crustal components were non-uniformly integrated into these rocks by the assimilation at the upper mantle or in the crust enroute to the surface, to make these rocks being composed of heterogeneous texture.

References: [1] Connolly H. C. et al. 2006. *Meteoritics & Planetary Science* 41:1383-1418. [2] Nyquist L. E. et al. 2009. Abstract #5347. 72nd Annual Meeting of the Meteoritical Society. [3] Bunch T. E. et al. 2006. Abstract #1375. Lunar and Planetary Science XXXII. [4] Borg L. E. et al. 2009. *Geochimica et Cosmochimica Acta* 73:3963-3980. [5] Jolliff B. L. et al. 2003. *Geochimica et Cosmochimica Acta* 67:4857-4879. [6] Fagan T. J. et al. 2003. *Meteoritics & Planetary Science* 38:529-554.