NOBLE GASES IN THE DHOFAR 489 LUNAR METEORITE.

Y. N. Miura[1] and K. Nagao[2]. [1]Earthquake Research Institute, University of Tokyo. E-mail: yayoi@eri.u-tokyo.ac.jp. [2]Laboratory for Earthquake Chemistry, Graduate School of Science, University of Tokyo.

Introduction: The lunar meteorite Dhofar 489, recovered from Oman in 2001, is a feldspathic crystalline matrix breccia with magnesian mafic silicates [1, 2]. We report here noble gas elemental and isotopic compositions, and discuss cosmic-ray exposure history and trapped noble gas component of the meteorite.

Sample and Experiments: A chip specimen was obtained from a block piece kept at National Science Museum, Tokyo. Gases were extracted stepwisely (6 steps : 600, 800, 1000, 1200, 1400 and 1750 ºC) from the 0.0442 g sample. Noble gas compositions were analyzed with a mass spectrometer (modified-VG5400) at the University of Tokyo.

Results and Discussion: The total concentrations (sum of all steps) are 1.9×10^{-6}, 7.3×10^{-7}, 1.6×10^{-7}, 1.6×10^{-9} and 8.2×10^{-11} cm^3STP/g for ^4He, ^{20}Ne, ^{36}Ar, ^{84}Kr and ^{132}Xe, respectively, which are at a lower range among those in lunar meteorites, e.g., [3]. The isotopic compositions of Ne indicate that Ne from 1000, 1200, 1400 and 1750 ºC is explained by the two component mixing between SEP and cosmogenic. Neon at low temperature steps is slightly moved toward the terrestrial atmospheric Ne. By least squares fitting of Ne data in the higher four temperature steps, we obtained $(^{20}Ne/^{22}Ne)_{trap} = 12.3$ (the intersection with the SW-SEP [4] line) and $(^{22}Ne/^{21}Ne)_c = 1.30$ (at $^{20}Nr/^{22}Ne = 0.85$). The trapped $^{20}Ne/^{22}Ne$ ratio is similar to SEP Ne found in lunar ilmenites and pyroxenes [4].

The elemental ratios of Ar/Kr/Xe show that solar noble gases were released at higher temperatures, particularly at 1400 and 1750 ºC, whereas majority of heavy noble gases at 600, 800 and 1000 ºC seems to be terrestrial atmospheric. The highest trapped $^{36}Ar/^{132}Xe$ and $^{84}Kr/^{132}Xe$ values are observed at 1750 ºC, which are ~7400 and ~15 after cosmogenic ^{36}Ar correction, respectively.

The concentrations of cosmogenic ^{21}Ne and ^{38}Ar are calculated to be 7.0×10^{-9} and 1.5×10^{-8} cm^3STP/g, respectively. The low abundance of $(^{21}Ne)_c$ as well as $(^3He)_c$ relative to $(^{38}Ar)_c$ indicates loss of light cosmogenic noble gases. Nishiizumi et al. [5] has reported that the transition time of Dhofar 489 is 6±2 kyr based on the radioactive nuclide measurements. This short exposure age produces only a small amount of cosmogenic noble gases (on the order of 10^{-11} cm^3STP/g adopting temporally the production rates of the feldspathic lunar highland breccia Yamato 86032), suggesting that most of cosmogenic noble gases have been produced on lunar surface.

References: [1] Takeda H. et al. 2002. *Meteoritics & Planetary Science* 37:A159. [2] Takeda H. et al. 2004. Abstract #1222. 35th Lunar & Planetary Science Conference. [3] Greshake A. et al. 2001. *Meteoritics & Planetary Science* 36:459-470. [4] Benkert J.-P. et al. 1993. *Journal of Geophysical Research* 98, E7:13147-13162. [5] Nishiizumi K. et al. 2004. Abstract #1130. 35th Lunar & Planetary Science Conference.