NOBLE GASES IN TWO FRAGMENTS OF DIFFERENT LITHOLOGIES FROM THE ALMAHATA SITTA METEORITE.

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Introduction: The Almahata Sitta meteorite, whose preatmospheric body was the asteroid 2008 TC_3, fell on October 7, 2008 in the Nubian Desert in northern Sudan [e.g., 1, 2]. Numerous fragments have been recovered during several expeditions organized from December 2008 [2]. The meteorite was classified as an anomalous polymict ureilite with several different kinds of chondritic fragments [e.g., 3–5]. Noble gas studies performed on several fragments from the meteorite showed cosmic-ray exposure ages of about 20 My [e.g., 6–8], although slightly shorter ages were also reported in [9, 10]. Concentrations of trapped heavy noble gases are variable among the fragments of different lithologies [9, 10]. We report noble gas data on two samples from the #1 and #47 fragments [2], which were the same as those reported by Ott et al. [9].

Experimental Procedure: Weights of bulk samples #1 and #47 used in this work were 16.1 mg and 17.6 mg, respectively. Noble gases were extracted by stepwise heating at the temperatures of 800, 1200 and 1800˚C for #1 and 600, 800, 1000, 1200, 1400, 1600 and 1800˚C for #47. Concentrations and isotopic ratios of noble gases were measured with a modified-VG5400/MS-III at the Geochemical Research Center, University of Tokyo.

Results and Discussion: Cosmogenic He and Ne are dominant in both #1 and #47, but trapped Ar, Kr and Xe concentrations are much higher in #47 than in #1, showing that noble gas compositions in #47 are similar to those of ureilites. $^{3}He/^{21}Ne$ and $^{22}Ne/^{21}Ne$ of cosmogenic He and Ne are 4.8 and 1.12 for #1 and 3.6 and 1.06 for #47, respectively, both of which plot on a Bern line [11]. This indicates negligible loss of cosmogenic ^{3}He from #1 in our sample, unlike the low $^{3}He/^{21}Ne$ of 3.1 for #1 by Ott et al. [9]. Concentrations of cosmogenic ^{3}He and ^{21}Ne (10^{-8} cc/g) are 30 and 6.3 for #1 and 32 and 9.0 for #47, respectively, which are higher than those in [9] and give cosmic-ray exposure ages of ca. 20 My depending on assumed production rates. Relative abundances of trapped ^{36}Ar, ^{84}Kr and ^{132}Xe for #1 resemble those of Q-component, which is a dominant trapped noble gas component in chondrites. In contrast to #1, #47 plots below a trend for ureilites [12] as well as Q, which implies a partial loss of trapped ^{36}Ar from the lithology of #47.

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