

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

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**Introduction:** The Almahata Sitta meteorite, whose pre-atmospheric body was the asteroid 2008 TC<sub>3</sub>, 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. <sup>3</sup>He/<sup>21</sup>Ne and <sup>22</sup>Ne/<sup>21</sup>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 <sup>3</sup>He from #1 in our sample, unlike the low <sup>3</sup>He/<sup>21</sup>Ne of 3.1 for #1 by Ott et al. [9]. Concentrations of cosmogenic <sup>3</sup>He and <sup>21</sup>Ne (10<sup>-8</sup> 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 <sup>36</sup>Ar, <sup>84</sup>Kr and <sup>132</sup>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 <sup>36</sup>Ar from the lithology of #47.

**References:** [1] Jenniskens P. et al. 2009. *Nature* 458:485–488. [2] Shaddad M. H. et al. 2010. *MAPS* 45:1557–1589. [3] Jenniskens P. et al. 2010. *MAPS* 45:1590–1617. [4] Zolensky M. et al. 2010. *MAPS* 45:1618–1637. [5] Bischoff A. et al. 2010. *MAPS* 45:1638–1656. [6] Welten K. C. et al. 2010. *MAPS* 45:1728–1742. [7] Welten K. C. et al. 2011. Abstract #2667. 42nd LPSC. [8] Meier M. M. M. et al. 2012. *MAPS* 47:1075–1086. [9] Ott U. et al. 2010. Abstract #1195. 41st LPSC. [10] Murty S. V. S. et al. 2010. *MAPS* 45:1751–1764. [11] Eberhardt P. et al. 1966. *Z. für Naturforsch.* 21a:414–426. [12] Nagao K. et al. 2014. Abstract #2016. 45th LPSC.