ALHA77005: MONITOR FOR TERRESTRIAL INFLUENCE ON NOBLE GASES AND ANALOGUE FOR MARS.

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Introduction: The noble gases in Martian meteorites are derived from the Martian interior and atmosphere, and cosmogenic nuclides [1], but quantifying the components is complicated by terrestrial cold desert storage which can cause serious contamination, partially obscuring the extraterrestrial heavy noble gas signatures [2, and references therein] upon which key observations have been made (e.g. Martian atmosphere in EETA79001, fractionated or ancient Martian atmosphere in ALH84001 [see 1 for references]). This study investigates the rim and interior of ALH77005 to characterise terrestrial air contamination, and derive potential correction procedures.

Sample and methods: We obtained rim and interior samples of ALH77005 (NASA, split ALH77005, 225, 227, thin section 54). Each split was gently crushed, ~20 grains were handpicked, irradiated at McMaster reactor (Canada), and measured by melting grains individually by laser heating for Ar isotope analysis (MAP215-50). Microscopy, virtual microscope documentation, and electron microprobe (Cameca SX 100) were done at the OU.

Results and discussion: Analysis of the rim of the sample revealed open fractures, which are lined by alteration minerals up to ~0.5 mm into the meteorite, but appear alteration free deeper into the sample.

Ar-Ar analysis reveals clear differences between rim and interior samples. Interior samples yield a range of ^{36}Ar/^{40}Ar of 0.001 to 0.003 but little correlation with ^{39}Ar/^{40}Ar. In contrast, exterior sample grains fall into two groups, one group displaying variable ^{39}Ar/^{40}Ar with a clear trend towards terrestrial atmospheric ^{36}Ar/^{40}Ar, but some analyses with low ^{36}Ar are associated with high ^{40}Ar/^{36}Ar. Average ^{40}Ar/^{36}Ar in these samples is lower than the values measured at Mainz (MZ) by the fusion of bulk-sample (50 mg) and by spot fusion measurement of the sample at OU [^{40}Ar/^{36}Ar 1229 (MZ) and 887 (OU)]. If relative probability plots of ^{40}Ar/^{36}Ar$_{tr}$ (cosm corr with (^{38}Ar/^{36}Ar)$_{tr}$=0.244, [3]) are investigated, both populations show two peaks with the exterior sample being considerably closer to terrestrial atmosphere (^{40}Ar/^{36}Ar$_{tr}$ of ~350 and 800 exterior; ~750 and 1400 interior). The second maximum of the interior sample is identical with ^{40}Ar/^{36}Ar$_{tr}$ measured in ol and pyx separates of ALH77005 [4].

Conclusions: Our Ar-Ar study reveals significant air contamination even in the inner parts of the ALH77005 sample. Future work will add heavy noble gas and trace element data in order to evaluate correction procedures for terrestrial contamination. The goal is to be able to see through terrestrial contamination even if only a small and weathered sample is available for study. Moreover, this will serve as an analogue to enhance our understanding of gas incorporation processes in cold deserts, which will help measuring Ar and noble gases on Mars [5,6].

References: [1] Swindle T.D. 2002. Martian Noble Gases. *Reviews Min.*, 47: 171–190. [2] Schwenzer S.P. et al. 2009. *Polar Sci.*, doi:10.1016/j.polar.2009.06.00. [3] Wiens R.C. 1988. *EPSL*, 91: 55–65. [4] Schwenzer S.P. et al. 2006. *MAPS*, 41: A161. [5] Bogard D.D. 2009. *MAPS*, 44: 3–14. [6] Talboys D.L.et al. 2009. *Planet. Space Sci.*, 57: 1237–1245.