NOBLE GAS RECORD OF THE ANOMALOUS CM DHOFAR 1434.

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Introduction: We report noble gases for Dhofar 1434 that has been classified as anomalous CM chondrite [1]. It was discovered about 600 m west of Dhofar 225 that is classified as anomalous CM, too [2]. Petrological and mineralogical data of Dhofar 1434 are very close to Dhofar 225 [3]; and both meteorites seem to be paired. The O-isotopes plot on the far extension of CM2 chondrites and have affinities to the anomalous CM chondrites Belgica-7904, Y-82162, and Y-86720 [3].

Samples and Experimental: Noble gases were analyzed by standard analytical techniques (e.g., [4]) in two fragments (sample I: 8.54 mg; sample II: 14.7 mg). Gas extraction was at 600°C, 1000°C, and 1800°C.

Results: Data for He and Ne are summarized in Table 1, those for Ar, Kr and Xe in Table 2.

#	^{3}He	^{4}He	^{22}Ne	^{20}Ne/^{22}Ne	^{21}Ne/^{22}Ne
I	0.5663 ±0.0134	1915 ±60	1.110 ±0.027	5.771 ±0.043	0.2346 ±0.0031
II	0.5100 ±0.0087	1760 ±44	1.074 ±0.021	5.562 ±0.034	0.2536 ±0.0025

Table 1. He and Ne results (abundances in 10^{-8} cc/g).

#	^{36}Ar	^{38}Ar/^{36}Ar	^{40}Ar	^{84}Kr	^{132}Xe
I	7.799 ±0.172	0.1871 ±0.0008	75.0 ±5.2	0.0891 ±0.0032	0.0942 ±0.0023
II	7.529 ±0.136	0.1862 ±0.0008	80.1 ±3.2	0.0792 ±0.0026	0.0918 ±0.0017

Table 2. Ar, Kr and Xe results (abundances in 10^{-8} cc/g).

Helium and neon. Neon data are shown in the 3-isotope plot of Fig. 1. The dominant trapped component is Ne-HL (Ne-A2) carried by presolar diamond [5, 6], with indications for a small amount of Ne with higher ^{20}Ne/^{22}Ne (air, P3, solar) released at the lowest temperature. Evident is also the presence of presolar SiC as carrier for Ne-E (Ne-G) indicated by the low ^{20}Ne/^{22}Ne [6, 7] at 1800 °C. With a trapped ^{20}Ne abundance of ~6x10^{-8} cc/g a significant amount – if not virtually all – of measured ^{4}He must be of trapped origin. In fact, for a trapped ^{4}He/^{20}Ne ratio of ~600 (as in primitive HL gases; [6, 8]) the expected amount of trapped ^{4}He is about twice that observed; For the ^{4}He/^{20}Ne ratio of "processed HL" gases [8] of ~ 290, on the other hand, the expected trapped ^{4}He agrees well with the observed amount, which then leaves little room for radionenic He. Almost half of ^{3}He would then be trapped, with corresponding uncertainties about the amount of cosmogenic He (see below).

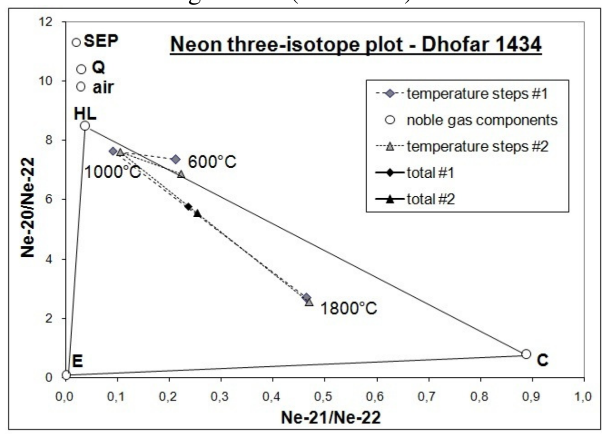

Fig. 1. Neon 3-isotope plot. The solid line spans the triangle defined by Ne-E, Ne-HL and a typical composition for cosmogenic Ne (C). The dashed line traces the stepped analysis. Reference compositions are from [6, 9]. SEP refers to the now discredited SEP component [10].

Argon, krypton, xenon. Ar, Kr and Xe are dominated by Q-gases [6, 11]. As shown in Fig. 2, a small contribution from adsorbed air is evident in the first release step, while HL-Xe carried by presolar nanodiamond [5, 6] makes a significant contribution (~25% of ^{132}Xe) at intermediate temperature (1000 °C).

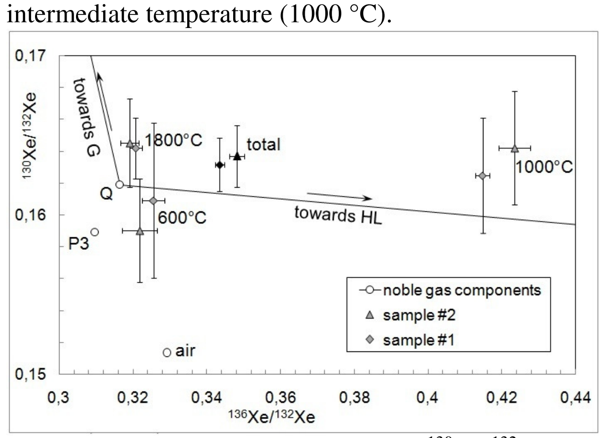

Fig. 2. Xenon 3-isotope plot of ^{130}Xe/^{132}Xe vs. ^{136}Xe/^{132}Xe. The lines are mixing lines between Xe-Q and a) HL-Xe carried by presolar diamond off scale to the right and b) Xe-G carried by presolar SiC towards the upper left. Reference compositions from [6].

Abundance of presolar phases. The isotopic excursions in Ne (Fig. 1) and Xe (Fig. 2) allow an estimate of the abundances of presolar diamond and SiC. Using the approach of [12, 13] and a "constant" Ne-E (= Ne-G) concentration in SiC of $16500x10^{8}$ cc/g [13], from the 1800 °C steps an abundance of ~6 ppm is inferred. A similar estimate for presolar diamond, based on ^{132}Xe-HL in the 1000°C steps of $\sim 6x10^{-11}$ cc/g and a typical ^{132}Xe-HL abundance in CM diamonds of $1.5x10^{-7}$ cc/g [8, 13] results in an estimated diamond abundance of ~400 ppm.

Ages. Assuming that Dho 1434 is paired with Dho 225 we used the chemical composition from [3] for age calculations. Nominal K-Ar ages based on the ^{40}Ar abundances in Table 2 (probably containing a significant air contribution) are 0.23 and 0.24 Ga. With a probably dominant contribution to ^{4}He from trapped He (see above), it is not possible to calculate a U/Th-He age. Cosmic ray exposure (CRE) ages that we have calculated following [14] suffer from the problem that the abundance of trapped Ne is too high for a reliable determination of the shielding parameter $(^{22}Ne/^{21}Ne)_{cos}$. Assuming "average shielding" (shielding parameter = 1.11) leads to CRE ages from ^{21}Ne of 0.74 and 0.79 Ma. Corresponding ages based on ^{3}He and the unrealistic assumption that all of ^{3}He is cosmogenic (see above) are 0.35 and 0.32 Ma, reflecting loss of at least half of cosmogenic helium.

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