ABUNDANCE AND ISOTOPIC COMPOSITION OF XENON IN THE UNGROUPED ACHONDRITE NWA 7325.

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Introduction: We report the first xenon isotopic analysis of Northwest Africa (NWA) 7325, a unique achondritic meteorite that possibly originated from Mercury [1]. Production of Xe by ^{244}Pu and ^{129}I decay allows characterisation of volatile reservoirs.

Mineralogical studies show NWA 7325 to be primarily composed of plagioclase, pyroxene, olivine and diopside [1-3]. Oxygen data suggest that it originated from a differentiated parent body on which mass dependent fractionation played a major role, but the isotopic composition does not match that of Earth, Mars or known differentiated asteroids [4]. Oxygen data suggest a possible link to ureilites, but Cr isotopic data do not [5]. Oxygen and Cr data for NWA 7325 also show some similarities to acapulcoites, but the mineralogy and chemistry is very different [5]. A U-Pb age of 4562.5±4.4 Ma has been reported [6].

Experimental: The xenon signature of a single, 1.67 mg sample of NWA 7325 has been analysed using the RELAX mass spectrometer at The University of Manchester [7,8]. This sample comprised ~11 small grains of bulk rock. Gas was extracted from the sample by laser step-heating at sequentially increasing powers. The gas extracted in each heating step was analysed and xenon isotope ratios determined for each step.

Results: An elevated ^{129}Xe/^{132}Xe ratio was observed, with values up to ~1.47 in individual heating steps. ^{129}Xe is produced by radioactive decay of ^{129}I (half-life 16 Ma), and excesses of ^{129}Xe can be chronologically significant in samples which closed to xenon loss when ^{129}I was still alive. Until a neutron-irradiated sample has been analysed it is difficult to be definitive, but in this sample we observe that xenon released in mid-temperature heating steps has a consistent ^{129}Xe/^{132}Xe ratio suggesting a trapped component with a signature inherited from a reservoir affected by ^{129}I decay. This would require processing after substantial decay of ^{129}I, several 10s of millions of years after solar system formation. Higher temperature releases exhibit higher ratios, perhaps indicating an in situ component (as expected given from the early closure of the U-Pb system).

The concentration of ^{132}Xe measured in this sample was $(4.03\pm0.02)\times10^{-11}$ cm^3 STP g^{-1}. The isotopic composition is dominated by solar wind xenon mixing with Xe-Q and/or terrestrial atmospheric contamination. There is no evidence of a cosmogenic component, nor of fission xenon derived from ^{244}Pu or ^{238}U.

References: [1] Irving A. J. et al. 2013. Abstract #2164. 44th Lunar & Planetary Science Conference. [2] Goodrich C. A. et al. 2014. Abstract #1246. 45th Lunar & Planetary Science Conference. [3] Weber I. et al. 2014. Abstract #1323. 45th Lunar & Planetary Science Conference. [4] Jabeen I. et al. 2014. Abstract #2215. 45th Lunar & Planetary Science Conference. [5] Kita N. T. et al. 2014. Abstract #1455. 45th Lunar & Planetary Science Conference. [6] Amelin Y. et al. 2013. Abstract #5165. 76th Annual Meeting of the Meteoritical Society. [7] Gilmour J. D. et al. 1994. *Rev. Sci. Instrum.* 65:617-625. [8] Crowther S. A. et al. 2008 *J. Anal. At. Spectrom.* 23:938-947.