THE IODINE-XENON SYSTEM IN ACHONDRITES.

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Introduction: The varying geochemical behavior of plutonium, iodine and xenon during crust formation must have contributed to the xenon isotopic compositions of terrestrial planet reservoirs. Achondrites allow us the opportunity to study this behavior. Here we report data from the ungrouped achondrite NWA 7325, and compare it with that in other achondrites.

Experimental: The xenon isotopic signatures of two neutron irradiated samples of NWA 7325 have been analyzed using the RELAX mass spectrometer [1,2]. Neutron irradiation of ^{127}I produces ^{128}Xe, allowing its behavior to be investigated alongside xenon isotopes. The samples were single chips of bulk rock, of masses 0.17 mg and 1.69 mg. Gas was extracted from the samples by laser step-heating at sequentially increasing laser powers, and the xenon isotopic composition determined for each step.

Results: To first order the data show uncorrelated iodine mixing with a component that has reproducible ^{129}Xe/^{132}Xe and I/Xe ratios. The ^{129}Xe/^{132}Xe ratios in these samples are consistent with the elevated ratios we reported previously for NWA 7325; there is little evidence of xenon from ^{244}Pu fission [3]. It is unclear whether the ^{129}Xe excess was incorporated early as live ^{129}I (half-life ~16 Ma) or later as part of an evolved xenon component. The latter would suggest inheritance from a reservoir with a high I/Xe ratio. Such an evolved reservoir would require processing after substantial decay of ^{129}I, and suggest incorporation as part of a second heating event [4] several 10s of millions of years after Solar System formation.

Discussion: The ungrouped achondrite GRA 06129 also shows evidence of a phase with an evolved ^{129}Xe/^{132}Xe ratio [5]. In this case it has been proposed that parentless ^{129}Xe in GRA 06129 was introduced by interaction with a fluid with an evolved ^{129}Xe/^{132}Xe ratio, but NWA 7325 does not show any evidence of fluid interactions [6]. NWA 6704 shows little evidence of excess ^{129}Xe with some evidence of a trapped xenon component [7]. In contrast, eucrites contain almost no trapped xenon, but iodine is present alongside excess ^{129}Xe and correlates with plutonium [8]. Xenon and iodine in glass from the angrite D'Orbigny are incorporated into different sites and behave independently from each other – in this case iodine and plutonium exhibit distinct behaviour [9]. The achondrite I-Xe dataset thus indicates a range of behaviors during early igneous activity and more work is needed to understand the controlling factors.

References: [1] Gilmour J. D. et al. 1994. *Rev. Sci. Instrum.* 65:617-625. [2] Crowther S. A. et al. 2008. *J. Anal. At. Spectrom.* 23:938-947. [3] Crowther S. A. 2014 Abstract #5319 77th Annual Meeting of the Meteoritical Society [4] Bischoff A. et al. 2013 Abstract #427 European Planetary Science Congress [5] Claydon J. L. et al. 2015 *Geochim. Cosmochim. Acta* 159:177-189. [6] Weber I. et al. *Meteorit. Planet. Sic.* In review. [7] Fernandes, V. A. et al. 2013 Abstract #1953. 44th Lunar & Planetary Science Conference. [8] Claydon, J. L. 2012. PhD Thesis, The University of Manchester. [9] Busemann, H. et al. 2005. Abstract #2299. 36th Lunar & Planetary Science Conference.