NOBLE GAS ANALYSIS OF THE GRIMSBY H CHONDRITE.

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Introduction: The Grimsby meteorite fell to Earth in a spectacular fireball on 25th September, 2009 in SW Ontario, Canada [1]. Initial petrological studies suggested that Grimsby was an H5 ordinary chondrite [1].

Experimental Procedure: Two Grimsby fragments were selected for noble gas analysis. GO is a fragment of ~ 30 mg recovered from the strewnfield three weeks after the initial fall, and shows some evidence of oxidation. GP is a pristine fragment of ~ 97 mg collected the morning after the initial fall. The GO sample was furnace step-heated in 600, 1000, 1800 and 1900 ˚C steps and emitted noble gases analysed using an MAP 215-50 instrument. Results for the GP sample will also be available at Metsoc 2010.

Results and Discussion: Table 1 shows the noble gas data of the GO sample following our analysis.

Table 1: Noble gas data for Grimsby GO fragment. Concentrations in cc/g. c = cosmogenic, tr = trapped.

^{4}He (10^{-6})	^{22}Ne (10^{-8})	^{40}Ar (10^{-6})	$^{36}Ar_{tr}$ (10^{-8})	^{84}Kr (10^{-10})	^{132}Xe (10^{-10})	$(^{22}Ne/^{21}Ne)_c$
12.8 ± 0.3	10.3 ± 0.1	31.6 ± 2.8	2.38 ± 0.12	1.11 ± 0.04	1.30 ± 0.06	1.060 ± 0.008

Cosmogenic Gases: CRE ages were calculated after [2] using average H chondrite chemical composition data [3]. We obtain ages of 21.4, 24.1 and 26.0 Ma for ^{3}He (T_3), ^{21}Ne (T_{21}), ^{38}Ar (T_{38}), consistent with the H6 peak at 24 Ma [4]. Based on calculations by [5] our GO $(^{22}Ne/^{21}Ne)_c$ ratio of 1.060 ± 0.008 indicates an initial meteoroid size with a minimum radius of ~ 40 cm.

Crystallisation Ages: A nominal K-Ar age of 3.45 Ga is calculated based on the ^{40}Ar concentration (Table 1) and an average H chondrite K content of 0.078 wt% [3]. The corresponding U/Th-He age is 3.24 Ga.

Trapped Gases and Classification: The ^{36}Ar concentration is consistent with a H5 chondrite class, whilst both ^{84}Kr and ^{132}Xe concentrations are consistent with a H6 class [6]. Overall, our noble gas data on both exposure ages and trapped gases for this sample are more consistent with an H6 classification for the Grimsby ordinary chondrite.

References: [1] McCausland P. J. A. et al. 2010. Abstract #1196. 41st Lunar & Planetary Science Conference. [2] Eugster O. 1988. *Geochimica et Cosmochimica Acta* 52:1649-1662. [3] Wasson J. T. and Kallemeyn G. W. 1988. *Philosophical Transactions of the Royal Society London, A, Mathematcial and Physical Sciences* 325:535-544. [4] Graf T. and Marti K. 1995. *Journal of Geophysical Research* 100:21247-21263. [5] Leya. I and Masarik J. 2009. *Meteoritics & Planetary Science* 44:1061-1086. [6] Marti K. 1967. *Earth and Planetary Science Letters* 2:193-196.