I-XE ANALYSES OF TAGISH LAKE MAGNETITE AND MONAHANS HALITE.

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Introduction: The I-Xe dating system is particularly applicable to aqueously-formed minerals, notable examples include halite from the H-Chondrite Zag [1] and magnetite from carbonaceous chondrites [2]. Here we report data from analysis of a magnetite-rich separate from the carbonaceous chondrite Tagish Lake and of a halite grain from the ordinary chondrite Monahans (1998) (H5).

Tagish Lake Magnetite: 17mg of material was magnetically separated from a disaggregated sample of the Tagish Lake meteorite. Synchrotron XRD of an aliquot using 1.75Å radiation (station 2.3, Daresbury) showed that the powder was ~70% magnetite, the rest consisting of forsterite and pyrrhotite. 200µg of the powder was neutron irradiated (with chips of Shallowater enstatite) and laser step-heating I-Xe analysis performed using the RELAX mass spectrometer [3].

Results are shown in comparison to literature data from Orgueil magnetite [2] in Fig. 1A. In contrast to magnetite from Orgueil and other carbonaceous chondrites [4], there is no evidence of excess ^{129}Xe (higher than the trapped component, which is isotopically planetary). The derived iodine concentration (10ppb) and the peak I/^{132}Xe ratios are lower than those of Orgueil magnetite, although the release pattern of iodogenic xenon with temperature appears similar. This suggests that the dramatically different result can be attributed to ^{129}I having decayed before the magnetite formed, implying a formation age at least 50 Ma later than the formation of CI magnetite.

Monahans Halite: A chip of Monahans halite, mass ~20 µg, was included in the same irradiation - a step release pattern is presented in Fig. 1B. All releases were dominated by iodine-derived xenon (^{129}Xe/^{132}Xe > 10 consistently). This sample produced a well-defined ratio of excess ^{129}Xe/I, which corresponds to an age ~4 Ma after the Shallowater enstatite standard, giving an absolute age of ~4.562 Ga (the Rb-Sr age is 4.7 +/- 0.2 Ga [5]). In contrast, data from Zag halite [1], though disturbed, suggested formation before Shallowater enstatite, placing it among the earliest known minerals. Our data demonstrate that the different events that resulted in the formation of halite/sylvite in Zag and Monahans [5] were separated by ~10 Ma, and that therefore aqueous processes on the H chondrite parent body, even if intermittent, were ongoing for at least the first 10 Ma of solar system history.

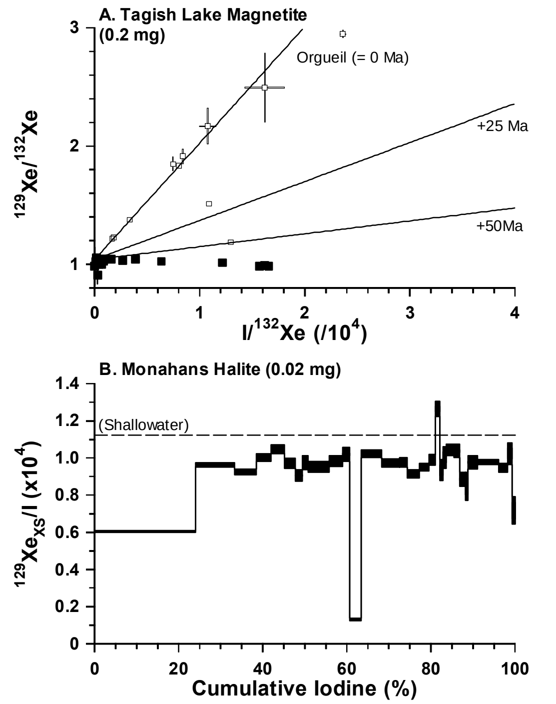

Figure 1: I-Xe data for Tagish Lake magnetite (A) and Monahans halite (B). In A, Orgueil data (open symbols - [2]) have been renormalised to ^{132}Xe. To allow comparison ^{128}Xe* has been converted to (nominal) iodine throughout.

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