I-Xe SYSTEM IN MAGNETITES SEPARATED FROM CO CHONDRITES OF DIFFERENT PETROLOGIC TYPE.

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Magnetites are one of the first alteration products formed in carbonaceous chondrites and thus provide insight for the onset and duration of aqueous alteration in different types of carbonaceous chondrites, as well as among different petrologic types within the same chondrite group.

In our previous work [1], in preparation for this extended study of magnetites from different types of carbonaceous chondrites, we investigated the possibility of iodine contamination during the chemical separation in LiCl, first applied by Herzog et al. [2]. Contamination by halogens can compromise the I-Xe system in magnetite, creating apparently younger ages if it roughly correlates with radiogenic ^{129}Xe. Two pure magnetite samples from Orgueil were separated using LiCl, one prior to irradiation, the other separated after the irradiation and thus free of chemically introduced iodine-derived ^{128}Xe. The I-Xe ages of both of these pure Orgueil magnetites were consistent with each other within the experimental uncertainties (about 3 Ma older than our earlier I-Xe age for the Orgueil highly magnetic fraction [3]), confirming that LiCl processing prior to irradiation does not compromise the I-Xe isochron.

Here we present first results for CO chondrites. Following the procedure of Herzog et al. we separated magnetites from 10 CO chondrites: Colony (3.0), Kainzas (3.1), Felix (3.2), Ornans (3.3), Yamato 82050,115 (3.3), Lance (3.4), Allan Hills A77003, 117 (3.5), Yamato 82094,110 (3.5), Yamato 790992,80 (3.5), Warrenton (3.6); almost completely covering the range of petrologic types (from 3.0 to 3.7 [4, 5]). SEM analyses confirmed samples to be iron oxides with small amounts of Ni present. Aliquots of these magnetite separates have been saved for future more detailed studies of the individual morphologies. The samples were irradiated in the Missouri University Research Reactor (MURR) with Shallowater (4,563.2 ± 0.6 Ma [6]), as the absolute age and irradiation standard.

The I-Xe system has been studied in Colony (3.0) and Kainzas (3.1). Kainzas did not contain any radiogenic ^{129}Xe but small amounts of ^{128}Xe were present at temperature steps lower than 1250 ºC, consistent with minor iodine contamination due to the chemical separation, and similar to that observed in our earlier work on Orgueil [1]. The I-Xe system in Colony magnetite closed 6.1 ± 3.1 Ma after Shallowater (4,563.2 ± 0.6 Ma [6]), ~ 8 Ma later than in Orgueil CI magnetite [1]. I-Xe measurements in other CO chondrites are in progress and the revealed history, alteration or solid-state diffusion can then be addressed.

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References: [1] Pravdivtseva et al. 2003. Abstract #1863. 34th Lunar & Planetary Science Conference. [2] Herzog G. F. et al. 1973. Science 180:489-491. [3] Hohenberg C. M. et al. (2000) Geochimica et Cosmochimica Acta 64:4257–4262. [4] McSween H. Y. Jr. 1977. Geochimica Cosmochimica Acta 41:479-491. [5] Scott E. R. D. and Jones R. H. 1990. Geochimica et Cosmochimica Acta 54:2485-2502. [6] Gilmour J. D. et al. 2006. Meteoritics & Planetary Science, 41:19–31.