THE I-Xe SYSTEM IN MAGNETIC FRACTIONS FROM CV3 METEORITES. O. V. Pravdivtseva and C. M. Hohenberg, Department of Physics and McDonnell Center for Space Sciences, Washington University, St. Louis, MO 63130 (olga@ocelot.wustl.edu).

Introduction: The I-Xe age of Orgueil (CI) magnetite was reported [1, 2] as the first result in an ongoing study of magnetites from carbonaceous chondrites. The anomalously old I-Xe age (≈7 Ma before the internal standard Sallowater) [3, 4] was not confirmed. New data place the formation of magnetite in the CI meteorite Orgueil and, by reference, CM Murchison, simultaneous with the formation of sodalite in Allende CAIs, which span a range of 4±2 Ma after Shallowater [5, 6]. Here we report new data on magnetic fractions, separated from four CV3 meteorites: Bali, Kaba, Groznaja and Mokoia.

Experimental: The magnetic fractions of Bali, Kaba, Groznaja and Mokoia were separated with a hand magnet from finely crashed meteorites. The presence of magnetite in separated magnetic fractions was confirmed by x-ray spectra, obtained on a JSM-840A scanning microscope. Samples were then split into two aliquots: the first was loaded into fused quartz tubes, sealed under vacuum and irradiated in Missouri University Research Reactor, receiving $\approx 2 \cdot 10^{19}$ n/cm^2. Chemical separation of magnetite in saturated LiCl solution for these aliquots was not applied in order to avoid possible iodine contamination. Such contamination could lead to lower I-Xe ages after conversion of I into ^{128}Xe in the course of neutron irradiation. Previous studies of both magnetite and bulk magnetic separates from Orgueil show magnetite to be the dominant iodine host phase [1, 2]. An I-Xe reference standard, Shallowater, was irradiated with the samples. To ensure uniform irradiation, samples were placed at the same horizontal plane. The actual fluence, monitored by 5 pieces of Al-Co wires, was uniform to within less than a percent for each flux wire in the same plane and differed by ≈2.5% for points 5 cm above the sample plane.

After irradiation, samples were transferred into individual Pt boats and loaded into the extraction system of mass-spectrometer for isotopic measurements. The Xe was extracted by stepwise pyrolysis, released gases were cleaned by exposure to SAES (ST-707) getter pellets kept at 280°C and sequential exposure to three freshly deposited Ti-films. The Xe was then separated by absorption on activated charcoal (-78°C) and its isotopic composition was measured by ion counting mass-spectrometry [7].

Second aliquots of magnetic separates of Bali, Kaba, Groznaja and Mokoia were purified by continuous stirring bar in saturated LiCl solution (60°C, 8 days) in order to remove any extraneous material. The magnetic stirring bar, with particles of magnetite adhered to it, was washed three times with ultrasonically agitated deionized water. The purified magnetite residue was then removed from the stirring bar, washed again with deionized water, acetone and finally dried in a desiccator. The morphologies of these magnetites were compared to the morphology of Orgueil magnetite. These purified magnetites were saved for comparison with the bulk magnetic separates to confirm that magnetite is the major iodine carrier, and will be used in the next irradiation and future I-Xe studies.

Results: Although the magnetic fraction was abundant in Groznaja, we failed to separate any pure magnetite from this meteorite by chemical procedure. Little radiogenic ^{129}Xe was found in this sample and the sample yielded no isochron, consistent with magnetite being the major iodine carrier in these separates.

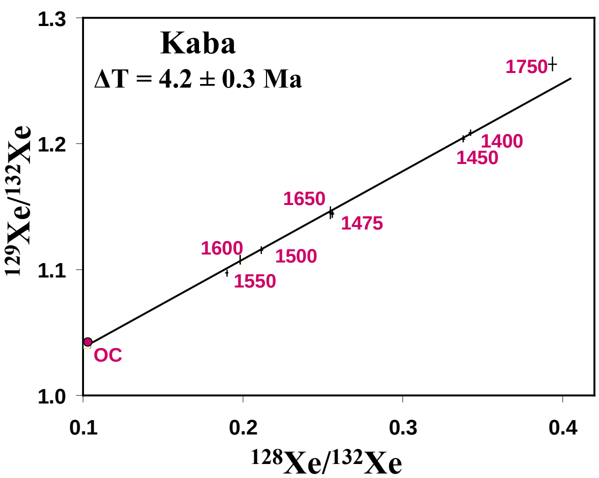
High resolution backscattered electron images at magnifications from 800 to 12000 were taken to compare the morphology of magnetites from Kaba, Mokoia and Bali to Orgueil's. According to Hua and Buseck [8], Orgueil is characterized by three major types of magnetite: spherules ≥5μm in diameter; framboidal clusters, mostly <2μm; and plaquettes. Framboidal clusters of magnetite were reported in some phylosilicate-bearing fine-grained inclusions in the Kaba and Mokoia CV3 meteorites [8]. Mokoia and Kaba magnetites, separated in course of this study indeed demonstrate the presence of fine framboidal grains. Surprizingly, Mokoia magnetite and Bali magnetite show features, which resemble stacked platelets – plaquettes - believed to be found only in Orgueil.

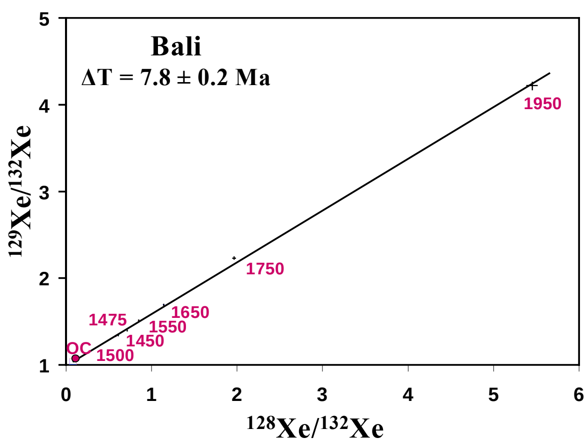
The Xe isotopic compositions were measured in all four magnetic separates. Groznaja, not yielding magnetite during the LiCl separation procedure, did not give an isochron, as previously mentioned. Despite the high concentration of trapped Xe in this sample, only a few of the low temperature steps contain radiogenic ^{128}Xe and ^{129}Xe.

The Mokoia magnetic fraction also did not give an isochron, with a complex release pattern for ^{128}Xe and ^{129}Xe at temperatures 1400-1900°C, suggesting a multiple component system. It may be that other carriers exist in the magnetic fraction from Mokoia, and that the pure magnetite will provide a chronology consistent with the others, or the I-Xe system is disturbed.

Sample	I-Xe age, Ma (after Shallowater 4.566±0.002 Ga)	I_{total}/I_{corr} (ppb)
Shallowater	≡0	47(47)
Orgueil	3.0±0.4	31(19)
Kaba	4.2±0.3	14/10
Bali	7.9±0.2	41/7
Mokoia	–	55-
Groznaja	–	28-

The magnetic separates from Kaba and Bali yield well-defined isochrones in temperature ranges 1400-1750°C and 1450-1950°C, respectively, and ^{128}Xe and ^{129}Xe release profiles suggest one major iodine carrier in magnetic separates from these meteorites.





The I-Xe system in the Kaba and Bali magnetic fractions closed 4.2±0.3 Ma and 7.9±0.2 Ma, respectively, after Shallowater. If magnetite is the carrier of correlated iodine in these samples, the age span of 3.7 Ma between Kaba and Bali magnetites, well beyond the relative uncertainties, could indicate origins in different aqueous settings.

Some morphological features of magnetite grains from Mokoia, Bali, and Kaba suggest that the environment in which Orgueil magnetite formed was probably not unique. These grains resemble the cores of plaquettes with visible remnants of parallel platelets. Indeed, plaquettes, found previously only in Orgueil, have large surface areas and should have been reprocessed first. Framboids, a more compact and stable form, could be present in less primitive carbonaceous chondrites. Other studies are currently underway: work on purified magnetites separated from CV3's is in progress, as is work on Tagish Lake, reported to have high concentration of magnetite [9].

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