THE I-XE AGE OF ORGUEIL MAGNETITE: NEW RESULTS. O. V. Pravdivtseva, C. M. Hohenberg, and A. P. Meshik, McDonnell Center for the Space Sciences and Department of Physics, Washington University, St. Louis, MO 63130, USA, (olga@wuphys.wustl.edu).

I-Xe ages of Murchison and Orgueil magnetites were reported to be the oldest [1] and interpreted as the condensation time of the solar nebula. More recent measurements, conducted on a highly magnetic separate from Orgueil (but not pure magnetite), gave much younger I-Xe ages [2]. We have since performed new studies on two pure separates of Orgueil magnetite, confirming the later closing time of the I-Xe system in this mineral phase.

In the previous work of Lewis and Anders [1] special attention was paid to the purity of the analyzed material. It was shown, that the trapped Xe resided mostly in hydrated silicates and the radiogenic ^{129}Xe in magnetite [3]. Therefore, Orgueil was finely ground and stirred with a saturated LiCl solution for 8 days at 60°C to remove the silicate-magnetite intergrowth. Although this procedure yields magnetic fractions that are at least 90% pure [1], it could potentially contaminate the magnetite with iodine and produce non-correlated ^{128}Xe and spurious I-Xe ages. To avoid this possibility, in our first work with Orgueil we deliberately omitted separation in LiCl solution. Instead, the meteorite was ground into a fine powder and the highly magnetic fraction was separated with a hand magnet and was confirmed to be largely magnetite [2]. The new work, reported here, was done in order to confirm our previous results and investigate the effects of the LiCl treatment on the I-Xe system in magnetite.

Orgueil was ground into a fine powder in a mortar and the highly magnetic fraction separated with a hand magnet. Two splits of this were made with one part undergoing the LiCl treatment, followed by further separation in NaOH and washing [4]. The purity of resulting magnetite was confirmed by x-ray diffraction analysis which yielded only magnetite lines. The other part of the magnetic separate was left “as is”, similar to our previous study [2]. Both samples were sealed under vacuum in separate fused quartz ampoules and irradiated in the package designated SLC-15 along with Shallowater - the usual reference standard and irradiation monitor. After irradiation, the magnetic split that was not processed in LiCl was further divided into two parts. One was processed in LiCl according to the procedure described earlier, yielding pure magnetite. As a result we had one magnetic fraction and two pure magnetite samples from Orgueil, one separated before, the other after irradiation. If the LiCl procedure contaminated the sample with iodine, it should be demonstrated by comparisons between the two processed samples.

I-Xe ages of these samples, along with previous data for Orgueil magnetites are shown in the Table (relative to Shallowater 4,566 ± 2 Ma, negative ≡ older than Shallowater).

	I-Xe age, Ma	
Shallowater	0	
Orgueil magnetite	-7	[1]
Orgueil magnetic	3.0 ± 0.4	[2]
Orgueil magnetic	1.5 ± 0.3	present work
Orgueil magnetite, separated in LiCl before the irradiation	-1.9 ± 0.2	present work
Orgueil magnetite, separated in LiCl after the irradiation	-2.4 ± 0.5	present work

The magnetic separate, analyzed during this work, had relatively large amount of trapped Xe, as expected. Only two temperature fractions (1000 and 1200°C) had significant radiogenic Xe. On a three isotope plot a line, drawn through these temperature points, passes near trapped Xe (OC-Xe), and corresponds to an apparent age 1.5 ± 0.3 Ma after Shallowater, somewhat older than our previous data for magnetic separate from Orgueil [2]. We now think that the magnetic separate may contain more than one iodine carrier and obtaining an I-Xe age for Orgueil magnetite requires further processing.

Magnetite, separated before the irradiation, gave a precise isochron defined by 14 temperature fractions with an apparent I-Xe age –1.9 ± 0.2 Ma (older than Shallowater). The magnetite sample processed after the irradiation fell through the coil during step-wise heating at 1250 °C. We were able to recover and reload this sample in a new Pt capsule. Although not contaminated during recovery (it was the first sample analyzed in a newly installed oven) some material was lost, resulting in only 2 mg of magnetite and an apparent isochron of lower precision. The I-Xe ages of both pure Orgueil magnetites are older than Shallowater and mutually consistent within experimental uncertainty. Such concordance demonstrates that LiCl processing prior to irradiation does not contaminate these samples with iodine. Simple magnetic separates are not sufficient to define the I-Xe age of pure magnetite.

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This work confirms that the I-Xe age of Orgueil magnetite is 5 Ma younger than previously reported [1]. The I-Xe age of Orgueil magnetite seems to be the same as those of Allende dark inclusions [5]. If the I-Xe system in both of them recorded the time of aqueous alteration, concordance would suggest similar timescales for the CI and CV meteorites.

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References: [1] Lewis R. S. and Anders E. (1975) *Proc. Nat. Acad. Sci., V.72, 1,* 268–273. [2] Hohenberg C. M., Pravdivtseva O. and Meshik A. (2000) *GCA 64, 24,* 4257-4262. [3] Jeffery P. M. and Anders E. (1970) *GCA 34,* 1175-1198. [4] Herzog G. F., Anders E., Alexander E. C., Jr., Davis P. K. and Lewis R. S. (1973) *Science 180*, 489-491. [5] Hohenberg C. M., Pravdivtseva O. V. and Meshik A. P. (2002) *Proceedings of 12th Goldschmidt Conf., GCA 66, 15A,* A337.