I-Xe DATING: COMPARISON OF I-Xe AND Pb-Pb AGES OF RICHARDTON CHONDRULES AND SEPARATED MINERAL PHASES. O. V. Pravdivtseva[1], Y. Amelin[2], C. M. Hohenberg[1], A. P. Meshik[1], Laboratory for Space Sciences and Physics Department, Washington University, CB1105, One Brookings Drive, Saint Louis, MO 63130 (olga@wuphys.wustl.edu), [2]Geochronology Laboratory, Royal Ontario Museum, 100 Queen's Park, Toronto, Ontario, Canada.

Introduction: I-Xe data for 5 different mineral phases separated from the Richardton chondrite have been reported in our previous work [1]. Cr-spinel and pyroxene yield I-Xe ages (4.565 ± 0.003 Ga and 4.567 ± 0.002 Ga respectively) that are close to the age of the Shallowater reference meteorite (≡ 4.566 ± 0.002 Ga [2]), corresponding to isotopic closures associated with or shortly after primary mineralization. Feldspar indicates Xe closure at 4.555 ± 0.003 Ga, about 10 Ma later, probably due to subsequent metamorphism. Troilite displays a strongly disturbed I-Xe system with apparent ("best fit") isochron age of 4.559 ± 0.005 Ma. While the Pb-Pb age for Richardton phosphate was determined to be 4.5534 ± 0.0006 Ga [3], the I-Xe system in apatite was completely disturbed.

Results: There is a general correlation between petrological type and textural integration in meteorites [4]. In spite of Richardton's equilibrated petrologic type (H5), it shows a surprisingly low degree of chondrule-matrix integration [5]. The metamorphism, which affected the Rb-Sr distribution in Richardton [5], had comparatively little effect on the textures and major element chemistry of the chondrules (but may be responsible for the uniform Fe/Mg ratio of the pyroxene and olivine in Richardton chondrules). If so, I-Xe studies of Richardton chondrules can provide insight into the earliest stages of metamorphism on the Richardton parent body.

Comparison of I-Xe and Pb-Pb ages of individual Richardton chondrules and separated mineral phases also allows us to test the absolute I-Xe age normalization. Absolute I-Xe ages are determined using the 4.566 Ga age for the Shallowater, which, in turn, is derived from Acapulco phosphate, the only mineral separate to date for which both I-Xe and Pb-Pb ages have been accurately measured [2, 6]. Data for Richardton pyroxene separates yield Pb-Pb age of 5.563 ± 1 [7] and absolute I-Xe age of 4.567 ± 3 Ga. Both I-Xe and Pb-Pb chronometers show the same ~ 10 Ma difference between closing time of the more refractory fractions (Cr-spinels and pyroxene) and the secondary phases (phosphate, feldspar and troilite).

Although these Pb-Pb and absolute I-Xe ages are in agreement to within the errors, Acapulco phosphate, with its relatively large (2 Ma) uncertainty in

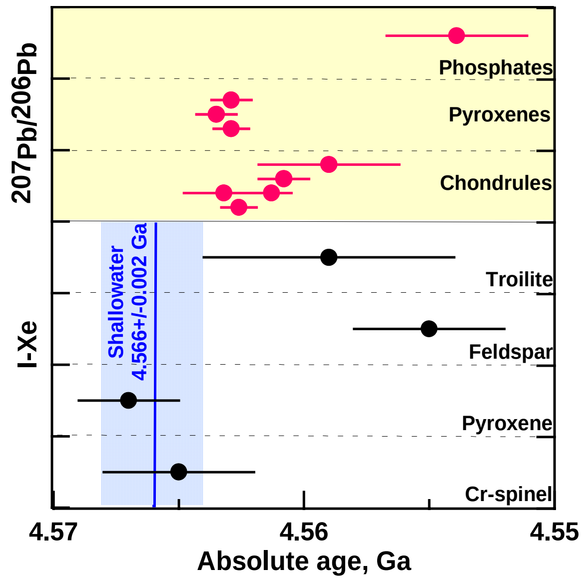
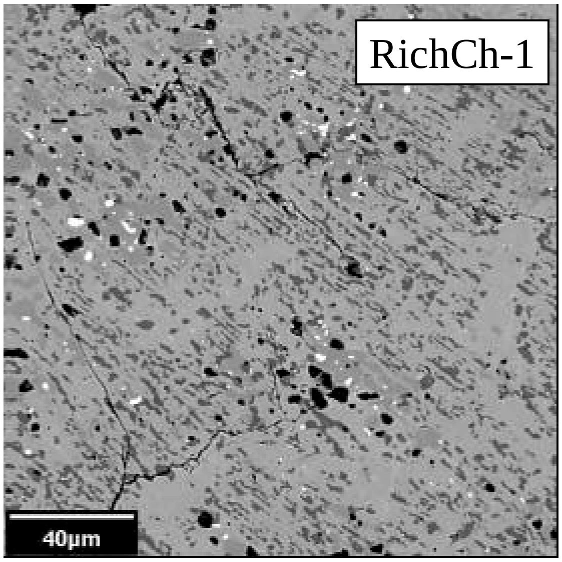
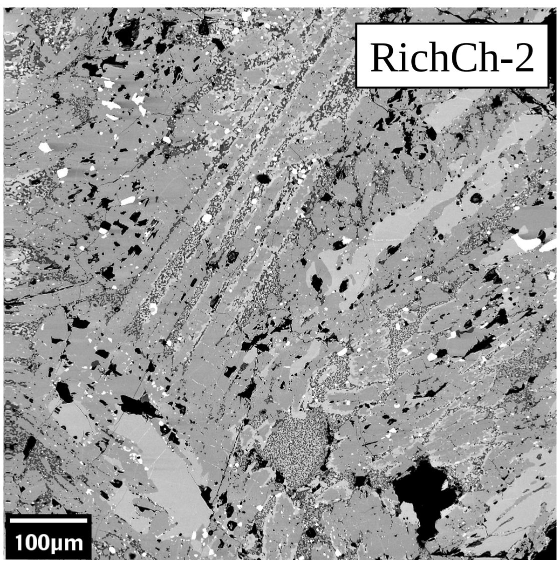


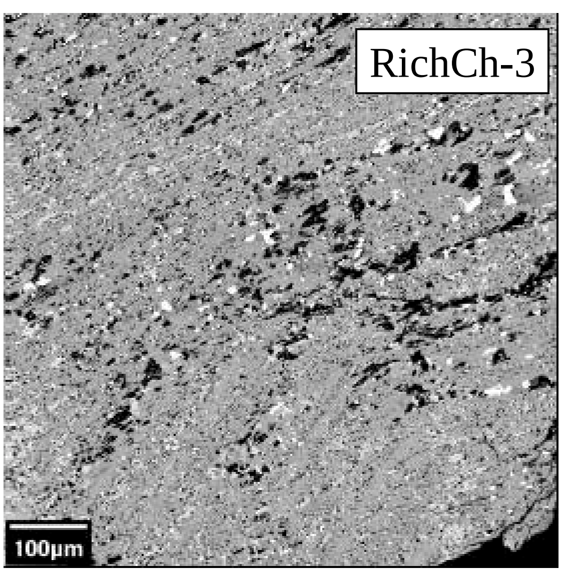
Fig.1 I-Xe ages [1,2] and Pb-Pb ages [7] of different mineral phases, separated from the Richardton chondrite. Pb-Pb data point (4.554±0.003 Ga) for phosphates represents the average for five phosphate fractions. Correction using Pb isotopic composition measured in Richardton troilite yields slightly older age of 4.557±0.005 Ga.

Pb-Pb age does not provide the most precise normalizationfor absolute I-Xe ages. As more I-Xe and Pb-Pb data are obtained on the same objects, the absolute I-Xe age normalization can be progressively refined. More precision for absolute I-Xe ages is important for better delineation of the fine structure of alteration and post-formational evolution in general.

Four fragments from different Richardton chondrules (Fig.2), weighting 5.873 mg (RichCh-1), 7.052 mg (RichCh-2), 4.366mg (RichCh-3) and 7.613 mg (RichCh-6), were irradiated for I-Xe study in the MURR, along with other samples in a package designated SLC-15. Other fragments from these same chondrules were used for Pb-Pb studies. The $^{207}Pb/^{206}Pb$ ages for RichCh-2, RichCh-3 and RichCh-6, shown on Fig.1, will be directly compared with the I-Xe ages obtained for each of these chondrules.







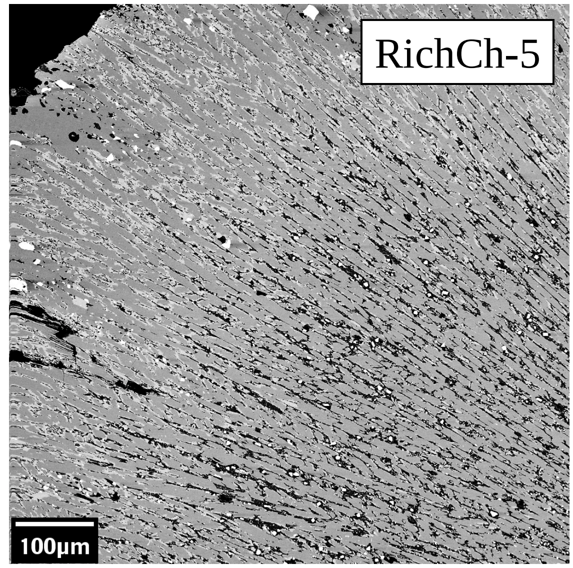


Fig.2 BSE images of 4 individual Richardton chondrules, chosen for I-Xe study. Dark grey - plagioclase or recrystallized mesostasis, medium-grey - pyroxene, lighter - olivine, white - metal or sulfide.

Although pyroxene is most likely the main (or only) iodine host in chondrules, a phase-by-phase laser extraction analysis on a chondrule fragment will establish the dominant iodine carrier. Step-wise extractions for the I-Xe dating of individual chondrules are now underway.

References: [1] Pravdivtseva O. V. et al. (1998) *Meteoritics & Planet. Sci., 33*, A126. [2] Brazzle R. H. et al. (1998) *GCA, 90,* 1151–1154. [3] Göpel C. et al. (1994) *EPSL, 121*, 153-171. [4] Dodd R. T. et al (1967) *GCA, 31*, 921. [5] Evensen N. M. et al. (1979) *EPSL, 42*, 223-236. [6] Nichols R. H. et al. (1994) *GCA 58*, 2553-2561. [7] Amelin Y. (2001) *LPSC XXXII,* A1389.

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