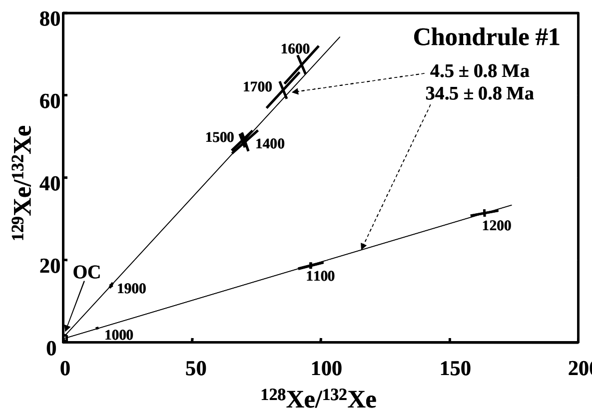
THE I-Xe RECORD OF LONG EQUILIBRATION IN CHONDRULES FROM THE UNNAMED ANTARCTIC METEORITE L3/LL3. O. V. Pravdivtseva, A. P. Meshik and C. M. Hohenberg, McDonnell Center for the Space Sciences and Department of Physics, CB 1105, One Brookings Drive, Washington University, St. Louis MO 63130 (olga@wustl.edu).

Introduction: The unnamed Antarctic meteorite studied here is of primitive chondritic type L3 or LL3, probably of grade 3.5 – 3.6 [1, 2]. Detailed mineralogyical and SEM analyses [2, 3] have revealed the existence of three distinct chondrule types in this meteorite Both iron-rich and some iron-poor chondrules are present with variably recristallazed matrices or mesostases reflecting variable equilibration. Patchy equilibration of chondrule mesostases suggests thermal metamorphism after accretion.

Results: The fragments of twelve chondrules were received from the Geological Survey of Canada, six (ranging in weight from 2.1 to 12.0 mgm) were irradiated for I-Xe studies along with a sample of Shallowater, the internal standard. Other fragments of these twelve chondrules were saved for Pb-Pb analyses.

Chondrules are complex objects and potentially contain multiple iodine host phases. It was shown in the previous studies of Richardton and Elenovka chondrules [4, 5], that step-wise heating can provide the closure ages of two phases if the extraction temperatures do not overlap too much. Xe from these chondrules was extracted in step-wise heatings with 50 °C increments to provide optimum resolution between possible low and high temperature iodine host phases. Smaller temperature steps are not practical since these small chondrule fragments would not have enough radiogenic xenon for reliable measurement.

After correction for minor uranium fission contributions, ^{128}Xe and ^{129}Xe were plotted versus ^{132}Xe, in which the relative slopes of apparent isochrons provide the closure ages relative to the Shallowater monitor (4,566 ± 2 Ma). All, except chondrule #2 demonstrate two fairly well resolved isochrons, showing Xe closure in distinct low- and high-temperature phases (Figure), but with higher uncertainties for the low-tempearture phases, defined by a smaller number of temperature steps. However, when considered together, the four of the five low temperature isochrons define a consistent age interval, 24.2 ± 0.5 to 34.5 ± 0.8 Ma after (younger) than Shallowater 4,566 ± 2 Ma. Chondrule #3 yielded that same age, 32.6 ± 0.3, but for the higher temperature isochron, and the low temperature isochron indicated an even younger age, 83.5 ± 1.4 Ma after Shallowater.



The higher extraction steps all provide isochrons with much older apparent ages (Table), the oldest chondrules (#1 and #2) tend to have broader release peaks for their radiogenic ^{129}Xe. The younger chondrules (#5 and #6) have very sharp release of radiogenic Xe in the 1300 °C – 1450 °C temperature interval and virtually no radiogenic signal above 1450 °C, suggesting post-formational metamorphism.

Although the apparent I-Xe ages spread from 4.5 ± 0.8 to 83.5 ± 1.4 Ma, they can be grouped according the temperatures of the release peak of the radiogenic ^{129}Xe and ^{128}Xe responsible for the isochrons. This probably indicates the presense of multiple iodine host phases. Detailed textural and mineralogical studies of this unnamed Antarctic meteorite [2, 3] have shown the presence of clinoenstatite, low-Ca orthopyroxene, Ca-pyroxene and a mesostasis or matrix partially or completely recristalized to feldspar in chondrules.

Chondrule	relative age, Ma after Shallowater 4,566 ± 2 Ma	
	1300 – 1900 °C	1100 – 1200 °C
#1	4.5 ± 0.8	34.5 ± 0.8
#2	5.5 ± 0.3	
#3	32.6 ± 0.3	83.5 ± 1.4
#4		24.2 ± 0.5
#5	15.0 ± 0.5	28.4 ± 1.0
#6	11.1 ± 0.4	32.1 ± 0.9

The wide range of I-Xe ages provided by these 10 isochrons from 6 chondrules suggests a long period of equilibration. Same conclusion was drawn by Herd et al. [2], based on six U-Pb and Rb-Sr analyses of fragments from 5 chondrules. The young isochron ages for Pb-Pb and Rb-Sr, 4489 ± 43 and 4385 ± 40 Ma respectively, support the conclusion that this meteorite has a more complex heating history than indicated by the textures and mineral analyses.

An attempt is now under way to determine the carriers of the radiogenic xenon by laser extraction from different mineral phases on polish sections of these chondrules.

Acknowledgments: This work was supported by NASA grant NAG5-12776. We thank Yury Amelin for the provided samples and University of Missoury Reactor staff for the irradiation of SLC-15 package.

References: [1] Herd R. K. et all. (2001) Meteoritics Abstract #5367. [2] Herd R. K. et all. (2002) *LPS XXXIII*, Abstract #1957. [3] Herd R. K. et al. (2003) *LPS XXXIV*, Abstract #2058. [4] Pravdivtseva et al. (2002) *GCA* **66**, A614. [5] Pravdivtseva et al. (2004) *Goldschmidt Conference*, A760 .