AR-AR IMPACT AGES OF SHOCKED LL CHONDRITES.

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Introduction: Due to the relatively low closure temperature of feldspar, Ar-Ar ages of shocked meteorites typically record the age of an impact, not the formation age. Ar-Ar dating of lunar rocks has shown an increase in the impact rate around 3.9Ga [1], and many eucrites [2] and H chondrites [3] give similar ages, but with a larger spread than in the lunar case. Although only a small number of shocked LL chondrites have had Ar-Ar ages determined, there seems to be clustering around 4.2-4.3Ga [4-6], possibly indicating an impact event at that time. To better constrain the impact history of the LL chondrite parent body, we have collected a suite of shocked LL chondrites. Here we present Ar-Ar age data for two melted LL-chondrites.

Results: Both NWA 1701 and LAR 06298 are variably crystallized, clast-rich impact melt rocks that contain sub-mm to cm-size lithic clasts. More pronounced weathering affected the melt in NWA 1701, effectively oxidizing most Fe-Ni metal. In contrast, LAR 06298 is a fresh sample of melt rock, in which highly shocked chondrite clasts are intruded with glassy shock melt veins. Macroscopically, LAR 06298 resembles the L chondrite Cat Mountain [7]. Three melt samples of NWA 1701 each gave two plateaus. Although the total range in ages of the apparent plateaus is only ~900Ma to ~1200Ma, the plateaus are not the same between any two samples, complicating the interpretation [8]. Clast samples of NWA 1701 indicate partial resetting, and yield older ages up to ~4Ga. Preliminary results of a single sample of the clast portion of LAR 06298 gives a plateau of 5 steps, which all agree within 2σ errors. These 5 steps give an age of 960 ± 130Ma after summing all steps together. A plateau of 3 steps that all agree within 1σ error give an age of 1240±170Ma, again after summing all 3 steps together. This constrains the Ar-Ar age of LAR 06298 to 950-1250Ma. While very different from many shocked LL chondrites, this age agrees well with the Ar-Ar age of NWA 1701 and Y-790964 [9]. More samples of both melt and clast of LAR 06298 will be run to further constrain the Ar-Ar age.

Discussion: The Ar-Ar ages of NWA 1701 and LAR 06298 chronicle an impact on the LL-chondrite parent body at ~1Ga. Thus, our data substantiates a second severe impact event on that asteroid, which post-dates the major collision at around 4.25Ga. At present, there is no indication for a more recent large impact on the LL-chondrite asteroid, such as that found on the L-chondrite asteroid at ~470Ma [1] and the H-chondrite asteroid at ~310Ma [3].

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