WHY DO U-PB AGES OF CHONDRULES AND CAIs HAVE MORE SPREAD THAN THEIR ^{26}AL AGES?

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Introduction: The ^{26}Al-^{26}Mg decay system (half-life: 0.705 Ma) is used to determine the relative timing of formation of early Solar System solids (e.g., [1-2], references therein). The reliability of relative ^{26}Al ages depends on the homogeneity of ^{26}Al in the early Solar System, which is extensively debated (e.g., [2-3]). Recently, [4] showed that the relative ^{182}Hf-^{182}W ages (half life: 8.9 Ma) between CAIs and angrites are consistent with their relative ^{26}Al ages and suggested ^{26}Al was homogeneously distributed in the early Solar System. Another test for ^{26}Al homogeneity is to compare relative ^{26}Al ages of chondrules and CAIs with their absolute U-Pb ages.

Comparison between ^{26}Al and U-Pb ages: Recent high precision internal ^{26}Al-^{26}Mg data of CAIs and chondrules show that inferred ^{26}Al/^{27}Al ratios of most CAIs are within 10% from the canonical value of 5.2×10^{-5}, while those of chondrules in type 3.0 chondrites (LL, CO, and Acfer 094) are lower, at $(0.5\text{-}1)\times10^{-5}$ [1-2]. These data imply a 2 Ma time gap between CAI and chondrule formation, with each major formation and reprocessing period being shorter than 0.2 Ma and 0.7 Ma, respectively. In contrast, U-Pb ages of several CAIs from CV3s (corrected for U isotope ratios [5]) vary by 0.7 Ma [6-8] and those of five chondrules (from CV3 and L3) spread from 0 to 3 Ma younger than CAIs [8].

Possible causes of variablity in U-Pb ages: Some of these U-Pb ages are obtained from Pb-Pb isochron regression of data with significant amounts of common Pb (measured ^{204}Pb/^{206}Pb $\geq$0.01). Common Pb in chondrules and CAIs may have multiple sources, not just from terrestrial contaminants and primodial Pb, but possibly also from parent body metamorphism, which is significant in CV3s. Parent body metamorphism could add extra radiogenic ^{206}Pb and ^{207}Pb, so that regression though multiple endmembers would result in inaccurate estimates of radiogenic ^{207}Pb/^{206}Pb ratios. Moreover, the U-Pb system of individual chondrules and CAIs could be partially disturbed by parent body metamorphism; this can be tested by the behavior of internal Al-Mg systematics in anorthite (e.g., [9-10]). At the meeting, we will summarize the relevant data and discuss possible causes of discrepancies between the two chronometers.

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