ARE CHONDRITES OLDER THAN ACHONDRITES? – THE TALE OF AL-26.

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Introduction: Chondrites are generally believed to represent the precursor materials from which planets, Moons, and a diverse suite of achondrite parent bodies accreted. We have measured ^{26}Mg in CAIs and chondrules from Allende (CV3) [1,2] and in whole rock and mineral separates from the eucrite Juvinas [3]. These new high precission chronological data and absolute Pb-Pb ages [4] of chondrules and CAIs suggest chondrule formation lasted at least 1 Ma and was still ongoing at the time when the HED parent body accreted.

Results: We find $(^{26}Al/^{27}Al)_0$ ratios for Allende CAIs in the range 3.5 1.0x10^{-5} to 6.3 1.8x10^{-5} suggesting that the Allende CAIs formed over a period of 0.6 0.2 Ma. Two aluminium rich chondrules and four out of seven ferromagnesian chondrules from Allende showed excess ^{26}Mg with $(^{26}Al/^{27}Al)_0$ ratios in the range from 1.7 0.6x10^{-5} to 4.8 0.6x10^{-5}. These data suggest that the Allende chondrules formed over a period of 1 0.5 Ma and that the oldest chondrules are as old as the oldest CAIs.

We have also found a $^{26}Mg^*$ excess in mineral separates from the eucrite Juvinas. If ^{26}Al was homogenously distributed in the nebula these data suggest that the HED parent body accreted while chondrules were still forming.

Implications for early solar system chonology: The overlap in formation ages for the chondrules and CAIs in Allende inferred from our data removes a previous concern that CAIs would no longer be present in the nebula by the time the chondrules formed. The extended duration of the chondrule formation event makes it possible that chondrules in different parent bodies formed at different timed thus explaning the different abundances of the early formed CAIs in different parent bodies. This would imply that chondrules in ordinary chondrites formed later than the chondrules in Allende.

Our data also has several significant implications for the formation of achondrite parent bodies: 1) ^{26}Al appears to have been the dominating heat source in the early Solar System. If ^{26}Al was homogenously distributed throughout the solar system this implies that the chondrite parent bodies must have accreted later than the achondrite parent bodies in order to escape heating and differentiation. 2) If achondrites come from parent bodies that accreted prior to the formation of chondrules in ordinary chondrites then we may have no samples of the precursor materials. Although ordinary chondrites are the most abundant type of meteorite falling on Earth today they may be different from the material ~150 achondrite parent bodies accreted from.

References: [1] Baker J.A. et al. (2004) *Goldschmidt Conf. Abstract #1305*. [2] Bizzarro M. et al. (2004) *Goldschmidt Conf. Abstract #896*. [3] Lundgaard, K.L.. et al. (2004) *Goldschmidt Conf. Abstract #250*. [4] Amelin, Y. et al. (2004) *Goldschmidt Conf. Abstract #958*.