^{26}AL-^{26}MG SYSTEMATICS OF UNGROUPED ACHONDRITES: IMPLICATIONS FOR TIMING OF PLANETESIMAL DIFFERENTIATION.

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Introduction: We have recently begun an investigation of the petrology, geochemistry, and chronology of several achondrites classified as "anomalous" or "ungrouped". The main goal is to gain a more comprehensive understanding of the time scales and processes involved in the accretion and differentiation of the diverse parent bodies of these unusual achondrites. In this work, high-precision ^{26}Al-^{26}Mg systematics are reported for the anomalous eucrites SaU 493 and NWA 4470, and the ungrouped primitive achondrites NWA 5297, and Tafassasset. The petrology of these samples has been described previously by [1,2] (and references therein). With the exception of Tafassasset [3], no previous chronologic data exists for these samples.

Analytical Methods: The methods for mineral separation, chemistry and mass spectrometry for Mg isotope analyses in the Isotope Cosmochemistry and Geochronology Laboratory at ASU have been described previously by [4,5]. We measured Al-Mg systematicss in mineral separates (pyroxenes and plagioclase) in SaU 493 and NWA 4470, and in whole-rock (WR) samples of SaU 493, NWA 4470, NWA 5297, and Tafassasset.

Results and Discussion: Internal Al-Mg isochrons for the two anomalous eucrites, SaU 493 and NWA 4470, are equilibrated and provide only upper limits on the ^{26}Al/^{27}Al ratios at their time of equilibration. Relative to the D'Orbigny angrite age anchor [4,6], these internal isochrons yield upper limits on the crystallization ages of SaU 493 and NWA 4470 of <4559.1 Ma and <4555.8 Ma, respectively. The SaU 493 and NWA 4470 whole-rocks have δ^{26}Mg* of 0.030 ± 0.011‰ and 0.032 ± 0.011‰, respectively. Model isochrons based on the Al-Mg systematics of these whole-rock samples and bulk chondrites [7] yield ages of 4564.4 (+0.3/-0.5) Ma and 4565.2 (+0.3/-0.4) Ma for SaU 493 and NWA 4470, respectively. These ancient ages suggest that the Al-Mg fractionation in the source reservoirs of these two achondrites occurred within ~2-4 Ma of CAI formation [8,9].

The whole-rocks of the primitive achondrites NWA 5297 and Tafassasset have δ^{26}Mg* values that are unresolvable from the chondritic value [7], while having subchondritic ^{27}Al/^{24}Mg ratios (~0.07 and ~0.02, respectively; errors on these values are ±5%). Chondrite-WR model isochrons (corresponding to timing of Al/Mg fractionation on their parent bodies) for these samples yield upper limits of <4567.9 Ma and <4567.7 Ma, respectively.

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