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Relative ages of CAIs: Al-Mg database and NC CAI measurements

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Calcium-aluminum-rich inclusions (CAIs) are the first-formed solids in the early Solar System. They are time capsules, recording the protoplanetary disk events that led up to planet formation. CAIs are found within chondrite meteorites; many thousands have been identified, and many hundreds have been measured isotopically. The short-lived radionuclide ^{26}Al, with a half-life of 0.7 million years, gives us the ability to relatively age-date CAIs [1]. We will present on 1) the new CAI database, which focuses on Al-Mg isotope systematics [2]; and 2) ordinary chondrite CAI Al-Mg data. We constructed the accessible CAI database to provide CAI data to the community. As an example, we use the database to compare melted CAIs, which experienced thermal events after formation, to unmelted CAIs, which appear as fine-grained condensates. Though the timelines of these two groups overlap, the unmelted CAIs began forming slightly before the melted ones, and they began condensing over a restricted time interval. The CAI database shows that very few CAIs from non-carbonaceous chondrites have been dated by the Al-Mg system. This is because they are very rare (~0.01 vol.% [3]), small (<100 μm), and difficult to measure. We measured six ordinary and enstatite chondrite CAIs, which have robust isochron fits, to show that CAIs found in inner and outer Solar System accreted bodies originally formed at the same time. All CAIs, regardless of the locations of the parent bodies they were incorporated into, appear to have started condensing around the same time.

[1] Davis (2022) *Annual Review of Nuclear and Particle Science* 72, 339-363. [2] Dunham et al. (2025) *ApJS* 282, 11-26. [3] Dunham et al. (2023) *GCA* 58, 643-671.

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