Combined Al-Mg and Hf-W isotope systematics of a large type B CAI

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Ca-Al-rich inclusions (CAIs) are the oldest dated solids of the Solar System and, as such, are pivotal reference points for short- and long-lived chronometers like the Al-Mg, Hf-W, and Pb-Pb systems. However, until now absolute (Pb-Pb) ages and the initial abundances of short-lived radionuclides (^{26}Al, ^{182}Hf) were obtained on different sets of CAI samples [*e.g.*, 1–4], hampering the direct comparison of these chronometers and the establishment of a precise chronology of the early Solar System.

To overcome this limitation, we are investigating an exceptionally large (~2 cm diameter) CAI from the CV3 chondrite NWA 6870, which allows combining detailed petrographic characterization with the analyses of multiple isotope systems and chronometers. This inclusion is a coarse-grained type B CAI [consisting mainly of melilite, fassaite (Ti-Al-rich calcic pyroxene), spinel, and anorthite], is rather pristine, and shows the typical flat (group I) REE pattern.

Al-Mg data obtained by SIMS yield an initial ^{26}Al/^{27}Al that is indistinguishable from the canonical value of $\sim 5.2\times10^{-5}$ [2,3], attesting to the pristine character of this CAI, and making it an ideal sample to precisely determine the Solar System initial ^{182}Hf/^{180}Hf. We are in the process of obtaining Hf-W data for different mineral separates, which will be presented at the conference. A previous study has shown that the Hf/W is strongly fractionated among the minerals in type B CAIs [5], which in combination with the much improved analytical precision, will make it possible to obtain a precise internal Hf-W isochron. As such, this CAI will be the first for which both precise Al-Mg and Hf-W data are available, making it an essential reference sample for comparing Al-Mg and Hf-W ages for meteorites and, hence, to assess the issue of whether ^{26}Al was homogeneously distributed within the early Solar System.

[1] Connelly et al. (2012) *Science* **338**, 651-655. [2] Jacobsen et al. (2008) *EPSL* **272**, 353-364. [3] MacPherson et al. (2012) *EPSL* **331-332**, 43-54 [4] Kruijer et al. (2014) *EPSL* **403**, 317-327. [5] Burkhardt et al. (2008) *GCA* **72**, 6177-6197.