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Nucleosynthetic W isotope anomalies and Hf-W chronometry of Ca-Al-rich inclusions.

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Obtaining a precise Hf-W chronology of the early solar system requires knowledge of its initial Hf and W isotope compositions. These can most directly be determined on Ca-Al-rich inclusions (CAI). However, as nucleosynthetic W isotope anomalies may significantly bias the inferred initial $^{182}W/^{184}W$ of CAI [1], precise quantification of such anomalies is required. We show that fine-grained CAI exhibit large nucleosynthetic W isotope anomalies, and that their decay-corrected $^{182}W/^{184}W$ define a precise correlation with $^{183}W/^{184}W$. This provides a direct empirical means to correct the $^{182}W/^{184}W$ of any CAI for nucleosynthetic isotope anomalies. After correction the Hf-W data define a precise bulk CAI isochron and solar system initial Hf and W isotope compositions. Using our new initial $^{182}Hf/^{180}Hf$ of CAI, there is good agreement between Hf-W and Al-Mg ages for angrites, suggesting that ^{26}Al was homogeneously distributed in the early solar system. However, the combined investigation of Hf-W, Al-Mg and Pb-Pb on a single CAI is required to fully assess the concordance of these chronometers.

[1] Burkhardt, C. et al. (2012) APJL 753, L6.

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