The search for a robust short-lived radionuclide anchor

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The determination of high-resolution timescales of early solar system processes relies on precise, accurate, and concomitant dating with long- (i.e., $^{238}U/^{235}U$-corrected ^{207}Pb-^{206}Pb) and short-lived (e.g., ^{26}Al-^{26}Mg, ^{53}Mn-^{53}Cr) chronometers. As the precision of mass spectrometric analyses has improved dramatically, inconsistencies have emerged between the different high-resolution chronometers. The range of solar system formation ages based on U-corrected ^{207}Pb-^{206}Pb internal isochron ages of CAIs and on achondrites is inconsistent with their corresponding ^{26}Al-^{26}Mg systematics (e.g. [1]). Consequently, the initial distribution of ^{26}Al and Mn-Cr model ages hold uncertainty. Sources of these discrepancies may be analytical or due to sample characteristics. The Pb-Pb ages are dependent on knowing precisely the U isotopic composition, which can vary among mineral phases of a given rock. There should also be an absence of secondary disturbance by planetary or weathering processes that are commonly observed in meteorite finds.

[1] Bouvier A. et al. (2025) Treatise on Geochemistry, 3rd Edition, vol. 7, 203-256.