Al-Mg and Mn-Cr systematics in CAIs from NWA 4502

J. WIMPENNY[1]*, M. SANBORN[1], Q.-Z. YIN[1], A.YAMAKAWA[1], M. SAPAH[2], Y. AMELIN[2], T. IRELAND[2], C. STIRLING[3], I. COOKE[3] AND A. N. KROT[4]

[1]Dept. Earth Planet. Sci., Univ. California, Davis, CA 95616 jbwimpenny@ucdavis.edu
[2]RSES, ANU, Canberra, ACT 0200, Australia
[3]Dept. of Chemistry, University of Otago, New Zealand
[4]University of Hawaii at Manoa, Honolulu, HI 96822, USA

The CV chondrite NWA 4502 contains large CAIs that have experienced lower levels of alteration or metamorphism compared to those in Allende or Efremovka [1]. This makes these inclusions suitable to investigate multi-isotope systematics, and to potentially better constrain early solar system chronology and the distribution of short-lived radioisotopes such as ^{26}Al and ^{53}Mn.

To this end we analysed Al-Mg and Mn-Cr isotope systematics, in addition to uranium and oxygen isotopes [2,3], in five CAIs from NWA 4502: two compact Type A, two Type B and one Fo-bearing Type B. All CAIs studied have initial ^{26}Al/^{27}Al ratios within an error of the canonical value [4]. The compact Type A CAI #7 has a resolvably negative initial δ^{26}Mg* value of –0.27±0.16‰, similar to the Allende CAI Egg-3 [5]. Mn-Cr systematics in separates from the 5 CAIs show an excess of ^{53}Cr correlated with ^{55}Mn/^{52}Cr ratio, suggesting decay of ^{53}Mn. However, if the entire data set is regressed the initial ^{53}Mn/^{55}Mn ratio is $\sim 3\times10^{-5}$, much higher than the expected canonical ratio of $\sim 6\times10^{-6}$. This could be due to terrestrial alteration causing excess scatter, or nuclear anomalies on ^{50}Cr or ^{52}Cr. We plan to repeat Al-Mg and Mn-Cr analyses on cleaner fractions in the coming months.

In addition to these data, we observe remarkable isotopic fractionation within CAI #7. Typically a single CAI contains a small internal range of δ^{25}Mg (~0.5‰) and ε^{54}Cr (~1ε) values. The Mg isotopic composition of six separate phases from CAI #7 has a range in δ^{25}Mg of ~14‰, similar to a range observed in 2 FUN inclusions [6] and recent observations from CAIs in Allende [7]. We also observe a 4ε range in ε^{54}Cr in 3 separate samples from CAI #7. The large heterogeneities in ε^{54}Cr with fractionated δ^{25}Mg values requires reconciliation with in-situ oxygen isotope data that do not show the same internal heterogeneities [3].

[1] Sapah *et al* 2013, 44th *LPSC*, #1036. [2] Cooke *et al* 2013, 44th *LPSC*, #1709, [3] Ireland *et al* 2014, 45th *LPSC*, #1671. [4] Sapah *et al* 2013, 75th *MetSoc*. #5156. [5] Wasserburg *et al* 2012, *MAPS*, **47**, 1980-1997. [6] Park *et al* 2013, 75th MetSoc, #5805. [7] Wimpenny *et al* 2014, 45th *LPSC*, #2235.