AN UPDATE ON DISCONNECTING CV AND CK CHONDRITES PARENT BODIES AND MORE. Q.-Z. Yin[1] and M. E. Sanborn[1]. [1]Department of Earth and Planetary Sciences, University of California-Davis, Davis, CA 95616, USA (E-mail: qyin@ucdavis.edu).

Introduction: The potential for a common parent body or single reservoir for the CV and CK chondrites has been proposed based on similarities in their oxygen isotopic composition [1] and certain bulk geochemical constraints, such as abundances of lithophile or siderophile elements (e.g., Cr, Sc, Co, Ni, and Au) [1,2]. The similarities are strong enough that the two chondrite groups are sometimes referred to as the CV-CK clan [3]. The idea of a single parent body has been incorporated into petrologic and thermal models that utilize a single parent body with increasing degrees of metamorphism at deeper depths with CV chondrites near the surface and highly metamorphosed CK chondrites at depth [4]. While the oxygen isotopic and geochemical data do indicate strong similarities between the two groups, other isotopic evidence may indicate distinct sources related to their formation. Oxygen has long been used as one parameter to try and associate different samples to a common source reservoir. However, recent use of adding a second parameter (e.g., Cr) has shown that oxygen alone is not always definitive in identifying a common source for two different meteorites (e.g., [5-8]).

Previously we reported on 3 new CK chondrites and a new aliquot of the CV chondrite Allende (CV_{OxA}) [9]. Here, we report on a significantly expanded dataset, including the CV chondrites Bali (CV_{OxB}), Grosnaja (CV_{OxB}), Mokoia ($CV_{OxA/B}$), Leoville (CV_{Red}), Northwest Africa (NWA) 7891, and the CK chondrites Karoonda, Hart, Ningqiang, and Maralinga, NWA 7461, NWA 7704, NWA 6703, NWA 8776, and a peculiar NWA 6047. Combining these new isotopic measurements with previously analyzed samples, we explore the genealogy of CK and CV chondrites, and identify a potential new C chondrite (NWA 6047).

Methods: For all CV and CK chondrite samples, a homogenized powder was made from an interior chip that was visually inspected to ensure no fusion crust was present. An aliquot (~15-20 mg) of each sample was placed into a PTFE capsule that was sealed in a stainless steel Parr bomb jacket with a 3:1 mixture of HF: HNO_3. The Parr bombs were heated at 190°C for 96 hours. After complete dissolution, the bulk rock samples were processed through a 3-column chemistry procedure (see [10]) to separate Cr from all other matrix elements. The purified Cr fractions were analyzed on a Thermo *Triton Plus* thermal ionization mass spectrometer at UC Davis. Each W filament was loaded with 3 μg of Cr (four filaments per sample) and each sample was bracketed with the NIST SRM 979 Cr standard. All isotope ratios are reported as parts per 10,000 deviations from the measured SRM 979 composition.

Results and Discussion: The Cr isotopic results for all the samples in this study and those reported in [9] are shown in Figure 1. The location of these samples in Cr-O space are shown in Figure 2 and 3. The new $\varepsilon^{54}Cr$ isotopic data for CV chondrites shows a broad consistency between the measured values in this study and for other CV chondrites for which Cr has been reported [9,11-15]. In particular, the new measurements have representative sample of each of the CV chondrite subgroups: oxidized subgroup Ox_A (Allende), Ox_B (Bali, Grosnaja), and reduced subgroup (Leoville, Vigarano). Regardless of subgroup, Cr is consistently indicating their formation from a common reservoir. This common reservoir also includes CV-like carbonaceous achondrites [6,7]. NWA 6047 is the only sample that significantly plots away from the CV chondrites. However, as discussed in [9] the provenance of this sample is unclear as it has been previously misclassified as CK chondrite and later reclassified as the CV chondrites [16]. However, NWA 6047 is distinctly separated in $\varepsilon^{54}Cr$ from the major population of the CV group. Repeat analyses of NWA 6047 is warranted to verify if there is heterogeneity at the sampling scale.

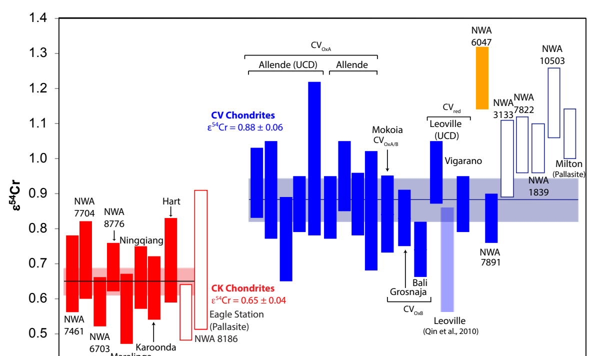

Figure 1. Weighted average of CK and CV chondrites calculated using Isoplot. All reference values are from [6,7,9,11-14]. Open symbols are for the carbonaceous achondrites reported in [6,7]. The shaded region indicates the 95% confidence interval of the weighted average (solid horizontal line) of the CK and CV chondrites only. Open symbols are not included in the regression, as well as the anomalous NWA 6047 (see [9] for discussion).

Among the 8 CK chondrites that have now been analyzed, there is also a consistent ε^{54}Cr composition within the CK group. This is regardless of petrologic type with petrologic grades CK3-5 included. As with CV chondrites, this indicates that all the CK chondrites originate from a common Cr isotopic reservoir, which is isotopically distinct from that of CV reservoir (Fig. 1). Hart, which was originally classified as CK (17,18), but later reclassified as CV [16] appears to be more consistent with the original classification based on Cr isotope composition (Fig. 1).

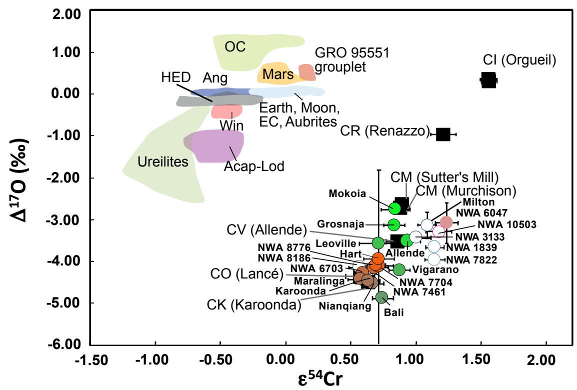

Figure 2. Isotopic composition of CK and CV chondrites in Δ^{17}O-ε^{54}Cr isotope space. Orange shaded symbols are CK chondrites and green shaded symbols are CV chondrites. Carbonaceous achondrites are represented by open symbols. Note the CV chondrite NWA 7891 plots below the x-axis at Δ^{17}O = -7.7 ± 4.5. Literature data from [6,7] and references therein. Figure adapted from [8].

A weighted average of the ε^{54}Cr for the CK and CV chondrites was previously reported by [9]. However, with the significant increase in the number of samples, it is now possible to recalculate the weighted average and evaluate distinct reservoirs with the updated data. The weighted average is ε^{54}Cr = +0.65 ± 0.04 for all the CK chondrites analyzed thus far and ε^{54}Cr = +0.88 ± 0.06 for CV chondrites (both 95% confidence level errors). The ε^{54}Cr composition of the CK and CV chondrite reservoirs are resolvable outside 4σ analytical uncertainty.

Such a clear distinction between the CK and CV chondrites in this study argues against a common origin for the two different chondrite groups. As additional data is put into context, this difference in the Cr isotopic composition of the two reservoirs becomes clearer at higher precision.

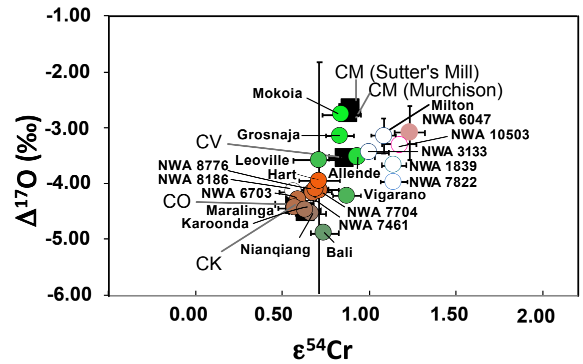

Figure 3. Same as Figure 2 but magnified to show the CV and CK region.

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