

**AQUEOUS ALTERATION AND ITS EFFECT ON $\epsilon^{54}\text{Cr}$:
AN INVESTIGATION OF CR1 AND CR2 CHONDRITES.**

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Introduction: The Renazzo-like carbonaceous (CR) chondrites represent some of the most primitive meteoritic samples and have experienced varying degrees of aqueous alteration as indicated by the presence of petrographic types 1 and 2 [1]. Variations in the stable $^{54}\text{Cr}/^{52}\text{Cr}$ isotope ratio have been reported across the entire range of carbonaceous chondrite groups [2-4]. However, a systematic study of any variation within a single carbonaceous chondrite group whose samples span a broad range of oxygen isotopic compositions and alteration grades has yet to be made. Previous studies investigating the Cr isotopic composition in carbonaceous chondrites (e.g., [2,4]) were limited to a single representative CR chondrite sample. However, the CR2 and CR1 chondrites span a broad range of oxygen ($\Delta^{17}\text{O}$) isotopic composition and have varying aqueous alteration histories from minimal alteration to nearly complete alteration of the primary mineral assemblages [5]. Here we present high-precision Cr isotopic measurements on five CR chondrites: GRO 95577 (CR1), QUE 99177 (CR2), LAP 02342 (CR2), MET 00426 (CR2), and GRA 95229 (CR2). These five samples encompass the broad range of aqueous alteration and range in $\Delta^{17}\text{O}$ from -0.36 to -2.89 [5,6].

Analytical Methods: Sample aliquots (15-20 mg) for each of the CR chondrites analyzed were obtained from bulk, homogenized powders from which previous aliquots were used for oxygen isotopic measurements [5]. Separation of Cr was completed using the procedure described by [7]. High-precision Cr isotope ratios were acquired using a Thermo *Triton Plus* thermal ionization mass spectrometer at the University of California at Davis (see [8] for details on the mass spectrometry procedure).

Discussion: The $\epsilon^{54}\text{Cr}$ composition for all five CR chondrites spans a narrow range from $+1.32 \pm 0.09$ (2SE) to $+1.49 \pm 0.11$ epsilon units (relative to terrestrial standard NIST SRM 979). No correlation is observed between $\epsilon^{54}\text{Cr}$ and the extent of aqueous alteration (and $\Delta^{17}\text{O}$ composition) with all samples overlapping within analytical uncertainties for $\epsilon^{54}\text{Cr}$. The absence of variability indicates that aqueous alteration processes occurring on the CR parent body did not affect the Cr isotopic composition established during accretion from the source reservoir. The lack of modification of the $\epsilon^{54}\text{Cr}$ value, even in the presence of significant alteration, reinforces the use of $\epsilon^{54}\text{Cr}$ to establish genetic links among Solar System materials.

References: [1] Weisberg M. K. et al. 1993. *Geochimica et Cosmochimica Acta* 73:1436-1460. [2] Trinquier A. et al. 2007. *The Astrophysical Journal* 655:1179-1185. [3] Yin Q.-Z. et al. 2009. Abstract #2006. 40th Lunar & Planetary Science Conference. [4] Qin L. et al. 2010. *Geochimica et Cosmochimica Acta* 74:1122-1145. [5] Schrader D. L. et al. 2011. *Geochimica et Cosmochimica Acta* 75:308-325. [6] Choi et al. 2009. Abstract #5339. 72nd Meteoritical Society Meeting. [7] Yamakawa A. et al. 2009. *Analytical Chemistry* 81:9787-9794. [8] Sanborn M. E. and Yin Q.-Z. 2015. Abstract #2241. 46th Lunar & Planetary Science Conference.