ELECTRIC PULSE DISAGGREGATION OF CV3 METEORITES: CHARACTERIZATION AND OXYGEN ISOTOPIC ANALYSES OF MATRIX

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CV3 meteorites possess a record of the Solar Nebula from the first condensation of solids (calcium- aluminium-rich inclusions, CAIs) through the condensation of low-temperature nebular dust (matrix) [1,2,3]. This class of carbonaceous chondrites has two different lithologies: oxidized (e.g., Allende), which contains FeO-rich olivine and magnetite; and reduced (e.g., Efremovka, Vigarano), which contains Fe-metal instead of Fe-oxide [1]. It has been suggested that both assemblages originate from the same parent body, with oxidized meteorites indicating more extensive thermal and aqueous alteration [2]. Oxygen isotopic data supports this hypothesis; however, the individual components of these meteorites preserve nebular heterogeneity. While there are extensive reports of CAI oxygen isotopic composition ($\Delta^{17}O \approx -25$ - -4 ‰), matrix has only been examined for a few oxidized CV3 meteorites ($\Delta^{17}O \approx -3$ ‰) [3].

We used electric pulse disaggregation (EPD) to break up samples of 3 CV3 meteorites, Allende, Efremovka, and Vigarano, into their individual nebular components. EPD analyses were done in collaboration with CNT Mineral Consulting, Inc. Samples were placed on a bed of 5 mm ultra-pure quartz in a Spark-2 EPD; we discontinued shock pulsing when the entire sample passed through a 1 mm sieve. Samples were then separated via heavy liquids from the quartz, as well as at 3.3 g/cm^3. Each density fraction was size-sorted. This technique successfully separated and preserved CAIs and chondrules. All samples contain matrix and crystal fragments; a complete characterization is underway to determine the compositional and textural variation between matrix separates.

We obtained oxygen isotopic data of separated matrix, specifically for the CV3 reduced lithology, to elucidate the nebular and parent body processes preserved. We analyzed mg-sized samples of specific size and density fractions via CO_2 laser fluorination using a ThermoFinnigan Delta mass spectrometer. Oxygen isotopic data has a precision of ± 0.02 ‰ in $\Delta^{17}O$. Thus far we have measured four samples of Efremovka matrix; $\delta^{18}O$ ranges from −2.37 ‰ to 0.12 ‰, and $\Delta^{17}O$ varies from −4.90 ‰ to −3.98 ‰. Two samples of Vigarano matrix yield $\delta^{18}O = -2.79$ ‰ and −1.79 ‰, giving $\Delta^{17}O = -5.77$ ‰ and −4.47 ‰, respectively. Allende matrix is characterized by $\Delta^{17}O = -2.7$ ‰ [3].

The preliminary data indicate that CV3 reduced matrix may be characterized by a more ^{16}O-rich composition; however, we may also be sampling matrix heterogeneity. We plan to correlate observed petrography with the oxygen isotopic data in order to verify that we are analyzing predominantly matrix, broaden the data set of CV3 matrix oxygen isotopic composition, and arrive at an understanding for the heterogeneity observed both within a given meteorite and amongst the CV meteorite class.

References: [1] McSween H.Y. 1977. *GCA* 41:1777–1790. [2] Krot A. N. et al. 1995. *Meteoritics* 30:748–775. [3] Clayton R. N. and Mayeda T. K. 1999. *GCA* 63:2089-2104.