A PRIMITIVE OXYGEN ISOTOPE RESERVOIR FOR CHONDRULES FROM CR CHONDRITES.

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Introduction: For carbonaceous chondrites, oxygen isotopic compositions of bulk chondrules [1-3] and individual chondrule mineral grains [4-6] lie close to the CCAM line on an oxygen three-isotope plot. There have been few studies of bulk chondrule isotopic compositions from primitive chondrites that allow comparisons between different chondrite groups [2]. For CR chondrites, the only available bulk chondrule oxygen isotope data are from Renazzo and Al Rais [7]. These analyses lie on a line of slope 0.84, but because both of these chondrites have undergone extensive aqueous alteration (CR2.4 and 2.3, respectively [8]), the data are unlikely to represent primary chondrule isotopic compositions. We have measured bulk oxygen isotopic compositions of chondrules from one of the least altered CR chondrites, EET92042 (CR2.8 [8]), with the objective of determining the primitive isotopic distribution for CR chondrules.

Analytical methods: We extracted nine chondrules from EET92042 using freeze-thaw disaggregation. Each chondrule was mounted in Crystalbond™, polished and analyzed using SEM and EPMA, and then demounted using acetone. Oxygen isotope analyses were performed on 0.6-2 mg fragments using the laser-fluorination method of [9]. We obtained duplicate analyses for one chondrule. Molecular O_2 was extracted in a BrF_5-atmosphere, cryogenically and gas-chromatographically purified, and the isotope ratios measured on a gas source mass spectrometer (Delta PlusXL). Analytical precision for $\Delta^{17}O$ is 0.02 ‰.

Results: All of the chondrules are metal-bearing type I POP chondrules, with mean olivine Fa contents 0.7-2.9 mole%. Chondrules show little to no alteration. Mesostases vary from being clear glass, to crystalline mixtures of clinopyroxene and anorthite. Primary igneous silica is present in mesostasis in the interiors of two of the chondrules. A linear regression through ten oxygen isotope analyses shows a strong correlation ($R^2 = 0.99$) with the equation $\delta^{17}O = 0.99 * \delta^{18}O - 2.78$. $\delta^{18}O$ values range from -3 to +3 ‰. The regression is essentially identical to a regression line through all *in situ* oxygen isotope analyses in CR chondrules summarized by [6]: $\delta^{17}O = 0.98 * \delta^{18}O - 2.90$.

Conclusions: Bulk chondrules from the unaltered CR chondrite EET92042 lie on a slope-one line on an oxygen three-isotope diagram, showing that CR chondrules initially record mass-independent isotopic fractionation, before parent body processes superimposed mass-dependent fractionation effects. The primitive CR bulk chondrule line differs from the CV_{red} bulk chondrule line [3] and from the slope-one line defined by [10].

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