STRONTIUM STABLE ISOTOPE VARIATIONS IN ALLENDE FINE-GRAINED INCLUSIONS

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Introduction: Strontium isotopic anomalies in meteorites are important in assessing nucleosynthetic sources to, and measuring the timing of, early solar system processes. However, conventional use of a constant $^{88}Sr/^{86}Sr$ value to correct for instrumental mass fractionation erases information on natural stable isotope fractionation. Using double-spike and TIMS methodologies, we obtain data for the four stable strontium isotopes in a suite of previously studied group II CAI from Allende [1]. We also report apparent nucleosynthetic anomalies, obtained on an unspiked sample aliquot.

Results: $\delta^{88/86}Sr$ for individual CAIs define a total range of ~5.3‰, and extend to values that are both lighter and heavier than a BSE value of ca. 0.29‰ [2]. This range is the widest observed so far in meteoritic materials. In three isotope space ($\delta^{88/86}Sr$ vs. $\delta^{84/86}Sr$), the data define an equilibrium mass fractionation line that is displaced from the standard to apparently higher $\delta^{84/86}Sr$ by 0.098‰ – consistent with previous internally normalized data.

Discussion of results: When coupled with REE and other trace element data, the range in our mass-dependent Sr variations preclude a simple formation scenario involving full condensation of Sr followed by partial evaporation. Instead, the most likely mechanism is partial condensation followed by vaporization, where the measured composition of each CAI represents an arrested 'snapshot' of that process. A constant offset in $\delta^{84/86}Sr$ (and lack of correlation with the large range in $\delta^{88/86}Sr$) indicates a primary nucleosynthetic anomaly in ^{84}Sr that most likely did not arise from variable processing of pre-solar materials.

References: [1] Tissot *et al.,* (2016) Sci. Adv. **4**, e1501400 [2] Charlier *et al.,* (2012) EPSL **329**, 31-40.