# OXYGEN ISOTOPES IN PEROVSKITES AND ASSOCIATED MINERAL ASSEMBLAGES IN A HIBONITE-BEARING ALLENDE CAI.

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**Introduction:** Corundum, hibonite, and spinel represent some of the earliest minerals to form from a solar nebular gas [1] and are found together in relatively pristine and rare CAIs [2]. The slow oxygen diffusion coefficients of these mineral phases has enabled them to preserve isotopic records of the primordial oxygen reservoirs of the solar system. Early-forming perovskites on the other hand are quite amenable to oxygen diffusion [3]. Hence, study of oxygen isotopes in hibonite-spinel-perovskite mineral assemblages could provide a more complete record of the changing oxygen isotopic composition of nebular gas in the early solar system.

**Sample and Analytical procedure:** Here we report our initial investigations of a unique hibonite-bearing CAI (EK5-2A) from Allende, that generally resembles a Type A inclusion. It contains a number of texturally distinct clots of refractory minerals including spinel, hibonite, and perovskite nested in melilite. The melilite-dominated interior is surrounded by a Wark-Lovering (WL) rim. Oxygen isotope imaging of perovskite and associated minerals was performed in multi-collection mode with the JSC NanoSIMS 50L. Isotopic images of $^{16,17,18}$O, $^{27}$Al, $^{24}$Mg$^{16}$O, $^{28}$Si, and $^{40}$Ca$^{16}$O were acquired. Madagascar hibonite, Burma spinel, and a synthetic perovskite were analyzed to evaluate instrumental mass bias. The selected mineral assemblages were imaged in 20×20μm rastered areas using a Cs beam and ROIs were selected to obtain the isotopic composition of each mineral phase.

**Results:** Perovskites in different mineral assemblages range from $^{16}$O-rich compositions ($\Delta^{17}$O ~-20‰) in the WL rim to $\Delta^{17}$O values between ~-5‰ to ~-17‰ in the interior. The oxygen isotopic composition of hibonite, spinel, and melilite in proximity to perovskite in the interior shows a rather uniform composition indistinguishable within in errors (~5‰, 2σ) of ~-10‰. In general, both perovskite and its associated hibonite, spinel, and/or melilite are indistinguishable. Exceptions include the perovskite present in the WL rim and one example in the core that is uncharacteristically $^{16}$O-rich compared to the adjoining spinel and hibonite and pervoskite in the margin of the melilite interior that is $^{16}$O-poor compared to that in both the rim and core. The significantly $^{16}$O-rich composition of perovskite present in the WL rim and core compared to pervoskite in the mantle and a majority of the interior presents isotopic evidence that the inclusion may contain relict phases and/or exposure with distinct nebular gases. This has implications for the transport and admixture of these early solar system solids between distinct astrophysical environments.

**References:** [1] Ebel D. (2006) In Meteorites and the Early Solar System II (Lauretta D. et al., eds) U. Arizona, Tucson, 253-277. [2] MacPherson G. J. (2007) *Treatise on Geochemistry* (Heinrich, D.H., Karl, K.T. (Eds.),. Pergamon, Oxford, 1-47. [3] Gautason, B. and K. Mudhlenbacks (1993) *Science* 260, 518-521.