EVIDENCE FOR AQUEOUS ALTERATION IN ORDINARY CHONDRITES FROM COMPOSITIONAL AND OXYGEN ISOTOPIC TRENDS IN AN EXOTIC FRAGMENT. K.A. Dyl[1], A. Bischoff[2], K. Ziegler[3], K. Wimmer[4], E.D. Young[1,3], [1]Department of Earth and Space Sciences, UCLA, Los Angeles, CA 90095 (kdyl@ucla.edu), [2]Institut für Planetologie, Wilhelm-Klemm-Str. 10, 48149 Münster, Germany, [3]Institute of Geophysics and Planetary Physics, UCLA, Los Angeles, CA 90095, [4]Suedendstr. 1, 86695 Nordendorf, Germany.

Introduction: Type 6 ordinary chondrites (OCs) have undergone extensive thermal metamorphism; however, the timescales and nature of this processing are debated [1,2]. Previous studies have documented the presence of halite, as well as evidence for aqueous alteration, in highly metamorphosed ordinary chondrites [3,4]. An exotic fragment in Villalbeto de la Peña (L6) offers a unique opportunity to probe fluid-assisted metamorphism in an OC. Shock veins indicate early incorporation into the parent body, and a coarse-grained rim is evidence of chemical interaction with its host [5]. We measured the compositional and oxygen isotopic gradients, using them to model diffusion at type 6 conditions with and without the presence of H_2O.

Results: The dark fragment, composed primarily of feldspathic groundmass, is ~spherical and 2 cm in diameter. The inclusion has a coarse-grained rim composed of albitic plagioclase (~An_{10}) indistinguishable from that in the host. A diffusion profile extends 500 μm into the fragment, where it reaches andesine composition (~An_{50}) characteristic of the fragment.

Oxygen isotopic data were obtained for the bulk meteorite and inclusion using CO_2 laser fluorination. Villalbeto de la Peña has an oxygen isotopic composition with $\Delta^{17}O \approx 1.1$ ‰, consistent with L6 ordinary chondrite. The bulk inclusion records a $\Delta^{17}O \approx -0.55$ ‰. The in situ UV laser ablation fluorination system at UCLA was used to measured $\Delta^{17}O$ across the host-fragment interface. The profile reveals a clear isotopic gradient 1000-1500 μm into the inclusion, indicating exchange.

We used our two data sets and previously determined diffusion parameters to model silicon diffusion (a proxy for albite-anorthite) and oxygen self-diffusion in the fragment, both "dry" [6,7] and in the presence of of $P(H_2O)$=1 bar [8,9,10]. Solid-state diffusion relying solely on thermal metamorphism cannot explain our data due to the sluggish diffusion of silicon through feldspar structure. Our "wet" diffusion models provide improved fit to our data sets when applying the same timescale to both processes.

Conclusions: We conclude that the exotic fragment present in Villalbeto de la Peña records alteration signatures from a volatile phase on the L chondrite parent body.

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