HYDROGEN ISOTOPIC COMPOSITION OF $^{15}$N-RICH CLASTS IN THE CB/CH-LIKE CHONDRITE ISHEYEVO.
L. Bonal, G. R. Huss, K. Nagashima, A. N. Krot. HIGP/SOEST, University of Hawai‘i at Mānoa, Honolulu, HI 96822, USA.

Metal-rich (CB, CH, Isheyevo) carbonaceous chondrites are characterized by the highest whole-rock enrichments in $^{15}$N ($\delta^{15}$N up to $+1500$‰) and nearly complete absence of interchondrule fine-grained matrix [e.g., 1]. The fine-grained material occurs mainly as chondritic clasts, which experienced low-temperature aqueous alteration on their initial parent body(ies) and were subsequently accreted with the CH and CB high-temperature components [e.g., 1]. We have recently reported the discovery of a unique type of chondritic clasts in the CB/CH-like meteorite Isheyevo, which are characterized by the presence of numerous $^{15}$N-hotspots ($\delta^{15}$N up to $+4000$‰) and by high bulk $^{15}$N-enrichment ($\delta^{15}$N up to $+1300$‰). These clasts may represent surviving pieces of the body that brought the $^{15}$N anomaly into metal-rich chondrites [2]. The identification of such isotopically anomalous material raises the questions of how, where and when the observed N-isotope fractionation occurred. FIB-STEM and NanoSIMS studies are under way to identify the $^{15}$N carrier [3, 4], which is likely to be organic. Here we report H-isotope composition of the clasts to further characterize this unique material.

The UH Cameca ims 1280 ion microprobe was used to collect isotope-ratio images (areas of $50 \times 50 \mu m^2$) of the Isheyevo $^{15}$N-rich clasts. Ion images were acquired using a 15pA Cs+ primary beam, focused to ~1.5 µm spot. The analyses were carried out in two steps: 1) images of H, D were acquired at low mass resolution with counting times of 3s and 60s respectively; 2) images of H, $^{12}$C, $^{13}$C, $^{12}$C$^{14}$N, $^{12}$C$^{15}$N, $^{18}$O, and $^{28}$Si were acquired at high mass resolution as described in [2]. The matrices of Renazzo (CR), Orgueil (CI), and Semarkona (LL3.0) chondrites were used as standards, assuming bulk H, C, and N values from [5]. L’image software (L. Nittler) was used to extract quantitative isotopic and elemental ratios on spatial scales of $\geq 1.5 \mu m$.

Our preliminary results on the Isheyevo clasts show (i) no high bulk enrichment in D ($\delta D_{bulk} \leq 500$‰), despite a high bulk $^{15}$N enrichment ($\delta^{15}$N $\sim 1000$‰); (ii) no D-rich hotspots, despite the systematic presence of $^{15}$N-rich hotspots.

Because Isheyevo clasts experienced aqueous alteration [3], hydrated phases, as well as organic matter (OM), are likely to be major H carriers. Dilution by D-poor hydrated phases could mask a potential D enrichment in OM, as could differential emission of H from hydrated phases and OM during ion beam sputtering. In addition, our current standards do not provide tight control on instrumental mass fractionation. Analytical issues are currently being investigated to better constrain the bulk H isotopic composition of the $^{15}$N-rich clasts. Thus, the relatively low bulk D enrichment of the matrix does not preclude yet that the $^{15}$N-rich carrier(s) in the Isheyevo clasts could be D-rich. Moreover, the absence of D-hotspots needs to be confirmed. However, the lack of D enrichment in $^{15}$N-hotspots already indicates that the molecular carriers of the most extreme D and $^{15}$N anomalies are different, as is the case in IDPs and primitive chondrite matrices [6, 7].