

HASSI EL BIOD 002: NEW UNGROUPED PALLASITE.C. B. Agee¹, A. J. Ross¹, M. N. Spilde¹, K. Ziegler¹, ¹Institute of Meteoritics, University of New Mexico

Fig. 1

Introduction: We report here on a recently classified ungrouped pallasite Hassi el Biod 002 (HeB 002) which is a unique type both in terms of olivine composition and oxygen isotopes. Along with Milton, HeB 002 is the only other ungrouped pallasite that is not a pyroxene pallasite (PP), however Milton and HeB 002 are not paired, and do not have olivine compositions and oxygen isotopes that are similar [1].

History and Physical Characteristics: HeB 002 was found near a dry riverbed approximately 50 km northwest of Foggaret Ezzoua in Salah Province, Algeria in 2020. The total known weight of HeB 002 is approximately 10 kg. Saw cut surfaces show angular cm-sized dark-orange olivine grains set in metal (figure 1). There are also smaller scattered olivines set in the host metal. The modal abundances are approximately 60% metal, 38% olivine, 2% troilite and chromite.

Petrography, Geochemistry, Oxygen Isotopes: Electron microprobe analysis and imaging reveal the presence of magnesian olivine, kamacite, and minor troilite and chromite. No other phases were detected with both EPMA and SEM searches. Olivine $Fa_{7.6\pm 0.1}$, $Fe/Mn=24\pm 1$, $Fe/Mg=0.082\pm 0.001$, $n=12$; metal $Fe=95.4\pm 0.4$, $Ni=5.2\pm 0.1$ wt%, $n=5$; chromite $Cr_2O_3=67.9\pm 0.7$, $Al_2O_3=1.6\pm 0.3$, $FeO=18.2\pm 1.8$, $MgO=8.0\pm 1.2$, $MnO=1.1\pm 0.3$ wt%, $n=3$. Oxygen isotopes: 6 acid-washed fragments analyzed by laser fluorination gave $\delta^{18}O=2.820, 3.390, 3.386, 3.186, 2.910, 3.341$; $\delta^{17}O=0.338, 0.440, 0.650$; $\Delta^{17}O=-1.151, -1.350, -1.138, -1.165, -1.142, -1.161$ (linearized, all per mil, TFL slope=0.528) with mean values $\delta^{18}O=3.172\pm 0.251$, $\delta^{17}O=0.490\pm 0.122$, $\Delta^{17}O=-1.185\pm 0.082$.

Unique Pallasite Hassi el Biod 002: HeB 002 clearly possesses all the textural characteristics of a pallasite, however it has unique characteristics that set it distinctly apart from the Pallasite Main Group (PMG), the Eagle Station Group (ESG), as well other ungrouped or anomalous pallasites. For example, its oxygen isotope values occupy a location in triple oxygen isotope space that is different from other known pallasites. Interestingly, HeB 002 oxygen isotope values are coincident with the acapulcoite-lodranite group, suggesting a possible genetic link (figure 2). HeB 002 also has olivine compositions that are more magnesian than any other known pallasite ($Fa_{7.6\pm 0.1}$, $Fe/Mg=0.082\pm 0.001$) with the lowest Fe/Mn values (24 ± 1) ever reported in pallasite olivine [2]. These HeB 002 olivine values resemble the more magnesian members of the acapulcoite-lodranite group as well as olivines in

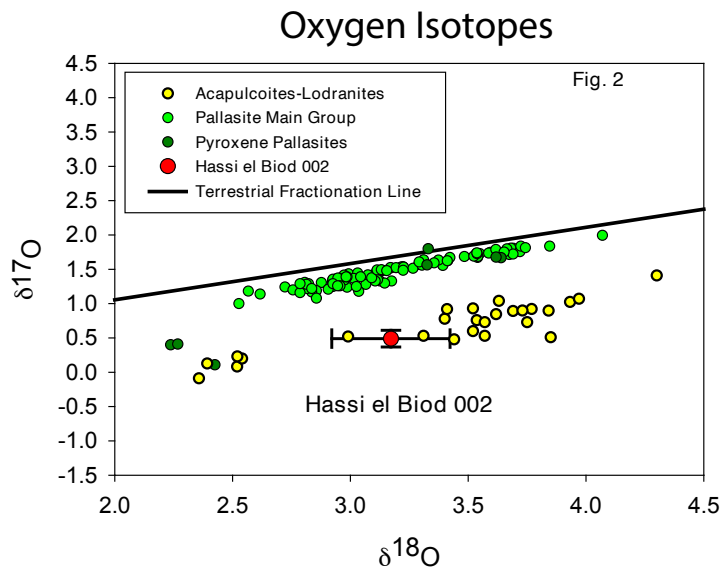


Fig. 2

winonaites. Chromite elemental values in HeB 002 also appear to be anomalous with respect to other pallasites. In particular Fe/Mn and Al/Cr values are among the lowest ever reported in pallasite chromite.

Acapulcoite/Lodranite-Like Parent Body for Hassi el Biod 002?: Because Main group pallasites have triple oxygen isotope values similar to HED and mesosiderites it has been proposed that PMGs are possibly derived from Vesta-like parent body [3]. Likewise Eagle Station pallasites and some carbonaceous chondrites appear to have a genetic relationship as seen in similar stable isotope values [4]. In the case of HeB 002, as discussed above, an acapulcoite/lodranite-like parent body seems plausible and more work is needed on HeB 002 to further test this hypothesis.

References: [1] Jones R. H. et al. (2003) *34th LPSC*, abstract 1683. [2] Boesenberg J. S. et al. (2012) *Geochim. et Cosmochim. Acta* 89, 134-158. [3] Ziegler K. and Young E. D. (2011) *42nd LPSC*, abstract 2414. [4] Dey S. and Yin Q.-Z. (2022) *53rd LPSC*, abstract 2428.