Magmatic H_2O contents and D/H ratios in olivine, pyroxene and melt inclusions from Martian meteorite RBT 04262

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Nominally anhydrous minerals (NAMs) and their inclusions, may record water contents and D/H ratios in achondrites that can be used to infer those of planetary mantles [1]. We constrain the volatile signature of the Martian mantle using the Cameca 6f SIMS at ASU to measure ^1H and ^2H in pyroxene, olivine, and olivine-hosted melt inclusions of Martian meteorite RBT 04262 (Fig.). The latter is an enriched lherzolitic shergottite with non-poikilitic (*nP*) and poikilitic (*P*) lithologies [2].

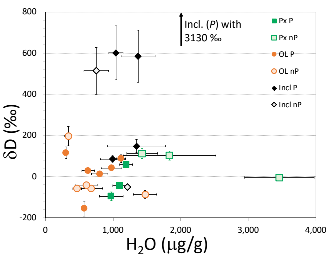

Fig. Water content (μg/g) and δD (‰) ±1σ in RBT 04262 olivine, pyroxene, and melt inclusions. Incl. = crystallized melt inclusion in olivine

Pyroxenes exhibit increasing H_2O content with decreasing Mg#, consistent with fractional crystallization. This correlates with decreasing δD in *nP* pyroxene, suggestive of melt degassing [3]. In *P* pyroxene, δD increases at the augite rim in contact with the *nP* lithology, likely from interaction with the *nP* melt. Lower H_2O content and higher δD are found at *nP* olivine edges compared to their cores, consistent with degassing of H after olivine crystallization [4-5]. Major elements and H_2O are homogeneous in *P* olivine, with a slight δD increase at the edge. The low (≤600‰) δD of the melt inclusions is lower than that of other melt inclusions analyzed in non-epoxied Martian meteorite sections (δD>1000‰ [6-7]), but similar to one melt inclusion from Yamato 980459 (275 ‰ δD [7]). Although a single inclusion here has elevated δD and H_2O content, characteristic of interaction with surficial water on Mars [7], the remaining six inclusions may record the δD signature of the enriched shergottite mantle (-50 to 602 ‰).

[1] Peslier *et al*. (2010) *JVGR* **197**, 239-258. [2] Usui *et al*. (2010) *GCA* **74**, 7283-7306. [3] De Hoog *et al*. (2009) *CG* **266**, 256-266. [4] Peslier *et al*. (2019) *GCA* In press. [5] Roskosz *et al*. (2018) *GCA* **233**, 14-32. [6] Mane *et al*. (2016) *MPS* **51 (11)**, 2073-2091 [7] Usui *et al*. (2012) *EPSL* **357-358**, 119-129.