OXYGEN ISOTOPIC COMPOSITION OF AN UNUSUAL CLAST IN THE PARIS CM METEORITE.

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Introduction: During the last meeting, Caillet et al. [1] reported the discovery of a 360-μm lithic clast in the Paris meteorite with unusual characteristics. Its Mg isotopic composition indicates the decay of in-situ ^{26}Al at the time of crystallization of the fragment and gave an age contemporaneous with chondrule formation event. The petrologic and chemical compositions of this igneous, volatile-rich, but incompletely crystallized clast disclosed a complex history and suggested a distinct origin. To better constrain the formation history of the clast, we report here the 3-oxygen isotopic composition of its olivine constituent. A nearby chondrule olivine and a large olivine grain in the matrix are also measured for comparison.

Methods: Oxygen isotopes were obtained with the Cameca NanoSIMS 50 at MNHN. Under Cs^+ primary ion beam (5μm) of 200-pA secondary ions of ^{16,17,18}O, ^{30}Si, and ^{24}Mg^{16}O were measured in a multi-detection mode using a Faraday cup (FC) (^{16}O) and 4 EMs. Brenham, Eagle Station and Springwater olivines were used as reference materials to calibrate the oxygen isotopic data.

Results: We made a total of 13 measurements of olivine, 8 of them in the clast (5 grains), 3 in separate olivine crystals of the chondrule, and 2 in the large olivine grains in matrix. On a three-O isotopic plot, the chondrule and the large olivine grains are well aligned with the Paris-CM line [2]. The large olivine has mean δ^{17}O and δ^{18}O values of -2.2‰ and +4.3‰ respectively, while the chondrule shows two domains, one close to the large olivine values and a spot with extreme values of -17.8‰ and -22.3‰, respectively. The clast shows a quite different trend with δ^{17}O and δ^{18}O ranging from -8.6‰ and -15.6‰ to -3.1‰ and -0.7‰, respectively. Two spots in the higher side of the trend form a connection to the Paris-CM line. The clast average δ^{17}O and δ^{18}O are -5.3‰ and -7.9‰, respectively, and plots slightly lower than the TF line (average Δ^{17}O of -1.2‰).

Discussion: Our isotopic results suggest that the fragment evolved in a gas reservoir from which the oxygen isotopic composition was inherited from evaporation of a body located on the terrestrial fractionation line. Analyses are in progress to show if the clast started to crystallize in this different O-isotopic reservoir or from that of the host Paris as our preliminary results would suggest. Its extended range to the Paris-CM fractionation line suggests a limited isotopic mixing with the latter. The average of the measured olivine crystals in the clast corresponds to none of the known meteorite-classes. Strikingly, it rather plots within O-isotopic composition range of rare individual olivine grains in CH chondrites [3]. Curiously, it also matches the Wild 2 cometary olivine grain Bidi [4] that could contain pieces of unknown old pristine differentiated bodies. In either case, the petrographic-chemical composition discrepancy is still indicating a more complex history of this clast.

References: [1] Caillet et al. 2013. *MAPS* 76:A5199. [2] Hewins et al. 2014. *GCA 124*, 190-222. [3] Jones et al. 2005. *36th LPSC*: A1813. [4] Nakashima et al. 2011. *42nd LPSC*: A1240.