A UNIQUE CHONDRITE CLAST IN THE NORTHWEST AFRICA 13262 (L3 BRECCIA) BEARING SIMILARITIES TO CARBONACEOUS AND ORDINARY CHONDRITES

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Introduction: In ordinary chondrites (OC) a large diversity of dark-colored clasts (or inclusions) can be found; however, these terms do not provide any information about the genetic origin and the mineralogy of the fragments [1,2] and encompass very different types of rocks summarized in [1]. Most clasts within OC breccias probably derived from projectiles, whereas other may have been included by early accretion. Here, we report on a chondritic clast that is different from material sampled by individual meteorites.

Samples and analytical methods: Northwest Africa (NWA) 13262 was found as a single stone of 29.7 g. The meteorite is brecciated and contains several lithic clasts. Back-scattered electron imaging (BEI), and chemical analyses (SEM) were conducted at the Institut für Planetologie, University of Münster. Bulk oxygen isotope analysis of the clast was obtained using IR-laser fluorination at the Universität Göttingen. In-situ oxygen-isotope analyses of carbonates and silicates were carried out using the Heidelberg Ion Probe (Cameca IMS 1280-HR).

Results and discussion: The host material is an OC with an apparent chondrule size of ~500 µm on average. The mean olivine and low-Ca pyroxene compositions are $Fa_{16.3\pm10.4}$ and $Fs_{7.9\pm7.4}Wo_{0.5\pm0.4}$, respectively. Based on the chondrule size, chondrule-matrix ratio, texture, and unequilibrated mineral chemistry the host is classified as an L3 chondrite. The sample is heavily weathered (W3/4). Several similar clasts are present in NWA 13262; those on the outer parts of the rock are highly altered and contain veins filled by terrestrial calcite as demonstrated by their O-isotopic composition ($\delta^{17}O$ = +16.3 ‰; $\delta^{18}O$ =+29.7 ‰). The least altered clast ("clast-2"; 5.4 x 3.9 mm) is located in the center of the stone and does not contain any calcite veins. Clast-2 consists of 67 vol.% matrix, 32.5 vol.% chondrules, and 0.12 vol.% of CAIs. The matrix predominantly consists of µm-to-subµm-sized silicates, minor troilite, and some Fe-Ni metal grains. The apparent diameters of intact chondrules range from 140 to 1200 µm with a mean of 500 µm. No chondrule rims are present. Olivine and low-Ca pyroxene within the chondrules are unequilibrated. Olivine ranges from $Fa_{2.8}$ to $Fa_{42.2}$ (mean: $Fa_{20.9\pm14.4}$; n = 46), and pyroxenes are $Fs_{4.8\pm4.0}$ $Wo_{41.1\pm6.4}$ and $Fs_{14.3\pm7.9}$ $Wo_{0.86\pm0.5}$. Moreover, the clast has undergone partial metamorphic equilibration as indicated by the uniform composition of the matrix olivine grains ($Fa_{\sim38}$). Thus the Fa-value may reflect the high bulk FeO content of the fine-grained matrix material. Some pyroxene grains show slight aqueous alteration and transformation into phyllosilicates.

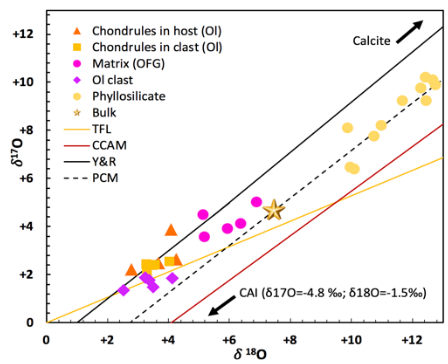

Fig. 1: δ18O vs. δ17O plot illustrating the oxygen isotopic composition of the bulk clast, chondrules and phyllosilicates. Ol=Olivine, OFG= Olivine fine-

The oxygen isotopic composition of the bulk clast-2 ($\delta^{17}O$ = +4.71 ‰; $\delta^{18}O$ =+7.45 ‰; Fig. 1) differs from that of other OCs; *in-situ* oxygen isotopic compositions of some chondrule constituents are consistent with those of the host material and some match those of the bulk clast. Oxygen isotopic compositions of the matrix olivine grains show similar compositions to that of the bulk, while phyllosilicates fall in a separate reservoir and are ^{16}O-poor, although they were analyzed only using the SC olivine as a standard.

Conclusions: According to all previous observations, clast-2 has some properties broadly resembling those of carbonaceous chondrites and ordinary chondrites. Some polymict breccias contain discrete clasts of different chondrite groups [3-7]. However, no single meteoritic lithology yet described has such peculiar characteristics as clast-2. Considering the modal abundance of matrix and chondrules, only "clast 6" within NWA 10214 [8] shows some similarities with this clast, but has different chondrule sizes and also shares some similarities with the enstatite chondrite groups, which is not the case for our sample.

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