# FIRST FIND OF A SERPENTINIZED PERIDOTITE CLAST IN A UREILITE? WHEN A MIX-UP IN THE LAB CAN RESULT INTO A SENSATIONAL CLAIM.

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**Introduction:** In the framework of a research project on ureilites [1], several samples, as polished mounts and rock chips, have been requested from different institutions. Ureilites are achondrite meteorites mostly consisting of mantle restites containing up to 8 wt% carbon, have recorded melting, smelting, and shock (e.g., [2]; [3]), and which can contain clasts with anomalous composition (e.g., [4]). During the planned investigations, which included LA-ICP-MS for in situ isotopic characterization of the main silicate phases (olivine and pyroxene) and electron microprobe for correlating the isotopic profiles with the chemical zoning of the given minerals, one of the samples kindly provided by the Natural History Museum (NHM) of London (UK) supposed to be a fragment of the Dyalpur ureilite revealed uncommon mineralogy and atypical REE in situ profiles for ureilites. A full set of additional investigations was applied to characterize this exceptional sample. The initial enthusiasm for a possibly extraordinary discovery of a new type of clast in a ureilite changed to disappointment, when both oxygen isotopy (performed at the CRPG) and cosmogenic radionuclide concentrations, measured by Accelerator Mass Spectrometry (AMS) using the unique Ion-Laser InterAction Mass Spectrometry (ILIAMS) setup at the Vienna Environmental Research Accelerator (VERA) [5], proved that the investigated specimen is not of extraterrestrial origin.

**The discussed sample:** Even though not being a meteorite, the sample presents interesting features. The polished mount labelled BM.51185 consists of pargasite-hornblende amphibole grains embedded in a forsteritic olivine ($Fo_{91}$) groundmass, crosscut by a serpentinite vein, in which relic olivine and chromite grains occur. Locally, Ca-pyroxene occurs at the margin of amphibole. Geothermobarometry applied to amphibole (e.g., [6]; [7]) yielded pressure of 6-7 kbar and temperatures in the range 790-840°C. However, amphibole is not in equilibrium with the groundmass, which did also not reach equilibrium, hampering the application of other geo-thermobarometers. The observed characteristics could be consistent with metasomatized peridotite-xenoliths in basalts recording breakdown of amphibole (e.g., [8]; [9]) due to decompression and heating or subduction of pargasite-lherzolite after dehydration of serpentinite (e.g., [10]). The samples under investigation showed distinct lower concentrations of long-lived cosmogenic radionuclides $^{26}Al$ and $^{41}Ca$ at the 29-sigma and 5-sigma level, respectively, compared to the literature data on the real Dyalpur sample. However, despite extensive efforts, also in collaboration with the colleagues of the NHM London, the origin of the rock that was accidentally mixed up with Dyalpur could not be identified.

**Final remarks:** The validation of a terrestrial origin, unequivocally supported by cosmogenic radionuclide evaluation, prevented the authors to publish the results of expensive analyses on the investigated sample in a high impact factor journal. Moreover, the missing identification of the sampling region hampers also any scientific publication on strictly geological journals. This unfortunate episode should move curators of historical meteorite collections to reconsider and improve the documentation on sample manipulation. Introducing a waiver of responsibility in the loan form would also be highly recommended. Caution is advised also to scientists, who should thoroughly test their specimens before claiming exceptional discoveries.

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**References:** [1] Chernonozhkin S.M. et al. (subm.) *Geochemical Perspectives Letters*. [2] Goodrich C.A. (1992) *Meteoritics* 27:327-352. [3] Goodrich C.A. et al. (2007) *Geochimica et Cosmochimica Acta* 71:2876-2895. [4] Bischoff A. et al. (2014) *Proceedings of the National Academy of Sciences of the United States of America* 111: 12689-12692. [5] Martschini et al. (2022) *Radiocarbon* 64: 555-568. [6] Hammarstrom J.M. and Zen E. (1986) *American Mineralogist* 71: 1297-1313. [7] Ridolfi F. and Renzulli A. (2012) *Contributions to Mineralogy and Petrology* 163: 877-895. [8] Ban M. et al. (2005) *Contributions to Mineralogy and Petrology* 148:511-523. [9] Kaeser B. et al. (2007) *Journal of Petrology* 48:1725-1760. [10] Niida K. and Green D.H. (1999) *Contributions to Mineralogy and Petrology* 135:18-40.