

A POSSIBLE PAIRED FALL OF NICOLÁS LEVALLE FROM ARGENTINA AND ITS P IN CHONDRULES .

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Introduction: Recently a meteorite from Argentina was classified as L5 and named Nicolás Levalle (Meteoritical Bulletin Database, in press). We examined a meteorite which is presumably paired to this possible fall considering the date and location which was reported to us from locals (Mr. Blanco). We classified our sample as LL4. In addition, we studied this meteorite focusing on the abundance and distribution of P in chondrules.

Petrology and Mineral Chemistry: Modal abundances are 78 % chondrules (PO, BO, RP), 14 % matrix, 5 % troilite, 1 % taenite, 1 % chromite and 1 % minor phases (apatite, e. g.). The Fa content of the olivines is 26.00 ± 0.33 mol%, $n = 67$ and the orthopyroxene composition is $Fs = 22.12 \pm 0.52$ mol%, $En = 76.60 \pm 0.44$ mol%, $n = 26$. Still, the PO chondrules studied contain a clear to turbid glassy mesostasis. Therefore, we suggest to classify the sample as LL4. Undulatory extinctions of the olivines accompanied by rare planar fractures are indicative of a shock stage S3 [1]. The Meteoritical Bulletin lists a lower Fa content of 24.9 ± 0.20 mol% ($n = 6$) possibly indicating a brecciated meteorite.

P-zoned Olivines in particular Chondrules: Some type IIA chondrules show P-zonation patterns within the olivines similar to those investigated in H-chondrites by [2], [3] and Semarkona LL3 by [4]. While divalent cations like Fe and Mg are completely equilibrated during thermal metamorphism, P retains the magmatic zonation patterns of the olivines. The incorporation of P during olivine crystallization is indicative of rapid crystallization and high P contents in the melt [5]. The content of P_2O_5 of the mesostasis of five investigated chondrules varies within a factor of about 5 (from 0.67 to 0.12 wt%) as P is locked up in phosphate whereas the content of SiO_2 , MgO, FeO, CaO, Al_2O_3 and Cr_2O_3 remains relatively constant due to diffusion of the elements across the chondrule rims. At the interface between dendritic clinopyroxene and glass within the mesostasis of chondrules with high P_2O_5 contents tiny phases ($< 1 \mu m$) rich in Ca and P occur which we consider as microcrystals of apatite formed during thermal metamorphism. The glass is free of P_2O_5 . This may allow us to distinguish different types of chondrules whose original chemistry is erased during thermal metamorphism. Other type IIA PO chondrules have lower contents of P_2O_5 within the mesostasis. No P-zonation features of the olivines were found in the latter. [6] also found a positive correlation between P content in olivine and the mesostasis. Further studies of the zoning of P and other trace elements in UOCs and EOCs are planned.

References: [1] Stöffler D. et al. 1991 *Geochimica et Cosmochimica Acta* 55: 3845–3867. [2] McCanta M. C. et al. 2008. Abstract #1807. 39th Lunar & Planetary Science Conference. [3] McCanta M. C. et al. 2009. Abstract #2048. 40th Lunar & Planetary Science Conference. [4] Hewins R. H. 2009. 40th Lunar and Planetary Science Conference. [5] Boesenberg J. S. et al. Abstract #1366. 35th Lunar & Planetary Science Conference. [6] Jones R. H. 1990 *Geochimica et Cosmochimica Acta* 54: 1785–1802.