

**MILIMETER-SIZED GRANULAR INCLUSIONS IN AL HAGGOUNIA 001
(LAAYOUNE, MOROCCO) ENSTATITE CHONDRITE :
HEXOTIC CLASTS OR RECRYSTALLIZED MACROCHONDRULES?**

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Introduction: Al Haggounia 001 meteorite was recovered from the rural district of Al Haggounia, located 100 kilometers east of Laayoune city, Morocco. Between 2015 and 2017 we carried out six field campaigns during which twenty samples for a total mass of 7 kg were collected. Their geographic distribution confirms the 10 by 60 km extension of the strewn field defined by [1]. The ¹⁴C terrestrial age is 23000 ± 2000 years [2]. The occurrence of relict chondrules indicates that Al Haggounia 001 is an enstatite chondrite, not an aubrite, e.g., [3] and [4]. Macrochondrules have textures and mineral assemblages like normal chondrules and so share a common origin. Clasts show evidence for fracturing from larger bodies and could be classified in different categories [5].

Petrography: Petrographic thin sections were realised from 52 of our samples at CEREGE-France, totalling a surface ca. 400 cm² for observation with a Zeiss-Axio Imager polarizing microscope in transmitted and reflected light, coupled with a digital camera, AxioCam-105-color at Dipartimento di Scienze della Terra - Università di Pisa Italy. Al Haggounia 001 contains many large mm-sized granular objects visible at naked eye, scattered or juxtaposed in aggregates (Fig.1.A). By microscopy we report radial crystals, granular and cryptocrystalline (Fig.1.B) in the same shape with large granular rims, we find too RP, BP and PP chondrules with their relicts.

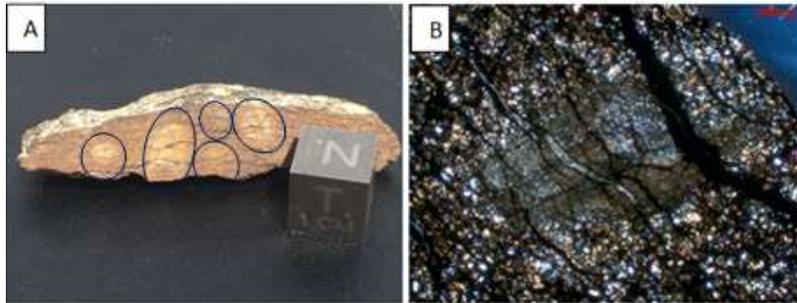


Fig.1:A- Image of slice of Al Haggounia fragment; A good example which contains five inclusions within one slice **B**-Polarized light microscope image of the largest shape on figure A.

Discussion: Knowledge of chondrules size distribution may help to provide constraints on models concerning chondrule genesis [6]. The term of “Macrochondrules” was used for the first time by [7] for chondrules >5 mm diameter. In 2016 [4] reported that mean chondrules size for NWA 7401 meteorite paired to Al Haggounia 001 ($1160 \pm 420 \mu\text{m}$) is much larger than that of average EL3 ($550 \mu\text{m}$) or any other major chondrite group. Here we report many large forms could be clasts or macrochondrules in enstatite chondrites with 11x6 mm-sized with millimetric rim thickness. The size was determined by completing the outline of the shape on the image.

To characterize and better understand the nature of these objects, other analyses are in progress, including SEM imaging, EDX compositional mapping and Raman spectroscopy. Results will be presented at the meeting.

References: [1] Chennaoui-Aoudjehane H. et al. 2007. *70th Met. Soc* #5329 [2] Chennaoui-Aoudjehane H. et al. 2009. *72nd Annual Met. Soc* #5037. [3] Irving A. J. et al. 2010. *73rd Annual Met. Soc* #5378. [4] Rubin A. E. 2016. *Meteoritics & Planetary Science*, 12679: 1–12. [5] Bridges J. C. et al., (1997), *Meteoritics & Planetary Science*, 32, 389-394. [6] Gooding J. L. 1983. *chondrules and their origins*, pp. 61-87. [7] Weisberg M. K. et al. 1988. *Meteoritics*, 23:309–310.