ALMAHATTA SITTA MS-17 EL-3 CHONDRITE FRAGMENT: CONTRASTING OLDHAMITE ASSEMBLAGES IN CHONDRULES AND MATRIX AND SIGNIFICANT OLDHAMITE REE-PATTERNS.

A. El Goresy[1], M. Boyet[2], and M. Miyahara[3]. [1]Bayerisches Geoinstitut, Universität Bayreuth, 95447 Bayreuth, Germany, E-mail: Ahmed.Elgoresy@uni-bayreuth.de, [2]Université Blaise Pascal, Lab. Magmas et Volcans, UMR CNRS 6524, BP 10448, F-63000 Clermont-Ferrand, France. [3]Department of Earth and Planetary Materials Science, Graduate School of Science, Tohoku University, Sendai 980-8578, Japan.

Introduction: Almahatta Sitta CT_3 2008 is considered a second-generation polymict asteroid dominated by ureilites [1]. The impact also delivered OCs, EH and EL chondrites. MS-17 preliminarily classified as shocked EL-3/4 chondrite [1] is full of chondrules and FeNi clasts. We report detailed petrographic studies, mineral chemistries and REE abundances of oldhamite (CaS) in chondrules and matrix in two large polished thin sections from its unweathered interior.

Results and Discussion: MS-17 is a chondrule-rich EL-3 conglomerate with a matrix dominated by fluffy accreted lithologies. The matrix is full of individual oblong FeNi metal objects containing prismatic crystals of enstatite and rarely diopside both grown from the metal outer surfaces into their interiors. FeNi metal objects have fluffy accretionary rims of idiomorphic troilite (FeS) with daubreelite exsolution lamellae, alabandite and sphalerite crystallites. Chondrules are exceptionally enriched in large amoeboid stoichiometric CaS grains with minor Mg, Mn and Fe-contents (1.34 mol% MgS, 1.55 mol% MnS, and 0.89 mol% FeS). CaS engulfs stoichiometric enstatite (En) crystals barren of MnO, poor in CaO (0.63 wt%) and FeO (0.76 wt%). In contrast to CaS in chondrules, every CaS in matrix contains $(FeNi)_3P$ inclusions hinting to different fO_2 conditions. We found no metal-troilite eutectic textures or shock-induced phase transitions of En to majorite or akimotointe. We reclassify MS-17 as a pristine EL-3 chondrite. En in FeNi clasts is barren of MnO but hosts higher FeO (1.19 wt. %) than in chondrule En (< 0.8 wt. %). Metal clasts enclose in their interiors 4 different graphite types, no shock twinning or inversion to diamond thus refuting origin of the metal clasts by shock melting. LA-ICPMS studies of 11 oldhamites in different settings reveal CI-normalized REE patterns with prominent negative Eu anomalies without Yb depletions. MS-17 is an unshocked EL-3 conglomerate of CaS-rich chondrules and FeNi- enstatite-graphite clasts decorated with FeS fluffy rims prior to accretion. Enstatite compositions point to separate nebular sources of chondrules and metal-bearing clasts.

Conclusions: MS-17 contains two different CaS populations: Grains with $(Fe, Ni)_3P$ inclusions in the matrix, and clear amoeboid grains in chondrules. CaS in MS-17 EL-3 depicts REE patterns (negative Eu anomaly) different from the *mainstream* pattern in EH-3 (positive Eu and Yb anomalies [2]). Presence of $(Fe, Ni)_3P$ in CaS in matrix is strongly suggestive of condensation of schreibersite at 1439 K and C/O ratio > 0.83 before condensation of CaS [3]. The two different settings of CaS in chondrules and matrix strongly suggest two different fO_2 at their condensations.

References:[1] Bischoff A. et al. 2010. *Meteoritics & Planetary Science*, 45, 10-11, 1638-1656 [2] Gannoun et al., 2011 *Geochim. Cosmochim. Acta* 75, 3269-3289. [3] Petaev, M. I. and Wood, J. A. 2000: *Meteoritics & Planetary Science*, XXXI, # 1608.