PETROLOGICAL DIVERSITY OF POIKILTIC SHERGOTTITES: INSIGHTS FROM THE 5-CENTIMETR SLAB OF NORTHWEST AFRICA 13366 SHERGOTTITE.

S. Yamazaki[1], T. Mikouchi[1,2], C. P. Tang[3], [1]Dept. of Earth and Planetary Science, The University of Tokyo, Hongo, Tokyo 113-0033, Japan (yamazaki-sojiro615@g.ecc.u-tokyo.ac.jp), [2]The University Museum, The University of Tokyo, Hongo, Tokyo 113-0033, Japan, [3]State Key Lab. of Lunar and Planetary Science, Macau University of Science and Technology, Macau, China.

Introduction: Shergottites record recent igneous activity of Mars and analyzing these samples allow us to understand magmatic compositions and their crystallization processes [e.g., 1-3]. However, the size of Martian meteorites that can be analyzed in the laboratory is limited, and mineralogical information is usually from a few cm scale of polished fs. Therefore, if we can analyze larger samples, we can better understand the diversity of the petrological texture and mineral compositions. In this study, we tried to directly analyze a NWA 13366 slab whose size is ~5 cm across by electron microprobe (EPMA) to determine textural and compositional differences on such a scale.

Sample and Methods: We analyzed a polished slab of NWA 13366 (~5 x 5 cm). Elemental maps were obtained using a JEOL JXA-8900L EPMA at Univ. of Tokyo (15 kV acceleration voltage and 80 nA beam current). The elemental maps were then used for quantitative analysis of olivine and pyroxene in both poikilitic and non-poikilitic lithologies. The quantitative analysis was set up at acceleration voltage of 15 kV and beam current of 12 nA.

Results: Fig. 1 shows a Ca map of the NWA 13366 slab analyed. It is obvious that NWA 13366 is a poikilitic shergottite containg scattered pyroxene oikocrysts (~5 mm) enclosing olivine chadacrysts. Most of the sample is showing a non-poikilitic texture and the poikilitic lithology is only 10-20 vol.% (region I). However, it is noted that at the upper part of the slab there is an area where pyroxene oikocrysts dominate (Fig. 1). Fig. 1 further shows that pyroxene oikocrysts have Ca-rich rims (augite) in both regions, but the core in region II is more Ca-poor than that in region I (Fig. 2). The rim of the pyroxene oikocryst in region II is thinner than that of region I and has a smaller chemical compositional range than region I. The Mg#s of olivine chadacrysts and pyroxene oikocrysts are also slightly different between regions I and II. In region I, the range of Mg# in olivine chadacrysts is 0.74-0.65 and the highest Mg# of pyroxene oikocrysts is 0.80. On the other hand, in region II, the range of Mg# in olivine chadacrysts is 0.76-0.61 and the highest Mg# of pyroxene oikocrysts is 0.81. There is no clear variation for the Mg# of olivine and pyroxene in non-poikilitic lithologies of both regions.

Discussion and Conclusion: The textural and compositional differences of two regions found in the 5 cm slab of NWA 13366 suggest that Mg-rich olivine first crystallized in the magma reservoir at depth and pyroxene subsequently crystallized enclosing olivine. Some early formed crumps of such oikocrysts were accumulated to form region II. The later formed oikocrysts were similarly accumulated, but the abundance was low and mostly crystallized when oikocryst-bearing magma moved near the surface to crystallize non-poikilitic lithology forming region I. Thus, this study suggests that a wide petrological variation of poikilitic shergottite may result from a few cm scale heterogeneity of the sample [e.g., 1].

References: [1] Howarth G. H. et al. (2014) *Meteorit. Planet. Sci.* 49:1812-1830. [2] Howarth G. H. et al. (2017) *Meteorit. Planet. Sci.* 52:391-409. [3] Rahib R. R. et al. (2019) *Geochim. Cosmochim. Acta* 266:463-496.

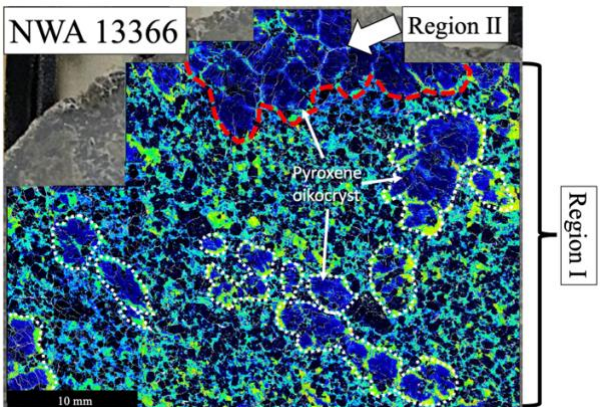

Fig. 1. Ca map of the NWA13366 slab studied. Note the presens of an aggregate of pyroxene oikocrysts at the upper portion of the slab (region II).

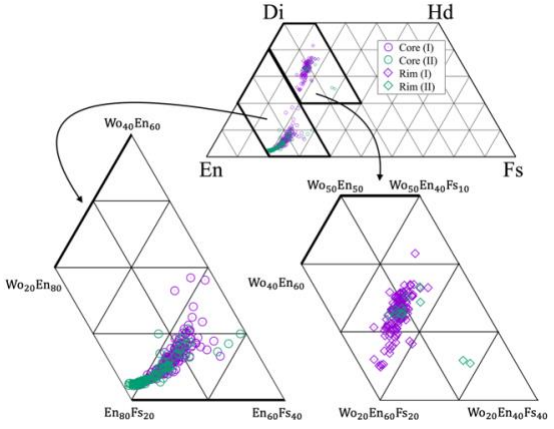

Fig. 2. Pyroxene quadrilateral of NWA 13366, showing slightly different core compositions between two regions.