COMPARISONS OF MINERALOGY OF PURE ANORTHOSITE IN LUNAR METEORITES, DHOFAR 489 GROUP AND PURE ANORTHOSITE OBSERVED BY KAGUYA.

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Introduction: The global distribution of "purest-anorthosite" (PAN; > 98 vol.% plagioclase) has been observed by the Multiband Imager (MI) and Spectral Profiler (SP) on board the Kaguya [e.g., 1]. The presence of the PAN rocks requires a global mechanism with efficient separation of plagioclase from coexisting mafic minerals inside lunar magma ocean [1]. The petrogenesis of the PAN rocks is interesting in the study of lunar magma ocean. We found some nearly pure anorthosite clasts (e.g., d2 clast) in feldspathic lunar meteorites, Dhofar 489 group [2,3,4]. In this work, we have derived the petrogenesis of these pure anorthosite clasts useful to investigate the association with these clasts and PAN, and the formation mechanism.

Sample and Methods: The polished thin section (PTS) of the d2 clast which is a white large anorthosite clast in Dhofar 489 was examined with the HITACHI S-3000N scanning electron microscope (SEM) at Waseda University and the JEOL JXA-8900 electron probe micro-analyzer (EPMA) at Atmosphere and Ocean Res. Inst., Univ. of Tokyo (AORI).

Results: The d2 clast (2.7×3.6 mm^2) is composed of 99.4 vol.% plagioclase, 0.4 vol.% pyroxene, and 0.2 vol.% olivine. In the d2 clast, the mafic silicates are very rare, and small in the grain sizes (< 30 μm). The plagioclase crystal (0.16 wt.% FeO, 0.13 wt.% MgO, An_{96}) presents original crystallization texture with twinning. The orthopyroxene ($Wo_3En_{65}Fs_{32}$, Mg number = 66) and olivine (Fo_{61-63}) in the d2 clast are more ferroan than the mafic minerals (Mg numbers > 70) in magnesian anorthosites in Dhofar 489 [2]. The chemical composition of the d2 clast is within the range of ferroan anorthosite (FAN). Takeda et al. [4] reported a pure anorthosite clast (2.4×1.8 mm^2) in Dhofar 911 paired with Dhofar 489. Olivine (Mg number; 82 [4]) in this anorthosite clast is more magnesian than those in the d2 clast. This difference of Mg numbers may imply the variation of Mg numbers of their source region in vertical or lateral direction. On another front, if these pure anorthosites crystallized from the same igneous activity, and experienced the separation of plagioclase from coexisting mafic minerals, the formation mechanism to form the Mg number variation of mafic minerals in restricted area is required. In either case, since the sizes of our pure anorthosite clasts are in the order of sub-cm, we still have to estimate how large their entire sizes of the areas and their variation of the Mg number between these areas exist, to compare the petrogenesis of these pure anorthosites to that of the PAN rocks with the order of kilometer size.

References: [1] Ohtake M. et al. (2009) *Nature*, 461, 236-240. [2] Takeda H. et al. (2006) *EPSL*, 247, 171-184. [3] Nagaoka H. et al. (2011) *Antarctic Meteorites XXXIV*, 56-57. [4] Takeda H. et al. (2012). *LPS XXXXIII,* Abstract #1379.