Japan Geoscience Union Meeting 2013
(May 19-24 2013 at Makuhari, Chiba, Japan)

PPS02-06 Room:203 Time:May 20 11:00-11:15

Formation of Ca-rich Plagioclase in Meteoritic and Lunar Crust and its Decomposition with Reference to Earth Environment

Hiroshi Takeda[1*], Hiroshi Nagaoka[2], Yuzuru Karouji[3], Makiko Ohtake[3], Yuuki Yazawa[4], Akira Yamaguchi[5], Takashi Mikouchi[1]

[1]Univ. of Tokyo, Graduate School of Science, [2]Waseda Univ., [3]JAXA/ISAS, [4]Chiba Inst. of Tech., Dept. of Life & Environm. Sci., [5]National Inst. of Polar Res.

In some Antarctic LL chondrites, we found the first evidence of a product of partial melting of the primitive solar materials in Y-74160 [1]. This andesitic material with albite and diopside assemblage, was found in the silicate inclusions in the IAB [2] and IIE irons [3]. In a part of crystalline granulitic clasts in the Y-981971 and Y-793214 LL [4], we found a sizable grain of albite in recrystallized mafic silicates. The presence of the andesitic material suggests that even the primitive solar system material shows evidence of extensive processes of melting and metamorphism. The mineralogy of Vesta, based on data obtained by the Dawn spacecraft's spectrometer [5], is consistent with howardite-eucrite-diogenite (HED) meteorites. Spectrally distinct regions include the south-polar Rheasilvia basin, which displays a higher diogenitic component. This is broadly consistent with our layered crust and magma-ocean models [6]. The unusually low Na in A881394 granuritic eucrite [7] suggests that Na may have been lost by catastrophic bombardment during magma ocean stage to produce Ca-rich plagioclase.

Based on the Th map made by KGRS, Kobayashi et al. [8] showed that the lowest Th regions in the lunar farside occurs north of the equatorial region and noted that the region (FS-DJ region) well correspond to the high Mg number (Mg#) region measured by SP, of the farside crust [9] and consists of rocks that crystallized from less-evolved magma than the nearside crust. The Th concentration of Dhofar 489 [10] are lower than those of the lowest-Th region. Anorthosites composed of nearly pure anorthite (PAN) at many locations in the farside highlands and a map of the Mg#s [9] also showed that the region around the FS-DJ basin is consistent with the Mg#(70 to 76) of the magnesian anorthositic clast in Dhofar 489 [10].. Lunar Magma Ocean (LMO) model deduced from the Apollo samples is not able to explain such dichotmy of the Moon. Convection model [9], or a Procellarum basin impact by Nakamura et al. [11] may explain the problems resulted from the above new findings. A large impact, which excavated a basin of the farside might have produced granulites at a large basin or in deep ejecta of a smaller impact. We investigated a process of decomposition of Ca-rich plagioclase similar to lunar ones by geochemical weathering with fulvic acid in comparison with normal acid. Fulvic acid is a complex natural organic acid produced in humified soils. The Ca ion released from plagioclase can be used to fix carbon dioxide as calcite as in oolites. This information is useful for reducing carbon dioxide from the atmosphere on the Earth.

References: [1] Takeda H. et al.(1984) *Earth Planet. Sci. Lett. (EPSL)* 71, 329-339. [2] Takeda H. et al. (2000) *Geochim. Cosmochim. Acta (GCA)* 64, 1311-1327. [3] Takeda H. et al.(2003) *GCA*, 67, 2269-2288. [4] Takeda H. et al. (2012) *Antarctic Meteorite* XXXV 54-55, NIPR. [5] De Sanctis M. C. et al. (2012) *Science* 336, 697-700. [6] Takeda H. (1979) *Icarus* 40, 455. [7] Nyquist L. E. et al. (2003) *EPSL* 214, 11-25. [8] Kobayashi S. et al. (2012) *EPSL* 337-338, 10-16. [9] Ohtake M. et al. (2012) *Nature Geosci.* 5, 384-388. [10] Takeda H. et al. (2006) *EPSL* 247, 171-184. [11] Nakamura R. et al. (2013) Nature Geosci. in press.

Keywords: Lunar farside, lunar meteorites, lunar crust, Kaguya mission, Vesta, LL chondrite.