P168-P008 **Room: Poster Session Hall** **Time: May 29**

Dehydration mechanism during heating of hydrous asteroids inferred from naturally and experimentally heated CM chondrites

Aiko Nakato[1]; Tomoki Nakamura[2]; Fumio Kitajima[2]; Takaaki Noguchi[3]

[1] Earth and Planetary Sciences, Kyushu Univ.; [2] Earth and Planetary Sci., Kyushu Univ.; [3] Ibaraki Univ

Aalteration took place in the interior of hydrous asteroids. At a certain period after the alteration, the hydrous asteroids were heated and dehydrated. However, it remains unknown when and how the asteroids were heated and dehydrated and what caused the heating. In the present study, we used Murchison, as an example of unheated samples, and Belgica-7904(B-) that came from the asteroids experienced heating and dehydration. We performed heating experiments for Murchison and compared the experimentally heated products with B-7904 to evaluate the conditions (duration and temperature) of heating.

The heating experiments of Murchison were carried out in high vacuum at 600^{o}C for 1 hour, 600^{o}C for 96 hours, 900^{o}C for 1 four, and 900^{o}C for 96 hours. The heated Murchison, the unheated Murchison, and B-7904 were characterized by an optical microscope, normal and field-emission scanning electron microscope (SEM and FE-SEM), electron-probe micro-analyzer, synchrotron X-ray diffraction, and micro-Raman spectroscopy.

We obtain the following results from the observation and analysis: (1) The phyllosilicates in matrix of Murchison are dominated by serpentine, but they were not detected in matrix of B-7904 due to decomposition by heating. (2) There are abundant secondary olivine and metal in B-7904. (4) Both B-7904 and Murchison experienced a moderate degree of aqueous alteration. (4) Both of the meteorites do not show extensive Fe-Mg zoning in chondrule olivines, but B-7904 shows a weak zoning. Based on these results, we focus on the following four processes which differ in rates of reactions. (a) inter-diffusion of Fe-Mg in primary olivine, (b) dehydration of the phyllosilicates, (c) crystallinity of secondary olivine, (d) crystallinity of amorphous carbonaceous materials. Then I carried out the heating experiments of Murchison in order to reproduce characteristics resulting from above four processes. In addition, we estimated partial pressures of oxygen during heating consistent with mineral combination found in B-7904.

Observation and analysis of the four experimentally heated Murchison showed that (a) All samples do not show extensive Fe-Mg zoning, but a weak zoning was observed in the sample heated at 900^{o}C and for 96 hours. The zoning profile is very similar to that in B-7904. When I calculated Fe diffusion distance in forsterites using currently-understood minimum diffusion rate, it needs 20 hours at 900^{o}C and 50-1000 years at 600^{o}C to reproduce the diffusion distance observed in naturally heated CM chondrite B-7904. (b) Judging from the results of quantitative chemical analysis of chondrule rims, heating duration of B-7904 was estimated longer than 1 hour at 900^{o}C and 96 hours at 600^{o}C. (c) Based on half maximum full-width of a major olivine diffractions, heating duration and temperature of B-7904 were estimated to be 1 hour at 900^{o}C. (d) Based on the crystallinity of amorphous carbonaceous materials, heating temperature of B-7904 was estimated at least 900^{o}C. Moreover, based on the combination of minerals, heating temperature of B-7904 were estimated higher than 610^{o}C (based on the absence of pentlandite) and lower than 988^{o}C (based on the lack of ubiquitous Fe-FeS melt).

All results, taken together, indicate that the heat-induced characteristics in B-7904 is best reproduced by the heating at 900^{o}C and for the duration at least for 1 hour but no more than for 96 hours. Therefore, it is suggested that B-7904 did not experienced long-duration heating at low temperature such as heating over million years by the decay of short-lived radio-nuclei 26Al, but experienced short-duration high-temperature heating such as shock heating.