REFLECTANCE SPECTRA MEASUREMENT OF VARIOUS CARBONACEOUS CHONDRITES USING HAYABUSA-2 NEAR INFRARED SPECTROMETER.

T. Nakamura[1], T. Iwata[2], K. Kitasato[3], M. Abe[2], T. Osawa[4], M. Matsuoka[1], Y. Nakauchi[2], T. Arai[2], M. Komatsu[5], T. Hiroi[6], N. Imae[5,7], A. Yamaguchi[5,7], H. Kojima[5,7], [1]Tohoku University, Miyagi 980-8578, Japan (tomoki@m.tohoku.ac.jp), [2]Japan Aerospace Exploration Agency, Kanagawa 252-5210, Japan, [3]University of Aizu, Fukushima 965-8580, Japan, [4]Japan Atomic Energy Agency, Ibaraki 319-1195, Japan, [5]Graduate University for Advanced Studies, Kanagawa 240-0193, Japan, [6]Brown University, Providence RI 02912, USA, [7]National Institute of Polar Research, Tokyo 190-8518, Japan.

Hayabusa 2 spacecraft was successfully launched in late 2014 and it will arrive at C-type asteroid 1999JU3 in 2018. The asteroid seems to consist of hydrated and dehydrated carbonaceous chondrite materials [1-3]. The Near Infrared Spectrometer (NIRS3) is an on-board spectrometer designated to detect absorptions between 1.8μm and 3.2μm wavelength [4, 5]. We measured reflectance spectra of nine carbonaceous chondrites (seven CM, one CI, and one CV) using the NIRS3 flight model (now in space with Hayabusa 2) so as to see whether the NIRS3 can detect mineralogical and compositional differences between carbonaceous chondrites and to understand how precisely water contents can be estimated based on 3μm feature. The first results were reported in [6].

Synchrotron X-ray diffraction analysis indicates that many of the CM and CI samples are heated and dehydrated. Reflectance spectra of the same carbonaceous chondrite samples were obtained by the NIRS3 flight model and a FT-IR spectrometer at Tohoku University, at the same phase angle of 30 degrees and at various grain size (<3350μm, <512μm, <155μm, and <77μm) in a vacuumed condition. During measurement some samples were heated to 50°C and 80°C.

The reflectance spectra taken by NIRS3 are basically similar to those by FT-IR: both show a positive linear slope from 1.8 to 2.7μm, a variable decrease at 2.7-3.0μm due to absorption of structural and molecular water. NIRS3 shows slightly jagged spectra due to sensitivity differences between 128 pixels of indium arsenide photodiode sensor, which is able to be calibrated using reference FT-IR data. The depth of the 3μm absorption band varies greatly depending on the degrees of heating: unheated samples (Murchison CM and Murray CM) shows the deepest absorption, moderately heated samples (Y793321 CM, Jbilet Winselwan CM, Y982086 CM, and Y980115 CI) show absorption ~ 40% shallower than Murchison, and strongly heated samples (B7904 and Y86720) show variable but shallow absorption. The depth of the 3μm absorption band correlates positively with water contents of meteorites. Irrespective of meteorite types, finer grain-size samples provide higher reflectance and more positive slope from 1.9 to 2.7μm in spectra. Samples heated at 50 and 80°C show higher reflectance from 2.4 to 3.2μm than room-temperature samples due to heat radiation. All results indicates that NIRS3 can characterize key properties of surface material of asteroid 1999JU3.

References: [1] Vilas F. 2008, *Astron. J.*, 135, 1101-1105. [2] Abe, M. et al. 2008, *LPSC*, 39, #1594. [3] Sugita S. et al. 2013, *LPSC*, 44, #2591. [4] Iwata T. et al. 2013, *LPSC*, 44, #1908. [5] Iwata T. et al. 2014, *LPSC*, 45, #1805. [6] Nakamura T. et al. 2014. *Antarctic Meteorites*, XXXVII, 54.