ORGANIC ANALYSIS OF TERMINAL PARTICLES OBTAINED FROM AEROGEL CAPTURE EXPERIMENT OF MURCHISON METEORITE AT 4 km/s. Y. Ogata[1], H. Yabuta[1], S. Nakashima[1], K. Okudaira[2], T. Moriwaki[3], Y. Ikemoto[3], S. Hasegawa[4], M. Tabata[4], S. Yokobori[5], H. Mita[6], K. Kobayashi[7], E. Imai[8], H. Hashimoto[4], Y. Kawaguchi[5], T. Sugino[5], H. Yano[4], M. Yamashita[4] and A. Yamagishi[5] and TANPOPO WG[4]. [1]Department of Earth and Space Science, Osaka University, 1-1 Machikaneyama, Toyonaka, Osaka 560-0043, Japan. E-mail: hyabuta@ess.sci.osaka-u.ac.jp , [2]University of Aizu, Tsuruga Ikki-machi, Aizu-Wakamatsu 965-8580, Japan, 3 SPring-8, [4]JAXA Institute of Space and Astronautical Science, 3-1-1 Yoshinodai, Chuo-ku, Sagamihara 252-5210, Japan, [5]Tokyo University of Pharmacy and Life Science, 1432-1 Horinouchi, Hachioji 192-0392, Japan, [6]Fukuoka Institute of Technology, 3-30-1 Wajiro-higashi, Higashi-ku, Fukuoka 811-0295, Japan, [7]Yokohama National University, 79-5 Tokiwadai, Hodogaya-ku, Yokohama 240-8501, Japan, [8]Nagaoka University of Technology, 1603-1 Kamitomiokamachi, Nagaoka 940-2188, Japan.

Introduction: Organic matter in interplanetary dust particles (IDPs) records the primitive chemical history in the early Solar System as well as it is thought to have delivered the building blocks of life to the early Earth [1]. Historically, a number of isotopic and molecular compositions of organic matter in IDPs collected in stratosphere have been studied [2-5]. The Japanese Astrobiology working group, Tanpopo, is planning to collect the IDPs using a low-density silica aerogel (0.01 g/cm^3) [6] on the International Space Station from 2013 [7]. The mission has a great advantage that collection of the pristine IDPs without atmospheric entry heating and terrestrial contamination will be expected. One thing that has to be considered is a possible modification of the chemical composition of organic matter in IDPs upon their high velocity impact to the aerogel. This issue has been also concerned in the Stardust comet sample return mission, and the laboratory simulations have been conducted to study the alteration of minerals [8, 9]. However, the alteration of organics under a *realistic* condition has not been well understood. As a ground-based experiment, we have conducted a laboratory experiment of aerogel capture of Murchison meteorite powder at 4 km/s using a two-stage light gas gun, in order to evaluate the extent of modification of organic matter in the meteorite.

Experimental: The Murchison meteorite powder (~ 500 µg) of a particle diameter of 30-100 µm in a polycarbonate sabot was shot at ~ 4 km/s using a two-stage light gas gun at JAXA/ISAS. The penetrations of the meteorite powder formed ~70 tracks of ~10 mm in aerogel. Six terminal particles were extracted from the aerogel tracks using a tungsten needle and were pressed between two aluminum (Al) foils. The particles on the Al foils were analyzed by micro-Fourier transmission infrared (FTIR) spectroscopy and micro-Raman spectroscopy. IR spectra were measured by a FTIR micro-spectrometer (FTIR620 and IRT30, JASCO Inc.) at Osaka Univ. IR imaging and spectra were acquired by a synchrotron-based FTIR micro-spectrometer (Bruker Vertex 70 and Hyperion 2000 systems) at the beamline 43IR, SPring-8. Reflection absorption method with 4 cm^{-1} resolution was applied. Micro-Raman analyses were performed by Spectra-Pro300i Raman spectroscopy with OLYMPUS BX50 at Osaka Univ. Argon laser beam (514.5 nm, 0.5 mW) was used. The laser spot size was 5 µφ. For a comparison, pre-shot Murchison meteorite powder was analyzed by these micro-spectrometers.

Results and discussion: The IR imaging detected the regions of absorptions of aliphatic carbons, CH_3 at 2960cm^{-1} and CH_2 at 2920cm^{-1} within the two Murchison terminal particles captured by aerogel. Thus, organic matter is survived through the high velocity impact at 4 km/s. The spectral intensities of aliphatic carbons in the terminal particles are slightly lower than those in the pre-shot Murchison meteorite. CH_2/CH_3 ratios obtained from the IR spectra of the terminal particles were 0.3 – 3, while those of the pre-shot sample were 1.3 – 2. The difference in the ratios may be reflected by modification of aliphatic chains of organic macromolecules in the meteorite, e.g., demethylation, methylation, or cracking, due to the high velocity impact heating. From the two terminal particles, D- and G- bands, which are derived from carbonaceous matter, were detected by micro-Raman analyses. Peak widths and positions of the two bands showed similar values to those for pre-shot Murchison meteorite. Thus, modification of aromatic structures after the aerogel capture is unlikely. Although relative amounts of organics were low in the four other terminal particles, this may be reflected by original heterogeneity of the meteorite.

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