STUDIES OF ITOKAWA'S SURFACE EXPOSURE BY MEASUREMENTS OF COSMIC-RAY PRODUCED NUCLIDES.

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Introduction: We plan to investigate the evolutionary history of surface materials from 25143 Itokawa, the Hayabusa samples. Our studies are based on the measurement of nuclides produced in asteroidal surface materials by cosmic rays. Cosmogenic radionuclides are used to determine the duration and nature of the exposure of materials to energetic particles. Our goals are to understand both the fundamental processes on the asteroidal surface and the evolutionary history of its surface materials. They are also key to understanding the history of Itokawa's surface and asteroid-meteoroid evolutionary dynamics. To achieve our key goals, in particular reconstructing the evolutionary histories of the asteroidal surface, we proposed: (1) characterizing Itokawa particles using SXCT, SXRD, and FE-SEM without modification of the sample; (2) embedding each particle in acrylic resin, then slicing a small corner with an ultra-microtome and examining it using super-STEM and SIMS for characterizing surface morphology, space weathering, and oxygen three-isotope analysis; and finally (3) measuring small amounts of cosmogenic radionuclides (10^4-10^5 atoms) in Hayabusa samples by AMS. However, we have to modify our plan due to unexpected situation.

Experiemetals: Two Hayabusa samples, RA-QD02-0188 and RB-CV-0022 were allocated our studies.

RA-QD02-0188. Since RB-CV-0022 is not avilable for further studies (see bleow), we determined that RA-QD02-0188 (175 μm, olivine, FeNi) is to be used exclusively for cosmogenic radionuclide measurement, excepting of course optical observations that can be done without touching the sample. We determined the shock state of the samples in the conventional manner under a standard petrographic microscope through Hayabusa container's window before any surface morphology change [1]. We anticipate that the ^{10}Be and ^{26}Al measurements will be perfomed before the symposium.

RB-CV-0022. To avoid polymalized glue by synchrotron X-ray radiation, the RB-CV-0022 was inserted into a JAXA's newly developed Si_3N_4 holder [2]. The synchrotron radiation X-ray microtomography (SXCT) was performed at SPring-8 to make observations of textures, mineralogy, and three-dimensional structures of RB-CV-0022 before cosmogenic nuclide measurements [3]. The preliminary results indicate the size of RB-CV-0022 is $5.1x10^6$ $μm^3$ and 146x98x74 μm instead of 164 μn in Hayabusa catalogue. The particle is mainly consisted with low-Ca pyroxene with minor olivine and troilite. When the RB-CV-0022 was returned to JAXA curatorial facility after SXCT, they found that the Si_3N_4 container was broken and the particle escaped from the container to clean chamber and never recovered yet.

References: [1] Zolensky M. E. et al. 2014. This Symposium. [2] Uesugi M. et al. 2014. This Symposium. [3] Tsuchiyama A. et al. 2011. *Science* 333:1125-1128. and This Symposium.