

はやぶさ試料最大粒子のコンソーシアム研究 A consortium study of the largest particle of Hayabusa-returned samples

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Hayabusa-returned samples retrieved by the Hayabusa spacecraft were already distributed and investigated in the preliminary examinations and international A/Os. Through the investigations, several insights have been obtained on the formation process of 25143 Itokawa and surface processes occurred on the asteroid, as well as the confirmation that the particles were certainly regolith particles from there [1-6].

There are several particles, however, which have not been distributed for those examinations because of their rare features appeared in the initial description done by extraterrestrial sample curation team (ESCuTe) of JAXA. Though those particles will provide us further information for Itokawa and evolution of the asteroid, the samples should be investigated as carefully as possible to reduce consumption and damage of the samples. RA-QD02-0136-01 is currently the largest sample of Hayabusa-returned samples recovered from the sample catcher. The major axis of the particle ra is around 310 μm , and weight of the particles is estimated around 20 μg , assuming the volume $V = 4/3\pi r_a r_b r_c \sim 4/3\pi/(2\sqrt{2})r_a^3$ and density of the particle as 3.4 g/cm^3 , where r_a , r_b and r_c are major axis, semi-major axis and minor axis, respectively. The RA-QD02-0136-01 is mainly composed of Ca-rich pyroxene, and also contains minor amount of low-Ca pyroxene, olivine, plagioclase and troilite. In order to maximize scientific gain from the Hayabusa-returned samples, we decided to investigate this particle by constructing a specific consortium for the analysis.

6 teams were joined the consortium, and following analyses were proposed.

M. Uesugi and A. Tsuchiyama : CT observation of 3D texture and surface observation

J. Park and Rutger team : Ar age analysis to determine the shock ages

K. Nishiizumi and K. Nagao : Analysis of cosmogenic nuclides to estimate the erosion rate of Itokawa

N. Kita and D. Nakashima : O-isotope analysis of high-Ca pyroxenes and plagioclases by SIMS

F. Langenhorst : TEM observation of the dislocations for estimating shock effect by small impacts

L. Keller : TEM observation of the space weathering rims

Currently, we prepare the sample cutting method, and evaluate effect of the cutting and sample transfer on the subsequent analysis. We will report the sequential flow of the analyses and results of the rehearsals.

References: [1] Nakamura et al. 2011. Science 333:1113-1116. [2] Yurimoto et al. 2011. Science 333:1116-1119. [3] Ebihara et al. 2011. Science 333:1119-1121. [4] Noguchi et al. (2011) Science 333:1121-1125. [5] Tsuchiyama et al. 2011. Science 333:1125-1128. [6] Nagao et al. 2011. Science 333:1128-1131.