

Current status and future prospects of JAXA's Astromaterials Research Group. M. Abe¹, T. Yada¹, M. Uesugi¹, Y. Karouji¹, A. Nakato¹, M. Hashiguchi¹, T. Matsumoto¹, K. Kumagai¹, M. Nishimura¹, and T. Okada¹. ¹Institute of Space and Astronautical Science, Japan Aerospace Exploration Agency.

History of JAXA curation facility:

We report the activity of current status of JAXA's Astromaterials Research Group (ASRG). JAXA curation facility of Extraterrestrial Sample Curation Center (ESCuC) was completed in 2008 for Hayabusa return sample acceptance. It's conceptual examination was started in 2005, and the specification was decided in 2007 by advisory committee of the Curation Facility [1].

Special feature of JAXA curation facility:

The feature of JAXA curation facility is the ability to be able to observe, and take out and keep a precious return sample scientifically, without being exposed to the atmosphere. Thereby, for example, noble-gas analysis and space weathering observation were enabled while they are difficult in the meteorite research due to the influence of terrestrial contamination. Moreover, in this facility the handling of the 10-micrometer size particle is also possible using electrostatically controlled micromanipulation system installed in clean chamber. The curation facility in which handling of such as small sample without exposing to the atmosphere is available is only in the world [1].

Initial description of Hayabusa sample:

About 500 particles of Hayabusa sample of 10 to 300-micrometer size are collected until now. Optical observation and SEM/EDS observation are carried out in almost all those particles, and these Hayabusa samples information are catalogued. Statistical discussion in the initial description was executed using the mineral composition of the 1 to 40-micrometer sized particles scratched by another tool. Using these data, it judged that recovered samples were returned from asteroid Itokawa [1,2].

Detailed analyses of Hayabusa sample:

In the preliminary examination phase started about six months after Hayabusa return, detailed analyses by XCT/XRD, TEM, EPMA, SIMS, FTIR, NAA, noble-gas-MS, ToF-SIMS, etc were conducted [2]. In these examinations, they are resolved the relationship between S type asteroid and ordinary chondrite, the figure of pre-rubble-pile body, and the mechanism of the space weathering phenomenon. After the sample distribution to NASA following the preliminary examination, international AO analyses were started and offer of the analysis opportunity to the global researchers was performed from 2012.

In the international AO research, age information other than surface exposure ages, such as

an Ar-Ar isotope age, is being extracted [3], and the investigations of the formation history of small bodies are progressing. Furthermore, in the curation facility, consortium researches on the rare particles which are not distributed for the international AO are also advanced, and the effort to obtain the maximum scientific result about a precious sample is made.

Future plan of curation facility:

There is still recovery of the Hayabusa return sample on the way, and it is expected that more than 500 particles are remaining into the sample catcher. Therefore, about two more years are needed to clarified the total amount of the Hayabusa return samples. We are planning to carry out the distribution for the international AO research with succeeding renewal of the sample catalog.

Preparation plan for Hayabusa 2 return sample receiving:

We have started examination of receiving facility of Hayabusa 2 return sample in this year. Since Hayabusa 2 is a sample return mission from C type asteroid, it is necessary to ensure recovery of the volatile matter from the samples containing an organic matter and water. Moreover, since recovery of the mm-sized particles which was not able to be performed by Hayabusa is expected, the technical development (for example sample cutting) of the handling method for large particles is required.

In Hayabusa 2, more attention is paid to contamination control than Hayabusa mission. Final cleaning of the sample catcher is executed in curation facility and cleaning level is known. Moreover, the contamination coupon is monitoring the contaminant during the construction of the sampling devices.

Organization of Astromaterials Science Research group:

JAXA organized Astromaterials Science Research group as a new group in this year. In this group, we collect the knowledge for planetary materials, based on non-destructive and uncontaminated precious description. We not only allocate the samples for researchers but also put emphasis on studies by ourselves to maximize the scientific outcomes.

References:

- [1] Yada et al. (2014) *Meteorit. Planet. Sci.*, 49, 135–153. [2] Nakamura et al. (2011) *Science*, 333, 1113–1116. [3] Park et al. (2014) *77th Annual Meteoritical Society Meeting*, #5190.