

Readiness of Receiving and Curation facility for Hayabusa2 Asteroid Sample Return Mission

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Introduction: Astromaterials Science Research Group (ASRG), established in 2015, is continuing curatorial work for Hayabusa returned samples and developing the curation facility for Hayabusa2 returned samples. JAXA curation facility of Extraterrestrial Sample Curation Center (ESCuC) was completed in 2008 for Hayabusa returned samples acceptance. Its conceptual examination was started in 2005, and its specification was decided in 2007 by the advisory committee of the Curation Facility [1]. After receiving the Hayabusa returned samples and curatorial work for them, we are going to research using these samples, such as international announcement of opportunity.

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 sized particle is also possible using electrostatically controlled micromanipulation system installed in a clean chamber under N₂ atmosphere. The curation facility in which handling of such small samples without exposing to the atmosphere is available is the only one in the world [1].

Hayabusa2 mission: Hayabusa2 spacecraft will bring back surface samples of the near-Earth C-type asteroid (162173) Ryugu at the end of 2020. Because the C-type asteroids, of which reflectance spectra are similar to carbonaceous chondrites, are highly likely to record the long history of the solar system from the beginning to planet formation including the supply of volatiles to terrestrial planets, the main scientific goals of the Hayabusa2 mission are the investigations of (a) the origin and evolution of the solar system, and (b) the formation process and structure of the asteroid.

Curatorial work of Hayabusa2 returned samples: After receiving the returned samples of the Hayabusa2 mission, prior to the initial analysis, the phase-1 curation (sample description) will be done at the JAXA receiving and curation facility. Along with the initial analysis, the phase-2 curation of returned samples will be done for integrated thorough analysis and description of samples to build a sample database and to obtain new scientific perspective from thorough analysis of samples. The phase-2 curation will be done both in JAXA and also in several research institutes outside JAXA led by the JAXA curation facility.

Preparation of receiving and curation facility for Hayabusa2: We have started examination of receiving facility of Hayabusa2 returned sample in 2015. Since Hayabusa2 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 components 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 the description and the handling method for large particles is required.

In Hayabusa2 mission, more attention is paid to contamination control than Hayabusa mission. Final cleaning of the sample catcher is executed in the curation facility and cleaning level is known. Moreover, the contamination coupon is monitoring the contaminant during the construction of the sampling devices.

Conceptual design of clean chamber for Hayabusa2: After examination of receiving facility for Hayabusa2, we had fixed the specification and conceptual design of the clean chambers for Hayabusa2 in this year. The clean chambers are consisted of mainly two part. One is CC3 in vacuum environment, the other one is CC4 in ultra-pure nitrogen gas environment. CC3 is separated to 3 rooms, one is used for opening sample container, second one is used for sampling in high vacuum environment, and third one is used for sample storage. CC4 is separated to 2 rooms, one is micrometer-size samples handling and sealing of sample holders similar to Hayabusa CC2 clean chamber, second one is millimeter-size samples handling.

Schedule until receiving of returned samples: We have started the production of clean chambers and clean room for the receiving facility from this year. Clean room had already been completed in this summer and the clean chambers will be installed by the next summer. After the manufacturing of the curation facility for Hayabusa2, we will execute the rehearsal of the operation to succeed the curatorial work of the returned samples of Hayabusa2 until the return of the Hayabusa2 spacecraft to the Earth.

References

[1] Yada T. et al. 2014. . *Meteoritics & Planetary Science* 49:135.