

Hayabusa2 sample recovery and phase-1 curation

M.Abe^{1,2}, T. Yada¹, K. Yogata¹, T. Okada^{1,3}, K. Sakamoto¹, M. Yoshitake¹, S. Furuya¹, M. Nishimura⁴, K. Kumagai⁴,
and H. Yurimoto^{5,1}

¹*Institute of Space and Astronautical Science,*

²*SOKENDAI,*

³*University of Tokyo,*

⁴*Marinen Works Japan LTD,*

⁵*Hokkaido University*

Hayabusa2 spacecraft will bring back the C-type asteroid Ryugu sample to the Earth in the end of 2020. Astromaterials Science Research Group (ASRG) of ISAS/JAXA will execute re-entry capsule recovery at landing site, sample extraction from sample container, initial description of the sample, distribution the samples to succeeding detail analysis, and storage the sample for future generation. In this presentation, we report the current plan of sample recovery and phase-1 curation of our group.

10 % amount of Hayabusa2 returned sample will be delivered to NASA according to MOU between NASA and JAXA. The rest of the sample will be used for detail analysis operated by initial analysis team directed by Hayabusa2 project and phase-2 curation teams collaborated with ASRG, and after that, will be open for international AO. Schedule of curatorial work and sample distribution plan for Hayabusa2 will be shown in Fig.1 as below.

Initial analysis will be done by the Hayabusa2 mission to maximize the scientific achievement of the project for 12 months after the phase-1 curation (sample description at the ISAS curation facility). The initial analysis should be a good showcase to prove the potential of the rest of samples. 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 ISAS and also in several research institutes outside JAXA led by the ISAS curation facility.

After the recovery of the re-entry capsule, the sample container will be extracted from the re-entry capsule at the landing site like Hayabusa mission. In Hayabusa2 mission, residual gas sampling from the sample container will be done at the landing site moreover. After that the sample container will be transported to ISAS curation facility, and outer lid extraction and cleaning of the outer surface of the sample container will be done in the clean room. Opening operation of the inner lid of the sample container and picking up operation of a few samples from sample container will be done in the clean chamber in vacuum environment.

The rest sample will be handled in the another clean chamber in ultra pure nitrogen environment. Returned sample will be stored in the sample catcher connected with inner lid of the sample container. Sample catcher is consisted in 3 rooms. The samples obtained from 3 touchdown sites of the spacecraft at the asteroid Ryugu is stored in each rooms. In the clean chamber, we will observe inside of each rooms using optical scope, and remove the samples of each rooms to the each quartz dishes. After extraction of the sample from sample catcher, we will initial description of bulk sample at first. These procedure will be used by optical microscope, infrared spectroscope, and weighing device. After bulk observation, we will pick up each particles of larger than 1 mm (TBD) size and storage into each quartz dishes separately.

In the phase-1 curation will be done within 6 months after the re-entry capsule recovery. After phase-1 curation, we will delivered some portion of the returned sample to detail analysis, which is operated by initial analysis team and phase-2 curation team. The amount of the sample for the initial analysis will be 15%(TBD) of the recovered samples. Representative and unprocessed sample will be desired by the initial analysis. Initial analysis also desires coarse and fine particle. ISAS curation will be delivered the fine particle in one bundle. The samples delivered to phase-2 curation will be selected by ISAS curation considering the result of the initial description. The amount of the samples will be 15%(TBD) including detail analysis at phase-1 curation and outreach sample. The purpose of phase-1 detail analysis is confirmation of the sample origin (the return sample is originated from Ryugu or not), ascertainment of the sample heterogeneity, and discrimination of the contamination by composition analysis of some portion of the returned sample using SEM (TBD) at ISAS curation.

In principle, during phase-1 curation, it is based on nondestructive and uncontaminated description, however, for conducting composition analysis, we will allow the contamination for some portion of the sample by SEM observation.

New clean room and clean chamber for receiving Hayabusa2 returned sample will be established by the end of this year. We are currently preparing the observation instrument and handling tool of returned sample. From this year we started the operational test of the clean chamber, and we will start to the rehearsal operation including handling test of the analog sample from next year. We will finish rehearsal and reharbush of the clean chamber by earth return of the spacecraft in the end of 2020.

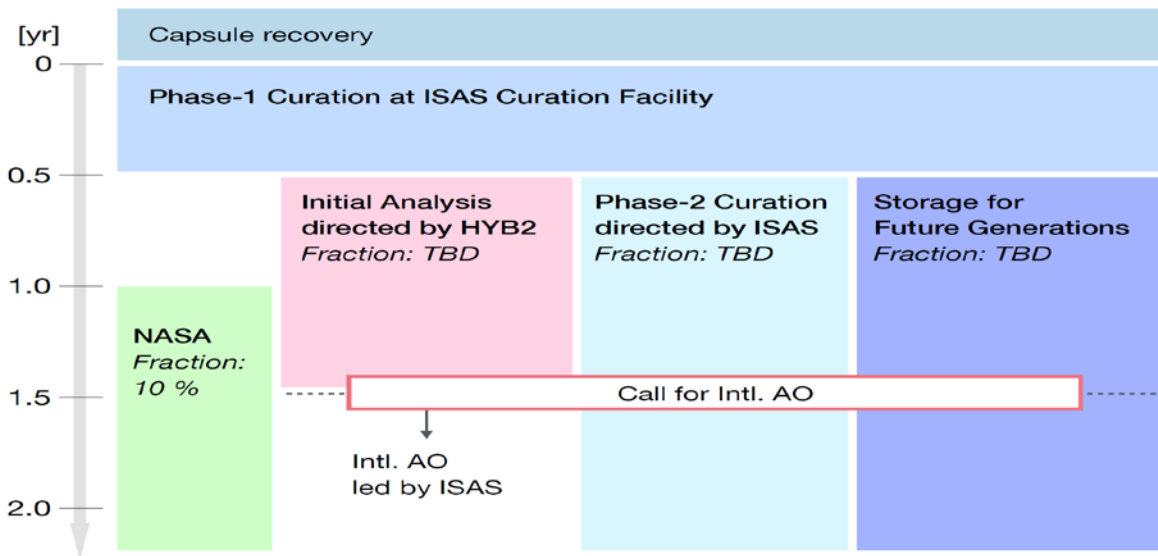


Fig.1 Shcedule of curatorial work and sample distribution plan for Hayabusa2

