

Overview of archive for analysis data of Hayabusa-returned samples (ver. 2016.03.08)

1. Analysis data of Hayabusa-returned samples
2. Environment of Initial descriptions in ESCuC
3. Hayabusa Sample Preliminary Examination Team
4. Data structure

1. Analysis data of Hayabusa-retuned samples

Particles captured in the sample catcher of the Hayabusa spacecraft (hereafter Hayabusa-retuned Samples) were continuously picked up after the recovery of the sample catcher at 2010. The Hayabusa-retuned samples were analyzed in Extraterrestrial sample curation center (ESCuC) by Astromaterials science research group (ASRG), and their properties, such as size, shape, mineral phases and chemical compositions, were obtained based on non-destructive analysis. Some of the Hayabusa-retuned samples were provided to Hayabusa sample preliminary examination team (HASPET) after the initial description, and detailed properties were obtained by analysis with non-destructive and destructive methods. In their analysis, some of the Hayabusa-retuned sample were totally consumed. All PIs of the preliminary examination were send back the Hayabusa-retuned samples and reports of their analysis to ESCuC.

After the preliminary examination, Hayabusa-retuned samples already analyzed and newly picked up were provided to the analyses of international AO.

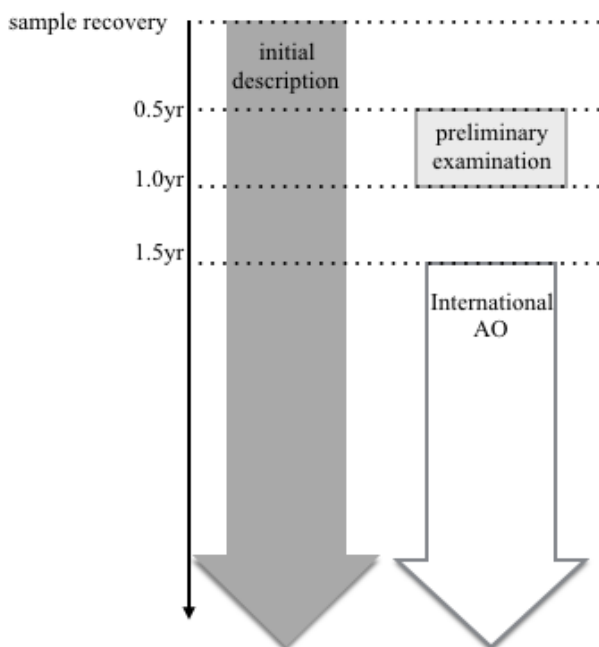


Fig. 1 Schematic illustration of analysis flow after the recovery of the sample catcher. Initial description was continuously operated with non-destructive method in atmosphere controlled environments. In the preliminary examination and the International AOs, various high precision data were obtained by analysis with non-destructive and destructive methods.

Data opened in DARTS are: (i) report and raw data of Initial description at ESCuC, (ii) analysis reports of preliminary examination, and (iii) brief summary of analysis done for the sample in International AO analyses.

Data for the new Hayabua-retuned samples, report of preliminary examination, and summary sheet of International AO will be added periodically (roughly each two or three months). Sample property text includes the date of data update. The data update will be also announced in the curation web site.

2. Environment of Initial descriptions in ESCuC

Hayabusa-retuned samples were stored sample catcher of the Hayabusa spacecraft which composed of Al, and dropped on the quartz (SiO₂) slide glass. They were picked up by electrostatically controlled micro-manipulator, which composed of quartz and Pt wire, from the slide glass. They were put on the sample holder and analyzed by Field Emission scanning electron microscopy (FE-SEM, Hitachi S4300SE/N and Hitachi SU6600) and energy dispersion spectrometer (EDS). The sample holder was composed of Cu or Au. Some of the samples were directly observed on the surface of the cover of the sample catcher which composed of Al by FE-SEM. Thus, Cu, Au and Al appear as the background of the EDS spectrum. Some of the Hayabusa-retuned samples were analyzed by Raman spectroscopy (JASCO NRS-5100). The spectrum data was provided as csv format file, which includes all information for the analysis environment, and images for the screenshot and spot.

All procedures of the sample transfer were recorded by optical microscopes with the sample name, operator, process and comments. These transfer histories are also opened in the DARTS as a part of the initial description.

Details of the analysis environments of the initial descriptions are included in data files, and also reported in Yada et al. (2014), *MAPS*.

3. Hayabusa Sample Preliminary Examination Team

Reports of the HASPET are also opened in DARTS. Most of the reports were provided as pdf file with free format from following PIs.

Tomoki Nakamura :	synchrotron radiation x-ray diffraction (SR-XRD), FE-SEM, field emission electron probe microanalyzer (FE-EPMA)
Akira Tsuchiyama :	synchrotron radiation computed tomography (SR-CT)
Mitsuru Ebihara :	instrumental neutron activation analysis (INAA)
Keisuke Nagao :	noble gas mass spectrometry
Hisayoshi Yurimoto :	secondary ion mass spectrometry (SIMS)
Takaaki Noguchi :	transmission electron microscopy (TEM)
Hiroshi Naraoka :	time of flight secondary ion mass spectrometry (ToF-SIMS), high performance liquid chromatography (HPLC)
Fumio Kitajima :	Fourier transform infrared spectroscopy (FT-IR), Raman spectroscopy, photoelectron emission microscopy (PEEM)
Eizo Nakamura :	FE-SEM, FE-EPMA, SIMS

Results were also reported in publications (see references).

Category 3

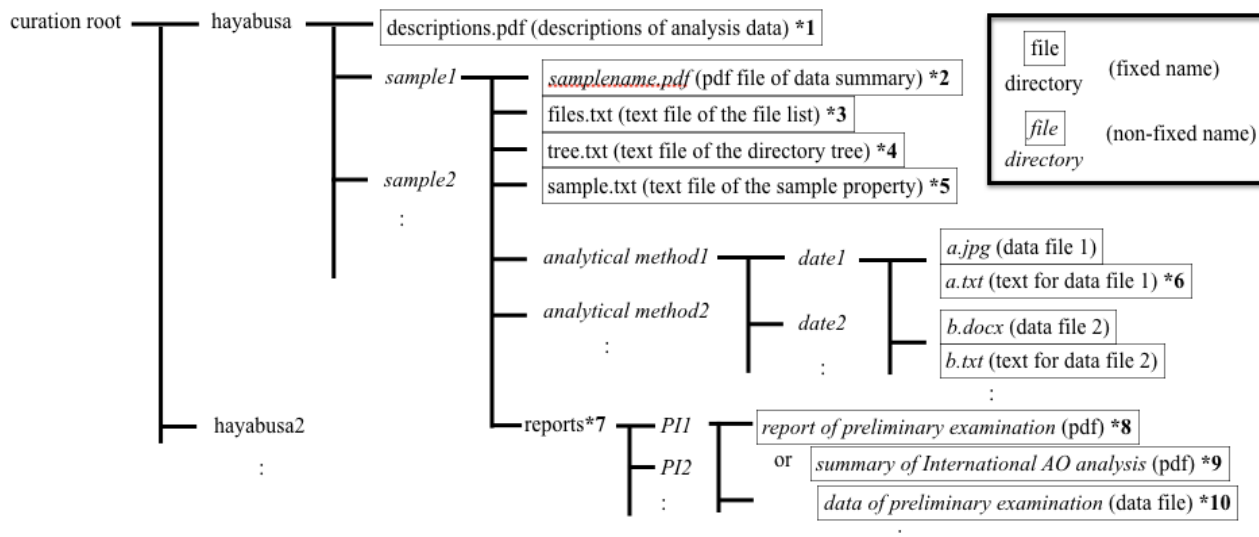
Preliminary examination of category 3 of the Hayabusa-retuned samples, which mainly composed of carbon, were also operated by following PIs.

Masayuki Uesugi :	TEM
Motoo Ito :	Nano-SIMS
Hikaru Yabuta :	X-ray absorption near edge structure (XANES)
Fumio Kitajima :	FT-IR, Raman spectroscopy
Hiroshi Naraoka :	ToF-SIMS
Yoshinori Takano :	preparation of standard samples

Hajime Mita: discussion

Results of the analysis were provided as report of pdf file format and opened in DARTS, and also reported in publications (see references).

4. Data structure of DARTS/curation data archive



- *1 This document
- *2 pdf file of all reports of initial description, preliminary examination and international AO.
- *3 text file for the list of all files in the sample directory
- *4 text file showing the directory tree
- *5 text file of sample properties such as sample status, size, transfer history, phases, categories and date for data update.
- *6 information of the data file, such as sample name, preID, process, operator and comments. “Process” shows name of analytical devices (SEM, TEM), or information of sample transfer.
- *7 the directory for the data and reports of other than initial description
- *8 reports of the preliminary examination, which includes summary of analysis data
- *9 summary sheets of the international AO, which does not include any analysis data
- *10 raw data of preliminary examination (zip archive of slice images of SR-CT)

References

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