Curation and initial analysis of Hayabusa2 samples in 2021

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The asteroid explorer Hayabusa2 began a 6-year round trip to return surface samples of a near-Earth carbonaceous-type asteroid 1999 JU_3. Hayabusa2 will arrive at 1999 JU_3 in mid-2018, and fully investigate and sample the asteroid at three locations during its 18-month stay. The samples from 1999 JU_3 will be delivered to the Earth in December 2020.

The characteristics of the Hayabusa2 sample container [1] leads to classification of returned samples into three categories; (1) mm-sized coarse grains separately stored separately in three chambers, (2) <100 μm-sized fine particles that may be mixed in the sample container, and (3) volatiles released in the sealed container. Coarse grains should represent the material properties at different locations, and petrologic and mineralogical studies of them will provide important constraints on understanding the history of the asteroid and the solar system. Fine particles will provide insights into the global average surface feature and surface geologic processes such as space weathering and regolith formation. Volatile components will be an important analysis target to investigate the origin and evolution of organic matter and water in the solar system.

Curation work of the returned samples will be first done at the JAXA Curation Facility, which will be the initial sample preparatory work for subsequent studies (phase 1 curation). The curation work for a fraction of the samples will be done in collaboration with institutes outside JAXA for detailed and thorough analysis (phase 2 curation). A different fraction of samples will be investigated by the Initial Analysis team in the Hayabusa2 project to accomplish the scientific goal of the mission [1]. Three categories of samples will be analyzed by multiple analysis teams focusing on non-destructive analyses of grains, elemental and isotopic analyses of grains, petrology and mineralogy of coarse and fine particles, chemistry and isotopes of volatiles, and chemistry of insoluble and soluble organic materials. A team to integrate all the results and link to remote-sensing data is also important, which can be done only for return samples.

[1] Tachibana S. et al. (2014) *Geochem. J.* **48,** 571-587.