Development of Hayabusa2 sampler: Current status

S. Tachibana[1], H. Sawada[2], R. Okazaki[3], Y. Takano[4], K. Sakamoto[2], Y. Karouji[2], T. Yada[2], M. Abe[2], C. Okamoto[5], H. Yano[2], and Hayabura2 sampler team
[1]Hokkaido Univ., [2]Japan Aerospace Exploration Agency (JAXA), [3]Kyushu Univ. [4]Japan Agency for Marine-Earth Science & Technology (JAMSTEC), [5]Kobe Univ.
E-mail: tachi@ep.sci.hokudai.ac.jp.

Introduction: Hayabusa2 is an asteroid exploration mission to return surface samples of a C-type near-Earth asteroid (162173) 1999 JU_3. Hayabusa2 will launch off in 2014, arrive at 1999 JU_3 in mid-2018, and fully investigate and sample the asteroid at three different locations during its 18-month stay. The spacecraft will return to the Earth with samples in December 2020. Return samples will be investigated by state-of-the-art analytical techniques in 2020 to understand the long history of the Solar System from the beginning to the present by combining with remote-sensing data sets and comparing with meteorites, interplanetary dust particles, and future return samples.

Haybusa2 Sampler: The concept and design of the Hayabusa2 sampler are the same as the original Hayabusa with some modifications to satisfy the scientific requirement. In order to collect sufficient amount of samples compliant with both monolithic bedrock and regolith targets, a 5-g Ta projectile will be shot at 300 m/s at the timing of touchdown, and the ejecta will be put into a sample catcher through an extendable sampler horn and a conical horn under a microgravity condition. Three projectiles are equipped for sampling at three surface locations.

The sample catcher of the Hayabusa2, located at the top-end of conical horn, has three chambers to store samples obtained at three locations separately. The sample catcher has a design that is much easier to be taken apart during curation at the ground than that of the original Hayabusa. After three sampling operations, the sample catcher is transported into the sample container inside the Earth re-entry capsule and sealed. The container sealing method is changed from double fluorocarbon O-rings to an aluminum metal seal to avoid the terrestrial air contamination after the Earth return that happened for the Hayabusa container. The new aluminum metal seal is designed to allow only a leak of 1 Pa air for 100 hours at the atmospheric pressure. To avoid further potential contamination, volatile components will be extracted prior to the opening of the container. The container will be attached to a vacuum line, and the bottom of the container will be pierced with a needle to extract volatiles.

A back-up sampling method is also prepared; The tip of the sampler horn is turned up like the teeth of a comb, and surface pebbles will be lifted up by the tip of the horn during touch down. The lifted pebbles will be put into the sample catcher by deceleration of the spacecraft.

We here make a final report on the development of Hayabusa2 sampler, and also discuss the contamination control and

References: [1] Tachibana, S., Abe, M., Arakawa, M., Fujimoto, M., Iijima, Y., Ishiguro, M., Kitazato, K., Kobayashi, N., Namiki, N., Okada, T., Okazaki, R., Sawada, H., Sugita, S., Takano, Y., Tanaka, S., Watanabe, S., Yoshikawa, M., Kuninaka, H. and Hayabusa2 project team (2014) Hayabusa-2: Scientific importance of samples returned from near-Earth C-type asteroid 1999 JU_3. *Geochemical Journal,* in revision.