Initial Descriptions for Samples Returned from the C-type Asteroid Ryugu by Hayabusa2. T. Yada[1], M. Abe[1], A. Nakato[1], K. Yogata[1], A. Miyazaki[1], K. Kumagai[2], K. Hatakeda[2], T. Okada[1], M. Nishimura[1], S. Furuya[1,3], M. Yoshitake[1,4], A. Iwamae[2,5], Y. Hitomi[2], H. Soejima[2], K. Nagashima[1], R. Sawada[2], L. Riu[1,6], L. Lourit[6], C. Pilorget[6], V. Hamm[6], D. Loizeau[6], R. Brunetto[6], J.-P. Bibring[6], Y. Cho[3], K. Yumoto[3], Y. Yabe[3], S. Mori[3], S. Sugita[3], S. Tachibana[1,3], H. Sawada[1], K. Sakamoto[1], T. Hayashi[1], D. Yamamoto[1], R. Fukai[1], H. Sugahara[1], H. Yurimoto[7], T. Usui[1], S. Watanabe[8], Y. Tsuda[1], [1]Inst. Space Astronaut. Sci., Japan Aerosp. Explor. Agency (JAXA), Kanagawa 252-5210, Japan (yada@planeta.sci.isas.jaxa.jp), [2]Marine Works Japan Ltd., Yokosuka 237-0063, Japan, [3]UTOPS, Grad. Sch. Sci., Univ. Tokyo, Tokyo 113-0033, Japan, [4]Japan Patent Office, Chiyoda-ku, Tokyo 100-8915, Japan, [5]Toyo Univ., Bunkyo-ku, Tokyo 112-8606, Japan, [6]Institut d'Astrophysique Spatiale, Université Paris-Saclay, CNRS, 91400 Orsay, France, [7]Dept. Earth Planet. Sci., Grad. Sch. Sci., Hokkaido Univ., Hokkaido 060-0808, Japan, [8]Dept Earth Planet. Sci., Grad. Sch. Sci., Nagoya Univ., Nagoya 464-8601, Japan.

Introduction: As previously reported, Hayabusa2 spacecraft accomplished touchdown sampling on the surface of near-Earth C-type asteroid 162173 Ryugu in Feb. and Jul. 2019 and returned the recovered regolith samples to the Earth in Dec. 2020 [1,2]. The reentry capsule containing the asteroid's samples landed on the ground of the Woomera Prohibited Area (WPA) in South Australia. It was immediately recovered by the Recovery Operation team to be transported to Quick Look Facility (QLF) in the WPA. As the samples were enclosed into the metallically-sealed container, volatile components in the container were recovered with the GAs Extraction and Analysis system in the QLF. Then the container was packed to transported to Japan by air.

Sample Extraction Procedures: As the sample container was transported into cleanroom of JAXA Sagamihara campus, it was disassembled for removing unnecessary parts without its bottom part and an inner lid, and cleaned on its outer surface. Then the container was introduced into a clean chamber and evacuated to high vacuum condition. The container was unclosed in the chamber in vacuo and a sample catcher was extracted from the container. As shown in Fig. 1, the sample catcher is composed of three chambers (A, B and C) and a rotation cylinder [3] and samples in the chamber A should be those obtained by the 1st touchdown and those in the Chamber C should be recovered by the 2nd one. In the vacuum condition, the chamber A of the catcher was opened and a few particles were removed from the chamber in the vacuum condition. Then the catcher was transferred to the clean chambers of purified nitrogen condition, to be handled for sample recovery from the catcher. The catcher was dismantled to recover samples from each chamber into sapphire dishes, which are recognized as "bulk samples" of each chamber.

Initial descriptions for the Ryugu samples: Then initial descriptions for the "bulk samples" of each chamber were done in the purified nitrogen condition. They were observed with a stereomicroscope and measured for their weights with a balance. Then they were analyzed with a Fourier transform infrared spectrometer (FT-IR) for their infrared spectra. They were also analyzed with a MicrOmega, an infrared imager comparable to the onboard instrument on the MASCOT lander of Hayabusa2 [4]. They were also measured with an optical microscopic imaging through six filters, compatible with the ONC-T camera of Hayabusa2, onboard instrument of Hayabusa2 [5]. Then individual particles are handpicked from the bulk samples into sapphire dishes for individual particles using a vacuum tweezer. The individual particles experience initial descriptions in the same manner as the bulk samples, which are now ongoing and to be continued for several years.

Sample Catalog and Distributions: Those obtained data for bulk and individual Ryugu samples are archived to the Hayabusa2 sample database [6]. The database for the Ryugu samples will be in public in near future, to be in use for researchers applying for announcement of opportunity (AO), which will start in early 2022.

References: [1] Tachibana S. et al. (2021) *LPS, XXXXXII,* Abstract #1289. [2] Yada T. et al. (2021) *LPS, XXXXXII,* Abstract #2008. [3] Sawada H. et al. (2017) *Space Sci. Rev. 208,* 81–106. [4] Bibring J.-P. et al (2017) *Space Sci. Rev. 208,* 401-412. [5] Sugita S. et al. (2020) *Science 364,* eaaw0422. [6] Nishimura M. et al. (2021), *this meeting*.

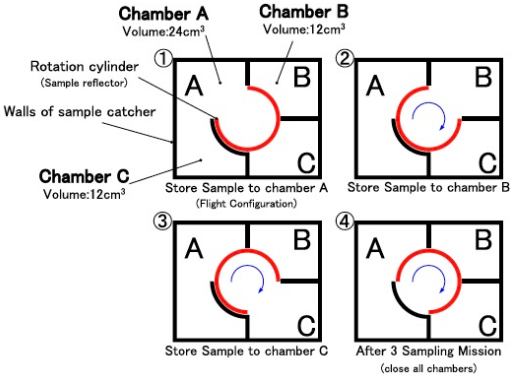

Fig. 1. A schematic viewgraph of a sample catcher of Hayabusa2, modified from Fig. 13 of Sawada et al. (2017) [3]. The 1st touchdown sampling was done in the (1) condition so that samples in the chamber A should be obtained by the 1st touchdown. The catcher was in the (3) condition when the 2nd one, as samples in the chamber C should be obtained by the 2nd touchdown.