INITIAL DESCRIPTIONS AND DISTRIBUTION OF RYUGU SAMPLES RETURNED BY HAYABUSA2 AND PREPARATION FOR OSIRIS-REX RETURNED SAMPLE CURATION IN JAXA. T. Yada[1], M. Abe[1], A. Miyazaki[1], K. Yogata[1], K. Nagashima[1], K. Hatakeda[2], A. Nakato[1], Y. Hitomi [2], Y. Sugiyama[1], R. Tahara[1], A. Nakano[1], T. Ojima[1], M. Nishimura[1], T. Okada[1], K. Sakamoto[1], R. Kanemaru[1], K. Kumagai[2], H. Soejima[1], R. Fukai[1], T. Ishizaki[1], H. Sugahara[1], S. Suzuki[1], S. Sugita[3], Y. Cho[3], K. Yumoto[3], Y. Yabe[3], S. Mori[3], Y. Aikyo[3], K. Furuichi[3], J.-P. Bibring[4], C. Pilorget[4], R. Brunetto[4], L. Riu[4], D. Loizeau[4], L. Lourit[4], V. Hamm[4], G. Lequertier[4], J. Carter[4], T. Le Pivert- Jolivet[4], C. Lantz[4], S. Tachibana[1,3], T. Usui[1], and M. Fujimoto[1], [1]Institute of Space and Astronautical Science, Japan Aerospace Exploration Agency, 3-1-1 Yoshinodai, Chuo, Sagamihara, Kanagawa 252-5210, Japan, (yada@planeta.sci.isas.jaxa.jp), [2]Marine Works Japan Ltd., 3-54-1 Oppama-Higashi, Yokosuka 237-0063, Japan, [3]UTOPS, Graduate School of Science, University of Tokyo, 7-3-1 Hongo, Bunkyo, Tokyo 113-0033, Japan., [4]Institut d'Astrophysique Spatiale, Université Paris-Saclay, CNRS, 91400 Orsay, France.

Introduction: Hayabusa2 spacecraft returned samples recovered from near-Earth C-type asteroid 162173 Ryugu on Dec 6, 2020. Initial descriptions on their bulk samples revealed that they are similar to hydrous carbonaceous chondrites [1, 2]. The samples had been distributed to initial analyses and phase-2 curation teams and their analyses revealed that Ryugu samples were most similar to CI chondrites [3-8], which are chemically the most primitive carbonaceous chondrites and recognized as reference material samples of the solar system [9, 10]. In contrast to CI chondrites, the Ryugu samples were free from terrestrial alteration [4, 6]. Thus, it was essential to handle and describe Ryugu samples with the least terrestrial contamination.

Progresses in initial descriptions: All the Ryugu samples have been handled in vacuum or purified nitrogen condition of clean chambers (CCs), and their initial descriptions have been conducted in nitrogen condition of the CCs without exposing to the air [1]. Their initial descriptions are limited to methods with which samples remain in the nitrogen condition of the CCs or additional chambers, including an optical microscopic observation, a weight measurement with a balance, infrared analyses with an FT-IR and a hyperspectral imager MicrOmega, and a visible spectrometer and semi-3D imaging with two digital microscopes [1, 2, 11-16]. After a series of descriptions, they are stored in nitrogen condition of the CCs, and their data are uploaded to the Ryugu sample database system established at the website in JAXA (https://darts.isas.jaxa.jp/curation/hayabusa2/) [17].

Thus far, 704 individual Ryugu grains have been described with the optical microscope and the balance. Fig. 1 shows optical microscopic images of the grains from the Chambers A and C, which are described recently. Their total weight of the described 704 Ryugu grains reaches 2.113 g, more than 40% of grains recovered from the Chambers A and C of the Hayabusa2 sampler catcher [11]. 270 grains have been described with the FT-IR [12], 175 grains with the MicrOmega [13, 14, 15], and 130 grains with the visible spectrometer [16].

Sample distribution status: As noted previously, Ryugu samples were distributed to initial analyses and phase-2 curation teams in Jun. 2021. 10 wt% of the samples were distributed to NASA in Dec. 2021 based on the memorandum of understanding (MOU) between JAXA and NASA. The 1st announcement of opportunity (AO) for Ryugu samples was announced in Dec. 2021. In the 1st AO, 57 proposals were submitted and 40 proposals were selected for sample distribution. The review result was announced in Jun 2022, and samples have been distributed to selected Principal Investigators (PIs) in 2022.

The 2nd AO was announced in Jun. 2022 and proposal submission was closed in Nov. 2022. Its review result will be announced in Jan. 2023 and subsequently we will start the sample distribution to PIs. The 3rd and the 4th AOs are planned to be announced in Jan. 2023 and summer 2023, respectively. AO after the 4th is under consideration.

Preparation for OSIRIS-REx sample curation in JAXA: OSIRIS-REx, an asteroid explorer of NASA, will return asteroidal samples from the near-Earth B-type asteroid 101955 Bennu on Sep 24, 2023 [18]. Its momentum transfer analysis onboard indicated that total weight of samples in its canister was 250±101 g. 0.5 wt% of samples returned by OSIRIS-REx (O-REx) will be distributed to JAXA within a year after their return to the Earth based on the MOU between JAXA and NASA, thus 1.25±0.5 g of Bennu samples will be transported to JAXA by the end of summer 2024 the latest.

Construction of a new clean room of ISO 6 in cleanliness level for O-REx returned samples was completed in Sep. 2022. Fig. 2 shows the newly renovated clean room for O-REx returned samples. Although it is still empty now, new CCs for O-REx samples will be installed in fall 2023. Initial description instruments using a digital microscope, a balance, a μ-FT-IR, the MicrOmega, which is the near-infrared imaging spectrometer, a visible spectrometer, and a semi-3D imager and their applications to the CCs are also under development. We plan to release initial description data on a database system as Hayabusa2 samples. The AO sample distribution for Bennu samples in JAXA is under consideration, but comparative study between Ryugu and Bennu should be encouraged as research theme for proposals for the AO.

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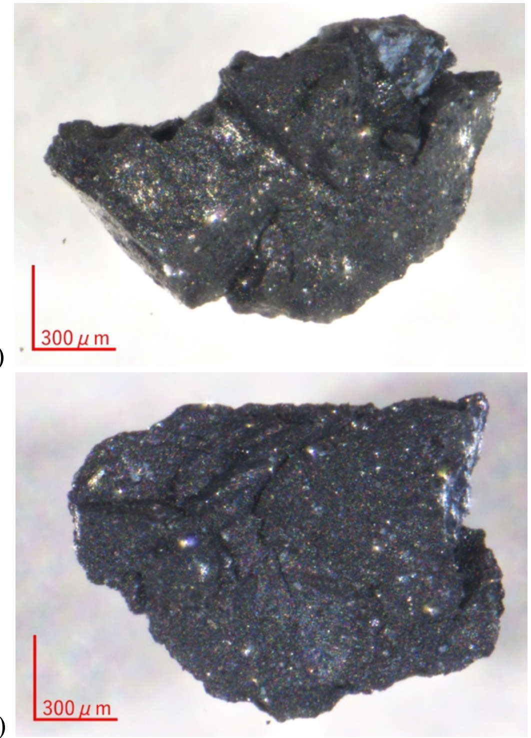

(a)

(b)

Fig. 1. Optical microscopic images of individual Ryugu grains which are described recently. (a) A0411, a 1st touchdown grain and (b) C0295, a 2nd touchdown grain.

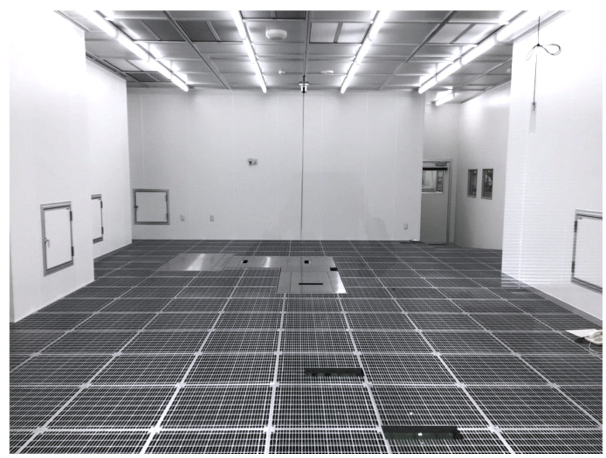

Fig. 2. A newly renovated clean room for O-REx returned samples. Its cleanliness level is ISO 6. It has a grating floor and a base for new CCs, which is under development and will be installed there in fall 2023.