Bulk analysis of a small fragment of the Hayabusa2 returned sample: A plan proposed by Phase2 Kochi

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Hayabusa2 sample capsule will return to Earth on early December 2020. The capsule may contain small fragments (expected amount of 100 mg and mm-sized grain) of surface and sub-surface regions on the C-type asteroid Ryugu (e.g., Tachibana et al., 2014; Arakawa et al., 2020). Those fragments may be a highly porous mixture of anhydrous/hydrous minerals and organic materials based on the results of on-board remote sensing instruments (Kitazato et al., 2019; Morota et al., 2020; Okada et al., 2020). Therefore, returned samples from the Ryugu may provide a key to understand the origin and nature of the Solar System as well as the asteroid-meteorite correlations, space weathering processes, water-rock interactions, evolution of organics on a small body, the diversity and history of asteroid families in the main belt together with the various spectroscopic images of the Ryugu surface.

Phase 2 curation Kochi team (Ph2K) was authorized by the JAXA Astromaterial Science Research Group (ASRG) and the steering committee of the ASRG in 2017. The primary objective of the Ph2K will focus on investigating of extraterrestrial water and primordial organic components in Hayabusa2 samples. The Ph2K will conduct an *in-depth* analysis of a few grains by the *state-of-the-art* instruments/techniques under nationwide collaborative activities by JAMSTEC, NIPR, Tokyo Met. Univ., JASRI/SPring-8, UVSOR/IMS, JAXA, MWJ, Osaka Univ., and Nagoya Univ. We, the Ph2K, are focusing on elucidating nature of the C-type asteroid Ryugu utilizing a combination of a coordinated micro-analysis and systematic bulk chemical analysis of the returned samples.

A coordinated micro-analysis proposed by the Ph2K consist of multi beam instruments to acquire complex micro-texture and chemical characteristics of the sample in sub-micrometer scale (Ito et al., 2020). We, then, developed the sample container (FFTC), Carbon nanotube sample holder for SR-CT, the universal sample holders for FIB, STXM-NEXAFS, NanoSIMS and TEM without degradation, contamination due to the terrestrial atmosphere (water vapor and oxygen gas) and small particles, and mechanical sample damage (Ito et al., 2020; Shirai et al., 2020; Uesugi et al., 2020). In parallel, we plan to conduct bulk analysis of the samples utilizing LA-ICP-MS, Raman spectroscopy, SEM-EDS, EPMA, XRD, SIMS/NanoSIMS and INAA. This bulk analysis can be found similarities or different chemical characteristics with the current knowledges of extraterrestrial materials (meteorites, micrometeorites) in Antarctic Meteorite Research Center of National Institute of Polar Research.

In this talk, we present current status of the Ph2K analytical plan utilizing a coordinated micro-analysis and systematic bulk chemical analysis of the samples, and scientific purposes.

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