A COMBINED STUDY INVESTIGATING THE INSOLUBLE AND SOLUBLE ORGANIC COMPOUNDS IN CATEGORY 3 CARBONACEOUS ITOKAWA PARTICLES RECOVERED BY THE HAYABUSA MISSION.

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Abstract: At the 3rd International Announcement of Opportunity (AO), we have been approved for five Category 3 carbonaceous Itokawa particles (RA-QD02-0012, RA-QD02-0078, RB-CV-0029, RB-CV-0080 and RB-QD04-0052) recovered by the first Hayabusa mission of JAXA. In this investigation, we aim to provide a comprehensive study to characterize and account for the presence of carbon-bearing phases as suggested by the initial Scanning Electron Microscopy (SEM) analysis carried out by JAXA at the curation facility, and to describe the mineralogical components of the particles.

The insoluble organic content of Itokawa particle has been investigated with the use of micro-Raman spectroscopy by Kitajima and co-workers [1]. The Raman spectra of Itokawa particles show broad G- and D-bands typical of low temperature material which offers an interesting contrast to the high metamorphic grade (LL4-6) of the Itokawa parent body. Amino acid analysis has been conducted by Naraoka et al. [2] to study the soluble organic component of Itokawa particles, but since it was a preliminary study and thus did not have the opportunity to target on Category 3 carbonaceous particles, only terrestrial contaminants were identified.

The investigation will be carried out in the following order prioritized according to the progressive damage the analytical techniques can induce: (1) micro-Raman spectrometry, (2) two-step laser mass spectrometry (μ-L^2MS), (3) ultra-high performance liquid chromatography with fluorescence detection and time-of-flight mass spectrometry (LC-FD/ToF-MS), and optimally if we can recover the particles after wet chemistry analysis, we will mount the samples and perform (4) electron beam microscopy (SEM, electron back-scattered diffraction [EBSD]) and (5) carbon X-ray absorption near edge structure spectroscopy (C-XANES). We will begin the analytical procedures upon receiving the samples in September/October. This work will provide us with an understanding of the variety and origins of the carbon-bearing phases present in primitive solar system bodies from a direct sample-returned mission, which is less likely hampered by risks of terrestrial contamination as compared to meteorite finds and falls.

References: [1] Kitajima F. *et al.* 2015. *Earth, Planets and Space* 67:1-12. [2] Naraoka H. *et al.* 2012. *GEOCHEMICAL JOURNAL* 46:61-72.