A CONSORTIUM STUDY FOR HAYABUSA-RETURNED SAMPLES: PARTICLES CONTAINING PHASE THAT MIGHT AQUEOUS ALTERATION PRODUCTS.

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Introduction: The Hayabusa spacecraft returned to the Earth in 2010 brought us small particles from the surface of Itokawa S-type asteroid. More than 400 particles have been analyzed by the Extraterrestrial Sample Curation Team (ESCuTe) of JAXA for the initial description [1], and some of them have been allocated to the preliminary examinations, international AOs, and NASA. However, some particles are not allocated to the international AOs because of their rare characteristics. For example, the largest particle [2], a particle bearing halite [3], and bearing Fe and FeS [4] are under investigations as the consortium studies lead by ESCuTe. In this paper, we propose three particles bearing Fe-S-Ni phase and Ca-Mg-Na phase, as new consortium studies. Since no other Itokawa samples contain the phases, these particles that may indicate a new variety of Itokawa surface material are rare and valuable. We present the particles' overview and research ideas. To maximize scientific gain from the Hayabusa-returned samples [5], we widely call for the proposal.

A Particles including Fe-S-Ni phase: RB-QD04-0040 is mainly consists of olivine (74 μm) with tiny Fe-S-Ni phase (<3 μm). Our motivation of this consortium study is to identify mineralogy of the Fe-S-Ni phase. After determination of internal structure obtained by XCT, the phase is characterized by XRD. STEM observation will be performed for the detail observation, especially the coexisting minerals. If this phase was the pentlandite single crystal, it can be the first discovery of the aqueous alteration product from the Hayabusa samples. In the case that pentlandite is present as lamellae within pyrrhotite, the texture would provide us information about thermal evolution process of Itokawa asteroid [6].

Particles including Ca-Mg-Na phase: Both RA-QD02-0210 and RA-QD02-0228 (about 30 μm) are particles containing Ca-Mg-Na phase. To identify the phase, SEM, XCT, and XRD would be performed. As Ca-Mg-Na phase, there are three possibilities: carbonate, organic matter, and plagioclase. Carbonate easily produces in the interaction with water. Therefore, we should identify whether the carbonate is extraterrestrial or terrestrial based on internal structure by XCT, presence of space weathering texture by TEM/EDX, and carbon isotopic composition by SIMS. In addition, oxygen isotopes of major phase olivine are also required. For organic matter, 44 particles which mainly consist of carbon have been reported. Previous study [7] suggests that the origin of these particles might be terrestrial contamination. Plagioclase can be affected by the composition of the surrounding HPx since their major constituent minerals are olivine, plagioclase, and pyroxene.

Presence of pentlandite and carbonate indicates that carbonaceous chondrite-like material distributes on the Itokawa surface. It reflects that these minerals might be evidence of implantation from C-type asteroid to the S-type asteroid.

References: [1] Yada et al. 2015. *78th MetSoc, this issue*. [2] Uesugi et al., 2014. *76th MetSoc, #5226*. [3] Yada et al., 2013. *76th MetSoc, #5150.* [4] Karouji et al., 2014. *77th MetSoc, #5240*. [5] Abe et al., 2013. *76th MetSoc, #5147*. [6] Schrader et al., 2015. *46th LPSC, #1604*. [7] Uesugi et al., 2014. *Earth, Planets. Space. 66:102.*