A CONSORTIUM STUDY FOR HAYABUSA RETURNED SAMPLES: AN AGGLUTINATE GRAIN.

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Introduction: Hayabusa spacecraft successfully recovered regolith particles from S-type Asteroid 25143 Itokawa. The preliminary examinations (PEs) and international announcement of opportunity (AOs) revealed that Itokawa particles are consistent with LL chondrites [1-3]. The Itokawa regolith particles show evidences of various surface processes on Itokawa, such as space-weathering [4, 5] and regolith gardening [5, 6].

Several Itokawa grains have not been distributed for PEs and AOs, which show rare features in composition, mineralogy and structures, or sizes [7]. The Extraterrestrial Sample Curation Team (ESCuTe) of JAXA has organized the consortium studies for these particles in order to maximize scientific gain from analysis [7]. In this paper, we describe one of the consortium particles and a tentative research plan.

RB-CV-0128: Initial description by SEM-EDS shows that most part of RB-CV-0128 has rounded molten shape. Vesicles and submicron-sized grains of Fe and FeS are common throughout the molten surfaces. Fractured olivine, pyroxene, and plagioclase grains are attached to the molten surfaces. These characteristics are quite similar to agglutinates found in lunar soils, which are considered to be formed by melting and mixing induced by micrometeoritic bombardment into the lunar regolith [8]. RB-CV-0128 is the only agglutinate grain found in more than 400 Itokawa particles described by ESCuTe.

So far, agglutinate in regolith breccias of ordinary chondrites has not been identified [9]. Despite that, the agglutinate was found in an extremely small amount of Itokawa regolith samples. In order to discuss the existence of the agglutinate in Itokawa samples, it is necessary to identify the origin of RB-CV-0128. Possible origins we consider are Itokawa, Itokawa's parent body, or another celestial body.

Research plan: We propose here a tentative research plan for RB-CV-0128. (1) Morphological and mineralogical features will be obtained using X-ray CT, XRD, SEM, and TEM/STEM. (2) Comparison between oxygen isotope ratio of the grain and those of Itokawa regolith particles and LL chondrites [2] can determine whether RB-CV-0128 come from another celestial body or not, using SIMS. In the later case, (3) we will calculate solar flare track density by observation of TEM/STEM, which can estimate solar-wind exposure age. If the exposure time is much longer than upper limit of cosmic-ray exposure ages of Itokawa particles (about 8 Myr [10]), the grain should have been exposed to the solar flare on Itokawa's parent body. The research plan is still tentative and we welcome research plan proposal from anyone interesting.

References: [1] Nakamura et al. (2011) *Science* 333: 1113-1116. [2] Yurimoto et al. (2011) *Science* 333: 1116-1119. [3] Ebihara et al. (2011) *Science* 333: 1119-1121. [4] Noguchi. et al. 2014. *Meteoritics & Planetary Science*. 49, 188-214. [5] Matsumoto et al. 2015. *Icarus accepted*. [6] Tsuchiyama et al. 2011. *Science*, 333, 1125-1128. [7] Yada et al. (2013) *LPS XLIV,* #1948. [8] Papike. et al. 1981. [9] Noble. et al. 2011. *Meteoritics & Planetary Science* 32:A74. [10] Nagao. et. al. 2011. *Science 333*:1128-1131.