A CONSORTIUM STUDY FOR HAYABUSA-RETURNED SAMPLES: A SILICA-CONTAINING PARTICLE.

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Introduction: More than 400 particles of Hayabusa-returned samples were catalogued by Extraterrestrial Sample Curation Team (ESCuTe) of JAXA [1]. Several insights into formation and evolution process of asteroid 25143 Itokawa have been obtained through the investigations by preliminary examinations and international AOs [e.g. 2-7]. Preliminary examinations showed that Itokawa particles were comparable to equilibrated LL chondrites [2-7]. These particles have experienced some degree of shock metamorphism and the shock state was discussed [2, 8].

Some of the Hayabusa-particles are difficult to allocate due to their unique characteristics in mineralogy, composition, structure, or size. These particles have been investigated by consortium study conducted by ESCuTe in order to obtain maximum scientific results [9-11]. In this paper, we report an overview and a tentative research plan for particle RB-QD04-0069 that is one of the consortium particles. This particle contains silica. Silica forms many polymorphs under high/low pressure and temperature conditions. Thus, investigation of the particle will constrain the pressure and temperature of shock metamorphism on asteroid Itokawa.

RB-QD04-0069: RB-QD04-0069 is a particle with 33 μm in size recovered from the Hayabusa sample catcher. Initial description by SEM-EDS showed that the particle consists of olivine, pyroxene, plagioclase, and silica. So far, this is the only particle containing silica among catalogued particles of Hayabusa-return samples. Silica is widespread in ordinary chondrites, but is rare (its modal abundance is usually less than ~1 vol %) [12]. Therefore, this particle is precious and should be investigated by consortium study.

Research Plan: Synchrotron X-ray diffraction analysis is planned to obtain crystallographic information of silica and host minerals. Textural information will be obtained by Synchrotron X-ray computed tomography (CT). We are also planning to cut the particle by focused ion beam (FIB) technique and distribute the pieces to further analysis. Measurement of oxygen isotope ratio by secondary ion mass spectrometry (SIMS) is required to indentify the origin of the particle and silica. Furthermore, measurement of chemical composition of the particle by field-emission electron microprobe analyzer (FE-EMPA), and transmission electron microscope (TEM) observation on plagioclase and pyroxene will provide important information for understanding the shock and thermal history of the particle.

The research plan is tentative and we welcome research plan proposals to this consortium study.

References:

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