A CONSORTIUM STUDY OF A HALITE-BEARING ITOKAWA PARTICLE.

T. Yada[1], M. E. Zolensky[2], M. Uesugi[1], Y. Karouji[1], Y. Ishibashi[1], T. Okada[1,3] and M. Abe[1,3]. [1]Instit. Space Astronaut. Sci. and [3]Lunar Planet. Explor. Program Group, Japan Aerosp. Explor. Agency, JAPAN. E-mail: yada@planeta.sci.isas.jaxa.jp. [2]Johnson Space Center, NASA, U.S.A.

Introduction: Hayabusa spacecraft returned its reentry capsule which enclosed asteroid Itokawa particles inside in 2010 [1]. The returned Hayabusa samples described to date number to more than 400, and 80% of them are from Itokawa [2]. So far, more than 100 of these have been distributed via an international announcement of opportunity (AO). Some of those having rare features, such as large size or rare mineral species have not been provided for the international AO because of their rarety. Based on the Memorandum of Understanding between JAXA and NASA, 15% of the returned samples are assigned to JAXA. Utilizing this fraction, JAXA is now starting consortium studies of rare Itokawa particles. Here, we introduce one of the consortium studies, for a particle containing NaCl (halite).

A halite-bearing Itokawa particle: Particle RA-QD02-0129 is mainly composed of silica-rich glass or plagioclase and contains three euhedral halites on its surface. The particle measures 40 μm and the halite size is from 2 to 5 μm. This is the only Itokawa grain mainly composed of silicate with halites so far. Because of its rarity and scientific importance, it was assigned to a consortium study.

Halites in extraterrestrial samples: In extraterrestrial samples, halites have been reported in regolith breccia H chondrites Monahans (1998) and Zag [3, 4], the carbonaceous chondrite Murchison [5], ureilites [6], a Martian meteorite [7], and lunar soil [8, 9]. Dating by three techniques, including ^{129}I, revealed that the halite formed in the early solar system, 1.7Ma later than Murchison (CM) formation [4]. Methane-bearing compounds were discovered within Monahans halite, and it has been suggested that halite parent body should be a large carbonaceous object having cryovolcanism, like Saturnian satellite Enceladus, orbiting in the main belt and that one of the possible candidate is Ceres [10, 11].

A plan for analysis for this particle: What is essential to the consortium study of the halite-bearing particle is to verify the extraterrestrial origin of halite. We are now accepting proposals for analyses for the particle until this Oct. Then we will discuss with researchers about a research scheme for the particle in order to maximize its scientific gain. So far, we initially plan to observe the particle with optical microscopy to confirm the color of halites, because those found in Monahans and Zag show purple/blue color due to the cosmic ray irradiation [3]. Then we plan to perform non-destructive analysis including synchrotron computed tomography before moving to destructive analysis, like transmitted electron microscopy and secondary ion mass spectrometry.

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