EVALUATION OF CONTAMINATION CONTROL IN HAYABUSA MISSION BASED ON INTIAL DESCRIPTION DATA OF PARTICLES FROM ITS SAMPLE CATCHER.

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Introduction: Hayabusa spacecraft returned its reentry capsule from asteroid Itokawa in Jun. 2010 [1]. Particles from asteroid Itokawa were identified in those recovered from its sample catcher [e.g. 2], and initial description of particles recovered from the sample catcher has been performed continuously by Extraterrestrial Sample Curation Team (ESCuTe) of JAXA [3]. In order to understand the nature of whole the particles in the catcher and evaluate contamination control of Hayabusa mission, we are now describing relatively unbiased group of particles.

Samples and Methods: Hayabusa's sample catcher consists mainly of room A and B, and a rotational cylinder. The cover of the catcher room B can be separated from the catcher and observed independently, thus we have developed a special holder for field emission secondary electron microscope (FE-SEM) in which the cover of room B can be set and introduced into FE-SEM to be observed directly. With this holder, we can map whole the area of room B's cover and describe all the particles on it by energy dispersive X-ray spectrometer (EDS) equipped in FE-SEM. With this method, we could expect relatively unbiased descriptions of particles in the sample catcher of Hayabusa.

Results: So far, one third of surface of the room B's cover has been mapped by the FE-SEM and a total number of the particles larger than 15 μm reaches 990. 319 particles among them are mainly composed of silicate, which are Itokawa origin. Among the rest of them, 76 particles are mainly composed of carbon, and 459 are artificial materials whose sources are identified. 136 of them are those whose origins are still unknown.

Discussion: Among two thirds of non-Itokawa particles, two thirds are artifitial materials whose sources are identified. For example, half of them are flakes of aluminum which should have been come off from the inner surface of the sample catcher, because they are coated by pure aluminum. On the other hand, the origins of rest one third of them are still unknown. The carbon-rich particles are now studied for their origins, still have not been identified their origins [4]. Some particles are composed only of metal like Ti, Zn and Fe, whose sources are still unknown, and others are only composed of NaCl or Ca phosphate, which are not identified as terrestrial or extraterrestrial.

Actions taken by Hayabusa 2 mission: We took actions for Hayabusa 2, the next sample return mission from asteroid. In order to exclude major contaminants, we avoided to coat aluminum on inner surfaces of its sample catcher, just mirror-polished them. And we have cleaned all the parts of its sample by cleaning procedures which had been checked its cleanliness level. Additionally, we put contamination coupons all the environments where its sampler had situated, and will analyze them for making a list of possible contaminants to return samples.

References: [1] Abe M. et al. (2011) LPS XXXXII, #1638. [2] Nakamura T. et al. (2011) Science 333, 1113. [3] Yada T. et al. (2013) Meteoritics Planet. Sci. 49, 135. [4] Uesugi M. et al. (2014) Earth Planet Space, submitted