**OUTLINE OF HAYABUSA SAMPLE PRELIMINARY EXAMINATION RESULTS.**

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**Introduction:** Fine particles on S-type asteroid Itokawa 25143 were successfully recovered from the smooth terrain by the Hayabusa mission. They are not only the first samples recovered from an asteroid, but also the second extraterrestrial regolith to have been sampled, after the Moon. Itokawa samples permit a direct validation of the relation between asteroids and meteorites. In addition, the properties of Itokawa particles permit studies of regolith formation and evolution. About fifty particles (30-180 μm in size) were allocated and examined systematically in preliminary examination (PE) throughout 2011. This paper presents its comprehensive results [1-8].

**Materials on Itokawa:** The samples are mainly composed of olivine, low- and high-Ca pyroxene, plagioclase, and troilite [1]. Modal abundances [5], elemental [1,3] and oxygen isotopic compositions [2] of the minerals indicate that the samples correspond to LL chondrites as estimated from the reflectance spectra of the S-type asteroid observed by ground-based telescopes and the Hayabusa spacecraft.

**Preexisting parent body:** Sample textures mainly indicate classification as LL5 and/or LL6, while some are LL4 [1,5]. The maximum temperature (~800$^{o}$C) estimated from the two-pyroxene thermometer and a heating model using $^{26}$Al indicate that thermal metamorphism occurred in the preexisting parental body of Itokawa, which was larger than 20 km in radius [1].

**Surface processes on Itokawa:** Fe-rich nanoparticles embedded in thin surface amorphous layers (<60 nm) of the particles show evidence of space weathering [4], which caused a change (reddening and darkening) in the reflectance spectrum of the airless body. Solar wind noble gasses, which were detected in the particles [6], seem to be responsible for the space weathering.

The 3D shape distribution of the particles is consistent with the results of mechanical disaggregation, primarily as a response to impacts [5]. No particles show large-scale melting, indicating relatively low-impact velocities (<~5 km/s) [5]. Rounded edges observed on some particle surfaces were probably formed from more angular edges by abrasion as grains migrated during impacts [5]. The noble gas release pattern is also consistent with grain migration. [6] The noble gas contents indicate a short residence time of the uppermost regolith layer (~150 yr.) and an upper limit of the residence time at Itokawa's surface (~8 Myr.) [6].

Organic materials have not yet been observed [7,8].

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