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[U-06_28AM1]New Progress toward the Understanding of Small Solar System Bodies

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Mon. Apr 28, 2014 9:00 AM - 10:45 AM 503 (5F)

This session is aimed at setting up a forum to discuss how we can make progresses in our understanding of the solar system evolution with our hands on data. Presentations related to the science of the small bodies in the solar system (satellites, asteroids, comets, interplanetary dust particles, trans-Neptunian objects, and planetesimals) are invited. In addition to the extensive astronomical/remote-sensing observations and theoretical works, Hayabusa has brought us samples back from Itokawa (S-type asteroid) for unprecedentedly detailed analysis. The results of the Hayabusa sample initial analysis do prove that analysis of returned samples will play a key role in our future study of the solar system evolution. While the mission preparation of Hayabusa2, which is targeted at a more primordial asteroid than Itokawa (1999JU3, C-type), is being matured, expectation of building a new gateway to biology-flavored topics via organic material and aqueous alteration analysis is ramping up. In this session, after summarizing the cutting-edge results obtained by various studies, including the impact physics important for the asteroid evolution, we will discuss the future shape of the study of the solar system evolution.

10:30 AM - 10:45 AM

[U06-P23_PG]Solidified and mixed materials on Asteroid body

3-min talk in an oral session

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Keywords:Asteroids, solid aggregates, amorphous materials, fluid, ion bombardment run, micro quasi life-like materials

The results of the present study are summarized as follows:1) Study of the Asteroids provides characteristic formation processes of primordial terrestrial and extraterrestrial celestial bodies.2) Identification of crystalline solids are almost similar between the Asteroids and Earth, though the Asteroid rocks might be formed by similar formation processes of terrestrial rocks based on the crystalline parts. However, extraterrestrial Asteroids show irregular mixtures of multiple states solidified amorphous solids.3) Formation of non-spherical Asteroid body formed mainly by impact-related melting process is observed as heterogeneous and irregular distribution of impacted grains.4) Local fluid-bearing depositions irregularly distributed on the surface and interior of the Asteroids might be based on storages on the interior formed by solidified mixtures of multiple states triggered by impact process on the Asteroids.5) Different processes of solids between the Asteroids and Earth can be observed silica Si-O frameworks which can be obtained by the ion bombardment experiments. Crystalline rocks with hard silicate structures on Earth show higher ion-peaks of alkali ions (Na, K and Ca etc.), whereas solid-aggregates of the Asteroids show higher ion-peaks of Si and Al ions which are relatively destroyed by ion bombardments. 6) Ion-peaks by the sputtering of terrestrial impact-breccias are clearly higher than those of the Asteroid meteorites, which the main differences are not rock textures of breccias but atomic bonding of slow or rapid cooling process.7) The air- and water-less Asteroids with solidified

materials with multi-states are formed from nano-grains to macroscopic rocks by impact-related evolution process,8) The primordial planet Earth with remained heterogeneous surface by impact-related process is considered to be cyclic system of three material states (air, liquid and solid) with macro-life activity which is formed by huge production from the interior triggered by huge collision process of the giant impact. On the other hand, the Asteroids without global cyclic changes of three materials states, microscopic quasi life-like materials might be locally found (mainly by high-resolution electron microscopy on in-situ or returned samples finally).9) It should be avoided to collect artificial impacted samples, because irregular mixtures of solidified amorphous solids from vapor and liquid states are easily destroyed to be escaped to be exaggerated solids with less volatiles.