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Initial analysis of the HAYABUSA recovery materials: Trace-element and isotope abundance

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After the analytical competition for the sample return mission MUSES-C in 2000 (Nakamura et al., 2003, ISAS Rep SP), we are expanding and further developing our Comprehensive Analytical System for Terrestrial and Extraterrestrial Materials (CASTEM). As part of the system we have developed in-house reference standard materials by coupling wet-chemical techniques with mass spectrometry including TIMS, ICPMS, and laser-fluorination assisted IR-MS. These reference materials will be used for in-situ trace-elemental and isotopic analyses including oxygen isotopes by secondary ion mass spectrometry (SIMS) and LA-ICPMS. We are now positioned to fully utilize the advanced analytical system and plan to determine precise and accurate elemental and isotopic abundances in small (several tens of micron diameter) particles delivered by the spacecraft Hayabusa.

Specifically, after sample preparation and petrological description, we plan to determine oxygen-isotope and trace-element abundances by SIMS, consuming approximately 10^3 micron^3 of material for each particle. For olivine grains, we plan to estimate [H], [Li], [B], [F], [Na], [Cl], [Ca], [Al], [Ti], [Cr], and [Ni]. Additionally [Ba], [Sr], [Y], [Zr], [Nb], [Ba], [REE], and [Hf] will be determined for pyroxenes. For particles larger than 20 micron, we also plan to determine lithium-isotopic abundances.

In this presentation, we plan to demonstrate our analytical results obtained by the in-situ technique applied to the particles of an asteroid Itokawa.

Keywords: Hayabusa, MUSES-C, Asteroid Itokawa, initial analysis