RAMAN MICROSPECTROSCOPY OF HAYABUSA PARTICLES.

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Introduction: The Hayabusa sample return mission was launched in 2003 by the Japan Aerospace Exploration Agency (JAXA). During this space mission material from the S-type, near-Earth asteroid (25143) Itokawa was sampled and returned to Earth [1]. Seven samples have been provided by JAXA to our consortium [2] in the scope of their 1st International Announcement of Opportunity: RA-QD02 -0035, -0051, -0049-1, -0049-4, -0158, -0187, and -0197. Raman micro-spectroscopy measurements, which allow a contactless non destructive mineralogical investigation, were performed on these Hayabusa samples. Three of the samples (#158, #187, and #197) arrived and remained in a N_2-filled container to avoid Earth atmospheric contamination while the other four were previously examined and exposed to air.

Measurements: Each Raman measurement was carried out with a Witec Alpha 300 Raman microspectrometer. The laser wavelength was 532 nm. The spectral resolution was about 4 cm^{-1} and for the 10 x objective the spot size on the sample was less than 1 µm. The measurement time was 120 s and 240 s and the power on the sample was 200 µW per measurement. Single Raman spectra were collected from the samples to identify minerals. The samples were scanned manually covering the sample surface pointing towards a lens. The samples in the N_2-filled container were measured through a transparent Quartz glass port that replaced the original JAXA top cover.

Results and Summary: The interpretation of the Raman spectra indicates that each sample mainly consists of Mg-rich olivines. This is based on the Gauss fitted olivine doublet observed between 800 cm^{-1} and 900 cm^{-1}. The fitted peaks were compared with two-peak calibration data sets of Kuebler et al. [3]. The intensity ratio of the doublet peaks (DP) was used to identify for sample #197 the relative orientation of the olivine crystals in each measurement location [4]. In some samples (#51, and #197) also pyroxene and plagioclase could be identified. Raman shifts at around 667 cm^{-1} and 1013 cm^{-1} are characteristic for pyroxene [4]. Plagioclase has been identified using the peaks around 480 cm^{-1} and 510 cm^{-1} by comparison with literature [5]. The results of the Raman measurements on olivine are consistent with LL 5-6 chondrites.

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