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Hayabusa2 Returned Samples: First Results From the MicrOmega Investigation Within the ISAS Curation Facility

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Introduction: On December 6, 2020, the Hayabusa2 mission successfully returned to Earth ~ 5.4 g of samples collected at the surface of the C-type asteroid Ruygu [1,2]. Its surface was first sampled on February 22, 2019, then on July 12, 2019, close to a 10-meter large artificial crater, so as to possibly access sub-surface material [3]. The collected samples are now kept at the Extraterrestrial Samples Curation Center of JAXA at ISAS in Sagamihara, Japan, for a first round of preliminary analyses, with the objective to characterize in a non-destructive manner both the bulk samples and a few hundreds of grains extracted from them [4]. In particular, the objective is 1) to support their further detailed characterization by the international initial analysis teams, which will start their activity in July 2021, and 2) to catalog the grains, accessible to the international community through AO selection, starting mid-2022.

The preliminary characterization of these samples is being conducted with a visible microscope with four color filters, a FTIR spectrometer operating in the 1-5 µm range and MicrOmega, a hyperspectral NIR microscope developed at Institut d'Astrophysique Spatiale (Université Paris-Saclay/CNRS, Orsay, France), operating in the near-infrared range (0.99-3.65 µm) [5]. It is noteworthy that never before have the preliminary analyses of returned extraterrestrial samples included the characterization by a NIR hyperspectral microscope.

Results: Preliminary outcomes of the analyses performed with MicrOmega will be presented at the conference. In particular, the question of the representativity of the samples collected by the Hayabusa2 spacecraft will be addressed thanks to the comparison of the spectra obtained by MicrOmega and the NIRS3 remote sensing IR spectrometer [6] which performed a spectral characterization (1.8-3.2 µm) of Ryugu's surface, including the sites of the samples' collection [7,8]. A preliminary analysis of the spatial compositional heterogeneity will be presented. Specific signatures, detected in grains typically present in <1% of the pixels, but of high relevance regarding the processes determining Ryugu formation and evolution, will also be discussed.

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