The 2.7µm OH band in different grains of Ryugu from the two collection sites, as seen by MicrOmega in the Hayabusa2 Curation Facility

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Hayabusa2 is the first space mission to study and collect samples from a C-type asteroid. In December 2020, the spacecraft brought back to Earth ~5.4g of materials from the surface of asteroid (162173) Ryugu. The samples were collected from two different sites TD1 and TD2 [1] at the surface of the asteroid, possibly sampling surface and subsurface materials. The samples were delivered to JAXA (Japan Aerospace eXploration Agency) Extraterrestrial Curation Center for preliminary analyses. Individual grains were extracted and analyzed in a controlled N_2 environment by an optical microscope, a FTIR microscope and MicrOmega, a near-infrared (0.99-3.65 µm) hyperspectral microscope. MicrOmega acquires images of 256x250 pixels with a spatial resolution of 22.5 µm. The total field of view covers ~5x5mm² [2].

In addition to the bulk samples, observations of individual grains, extracted from the bulks, were performed with MicrOmega at different azimuth angles to optimize the coverage and avoid potential photometric biases. In order to extract average spectra of the individual grains (typical size 1-4.5 mm), we developed a novel procedure using thermal emission maps measured by MicrOmega: first the grains were isolated from the rest of the field of view (the sample holder) thanks to their difference in terms of thermal emission, then their pixels were averaged at each azimuth orientation. Spectral parameters were finally calculated to characterize the position and the depth of the 2.7 µm OH feature. This band is believed to be related to the presence of metal-OH stretching modes in phyllosilicates [3], and it is observed at large scale over the surface of Ryugu [4].

We shall present the distribution of the spectral parameters of the 2.7 µm feature observed by MicrOmega on grains extracted from chamber A and chamber C, corresponding to TD1 and TD2 respectively. We will discuss the potential variations of the spectral parameters, in particular with regards to the observations performed at a much larger scale by NIRS3, and their possible implications regarding the hydrothermal and space weathering history of the asteroid.

References

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