# Organics in Ryugu samples, from MicrOmega and FTIR analyses within the ISAS curation facility

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Within the ISAS/JAXA facility, in which all samples collected by the Hayabusa 2 JAXA are maintained preserved from any terrestrial contamination [1], the MicrOmega instrument [2] has analyzed bulk samples from both collection sites, spread onto 6 main dishes, as well as hundreds of grains extracted from them. Two features show up in the NIR (0.99 µm to 3.6 µm) spectra of essentially all grains, as acquired by MicrOmega: one, peaked around the 2.7 µm, is diagnostic of OH stretch, primarily within the matrix material [3] while a second one, at ~3.4 µm, is due to either or both carbonates [4] and organics [5]. This paper focusses on the later one, with updated results and interpretation.

Most of the ~3.4 organics-related features within MicrOmega spectra are peaked at 3.42 µm, diagnostic of $CH_2$ asymmetric stretch, with less significant $CH_3$ absorption, around 3.38 µm (asymmetric) nor 3.45 (symmetric), pointing at aliphatic methylenic moieties, with high $CH_2/CH_3$. MicrOmega spectra of a number of grains exhibit several other features, in a variety of intensities, often coupled with the 3.42 µm and/or among themselves, primarily peaked around 2.9 µm, 3.05 µm, 3.25 µm, 3.55 µm. The candidate functional groups they are diagnostic of, are: aldehyde, alcohol, organic acid, amine and amide, and aromatics. The recent spectral upgrade of the FTIR within the curation facility, ranging up to 8.5 µm, has demonstrated, through preliminary analyses of the larger grain of the collection (C9000, > 1 cm wide), the potential of joined MicrOmega/FTIR measurements on the same grain.

Specifically, the FTIR provides means to discriminate between distinct potential compounds in two spectral domains: 5.2-6.2 µm, and 6.8-7.8 µm. Noticeably, C=O bonds (absorptions peaked at ~5.8 µm) can be distinguished from C=C bonds (absorptions peaked at ~6.2 µm). In addition, in a few spots, a critical feature shows up around 4.7 µm, potentially tracing nitrile (-C≡C-) or cyanate ($O=C=N^-$). In addition to N-rich compounds, P-rich bonds [6] could be confirmed and characterized by FTIR.

We shall review all measurements performed up to now, by both MicrOmega and the upgraded FTIT within the curation facility, and discuss them in the frame of the evolution of the pristine organic constituents within Ryugu.

**References**

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[2] Pilorget et al. (2022) Nat Astron, 6, 221-225
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