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UV Raman Spectroscopy for in-situ planetary Applications: MIRAS II Performance and Results

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A Raman device in combination with a Laser Induced Breakdown Spectroscopic (LIBS) apparatus is considered as part of the Pasteur payload for the ExoMars. While the concept for this proposed instrument is already set, innovative technical improvements concerning the Raman part (MIRAS II) to achieve the best performance will be presented within this contribution. In particular the application of Raman excitation wavelengths in the deep UV marks a promising approach exhibiting several advanatges: (I) higher scattering efficiency compared to VIS-IR Raman excitation wavelengths, (II) electronic resonance effects which increasing the intrinsically weak Raman signal thus improving the S/N ratio of the detected Raman signals, (III) spectral separation of Raman and fluorescence signals. The breadboard version of the MIRAS II device is presented together with the first measurement results. The MIRAS II breadboard is built in a modular setup consisting of a pulsed hollow cathode laser operating at 248 nm, a hadamard microspectrometer with subpixel resolution, a commercially available CCD camera, and a miniaturized Raman optical head specially designed for 248 nm. Laser, spectrometer and optical head are interconnected via a

glass fiber. Raman spectra of mineral and organic samples recorded with this breadboard are presented. High S/N ratio spectra were recorded with as low as ∼0.04 mW averaged power at the sample position. The pros and cons of using UV excitation vs. VIS-IR excitation are examined. This work has been funded by DLR (Deutsches Zentrum für Luft- und Raumfahrt) under grant number 50OW0502 MIRAS II and 50QX0604 Raman Libs – CORALIS.