MIRAS 2 - comparative Raman studies with different excitation wavelengths performed on Mars meteorite material

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In the last few years Raman spectroscopy has been recognized as a possible method for in situ planetary analysis. The most important fields Raman spectroscopy is addressing are the mineralogical and organic/biological analysis. The new design of the MIRAS 2 minaturized and robust Raman device (Mineral Investigation by in situ Raman Spectroscopy) is based on a deep UV laser and a UV capable spectrometer. To demonstrate the strengths of the application of deep UV Raman excitation wavelengths, we have performed Raman mapping experiments on the three Martian meteorites: SAU 008, DAG 735 and Zagami. The Raman mapping experiments have been carried out with different excitation wavelengths at 244, 257, 532, 633 and 830nm. Addressing exactly the same scanning area on the samples (200 x 200μm) for the different Raman excitation wavelengths was achieved by means of a home-build taylor made sample holders utilizing a micro-raster were. The experiment show that Raman UV excitation yields by far the best results (fluorescence free Raman spectra with high signal to noise ratio) when compared with a VIS/NIR excitation.

In order to achieve an unambiguous identification of the investigated planetary material a combination with other methods, especially with optical microscopy is very promising. A microscope can among other things (I) be used to study the physical and structural properties of a surface, (II) can contribute to studies of the planetaries' atmosphere, (III) can be applied to characterize and/or select a sample before it is passed to another analytical instrument and (IV) can be used to study the morphology of a potentially biological sample.