Applications of Raman Spectroscopy to Astrobiological Investigations

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The applications for Raman spectroscopy are broad. In the research area of astrobiology they include life detection and the monitoring of biological changes over time. Indications of life include the detection of Raman spectral features in the CH-stretching region around 2800 cm^{-1} and the detection of Raman spectra of organic compounds such as carotene and certain mineral products, which can be used as a signature of former and recent biological activity. Raman spectroscopy has the advantage that no sample preparation has to be done, which is a critical point for space missions such as the ExoMars rover, on which a Raman spectrometer is planned to be mounted. With Raman spectroscopy spectral changes can be monitored that are indicative of changes in the chemical composition of a cell over time. Further, changes in the cell composition can be detected which correlate to morphological modifications. The detection of biological changes has not only been shown in the laboratory setting, but also in space experiments such as BIOMEX.