

Raman Measurements under Simulated Martian conditions

Bettina Haezeleer^{1*}, Ute Böttger², Heinz-Wilhelm Hübers², Jean-Pierre de Vera², Stefan Fox¹, Henry Strasdeit¹

¹*Department of Bioinorganic Chemistry, Institute of Chemistry, University of Hohenheim, 70599 Stuttgart, Germany,*

²*DLR Institute of Planetary Research, 12489 Berlin, Germany*

* E-mail: Bettina.Haezeleer@uni-hohenheim.de

Raman spectroscopy is generally regarded as nondestructive. It is easy to apply, as no extensive sample preparation is necessary. As part of the ExoMars mission 2018, a compact Raman laser spectrometer (RLS) will analyze the mineral composition of the Martian soil and in particular search for organic matter [1]. Considering the possibility that life once evolved on Mars, its chemical traces may be detectable in Martian mineral matrices [2].

Our investigations on biomolecules have shown that high laser powers can influence the spectral outcome and even lead to complete sample destruction. To ascertain parameters and sample preparations favorable for an application on Mars, we developed a new measuring set-up simulating Martian environmental factors. Using a cryostat as simulation chamber, the samples were cooled down stepwise to 200 K. To minimize the oxygen level, a special pump created a stable vacuum of ca. 10⁻⁶ mbar. Different sample types (powders, pellets) have been measured with increasing laser power.

The results are quite revealing as they show a major influence of the physical properties of the samples.

[1] F. Rull et al., 42nd Lunar and Planetary Science Conference, LPI Contribution No. 1608, Abstract No. 2400 (2011).

[2] F. Westall et al., *Planet Space Sci.* 59: 1093–1106 (2011).