Geophysical Research Abstracts, Vol. 8, 03050, 2006
SRef-ID: 1607-7962/gra/EGU06-A-03050

Raman spectroscopy of organic minerals as an efficient technique for tracing possible markers of biogenic processes

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Raman spectroscopy can be recommended as a useful detection tool, for studies in an exobiological context to detect several fragments or key structures which can be considered as having relevance to biological processes (metabolites and alteration products as well as bioprotective pigments). Recently, the inclusion of miniaturised Raman spectroscopic instrumentation for consideration for adoption as part of the ExoMars robotic suite by ESA has been announced and a much wider database of Raman spectral organic signatures is perceived to be necessary to affect this. Recently, Raman spectroscopy has been used to identify several highly specific structural units or functional groups of complex mixtures. Numerous salts of simple organic acids (whewellite, mellite) can be considered as signatures of the Krebbs cycle of higher plants. Medium temperature transformation products (idrialite, evenkite) are accumulated where condensation of organic pyrolytic products has occurred within the frame of volcanic systems. The presence of high temperature transformation products (graphite) confirms rather severe temperature conditions and especially elevated oriented pressures. Indeed, several papers have appeared in which Raman spectroscopy has been used to identify discrete organic-rich localities of interest in specimens of archaeological art work which can then be minimally sampled destructively using other analytical techniques. We present here an application which lends itself similarly to organic geochemistry.