Geophysical Research Abstracts, Vol. 9, 11358, 2007
SRef-ID: 1607-7962/gra/EGU2007-A-11358

Raman Imaging Spectroscopy of a purported 3.5 billion year old microfossil

Steele A.1, Fries M.D.1, Green, O.R.2, Schweizer M.2, Lindsay, J.F.3

1 - Geophysical laboratory, Carnegie Institution of Washington, 5251 Broad Branch Rd, Washington DC. USA., 2 - Earth Science Department, University of Oxford, South Parks Road, Oxford, OX1 3PR, UK., 3 - Lunar and Planetary Science Institute, Houston, Texas 77058. USA

Raman spectroscopy peak mapping of microfossils in cherts has been extensively utilized recently in attempts to elucidate the biological nature of these features (Schopf et al., 2002; Schopf et al., 2004; Brasier et al., 2002). Of particular relevance to this study is the emphasis placed on whether features in the Apex chert of the Pilbara, Australia constitute evidence of 3.5 billion year old filamentous organisms (Schopf et al., 2002; Brasier et al., 2002). In these studies, confocal Raman peak mapping has been used for the first time to analyse microfossils from a range of samples (including Apex) and it is evident that the ordered and disordered (D and G bands respectively) peaks of macromolecular carbon exist in all types and ages of fossils and features analyzed (Schopf et al., 2002; Schopf et al., 2004). However, the presence of these Raman peaks for D and G band carbon cannot be used to imply biogenicity (Pasteris and Wopenka 2003). Therefore, in essence these studies still rely on the accurate determination of morphology. While a feature may appear to be filamentous and contain carbon, only accurate interpretation of the morphology and context of the feature can prove the assertion that it is in fact a bona fide 3.5 billion year old microfossil. Therefore any Raman carbon peak signature present can only be inferred as biogenic through careful cataloguing of the sample and not as a primary means to prove biogenicity. We have undertaken 2-D microRaman imaging using instrumentation that has a spatial and spectral resolution that are much higher than used in the previous studies in an attempt to prove or disprove the biogenicity of the fossils by studying the context of the Apex fossils within the host rock. In the case of the Apex chert we obtained thin section samples containing the originally described microfossils from the Apex locale

(Schopf 1993). While we analyzed several features of interest we were only able to locate a single filament described previously (holotype; Eoleptenema apex). Raman peak imaging of this structure has been undertaken in other studies (Schopf et al., 2002) and it is one of the originally described taxa from the Apex and thought to be a 3.5 billion year old microfossil. By mapping variations in the quartz peak intensities we have been able to show that the fossil is in fact carbon infilling a transgranular crack within the rock. The D/G carbon peak ratio shows 2 distinct populations of carbon between the fossil and the matrix. We therefore conclude that this fossil is indeed a pseudofossil and therefore the original Raman analysis of this fossil is flawed in its biogenic interpretation. By inference all microfossils from the Apex chert should be treated as pseudo fossils until extensive analysis has been completed.