



Potential and limitations in geochemical analysis of archean organic matter

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Bringing evidence for life in the oldest terrestrial rocks has been a challenge for many years. Several independent discoveries pointed to the presence of biosignatures in 3.5 b.y. old rocks. Such findings were obtained using a large array of approaches and techniques. However, most of the initial evidences for biogenicity of syngeneity with the host rock were shown to be controversial, the most famous example being the morphology of the so-called microfossils from the Warrawoona chert which was then mimicked in abiotic experiments. Similar pitfalls were revealed for data from Raman spectroscopy and carbon isotope compositions. A new criterion, in the form of an indisputable biomarker, is therefore needed in order to resolve the debate about when life first appeared on Earth. Organic geochemistry approaches were used to reveal such biosignatures in the archean organic matter, including both the soluble and insoluble organic fractions. When kerogens are considered, several techniques ranging from various spectroscopies to pyrolyses coupled with gas chromatography and mass spectrometry were applied. The limitations of these approaches will be discussed using recent results. The potential of a more rarely used technique, namely electron paramagnetic resonance, in this debate will be also presented.