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Infrared microspectroscopic characterization of Ediacaran microfossils from Doushantuo Formation, Weng'an area

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Phosphatic embryo-like fossils (500-700 μm in diameter) from the Ediacaran Doushantuo Formation in Weng'an area, southern China (about 580 million years ago) were analyzed by micro-Fourier transform infrared (FTIR) spectroscopy in order to obtain organic signatures for classification of the microfossils. Transmission IR spectra of the microfossils have absorption bands around 2960 cm^{-1} and 2925 cm^{-1} , together with that around 1600 cm^{-1} , indicating the presence of aliphatic hydrocarbon (aliphatic CH_3 and aliphatic CH_2 , respectively) and aromatic moieties (aromatic $\text{C}=\text{C}$). In addition, IR microscopic mapping indicates the distribution of aliphatic CH_2 and CH_3 groups inside the microfossils. Two types of phosphatic embryo-like fossils (Megasphaera and Megaclonophycus) have distinctive 2960/2925 cm^{-1} (CH_3/CH_2) peak height ratios ($R_{3/2}$ values) from ~ 0.6 to ~ 0.8 , which are higher than $R_{3/2}$ values of Proterozoic acritarchs and bacterial fossils (Marshall et al., 2005, Precam Res; Igisu et al., 2009, Precam Res). These results are inconsistent with suggestion that they are bacteria and acritarchs. Conversely, this implies that the Doushantuo microfossils analyzed in this study are kinds of animal embryo, while chemical signatures for taxonomy of animals need to be explored.

Keywords: embryo-like microfossil, Doushantuo Formation, FTIR imaging, aliphatic hydrocarbon