

Preservation and Evolution of Organic Matter During Experimental Fossilisation of the Hyperthermophilic Archaea *Methanocaldococcus jannaschii*

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Received: 13 September 2011 / Accepted: 6 November 2012 /

Published online: 20 December 2012

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Abstract Identification of the earliest traces of life is made difficult by the scarcity of the preserved microbial remains and by the alteration and potential contamination of the organic matter (OM) content of rocks. These factors can confuse interpretations of the biogenicity and syngenicity of fossilised structures and organic molecules found in ancient rocks. In order to improve our knowledge of the fossilisation processes and their effects at the molecular level, we made a preliminary study of the fate of OM during experimental fossilisation. Changes in the composition and quantity of amino acids, monosaccharides and fatty acids were followed with HPLC, GC and GC-MS analyses during 1 year of silicification of the hyperthermophilic Archaea *Methanocaldococcus jannaschii*. Although the cells themselves did not fossilise and the accompanying extracellular polymeric substances (EPS) did, our analyses showed that the OM initially present in both cells and EPS was uniformly preserved in the precipitated silica, with amino acids and fatty acids being the best preserved compounds. This study thus completes previous data obtained by electron

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