Early diagenetic reduction of organic matter: Implications for paleoenvironmental reconstruction

Y. HEBTING[1,3] P. SCHAEFFER[1] A. BEHRENS[1] P. ADAM[1] G. SCHMITT[1] P SCHNECKENBURGER[1] S.M. BERNASCONI[2] AND P. ALBRECHT[1]

[1] Laboratoire de Géochimie Bioorganique, UMR 7509 CNRS, Université Louis Pasteur, ECPM, 25 rue Becquerel, 67200 Strasbourg, France ; albrecht@chimie.u-strasbg.fr

[2] Geologisches Institut, ETH-Zürich, CH-8092 Zürich, Switzerland

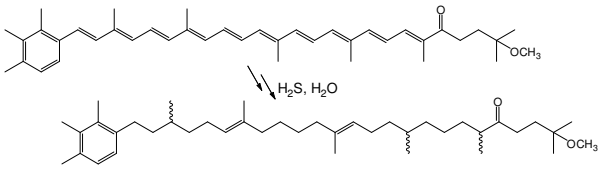
[3] Present address : Department of Earth and Planetary Sciences, Massachusetts Institute of Technology, 77 Massachusetts Avenue, Cambridge, MA 02139, USA; yhebting@mit.edu

Reduction of organic matter in recent sediments.

An abiotic process responsible for the reduction of organic matter at very early stages of diagenesis has been discovered through the use of molecular structural analysis and chemical simulation experiments [1]. This process, paramount for the preservation of organic matter, leads from functionalised organic molecules to their saturated homologues, allowing amongst other things, the formation of petroleum. It involves hydrogen sulphide as a reducing agent, water as a source of hydrogen, and operates *via* successive single electrons and hydrogen transfers. The net reaction is the formal hydrogenation of functionalities such as double bonds, alcohols and ketones and therefore can modify to some extent the biosynthetic H/D signatures of biomarkers at this very early stage of burial.

Implications for paleoenvironment reconstruction.

Isoprenoids and carotenoids are the most striking examples of this process. Figure 1 illustrates that this process can reduce up to 8 double bonds and can therefore induce the incorporation of 16 hydrogen atoms on a C_{40} skeleton. The use of compound specific H/D isotopic analysis to reconstruct paleoenvironment should therefore take this multiple-step hydrogenation process into consideration along with the biosynthetic fractionation.



References

[1] Hebting Y., Schaeffer P., Behrens A., Adam P., Schmitt G., Schneckenburger P., Bernasconi S.M. and Albrecht P., *Science*, in press.