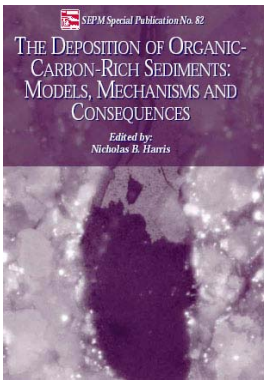
Journal of Sedimentary Research
An International Journal of SEPM
Colin P. North and Kitty L. Milliken, Editors
A.J. (Tom) van Loon, Associate Editor for Book Reviews
Review accepted 22 August 2005

The Deposition of Organic-Carbon-Rich Sediments: Models, Mechanisms, and Consequences, edited by Nicholas B. Harris. SEPM Special Publication 82. Society for Sedimentary Petrology (SEPM), 6128 E. 38th Street, Suite 308, Tulsa, OK 74135-5814, United States of America. Hardcover, 282 pp. Price USD 138, SEPM members USD 99.00, SEPM student-members USD 69.00. ISBN 1-56576-110-3.



Organic-carbon-rich sediments - or, when preserved in the subsurface hydrocarbon, source rock - have been the subject of intense study and controversy over the years. The disagreement between source-rock researchers revolved around three principal factors that are thought to govern organic-carbon deposition: reduced oxygen levels, organic productivity and slow sedimentation. The current volume attempts to answer some of these questions in a collection of twelve papers that can be regarded as a status report rather than a definite answer. Meanwhile, new questions have been raised, like the recognition of the possible importance of sulfurization of organic molecules and the adsorption of these molecules in clay particles enhancing their preservation. Unlike the milestone publication by Klemme & Ulmishek (1991), the current book is not a review of global source-rock development and occurrence, although some useful information is presented. As adequately described in the title, this collection of papers concentrates on models, mechanisms and consequences of source-rock deposition.

The two opening papers by Tyson and Katz comprehensively provide the current views on the controlling factors of source-rock development and a discussion on the ‘productivity versus preservation’ controversy.

A number of papers present case histories, including some source rocks in petroliferous basins. Bohacs et al. review three different source rocks: the Cretaceous in the Western Interior Seaway, the Permian from the Delaware Basin and the Miocene Monterey Formation from California in North America. Tribovillard et al. present a study of the prolific Kimmeridge Clay from England and France, concluding that reduced sedimentation, in combination with anoxia and organic productivity, determine the occurrence of organic-rich cycles. Harris et al. present a study from the lacustrine Marnes Noires in the West African Congo Basin. Beckmann et al. link the organic-carbon record in the West African Ivorian Basin to climatic variations and the in vogue Milankovich cyclicity.

Papers by Röhl et al., Van Buchem et al. and Arthur et al. focus on the relationship between source-rock richness and sea-level variations. Cases are described from the Early Jurassic Posidonia Shale in Germany, the Pennsylvanian Paradox Formation in the Western U.S., the Cenomanian-Turonian Natih Formation in Oman and the Late Devonian Duvernay and Pedrix formations from Canada. Examples from the modern Black Sea, the Cretaceous of the Western

Interior Seaway of North America and the Devonian of the Appalachian Basin also show the significance of sea-level fluctuations on organic productivity.

Huc et al. studied the role of longer first- and second-order sedimentary cycles on organic deposition. They investigated the correlation between organic-carbon deposition and tectonically driven CO_2 outgassing. The authors propose that higher levels of atmospheric CO_2 lead to enhanced chemical weathering, which in turn leads to enhanced nutrient supply and organic productivity.

Tsuchida et al. focus on the modern Lake Tanganyika system in the East African Rift valley, applying numerical modeling tools to simulate water movements. Pancost et al. studied samples from the Late Jurassic Kimmeridge Clay in England to test whether Type-I kerogenous fluctuations impacted organic-carbon content variations.

The papers in this book clearly demonstrate that the polarized traditional 'productivity versus preservation' debate fails to explain the complexity of hydrocarbon source-rock development and occurrence. As so often in the earth sciences, the 'either, or' question can be answered satisfactorily only by trying to understand the apparent multiple processes involved. Future multidisciplinary studies are likely to contribute significantly to this fascinating subject.

This book is an excellent state-of-the-art review of the contemporary hydrocarbon source-rock research. It will appeal to explorationists who require input for petroleum system models, organic and inorganic geochemists who study genetic processes, sedimentologists who interpret ancient depositional environments, and climatologists and oceanographers who reconstruct the history of the ancient atmosphere and oceans.

Reference

Klemme, H.D. & Ulmishek, G.F., 1991. Effective petroleum source rocks of the world: stratigraphic distribution and controlling depositional factors. AAPG Bulletin 75, 1809-1851.

Jan de Coo
Petroleum Geological Consultant
The Hague
The Netherlands
e-mail: jandecoo@planet.nl

SEPM - The Society for Sedimentary Geology