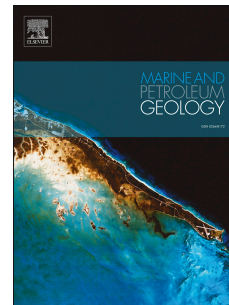


Accepted Manuscript

Clay mineral diagenesis and source rock assessment in the Bornu Basin, Nigeria:
Implications for thermal maturity and source rock potential

Peter S. Ola, Ademola K. Aidi, Olabode M. Bankole



PII: S0264-8172(17)30432-4

DOI: [10.1016/j.marpetgeo.2017.10.031](https://doi.org/10.1016/j.marpetgeo.2017.10.031)

Reference: JMPG 3124

To appear in: *Marine and Petroleum Geology*

Received Date: 28 April 2017

Revised Date: 18 October 2017

Accepted Date: 30 October 2017

Please cite this article as: Ola, P.S., Aidi, A.K., Bankole, O.M., Clay mineral diagenesis and source rock assessment in the Bornu Basin, Nigeria: Implications for thermal maturity and source rock potential, *Marine and Petroleum Geology* (2017), doi: 10.1016/j.marpetgeo.2017.10.031.

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

**Clay mineral diagenesis and source rock assessment in the Bornu Basin, Nigeria:
implications for thermal maturity and source rock potential**

Peter S. Ola^{1*}, Ademola K. Aidi¹, Olabode M. Bankole^{2*}

¹Department of Applied Geology, Federal University of Technology, Akure, Ondo, Nigeria

²IC2MP-HydrASA, UMR CNRS 7285, Université de Poitiers, Poitiers, France

* Corresponding authors: Peter S. Ola: psola@futa.edu.ng

Olabode M. Bankole: olabode.bankole@univ-poitiers.fr

ABSTRACT

An understanding of the mineral and organic matter modifications during burial are critical in assessments of potential source rocks in petroleum exploration studies. Here, we examined the relationships between clay mineral diagenesis and organic thermal indicators (vitrinite reflectance, and Rock-Eval Tmax) to constrain the thermal maturity and hydrocarbon potential of source rocks in the Mbeji-1 well in the northeastern part of the Cretaceous/Tertiary Bornu Basin. X-ray diffraction mineralogical data show that the <2 µm clay-sized fraction consist of mixed layer illite/smectite (I/S), kaolinite, illite, and Fe-chlorite clay mineral assemblages. The major diagenetic changes in the clay mineral evolution are transformation of random (R0) to ordered (R1) illite/smectite (I/S) mixed layer between ~2500 m and ~3640 m depths, decrease in smectite in I/S with burial, and appearance of chlorite at ~2500 m. Total organic carbon and Rock-Eval pyrolysis parameters (HI, S2, T_{max}) indicate presence of lean shales consisting of gas prone to inert terrestrial organic matters. Source rocks at shallower depths below 2500 m are immature while those below this level within lower Fika Formation to upper Gongila formations are marginally matured with respect to hydrocarbon generation. The variation between I/S transformation and VR for the Mbeji-1 well shows a delay in illitization process compare to organic matter maturity. We considered that other than temperature, insufficient and variable potassium availability, and short-heating time resulted in retarding the smectite illitization reaction relative to the organic matter parameters (vitrinite reflectance and Tmax). These differences further demonstrates that organic matter responds quickly to increasing temperature than mineral reactions at short heating time in young sedimentary basins.

Key words: Illitization, Source rocks, Thermal maturity, Vitrinite reflectance, Bornu Basin, Clay minerals.

Download English Version:

<https://daneshyari.com/en/article/8909265>

Download Persian Version:

<https://daneshyari.com/article/8909265>

[Daneshyari.com](https://daneshyari.com)