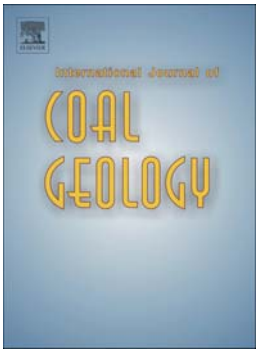

Hydrocarbon generation and migration under a large overthrust: The carbonate platform under the Semail Ophiolite, Jebel Akhdar, Oman

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PII: S0166-5162(16)30030-1
DOI: doi: 10.1016/j.coal.2016.02.007
Reference: COGEL 2595

To appear in: *International Journal of Coal Geology*

Received date: 2 December 2015
Revised date: 24 February 2016
Accepted date: 25 February 2016

Please cite this article as: Grobe, A., Urai, J.L., Littke, R., Lünsdorf, N.K., Hydrocarbon generation and migration under a large overthrust: The carbonate platform under the Semail Ophiolite, Jebel Akhdar, Oman, *International Journal of Coal Geology* (2016), doi: 10.1016/j.coal.2016.02.007

Hydrocarbon generation and migration under a large overthrust: The carbonate platform under the Semail Ophiolite, Jebel Akhdar, Oman.

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Keywords: burial history, Oman Mountains, solid bitumen reflectance, temperature, Raman spectroscopy, FT-IR

Highlights

- Thermal and burial history of Natih B in Wadi Nakhr;
- Natih B reached maximum of 240 °C at a maximum burial depth of 7.4-8 km;
- Paragenetic sequence of Natih and Muti Fm.;
- Proof that Raman spectroscopy of organic rich matrix reveals valid maturity results;
- Modelling of hydrocarbon generation and migration events.

Abstract

The Natih B source rock of the Jebel Akhdar dome in the Oman Mountains hosts at least three different generations of solid bitumen. This study presents detailed analyses of thermal maturity based on solid bitumen reflectance, Rock-Eval pyrolysis, Fourier transform infrared spectroscopy and Raman spectroscopy of matrix and solid bitumen. The Natih B source rock was sampled in different valleys (Wadis) around the Jebel Akhdar Dome. Detailed petrography of organic material was conducted by optical and scanning electron microscopy (SEM). The petrographic data was used to calibrate an integrated thermal basin model of the Wadi Nakhr area. Due to ophiolite obduction the Natih B source rock was buried to 7.4 to 8 km and a maximum temperature of c. 240 °C. Hydrocarbon generation and associated primary migration was burial induced and took place from 78 to 66 Ma with solid bitumen precipitation in the source rock. A resulting high-reflective solid bitumen generation reflects temperatures of deepest burial in the order of 225 °C to 240 °C. Based on an elaborated paragenetic sequence two other solid bitumen generations were linked to two oil migration events taking place during uplift (55-50 Ma and 48-45 Ma), after deepest burial (around 65 Ma).