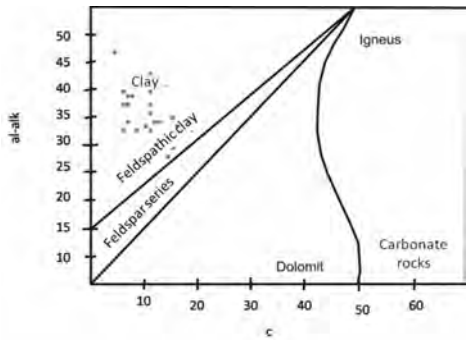

Figure 7: Binary graph of log (Na_2O/K_2O) against log (SiO_2/Al_2O_3).

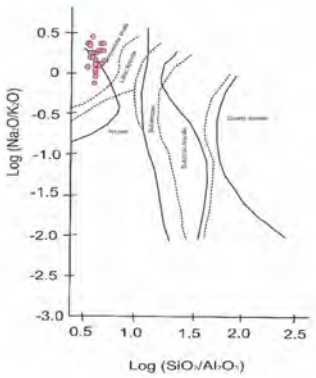

Figure 6: Binary graph of log (Na_2O/K_2O) against log (SiO_2/Al_2O_3).

Paper P2-23

A comparative study of the source rocks in the Shoushan Basin, Egypt and the Malay Basin, Malaysia

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This paper discusses the source rock quality of the Jurassic shales of the Khatatba Formation in the Shoushan basin, Egypt, and Tertiary shales in the Malay Basin, Malaysia (Figure 1; EGPC, 1992). The Khatatba Formation is composed mainly of shales and sandstones. These sediments are interpreted to deposit in a marine environment (Figure 2a; Schlumerger, 1984, 1995).

Lacustrine shales have been recognized as perhaps the single most oil-prone facies, especially in the Southeast Asian Tertiary basins (Cole and Crittenden, 1997). In the Malay Basin, it has been widely accepted that lacustrine shales are closely associated with the sediments of Groups K, L and M (Figure 2b; Petronas, 1999), which occur in the Oligocene/Early Miocene time. An assessment, based on organic facies characteristics, has been carried out on these sediments, in order to distinguish, characterize and evaluate source rocks deposited in different sedimentary basins. Organic matter content, type and maturity as well as some petrographic characteristics of the Jurassic source rock exposed in the Shoushan Basin and Tertiary source rock in the Malaya Basin were evaluated and their depositional environments were interpreted using organic geochemical and organic petrological studies.

In the Shoushan Basin, the Jurassic Khatatba Formation source rock composed mainly of shales and coal seams. The TOC contents are high and range from 1 to 32 wt. %. The Jurassic Khatatba sediments have a Rock-Eval T_{max} of 441–458 °C and HI values range of 100- 265 mg HC/g TOC, pointing to kerogen Types II-III and III (Figure 3a). Vitrinite reflectance values range between 0.77 and 1.07%, indicating that the samples are thermally mature and have entered the mature to late mature stage for hydrocarbon generation. In construct, the Tertiary lacustrine shale sequences in Groups K, L and M in the Malaya Basin have TOC content from 0.35 to 2.00 wt.% (Abdul Jalil, 2010). Kerogen composition of these shales varies, showing mixtures of Type I to Type III indicating variable combination of organic source input (Figure 3b). This is indicated by hydrogen index (HI) values ranging from 137 to 403. The variation in the source rock quality within the Groups K, L and M may be due to a combination of organic source input and factors controlling the preservation of organic matter within the environments of deposition (Abdul Jalil, 2010). The lacustrine shales have a Rock-Eval T_{max} of 435–455 °C, indicating thermal maturity level (oil window) sufficient for hydrocarbon generation (Figure 3b; Abdul Jalil, 2010).

The organic geochemical (biomarker distributions) approach here has been able to clearly differentiate between marine and lacustrine depositional setting. Biomarker parameters such as Pr/Ph, Pr/C_{17}, Ph/C_{18}, Tm/Ts and C_{29}/C_{30} hopane rations appear to reflect variation in depositional conditions and source input. Although there is a mixture of land-derived and marine-derived organic matter in both sediments, the depositional conditions of these formations can be distinguished based on these organic facies parameters, whereby the Khatatba shale samples were deposited in a reducing suboxic marine condition while the lacustrine shales of Groups K, L and M in oxic condition of deposition.

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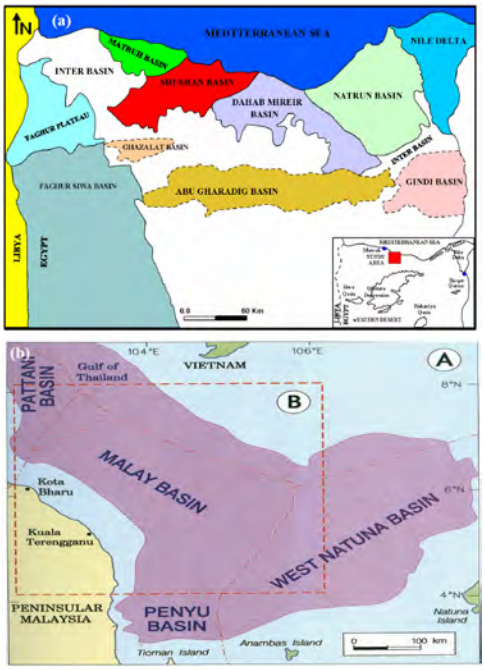

Figure 1: (a) Location map of the Shoushan Basin, Egypt (EGPC, 1992) and (b) Malaya Basin, Malaysia (Petronas, 1999).

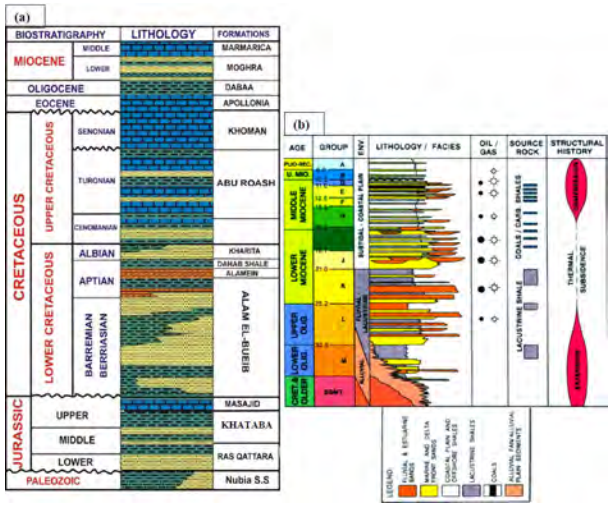

Figure 2: (a) Generalized stratigraphic column for the Shoushan Basin, Egypt (Schlumerger, 1984, 1995) and (b) Malaya Basin, Malaysia (Petronas, 1999).

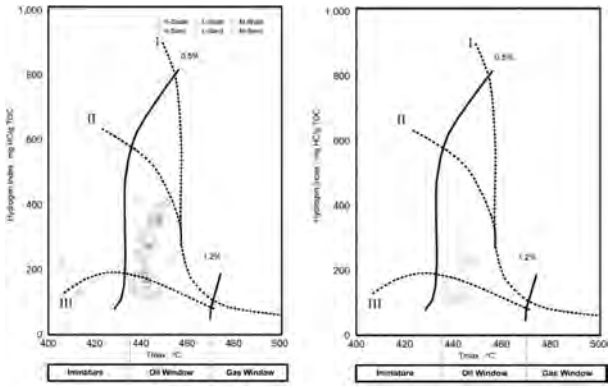

Figure 3: Plot of Hydrogen Index versus Rock-Eval T_{max} for the samples analysed from Malaya Basin, Malaysia (left) and Shoushan Basin, Egypt (right), showing kerogen quality and thermal maturity stages