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ATR-FTIR Characterization of Shales from Kubang Pasu Formation, Malaysia

ZAKY AHMAD RIYADI, ESWARAN PADMANABHAN, IBAD MAHMOODI, YANG WANG CHUAN & TEIVARDASHNI GUNASERGARAN

Department of Geosciences, Faculty of Geoscience and Petroleum Engineering, Universiti Teknologi PETRONAS, Bandar Seri Iskandar, 31750 Tronoh, Perak, Malaysia

Shale samples have been taken from two small hills in the Beseri area of Perlis: Bukit Chondong and Kampung Guar Jentik, Kedah, and accounted for organic geochemical properties during this study to provide an opportunity to explore the hydrocarbon distribution in these black shale. The basal unit of the Kubang Pasu Formation (Early Carboniferous) is represented by a thick unit of blackish grey shale interbedded with sandstone (Figure 1) [1, 2]. In this study shale samples were collected from the basal unit of Kubang Pasu formation. The Fourier transform infrared spectroscopy (FTIR) and Ultraviolet-Visible Spectroscopy (UV-Vis) were used in the assessment of liquid hydrocarbon present in rocks [3]. Recent advances in FTIR spectroscopy particularly in the development of ATR-FTIR has made it possible for such investigations to be carried out on both liquid and solid samples. The ATR-FTIR shows that shales from Kubang Pasu formation comprise saturated, unsaturated and aromatic hydrocarbon. The FTIR spectra of different shales exhibited similar absorption bands and characteristic absorption peaks (Figure 2). Analysis with the ATR-FTIR shows that the presence of aromatic in plane CH stretching (aromatic IPCH) hydrocarbon and aromatic out of plane CH stretching (aromatic OPCH) hydrocarbon groups (both occur in the finger print region) are found more in the Kubang Pasu Formation as compared to other functional groups. OH groups stretching vibration, alkyne C-H bending bands and alkane C-H bending band in aliphatic hydrocarbons and absorption spectrum of aromatic C=C stretching and aromatic OPCH are found in the FTIR spectra of Kubang Pasu black shales (Table 1)[4-8].

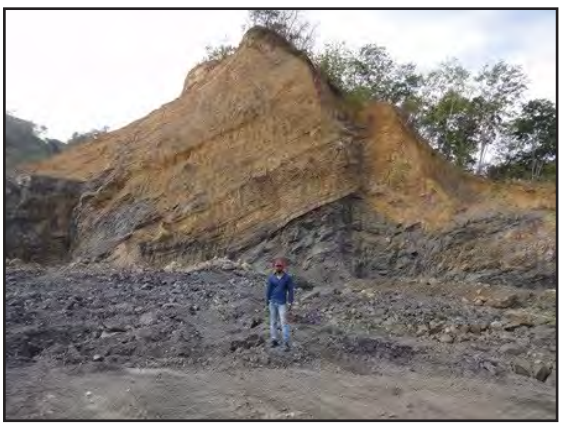

Figure 1: Study outcrop of the Kubang Pasu Formation represented by a thick unit of blackish grey shale interbedded with sandstone.

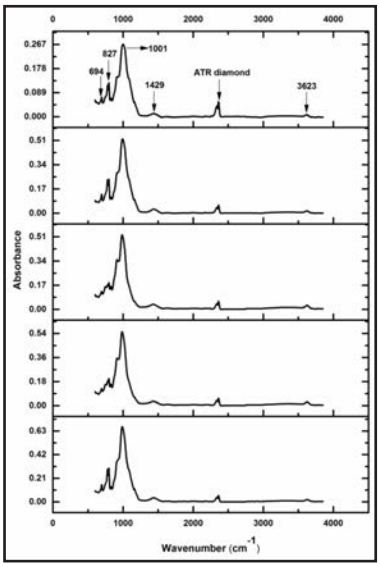

Figure 2: FTIR spectra of some shale samples of Kubang Pasu formation.

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Table 1: Functional groups identified through FTIR spectra in the Kubang Pasu Shale samples.

Sample	Aromatic C=C stretching 1430-1650 Absorbance	Alkane APH 720 C–H bending Absorbance	Aromatic bending 900–690 Out-of-plane C–H bending Absorbance	Aromatic bending 1250–1000 Out-of-plane C–H bending Absorbance	Alkyne APH 700–600 =C–H bending Absorbance	-OH Stretching 3600-3000 Absorbance
KPP-1	√	√	√	√		√
KPP-2	√		√	√		√
KPP-3			√	√	√	√
KPP-4			√	√	√	√
KPP-5			√	√	√	√
KPP-6			√	√	√	√
KPP-7			√	√	√	√
KPP-8	√	√	√	√	√	√
KPP-9	√	√	√	√	√	√
KPP-10	√	√	√	√	√	√

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