

E_4/E_6 Ratio Measured by UV-VIS Spectroscopy as an Indicator of Organic Matter Quality in Late Devonian Shales

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This study focus on the Devonian black shales of Sanai Formation (Late Devonian) located at Hill B in Kampung Guar Jentik, Beseri District, Perlis State of Peninsular Malaysia, just south of Timah Tasoh Dam, and roughly 10 km north of Kangar. The Sanai Formation seems to be limited in distribution, complete succession exposed on the northern side of the hill [1]. Sanai formation is composed of limestone, intercalated with dark grey to black shales. In geological literature, "black shale" is common name for a variety of fine-grained rock bodies that are rich in organic matter [2, 3]. Organic spectroscopic studies of ten Devonian black shales (Table 1) provided an insight on the hydrocarbon distribution and type of humic substances present in these black shales. Biodegradation of organic matter contributes to the formation of humic substances which are the major components of the natural organic matter in geological organic deposits such as brown coals and shales. The E_4/E_6 ratio has been widely used to study the humic acid fraction and to characterize the quality of organic matter. UV-Vis results indicated that the samples comprise almost equal proportions of E4 and E6 and also the fact that humic acids were present in all the black shales. This suggests that possibly the origin of organic fraction in these shales were probably terrestrial components of Devonian in age (Figure 2). The FTIR spectra of the black shale samples from Sanai formation is divided into three zones, A) -OH groups stretching vibration, B) Alkyne Aliphatic =C-H bending in Aliphatic hydrocarbons and absorption spectrum of Aromatic C=C stretching, C) Aromatic In plane C-H bending (Aromatic IPCH) and Aromatic out-of-plane C-H bending (Aromatic OPCH) (Figure 2)[4-8].

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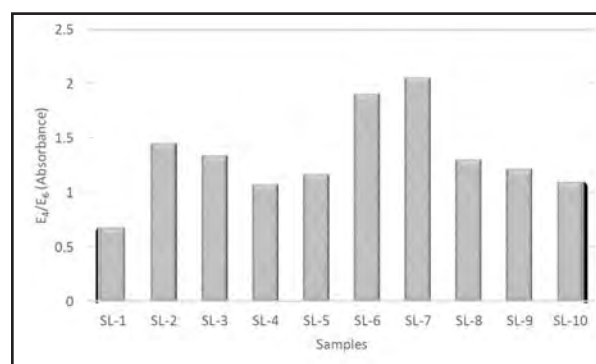


Figure 1: E_4/E_6 ratio in Black shale of Sanai Formation.

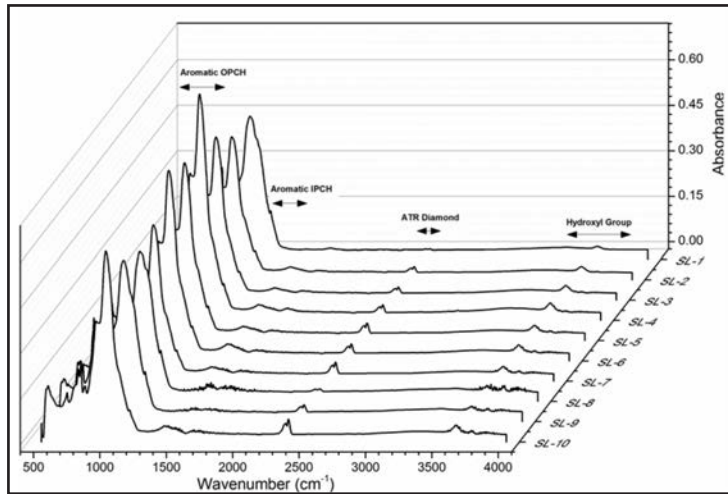


Figure 2: IR spectra of black shale from Sanai formation.

Table 1: Colour of the Sanai formation black shale samples according to the Munsell color chart

Age	Formation	Samples	Munsell Code	Color
Late Devonian	Sanai Formation	SL-1	N3	Dark Gray
		SL-2	N5	Medium Gray
		SL-3	N5	Medium Gray
		SL-4	N5	Medium Gray
		SL-5	N5	Medium Gray
		SL-6	N5	Medium Gray
		SL-7	N5	Medium Gray
		SL-8	N3	Dark Gray
		SL-9	N3	Dark Gray
		SL-10	N5	Medium Gray