Interpretation and Reconstruction of Depositional Environment and Petroleum Source Rock Using Outcrop Gamma-ray Log Spectrometry From the Huai Hin Lat Formation, Thailand

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Gamma ray logs are most useful in identifying subsurface lithology and interpreting depositional environments. This study highlights the use of outcrop gamma-ray logs along with outcrop observations and total organic carbon (TOC) analysis to provide the stratigraphic framework of the organic-rich rocks of Huai Hin Lat Formation in central Thailand. The study reveals five sedimentary facies including (1) structureless sandstone, (2) structured sandstone, (3) interbedded sandstone and siltstone, (4) interbedded mudstone and siltstone and (5) calcareous mudstone. These facies can be grouped into two facies associations; mudstone-dominated and sandstone-dominated facies associations. The depositional environment was interpreted as lacustrine basin-fill subdivided into deep lacustrine environment and sublacustrine fan associated with the turbidity currents. The total gamma-log characteristics are closely related to the lithologies controlled primarily by clay mineral compositions. Whist, the use of spectral gamma-ray can reveal more details on depositional environments and conditions. In this study, uranium (U) concentrations is proven to be useful in highlighting organic-rich rocks in low potassium (K) and thorium (Th) concentration successions due to its ability to be fixed in clay minerals and organic materials under an anoxic condition. Thus, the U spectral gamma ray is suggested to combine with conventional gamma ray log for depositional environment and recognition of organic-rich rocks.