

Geochemical and Biomarker Characterization of Source Rock and Crude Oil from Evbu Field, Niger Delta

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Forty four (44) shale principally ditch cuttings, eight (8) crude oil and three (3) condensate samples were collected from three wells from the northern depobelt of Niger Delta. Geochemical approach involving rapid screening by total organic carbon (TOC) content, and rock-eval pyrolysis of ditch cuttings were carried out. This was followed by fingerprinting with gas chromatography (GC) of chemical extract and gas chromatography-mass spectrometry (GC-MS) for biomarkers evaluation. Hydrocarbon bearing zones are deduced from values of rock-eval parameters S1, Tmax, hydrogen index (HI) and production index (PI). The aim was to determine the source potential and thermal maturity of the samples as well as to correlate oil to source rock.

The TOC generally ranges from 0.35 to 20.3 wt% indicating wide range of variation for different lithology and depth intervals. The HI values range from 98 to 342 mgHC/gTOC indicating terrestrial gas prone organic matter for the upper segment of the wells and mixed oil-gas prone towards the middle and bottom of the wells. The kerogen quality indicates Type II /III kerogen capable of generating oil and gas. The plot of saturated, aromatic and non-hydrocarbon in a ternary diagram indicate that most of the samples are characterized by high content of saturated and non-hydrocarbons. The peak ratios of Pr/Ph (1.02 to 8.99), Pr/nC17 (0.99 to 72.18) and Ph/nC18 (0.49 to 8.73) indicating that the study wells are moderately biodegraded and have immature to marginally mature source rocks.

The degree of thermal maturity as projected from the rock eval data as well as 20S/20S+20R and $\beta\beta/\beta\beta+\alpha\alpha$ C29 sterane ratio of about 0.5 and 0.7 respectively, imply that the samples are immature to marginally mature and are deposited in oxic to sub-oxic environment