Geochemical characterization of the Permian series and associated oil indices in the Jeffara area: origin of hydrocrabon and 1D thermal maturity modeling

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Abstract

Permian rock samples from two wells (W-1 and W-2) drilled in the Jeffara basin (Southern Tunisia) were analyzed using the Rock Eval pyrolysis (RE) and Gas chromatography coupled to Mass Spectrometry (GC/MS). Oil indices from the same series were also examined. The two objectives pursued through this study were: (i) First, to geochemically characterize the Permian series in order to determine their source rock potential (2) second, to identify the origin of hydrocarbons occurring in the Permian layers through oil-oil correlations and oil correlations to source rocks candidates (Permian, Azzel, Fegaguira, and Zoumit).

The attained results show that the lower part of the Permian series is rich in organic matter and may constitute a good source rock of "Oil and Gas prone" quality. The oil indices found in the top part of the Permian series were generated simultaneously by the Permian source rock and the Paleozoic source rock (Azzel and Fegaguira).

The 1D basin modeling results indicate that, overall, the hydrocarbon generation started since the Permian (240 Ma) while oil expulsion took place during the upper Triassic (230Ma).

Key words: Jeffara area, Permian, source rock, biomarkers, CPL, GC/MS, Rock Eval, 1D modeling