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Depositional Environment and Source Potential of Devonian Source Rock, Ghadames Basin, Southern Tunisia

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Abstract : Depositional environment and source potential of the different organic rich levels of Devonian age (up to 990m thick) from the onshore EC-1 well (Southern Tunisia) were investigated using different geochemical techniques (Rock-Eval pyrolysis, GC-MS) of over than 130 cutting samples. The obtained results including Rock Eval Pyrolysis data and biomarker distribution (terpanes, steranes and aromatics) have been used to describe the depositional environment and to assess the thermal maturity of the Devonian organic matter. These results show that the Emsian deposits exhibit poor to fair TOC contents. The associated organic matter is composed of mixed kerogen (type II/III), as indicated by the predominance of C29 steranes over C27 and C28 homologous, that was deposited in a slightly reduced environment favoring organic matter preservation. Thermal maturity assessed from Tmax, TNR and MPI-1 values shows a mature stage of organic matter. The Middle Devonian (Eifelian) shales are rich in type II organic matter that was deposited in an open marine depositional environment. The TOC values are high and vary between 2 and 7 % indicating good to excellent source rock. The relatively high IH values (reaching 547 mg HC/g TOC) and the low values of t19/t23 ratio (down to 0.2) confirm the marine origin of the organic matter (type II). During the Upper Devonian, the organic matter was deposited under variable redox conditions, oxic to suboxic which is clearly indicated by the low C35/C34 hopanes ratio, immature to marginally mature with the vitrinite reflectance ranging from 0.5 to 0.7 Ro and Tmax value of 426°C-436 °C and the TOC values range between 0.8% to 4%.

Keywords : biomarker, depositional environment, devonian, source rock
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