

Libyan Murzuq Basin Source Rocks

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Several hundred shales and some oils from the Murzuq basin in south-western Libya have been analysed. All routine organic geochemical techniques were employed in the study, including, saturated and aromatic GC and GC-MS (SIR) and stable carbon isotope analysis.

Four potential Palaeozoic source rocks have been considered, the Marar, Awaynat Wanin, Tanezzuft and Hot Shale Formations. From the standpoint of source rock potential for oil, the Carboniferous Marar formation has the least potential and is mainly poor and gas prone, possibly improving in quality towards the south-east. The best shales in this formation have TOC contents greater than 2% and type II/III kerogen (HI > 200 < 300 mg HC/g TOC). Kerogens are composed mostly of woody and herbaceous remains indicating a land plant-dominated source rock. The formation is regarded as an inner shelf marine deposit.

The Devonian Awaynat Wanin has a generally similar potential to the richer Marar Formation, but in some parts has type II kerogen with a slightly greater algal content and was deposited in environments ranging from marine to fluvial.

The Silurian Tanezzuft formation has mostly poor to fair oil potential, increasing in richness just above the Silurian Hot Shale formation. The Hot Shale formation has by far the greatest potential, with %TOC up to at least 15% and Rock-Eval S2 up to at least 60 mg HC/g rock and hydrogen indices originally greater than 500 mg HC/g TOC at pre-oil generation. The Tanezzuft and Hot Shale formations are regarded as being deposited in marine inner shelf environments, with the most anoxic conditions during Hot Shale deposition.

From the central part of the basin northwards there is an increase in maturity of the Hot Shale from early mature to condensate window mature. Towards the northern rim of the basin the depth of the oil window is considerably influenced by uplift and erosion so that the oil window in this area is at shallow depths (less than 5000 ft). The oil kitchen in this area was probably only effective during the Jurassic-Cretaceous. To the south and east there has been less uplift and erosion, so that the Tanezzuft/Hot Shales, are mostly within the oil window. The Hot Shale is the dominant effective oil source rock, although there are parts of the Tanezzuft formation with some potential. The younger source rocks are generally not mature enough to be effective source rocks over most of the basin.