The Black Shale in Egypt: A Promising Tremendous Resource of Organic Matter

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The present study provides factual data about the black bituminous and oil shale in Egypt to be regarded by studying its potentiality as a promising source of energy. The black shale in Egypt belong to two stratigraphic formations namely, Duwi at the base overlain by the Dakhla of Campanian-Maastrichtian age. Both formations persistently extend along the southern escarpments which bound the western Desert to kharga oasis and to south kharga and further to the western reaches of Kom-Ombo, traced along the Nile valley in wadi Qena and the Galala plateau, along the Red Sea Coast between Qusseir and Safaga and in some occurrences in Sinai.

Both formations represent marine transgression phase from shallow marine for the lower part of the Duwi Formation with pronounced influx of terrestrial pollen and spores to relatively open marine for the Dakhla Shale (Schrank, 1987).

The black shale are widely distributed in Egypt in several stratigraphic horizons of different geologic ages: 1- Paleozoic carbonaceous shale bands and oil shale at both sides of the Gulf of Suez, and in Sinai 2. Upper Cretaceous – Lower Tertiary bituminous black shale in the southern part of the Western and Eastern deserts.

On the eastern side of the Gulf of Suez occur argillaceous deposits containing carbonaceous matter that induces a dark color, between grey and black depending on the concentration of the carbonaceous matter. These deposits are characterized by high contents of volatiles (9.98 – 18.98 wt%) and fixed carbon (9.02 – 21.92 wt %). The evaluated reserves are 75 million tons per each square kilometer (Tawfik, 1995).

The oil shale in East Sinai, includes two areas 1) Al-Qusiema – Al- Kuntella area and 2. Al Thamad (west longitude 34° 25`N and latitude 29° 10`E). The exposed rock units range in age from Triassic to Middle Eocene. The oil shale are of Upper Cretaceous (Campanian-Maastrichtian) age. The thickness of shale ranges from 3.00 up to 16.50 m and increases westward to be 28.0 m to 109.0 m. Similarly the overburden increases from 4.00 - 14.50 m to 28-109m.

The successions of the black shale forming the Upper Cretaceous-Lower Tertiary (Duwi and Dakhla formations along the Red sea coast between Safaga and Qusseir contain high content of organic matter (3.28-13 wt%). The total organic carbon (TOC) of the subsurface black shale of the Dakhla Formation ranges from one to 22 wt%. On contrary it ranges from 0.2 to 10.6 w% in the weathered sediments. The uppermost part of Duw Formation is enriched in organic matter (kerogen II and/or III). Most parts of the Dakhla Formation are enriched in margin organic matter. The kerogen analysis suggests the organic facies of the Dakhla shale are mostly of kerogen type I and / or II. These black shale are immature with good hydrocarbon potential for oil. The lower parts of the succession have lipitintic organic matter with excellent hydrocarbon potential and high soluble organic matter content (T.O.C. > 4 wt%). The organic matter is derived from dominating marine organisms under strong reducing conditions (El Kammar, et al., 1990 and El-Kammar, 1993).

The Duwi and Dakhla formations (150-310m thick) persistently extend along the southern escarpments which bound the Western Desert southern escarpments which bound the Western Desert plateau from Dakhla to Kharga Oasis (including Abu Tartour Plateau) and further to the western reaches of Sinn El-Kaddab escarpment bordering the Nile Valley south Aswan. This district lies between latitudes 24°-26° and longitudes 29°-31° forming a major black shale belt. The Duwi formation at Abu Tartour Plateau contains organic matter ranging from (1.19-14.53) of marine origin as well as non marine (2.32-18.27%).

An estimation of the total volume of all potential organic rich Cretaceous shale amounts to 4.5 billion bbl of oil in place concerning the area Safaga-Qusseir. In the area of Abu Tartour 1.2 billion bbl of oil in place was calculated by Troger, (1984).

The obtained results favor that the black shale widely distributed in Egypt represent promising target for detailed evaluation studies as high potential resource for energy.

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