Use of molecular geochemistry to identify the Albian-Early Cenomanian black shale strata in Northern Tunisia

Tahani HALLEK[1], Dhaou AKROUT[1], Riadh AHMADI[2], and Mabrouk MONTACER[1]

1 Research unit of Geosystems, Georesources and Geoenvironnements (UR3G), Department of Earth Sciences, Faculty of Sciences of Gabes, University of Gabes, 6072, Zrig, Gabes, Tunisia.

2 Laboratory of Water (Eau), Energy and Environment (LR3E), National School of Engineering of Sfax, University of Sfax, 3038 Sfax, Tunisia.

E-mail: tahanihallek@gmail.com

Abstract

The present work is an organic geochemical study of the Fahdene Formation outcrops at the Mahjouba region belonging to the Eastern part of the Kalaat Senan structure in northwestern Tunisia (the Kef-Tedjerouine area).

The analytical study of the organic content of the samples collected, allowed us to point out that the Formation in question is characterized by an average to good oil potential. This fossilized organic matter has a planktonic marine origin (type II), as indicated by the relatively high values of hydrogen index. This origin is confirmed by the C29 Steranes abundance and also by tricyclic terpanes C19/(C19+C23) and tetracyclic terpanes C24/(C24+C23) ratios. Tmax values are in the range 440°C and attest a thermal stage of the oil window beginning. This maturity is suggested by Ts/Tm ratio, and by S configuration of Carbon 20, with αα and ββ isomerization for carbon 14 and 17 in the C29 Steranes.

Mineralogical study found the existence of macro and micro fractures that are parallel to rock stratification or oblique with a high density. Fill standpoint, the major component of the mineralized veins is the fibrous calcite with bitumen traces. The composition of these fractures is mainly due to the availability of chemical elements scattered in the surrounding rock. As for the origin of these fractures, we assume that fluid pressure processes are heavily involved, together with the regional compressional tectonic stress regime. About lithology, the abundance of steranes compared to the diasteranes indicates a carbonate lithology; that is confirmed by the greater or less concentration of tetracyclic terpane t24. Moreover, the two isomers αβ and βα of C27-diasteranes have relatively low contents relative to carbonate facies.

The Fahdene Formation has a great importance about conventional oil development as a potential source rock, and even in terms of unconventional oil exploitation through the intense fracturing allowing the percolation of gas shale and facilitating its exploitation.

KEYWORDS: *Organic matter, GC-MS, Biomarkers, fluid pressure, oil exploration.*