

Geochemical Characteristics of Crude Oils Studied from the Lower Fars Reservoir in the Ratqa Field / Northern Kuwait

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Kuwait contains an estimated 96.5 billion barrels of proven oil reserves, around 8% of the world total. Once thought to be an independent reservoir, the Ratqa Field is actually a southern extension of the Iraq's super-giant Rumaila field. The Ratqa field belongs to the five northern oil fields, which Kuwait plans to increase output.

The subsurface strata in Kuwait is divided into two geological units, namely, the Kuwait Group including Dibdibba, Lower Fars and Ghar formations, and Hasa Group including Dammam, Rus and Radhuma formations, in a descending age. The Lower Fars Formation is composed of fine sediments, conglomeratic sandstone, shale and thin fossiliferous limestone.

A total of three heavy oils from the Lower Fars Formation have been studied using petroleum geochemistry methods including high resolution gas chromatography, gas chromatography-mass spectrometry (GC-MS) of biomarkers and stable isotope (carbon and sulfur) mass spectrometry.

The oils studied are moderately to severely biodegraded and are relatively rich in resins and asphaltenes. As expected, they are rich in sulfur-containing thiophenes. Based on biomarker maturity parameters, the lower Fars oils investigated appear to be low maturity, equivalent to the early oil window.

The biomarker (saturate and aromatic) fingerprints as well as characteristic ratios suggest that they are genetically related, and that they have been generated from marine carbonate source rocks, rich in sapropelic organic matter (Type II-S kerogen) deposited in dystrophic (oxygen-poor) environment.

The close similarities between the isotopic compositions of the Lower Fars oils investigated in this study support the conclusion that the Lower Fars oils from the Ratqa field are derived from the same and/or similar source rock(s). The minor variation observed is most probably attributed to a possible facies change.

The asphaltenes of the Lower Fars oils were selected for bulk kinetic assessments. Bulk kinetic parameters describe the rate at which organic matter decomposes into hydrocarbons. Bulk kinetic parameters which have been determined for the Lower Fars oils using Humble Instrument's SR Analyzer Arrhenius WorkStation will be discussed In this study.

