

Source Rock Characteristics, Thermal Maturity and Hydrocarbon Generation Potential of Mesozoic Section of Kuwait

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Abstract

The State of Kuwait is characterized by two main petroleum systems of the Mesozoic age based on geochemical analysis of Rock-Eval, biomarker, diamondoid and vitrinite reflectance data. These datasets are integrated with the geological data for the evaluation of the hydrocarbon source potential of the Najmah and Makhul source rocks to establish if they belong to a single or multiple petroleum system(s).

Najmah Formation of Oxfordian to Kimmeridgian age, comprises argillaceous lime mudstones and shales deposited in an outer ramp to basinal setting. The formation has an average thickness of 210 ft with a TOC range of 1-17% and an average Hydrogen Index of 308 mg/g TOC. The HI and OI ratios of kerogen suggest it to be type II kerogen. The analytical data such as Vitrinite reflectance, spore color index and biomarker shows it is in mid to late maturity oil widow.

Makhul Formation of Tithonian age consists of a kerogen rich lime mudstone unit developed in the basal part, which is deposited in a middle to outer ramp setting. The Basal Makhul is about 70-300 feet thick and is characterized by TOC of 1-7%. Vitrinite reflectance, spore color index and biomarker data indicates early-to mid-maturity oil widow for the unit.

Both Najmah and Makhul are productive oil/gas source rock and still have significant hydrocarbon potential. 3D basin model suggests two major hydrocarbon kitchens located in the offshore and northwestern part of onshore Kuwait.