

Paper Number: 446

Correlation of Thermal Maturity Parameters Using Geochemical Methods in Azadegan Oil Field

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Abstract

One of the most important input factors in constructing a basin model is the source rock properties especially its thermal maturity. The presence of thermally mature source rocks is a necessary element for the existence of a petroliferous basin. Many detailed geochemical parameters have been proposed as indicators of thermal maturity in oil and gas source rocks that each of them has limitation and if we do not consider these limitations, it can lead to spurious maturity estimation. Among these parameters, the biomarker maturity parameters are most commonly used, but also associated with limitations and problems. In this article, discussion on applicability and the pitfalls of using biomarker maturity indicators has been carried out biomarker maturity parameters are not related only to maturity variation and are influenced by other factors such as source input, lithology, depositional environment, and redox potential. All these factors were recognized in Kazhdumi and Gadvan formations of Azadegan oil field by first using Rock-Eval parameters, gas chromatography (GC), and gas chromatography–mass spectrometry (GC-MS) data. The 20S/(20S+20R) proportion considered as a proper maturity indicator in Kazhdumi formation and its values showed maturity equivalent to immature and early mature zone for this formation. Furthermore, according to 20S values the maturity of Kazhdumi formation was increasing toward middle of field. On the other hand the 20S ratio in Gadvan formation had reached to equilibrium but other parameters such as $\beta\beta/(\beta\beta+\alpha\alpha)$ proportion showed that further maturity did not happen after 20S isomerization completion. Moreover, the Ts/(Ts+Tm) ratio which began to increase quite after the 20S isomerization completion, considered as a supplement the sterane maturation. In addition, maturity parameters showed maturity equivalent to peak oil window for Gadvan samples. Furthermore, according to Ts/(Ts+Tm) values the maturity of Gadvan formation was increasing from south to north of field.

Key words: Azadegan oil field, thermal maturity, biomarker maturity parameters, vitrinite reflectance, gas chromatography–mass spectrometry, Rock-Eval pyrolysis.

