Organic geochemical characterization of 30F-1X core samples from Maracaibo Basin, Venezuela.

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Introduction

There are several studies on source rock characteristics from Maracaibo Basin, Venezuela, which have helped in determining the petroleum system in this basin. However, a little information has been obtained by analyzing core samples 30F-1X located in west of the basin.

In 1992, Gallango and Cassani studied extracts from the Maracaibo’s Lake and only analyzed a sample of rock core 30F-1X. For this reason, a larger number of samples in this study represent a contribution to the petroleum system of Maracaibo’s Lake basin.

Experimental

Five samples of ALPUF 30F-1X core from west Maracaibo’s Lake basin were used. Total carbon concentration (Ct) was determinate by LECO carbon analyzer C-144; carbonate-carbon (Cinorg) by Bernard calcimeter method and total organic carbon (TOC) by difference. Another analysis includes Tmax values obtained from rock samples by Rock-Eval pyrolysis.

Bitumen was extracted from powdered rock by Soxhlet extraction with methylene chloride as solvent. Asphaltene was precipitated from bitumen by n-heptane addition. Then, the maltene fraction was separated by adsorption chromatography on alumina column as stationary phase, using hexane to separate the saturation fraction, toluene to aromatic fraction and toluene/methanol in a relation 70/30.

The biomarkers were determined for m/z 113 in the aliphatic fraction and m/z 178 and 192 in the aromatic fraction, with a mass selective detector (MS)-(GC/MS), Agilent technologies, models 6890N (GC) coupled with 5975 mass spectrometer (MS).

Results and discussion

The ALPUF 30F-1X core samples contain organic carbon ranging from 4.2 to 8.9% and bitumen from 3196 to 15919 ppm. According to these values, core rocks are considered excellent hydrocarbon source rock (Hunt, 1995).

The Tmax values obtained from Rock-Eval pyrolysis range from 431° to 438 °C indicate a mature stage. The ratio C29 (αββ/((ααα + αββ)) range from 0.51 to 0.53 and C29 ααα (20S/(20S +20 R)) range from 0.43 to 0.48. This suggests that the samples have reached maturity stages to liquid generation hydrocarbons. The maturity parameter based on methyl phenanthrene index, MPI (Radke and Welte, 1983), yields calculated vitrinite reflectances (Rc %) ranging from 0.7% to 0.8% corresponding to peak oil generation.

The results of GC/FID show a unimodal distribution of lower molecular mass n-alkanes which maximum in n-C16 and n-C18. This distribution show n-alkanes characteristic distribution from marine source (Killops and Killops, 2005, Peters et al., 2005), corresponding to sedimentary environment where the rock samples in this study was originated, La Luna Formation (González et al., 1980; James, 2000).

The cross plot of dibenzothiophene/ phenanthrene versus pristane/ phytane (P/F vs MDTF/MF) indicates that all samples are derived from marine environment with high sulfur concentration under reducing conditions (Hughes et al., 1995).

Conclusion

The 30F-1X core was sedimentsed under reducing conditions with marine organic matter input as main contribution and the organic matter is within the oil window.

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References


