

**GEOCHEMISTRY OF THE PEDREGOSO FORMATION (EARLY MIOCENE),  
FALCON BASIN, VENEZUELA: PALEOREDOX CONDITIONS, ORIGIN AND  
MATURITY OF ORGANIC MATTER**

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The Falcon Basin, located to the northwest of Venezuela, is an oil-containing marginal basin that, in spite of having few liquid hydrocarbon volumes, shows significant gas reserves and coal deposits. Nevertheless, few studies of this basin were conducted from the geochemical point of view. In the stratigraphic column, several units contain preserved organic matter (Boesi and Goddard, 1991). One of them is the Pedregoso Formation (Early Miocene) deposited during a marine transgression, and made of an alternation of thin layers of dark claystones with limestones and sandstones that represent a turbiditic sedimentation at the foot of the San Luis paleo-reef (Diaz of Gamero, 1977). The lithological characteristics and the stratigraphical position confer to this formation a great interest regarding the petroleum system of the Falcon Basin (Ghosh et al., 1997); but the geochemical characteristics of the preserved organic matter were not studied yet. To fill this gap, inorganic and organic parameters were determined for the Pedregoso Formation with the purpose of evaluating the paleoredox conditions that controlled organic-matter accumulation and preservation, as well as to determine the type of organic matter and the degree of thermal maturity it reached. The interpretations are based on the determination of the CaCO<sub>3</sub>, TOC and S<sub>total</sub> contents, the degree of pyritization (DOP), C-S-Fe relationships, kerogen elemental analysis (C, H, N, S, O), Rock Eval pyrolysis and biomarkers analysis of the saturated and aromatic fractions of hydrocarbons.

A negative correlation is observed between the CaCO<sub>3</sub> content and the TOC: the TOC values decrease from 0.85% for shales to 0.45% for marls down to 0.25% for limestones. The proxies used here to reconstruct paleodepositional conditions (TOC, C-S-Fe, DOP, pristane/phytane) suggest that oxic to dysoxic conditions predominated during deposition of the sediments of the Pedregoso Formation (Fig. 1A). The biomarker distribution in the hydrocarbon saturated fraction indicates that the organic matter is predominantly of marine origin, and that it accumulated in a carbonate-prone marine environment with high organic productivity and good oxygenation, typical of reefal milieus (Fig. 1B and 1C). The T<sub>max</sub> data

(~478-491°C), and the parameters of maturity derived from the distribution of biomarkers, indicate that the studied organic matter is overmature (late catagenesis stage). In this stage, the oil that could have been generated previously was expelled and the remaining organic matter is only capable to generate gas. The little variability observed in the distribution of saturated and aromatic biomarkers allows inferring two scenarios. 1 – The Pedregoso Fm. underwent constant conditions of organic matter deposition; nevertheless, the sedimentary features record a progressive shallowing from base to top that is not evidenced by the organic record. 2 - The bitumen underwent migration processes and is mostly allochthonous. The migration was lateral or vertical, probably induced by the compressive stresses to which the Falcon basin was submitted by the motion of the Caribbean tectonic plate.

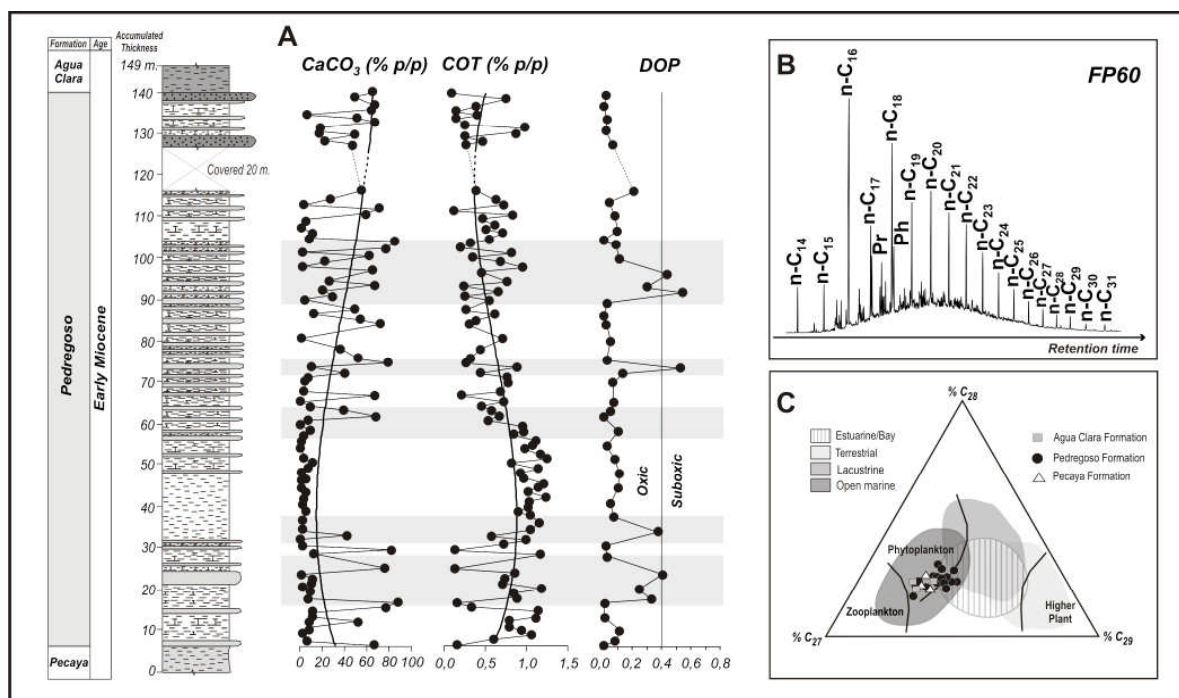


Figure 1. (a) Stratigraphic distribution and general tendency of the contents in CaCO<sub>3</sub>, TOC, and DOP; (b) Example of chromatogram of the fraction of saturated hydrocarbons (TIC), n-C<sub>x</sub>=n-alkanes, Pr=pristane, Ph=phytane; (c) Relative abundance of regular steranes (C<sub>27</sub>-C<sub>28</sub>-C<sub>29</sub>) in the studied organic matter.

## REFERENCES

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