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GEOCHEMICAL STUDY AND APPLICATION OF EXPLORATORY ANALYSIS TO THE DIFFERENTIATION OF ONSHORE CUBA SURFACE PETROLEUM SHOWS

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Traditional biomarker parameters obtained from steranes, terpanes and aromatic compounds were applied, to characterize and classify 10 surface petroleum shows from onshore West and East Cuba.

Cuban oils have already been classified in three main families according to their molecular and isotopic compositions (López *et al*., 2004, 2006; Pascual *et al*., 2006; Dominguez, 2006). In the present study, genetic molecular parameters were compared in order to establish oil-oil correlations between surface asphaltites (asphaltene rich petroleum samples occurring as seeps or filling veins, joints, cavities and fissures) and reservoir oil samples.

All surface samples showed indications of biodegradation and intense loss of volatiles. Gas chromatograms showed partial to total loss of n-paraffins, isoprenoids (pristane and phytane) and humps of unresolved compounds (UCMs). In three samples, *n*-paraffins and low molecular weight compounds suggest a “fresh” pulse of oil. The series of 25 norhopanes were observed only in eight of the ten samples.

Concerning the study of aromatic compounds, four surface samples revealed predominance of dibenzothiofene (DBT) over phenantrene (P), as well as predominance of methyl-dibenzothiophene (MDBT) over methyl-phenantrene (MP), suggesting a sulphur rich carbonate source-rock (Hugues, 1984). In four samples, the distribution of MDBT in V shape (4MDBT > 2 3MDBT < 1MDBT), also suggests a carbonate source paleoenvironment, although Radke and Willsch (1994) have interpreted this feature as indicating low maturation rather than a carbonatic character. Other four samples showed a distinct pattern, with 4MDBT > 2 3 MDBT > 1 MDBT, which would be typical of a siliciclastic origin (Hugues, *ibid*). In two samples, 2 3MDBT was the most abundant compound, which might indicate its resistance to biodegradation (Volkman *et al*. 1984, William *et al*. 1986).

Thermal evolution were investigate using several biomarker maturity parameters as C_{29} steranes isomers (20S/20S+20R and $\alpha\beta\beta/\alpha\beta\beta+\alpha\alpha\alpha$), 22S/22S+22R homohopane isomerization of C_{31} and ratios of aromatic compound (Methyl Phenantrene Index and Methyl Benzothiophene Ratio (Radke *et al*. 1986). There is general agreement between different maturity parameters, including C23/C21 tricyclics (Ekweozor and Strauz, 1983; Cassani, 1986). All samples seem to represent petroleum in the early catagenetic stage.

Statistical procedures used as auxiliary technique to the genetic characterization and classification of samples (PCA and Cluster Analysis) point that they represent oils of the Family II (marine anoxic carbonate sourced oils,), except for 1 sample interpreted as belonging to Family III oils (normal marine siliciclastic suboxic sourced oils). Aromatic compounds *(e.g.* phenanthrene and alkyl derivatives, dibenzothiophene and alkyl derivatives) showed to be very useful in oil-oil correlation of biodegraded surface petroleum shows.

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