

APPLYING THE BIODEGRADATION PARAMETERS BY STATISTICAL ANALYSIS TO BRAZILIAN OILS

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INTRODUCTION

Oil can pass for transformations that produce considerable changes in its original composition. One of the most important oil alteration processes is biodegradation. Reservoired oil biodegradation consists of the selective degradation of certain organic compounds by the action of aerobic and/or anaerobic microorganisms (bacteria) found in the reservoir (PETERS et al., 2005).

The extent of biodegradation can be quantitatively estimated by analyzing the changes observed for some biomarkers ratios (25-Norhopane and Bisnorhopane), percentage of saturated compounds, aromatic and polar, in addition to the saturated hydrocarbon distribution profile and the isoprenoid compounds ratios as pristane to phytane, pristane to nC17, and phytane to nC18, in the oil samples.

The aim of this study was to evaluate the extent of biodegradation of selected oils from a Brazilian basin applying biomarkers parameters through statistical analysis.

EXPERIMENTAL

The 50 oil samples were analyzed as following: - determination of the relative percentage of saturated hydrocarbons, aromatic hydrocarbons, and resins/asphaltenes fractions; - gas chromatography using flame ionization detector (GC/FID) analyses were carried out on Agilent Technologies 5890 Series II instrument.

The saturate hydrocarbon fractions were isolated and later analyzed by Gas Chromatography/Mass Spectrometry (GC/MS). The analyses were performed on an Agilent Technologies 5890A Gas Chromatography coupled to Agilent Technologies 5972 mass selective detector, using electron ionization at 70 eV. Selected ion monitoring (SIM) was used to 25-norHopane (25 NH) and Bisnorhopane (BNH) determination at m/z 177.

Statistical (99 Edition) software for cluster analysis and Ward's method was used. For cluster analysis, eight biodegradation parameters data from each oil sample were used as the

factors (25-Norhopane; Bisnorhopane; saturated, aromatic and resin/asphaltenes percentages; pristane /phytane, pristane /C17 and phytane/C18 ratios).

CONCLUSIONS

The evaluation of the biodegradation degree led to the formation of three groups, Figure 1: biodegraded oils as a result of BNH and 25NH presence, although also showing the homologous series of paraffins virtually intact, thus, clearly being a mix of biodegraded and nonbiodegraded oil (Group I). Group II includes paraffinic and nonbiodegraded oils, being characterized by a high percentage of saturated hydrocarbons and the absence of BNH and 25NH. Group III is characterized by oils with high contents of aromatic hydrocarbons and partially biodegraded paraffins.

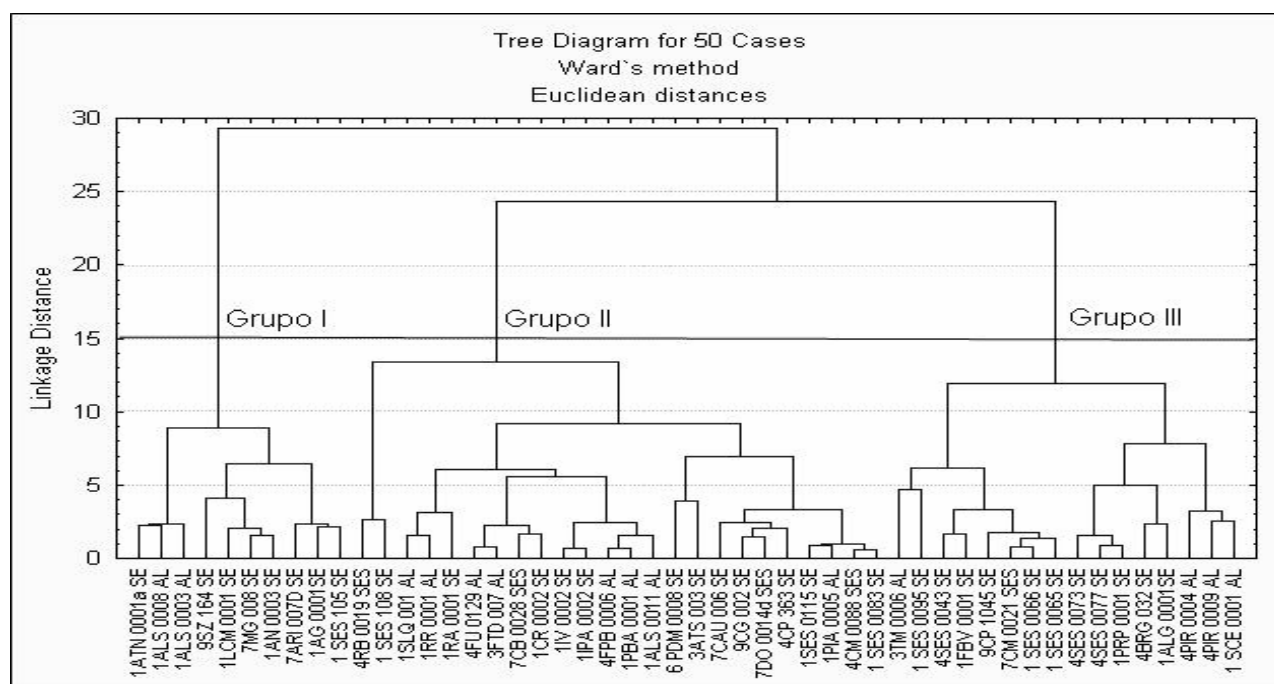


Figure 1. Hierarchical Cluster Analysis of biodegradation for the 50 Brazilian oil samples.

REFERENCE

Peters, K.E., Walters, C.C., Moldowan, J.M., *The Biomarker Guide: Biomarkers and Isotopes in the Petroleum Exploration and Earth History*, 2nd Edition, Vol.2, Cambridge University Press, 2005.