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Hydrous pyrolysis experiments applied to samples of Terciary Kerogen Type I from Permian and Kerogen Type III from Permian from Brazil

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Introduction and Aim.

Hydrous pyrolysis is an artificial maturation technique simulating the process of petroleum generation and expulsion, in a short period of time, in the presence of water under high temperature and pressure. It simulates the thermal evolution allowing an analysis of the organic matter transformation along the time and temperature leading to a better understanding of the petroliferous systems regarding the characteristics of the source rocks at different maturation levels. The objectives of the present work were: to investigate the variation of the vitrinite reflectance and the geochemical parameters measured in the rock and in the bitumen and expulsed oil, regarding their application as indicators of thermal maturity; to establish a correlation between thermal maturity index as well as a correlation between the biomarker distribution and the rates of organic matter transformation.

Materials and Method.

Two samples with distinct characteristics were studied, kerogen type I (Tertiary – bitumen shale from Tremembé Formation – 14 wt% of Total Organic Carbon (TOC)) and kerogen type III (Permian - Candiota coal – Rio Bonito Formation – 32.73 TOC wt%). The samples were submitted to hydrous pyrolysis experiments under the following conditions: temperatures of 280, 300, 320, 340 and 355°C for time zero (experiment finished when maximum temperature was reached), experiment times varying from 0 to 400 hours for temperatures of 340, 350 and 355°C. Petrographic and geochemical analyses (TOC, Vitrinite Reflectance, Rock Eval Pyrolysis), Liquid Preparative and Gas Chromatography were carried out in the original samples as well in the hydrous pyrolyzed ones, bitumen and oil expulsed.

Results.

The results showed that the increase of temperature and time of the experiment lead to an increase of organic matter transformation resulting in the increase in oil generation, in Vitrinite Reflectance and in the ratio Tricyclic/Pentacyclic terpanes; while the Carbon Preference Index, in the ratios of Pristane/nC17, Phitane/nC18, TS/(TS+TM), TOC and S2, decreased.

Conclusions.

The results showed that the increase of temperature and time of the experiment lead to an increase of organic matter transformation showed that the hydrous pyrolysis process is efficient to simulate the process of petroleum generation and expulsion for both samples worked.