

ESR OF ANHEMBI TAR SAND (BRAZIL): INVESTIGATION OF ORGANIC FRACTIONS

J. J. F. de Sousa, N. V. Vugman and C. Costa Neto*

Instituto de Física and *Instituto de Química
Universidade Federal do Rio de Janeiro, 21945 Rio de Janeiro, Brasil.

ESR measurements were made on Anhembi tar sand in order to investigate the distribution of organic free radicals among fractions obtained in the conventional treatment of bitumens (1).

ESR parameters were measured for: 1) the tar sand, 2) the bitumen fraction (chloroform extraction), 3) the extraction residue (sand), 4) the asphaltene fraction (n-pentane extraction residue from bitumens), 5) two resins and hydrocarbons resulting from maltene chromatography. Figure 1 shows the measured ESR spectra, g-values, line-widths and free radical concentrations for these fractions. The resonance signal with $g=2.0027$ observed in Anhembi tar sand is due to its organic fraction, while the divalent manganese traces belongs to its mineral fraction. The observation of different g-values in the asphaltenes, resin 1 and resin 2 samples indicates that bitumen ESR spectra results from superposition of different lines, related to free radicals with very close g-values. The asphaltene fraction contains the greatest free radical concentration.

Laboratory pyrolysis performed on nitrogen atmosphere sealed tar sand samples (2 hours) indicate that free radicals can be thermally generated in the interval from 300 C to 450 C. At higher temperatures they probably recombine or are destroyed (fig. 2). This behaviour is similar to the one observed for the Irati oil shale kerogen (2).

REFERENCES :

- (1) T. Ignasiak, A. V. Kemp-Jones and O. P. Strausz, J. Org. Chem. 42, 312 (1977).
- (2) J. J. F. Sousa, N. V. Vugman and A. S. Mangrich, Bull. Magn. Reson. 5, 246 (1983).

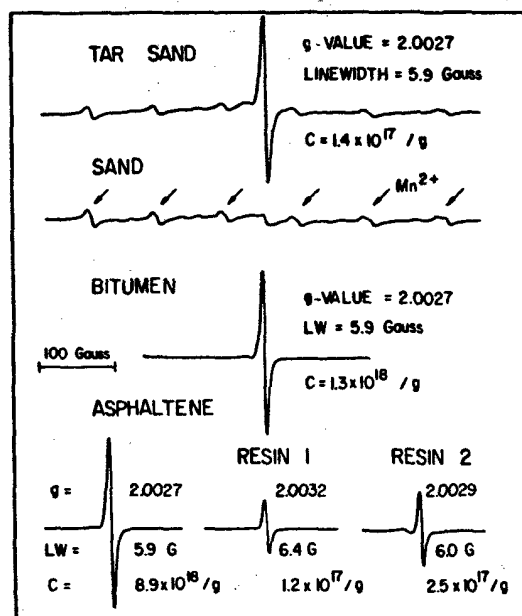


Figure 1: ESR Spectra and Parameters of Anhembi Tar Sand Organic Fractions.

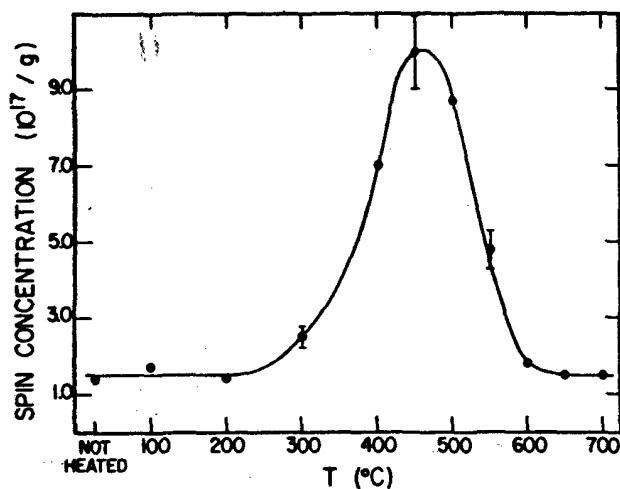


FIGURE 2: Spin Concentration of Heated Tar Sand as a Function of Pyrolysis Temperature.