

# Photochemical weathering of Brazilian petroleum by EPR spectroscopy

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Petroleum asphaltenes have been monitored during the photodegradation process of the crude oil [1]. The photochemical weathering by sunlight of crude Brazilian petroleum placed as a film over seawater has been studied using EPR. The samples were subjected to Electron Paramagnetic Resonance (EPR) analysis in a BRUKER (ESP- 300) equipment, which operates in the X band (9 GHz) at room temperature. Paramagnetic species have been observed in Brazilian oil before and after irradiation by EPR. The EPR spectra have shown signals that are characteristics of free radicals,  $\text{VO}^{2+}$  and  $\text{Fe}^{3+}$ . The signal of the free radical has a value of  $g=2.0045$  and a narrow linewidth, due to the high percentage of aromatics in the Brazilian oil. The values of parameter  $g$  suggest the presence of free radicals in carbon and nitrogen. The majority of the free radicals contained in the crude oil are imprisoned in complex molecular structure of the asphaltenes. The effective  $g$  values that correspond to the  $\text{VO}^{2+}$  species are typical values of vanadyl porphyrins. After the irradiation the  $g$  values of the  $\text{VO}^{2+}$  indicated presence of vanadium non-porphyrinic complexes containing nitrogen and sulfur, as binders. The  $g$  values determined for the  $\text{Fe}^{3+}$  showed signs of  $\text{Fe}^{3+}$  ions in non-porphyrinic organic complexes or inorganic solids. Solar irradiation of Brazilian Petroleum film on seawater generates free radicals, promotes degradation of aromatics and reduces the oil's asphaltenic fraction.

[1]. Carmen L. B. Guedes, Eduardo Di Mauro, Antonio S. Mangrich, Marcos Ramoni and Valdemir Antunes, *Série Ciência- Técnica- Petróleo*, Seção Química, Volume 3, CD-ROM, 2001.