

Micro-ESR Spectra of Crude Oil

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Five samples of crude oil were tested by Micro-ESR spectrometry. The samples were:

Sample Number	Location
1	Vasconia, Magdalena Basin, Columbia
2	Merey, Eastern Venezuela Basin, Venezuela
3	Oriente, Oriente Basin, Ecuador
4	Qua Iboe, Agbada Formation, Niger Delta
5	Basrah Light, Zubair Zone, Iraq

The following spectra were observed:

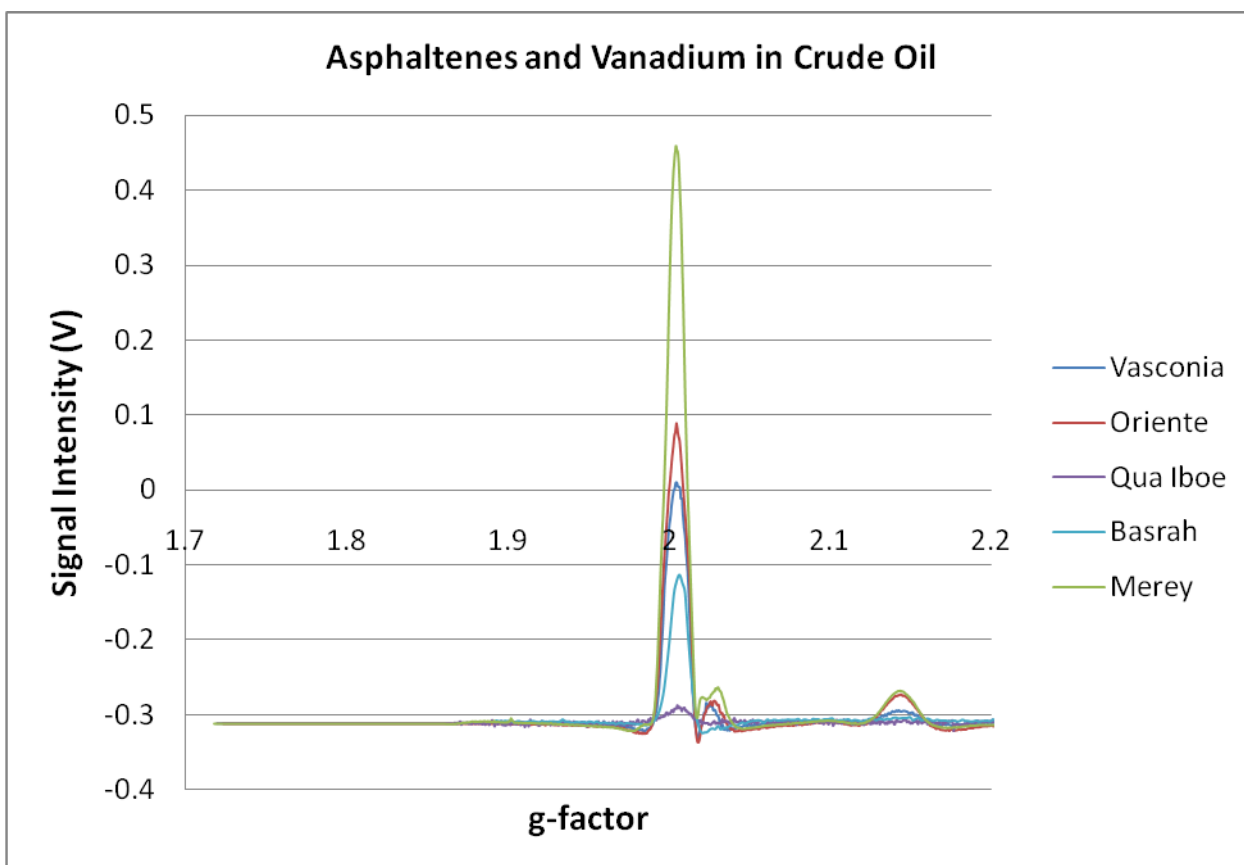


Figure 1: Micro-ESR Spectra of Crude Oil

The central peak is a combination of a persistent carbon-centered organic radical ($g = 2.003$) found in asphaltenes, and a vanadyl (VO^{2+}) peak. The additional smaller peaks are associated with vanadyl only.

For producers, the technique could be used to rapidly measure asphaltene concentration on-line. The spin density of the organic radical is a function of the maturity of the oil and will of course vary between deposits. Notwithstanding, rapid electronic measurement of asphaltenes remains a topic of great interest. Similar techniques have also been used to assess the quality of coals.

For refiners, vanadium is a contaminant that poisons the refinery catalyst. ESR has been used by refiners since 1962 to rapidly measure vanadium content in crude oil feedstocks both on-line and in laboratories.

Active Spectrum Inc.'s Micro-ESR is shown below. It is 2.25" in diameter by 2.5" high. Power input is 12-30VDC, and the data interface is USB. The device is available as either an on-line sensor or as a benchtop unit.



Micro-ESR™ Oil Condition Sensor Ø2.25"

Figure 2: Micro-ESR Sensor