

Evaluation of polycyclic aromatic hydrocarbons in heavy oil fractions

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Polycyclic aromatic hydrocarbons (PAHs) are ubiquitous contaminants and are well known for their toxic, carcinogenic, and mutagenic effects [1]. Several industrial applications use streams with PAHs as inputs or solvents, depending on the type and aromatics concentration.

The quantification of PAHs in heavy oil is difficult due to the high complexity of compounds, which encumbers characterization without prior separation steps. Several methods have been proposed for the quantification of these compounds [2-4].

In this study, three different heavy mineral oil samples (Table 1) were evaluated using two different methods: polycyclic aromatics content (IP 346) and FTIR spectrophotometry.

Table 1.
Properties of heavy oil samples.

	HOS1	HOS2	HOS3
Density at 20/4°C	0.915	0.940	1.012
Sulfur content, FRX, % m	0.57	0.75	3.70
Refractive index at 20°C	1.511	1.521	1.576
Molecular weight, g/mol	328	394	420
Pour point, °C	-18	-9	6
Flash point, °C	148	232	242
Kin. viscosity, cSt	40 °C	31.7	410.3
	100 °C	4.52	14.54

The samples were analyzed using a FTIR spectrometer (BIO-RAD, resolution of 8 cm⁻¹) with a Krs-5 cell of 32 mm and optical path of 0.2 mm. The concentration of the samples was evaluated from the area under the band between 1605 and 1585 cm⁻¹ of the infrared spectrum, which corresponds to the aromatics band (Table 2). Pure naphthalene was used as a reference for the calibration of the method.

Table 2.
Total aromatics by FTIR.

Samples	Conc. (% wt)
HOS1	27.8
HOS2	29.1
HOS3	43.7

The IP346 method was used to evaluate the polycyclic aromatics content, with results shown in Table 3. Similar to what had been observed with the FTIR method, the samples HOS1 and HOS2 showed the lowest and highest results, respectively. It may also be noted a similar ratio between the polyaromatics content and the total aromatics content for all samples.

Table 3.
Polycyclic aromatics by IP 346.

Samples	Conc. (% wt)
HOS1	6.1
HOS2	8.2
HOS3	17.8

References

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