

Supporting Information

Microcalorimetry Study of the Adsorption of Asphaltenes and Asphaltene Model Compounds at the Liquid-Solid Surface.

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¹H NMR spectra of BisAC11 and C5PeC11.

Figures S1 and S2 show the ¹H NMR spectra of the model compounds BisAC11 and C5PeC11 respectively measured on a 400 MHz apparatus and whose structure is shown in Table 3 of the main article. For both spectra, the interpretation of the peaks is in the figure caption. It is important to note that the peak located at δ (ppm) 7.25 ppm corresponds to the solvent used for the measurement, in this case, CDCl₃. The letters *m* and *t* denote multiplets and triplets respectively. Further details of the synthesis of these compounds can be found in Nordgård et al¹ and Wei et al².

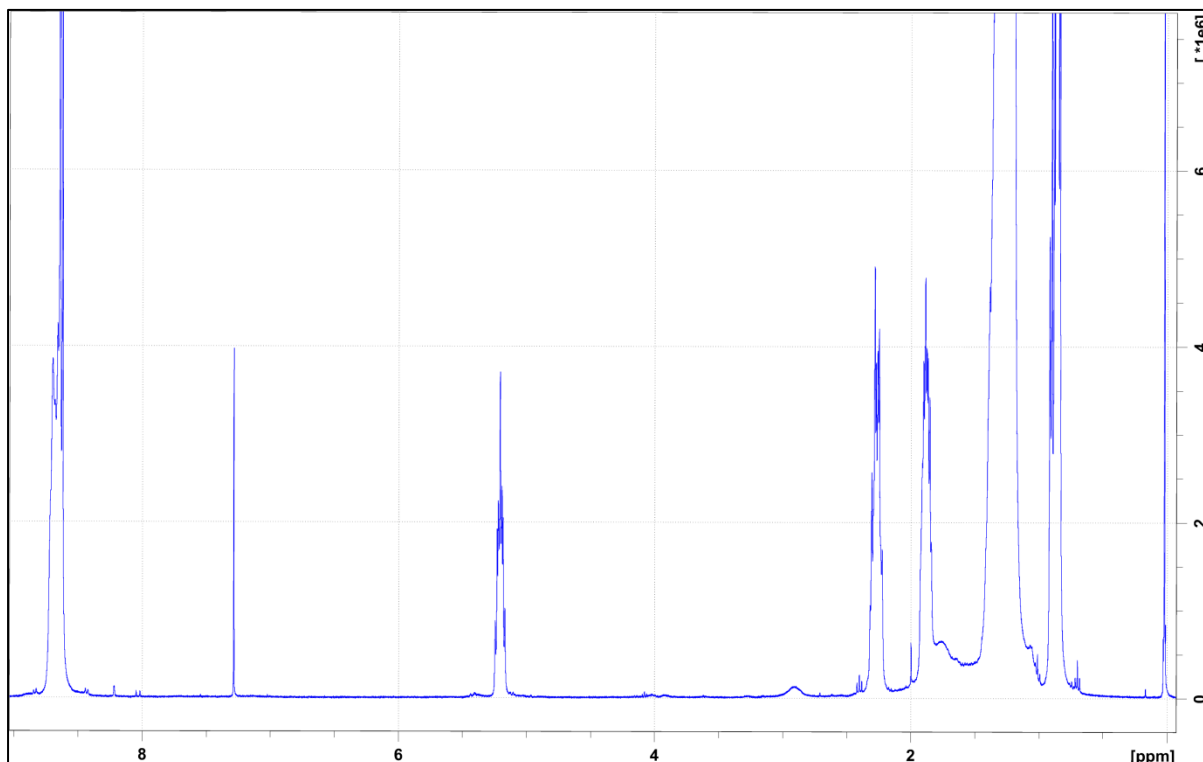


Figure S1. ¹H NMR spectrum of the compound BisAC11. The peaks are: δ 8.65 (8H, *m*, perylene), δ 5.2 (2H, *m*, 2 CHN), δ 2.25 (4H, *m*, CH₂CHN), δ 1.85 (4H, *m*, CH₂CHN), δ 1.2-1.4 (72H, *m*, 36 CH₂), δ 0.85 (12H, *t*, CH₃), δ 2.9 (small impurity).

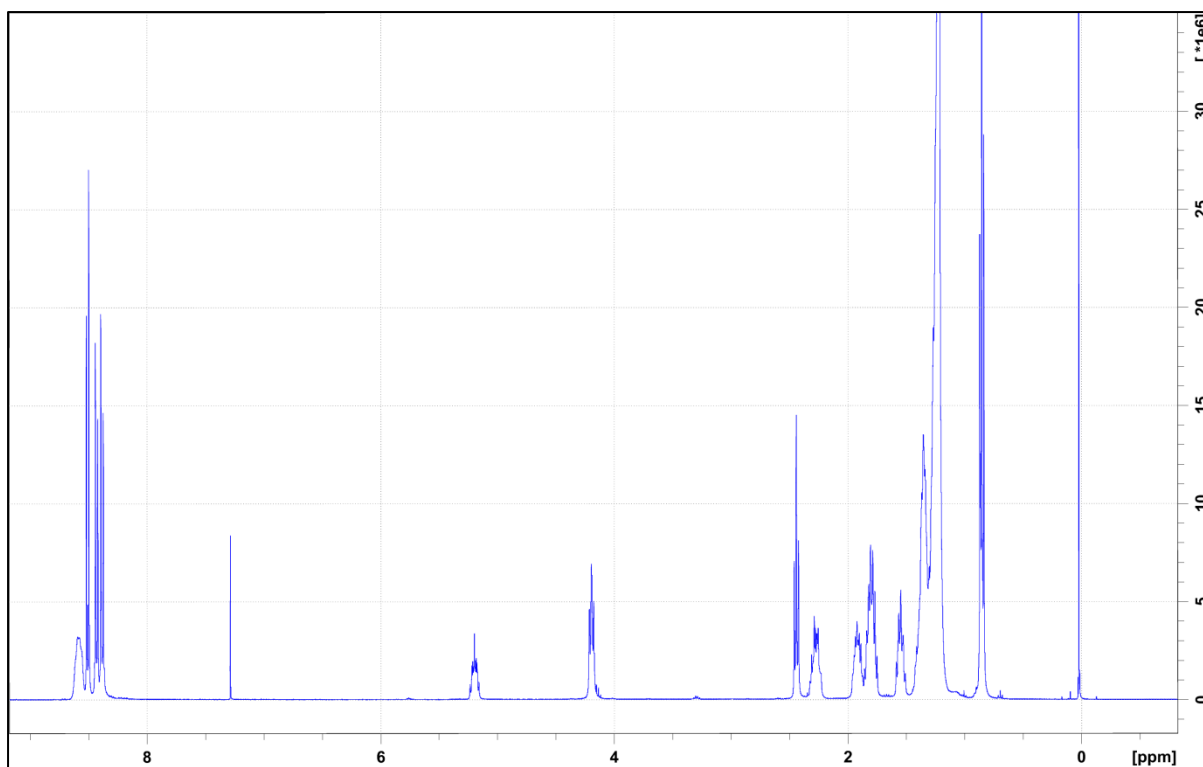


Figure S2. ^1H NMR spectrum of the compound C5PeC11. The peaks are: δ 8.65 (8H, *m*, perylene), δ 5.2 (1H, *m*, CH_2CHN), δ 4.2 (2H, *t*, NCH_2 on the acidic side), δ 2.4 (2H, *t*, HOOCCH_2), δ 2.25 (2H, *m*, CH_2CHN), δ 2.0 – 1.0 (44H, *m*, 22 CH_2), δ 0.85 (6H, *t*, CH_3).

FTIR spectra of esterified and non-esterified asphaltenes.

Figure S3 shows the FTIR spectra of esterified and non-esterified asphaltenes. Interpretation of the characteristic peaks is as follows³⁻⁶. The stretching and bending vibrations of aliphatic $-\text{CH}_2$ and $-\text{CH}_3$ groups are located at 2920, 2850, 1450 and 1375 cm^{-1} respectively; the stretching vibrations typical of aromatic rings are located at 1600 cm^{-1} ; Their in- and out-of-plane bending vibrations are seen at 869, 810 and 745 cm^{-1} . All these peaks are the same in figure S3, the only difference between the spectra is a peak located between 1720-1730 cm^{-1} which corresponds to the stretching vibrations of C=O ester bonds (or the Carboxyl-Carbonyl area as defined by Juyal et al.⁷) indicating the complete replacement of the $-\text{COOH}$ groups from the non-esterified asphaltenes. The peaks located between 2300-2400 cm^{-1} correspond to the presence of CO_2 in air.

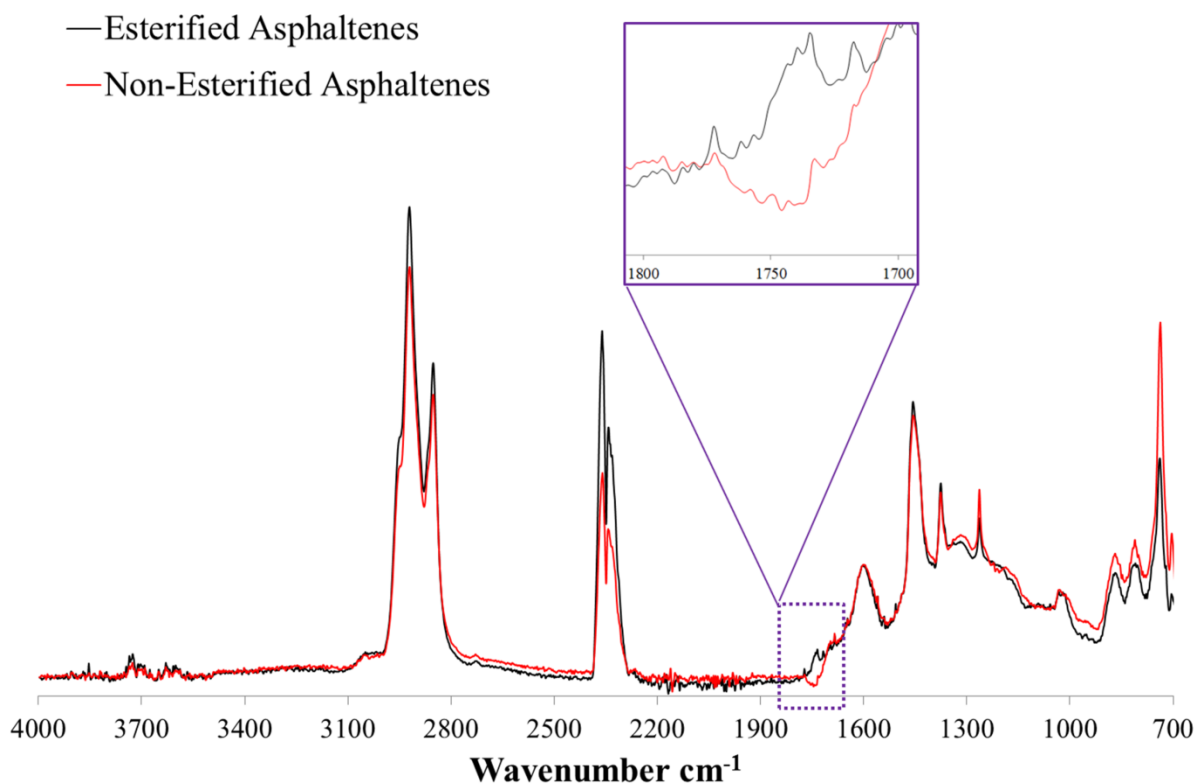


Figure S3. FTIR spectra of esterified and non-esterified asphaltenes. The inset shows a magnification of the peak between 1720-1730 cm^{-1} which represents the stretching vibrations of C=O ester bonds.

Table S1. Weight percentage (% wt) of mass desorbed after 3 consecutive washouts with toluene determined through QCM-D measurements. The asphaltene concentration before the desorption step was 1.5 g/L.

Surface	Esterified Asphaltenes (wt%)	Non-esterified Asphaltenes (wt%)
Silica	22 ± 3	16 ± 2
Stainless Steel	15 ± 1	19 ± 1

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