Supporting Information

Intermolecular Interactions of Isolated Bio-Oil Compounds and Their Effect on Bitumen Interfaces

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Figure S6. Plot showing the same spectra presented in main text Fig. 4 of undoped and doped bitumens focusing on the alkane stretching vibrations. Because the spectra are normalized to the peak near 1455 cm⁻¹ (mostly a mixture of the CH₂ scissor and CH₃ antisymmetric deformations), the elevated peaks at 2920 and 2850 cm⁻¹ (CH₂ antisymmetric and symmetric stretching, respectively) indicate that the original bitumen contains a lower ratio of CH₂ to CH₃ groups than hexadecanamide.

Figures

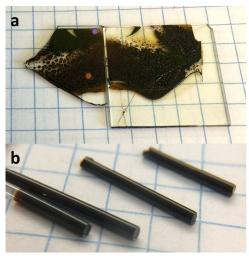


Figure S1. (a) Example of a sandwiched bitumen film after fracturing to reveal an in-plane crosssection. ATR-FTIR spectra shown in main text Figure 4b were taken where the film separated in a brittle fashion almost cleanly from the opposing glass slide (\bullet , "glass interface") and where the film separated in a plastic fashion (\bullet , "interior"). (b) Bitumen sample in a capillary tube that was fractured to reveal a vertical cross-section and the bitumen-glass interface for AFM imaging. Grid lines are 5 mm in both photographs.

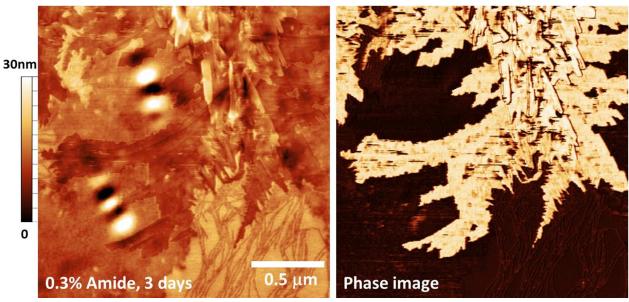


Figure S2. AFM height (left) and phase (right) image of 0.3% Amide-doped bitumen after 3 days showing partial crystal growth at the surface.

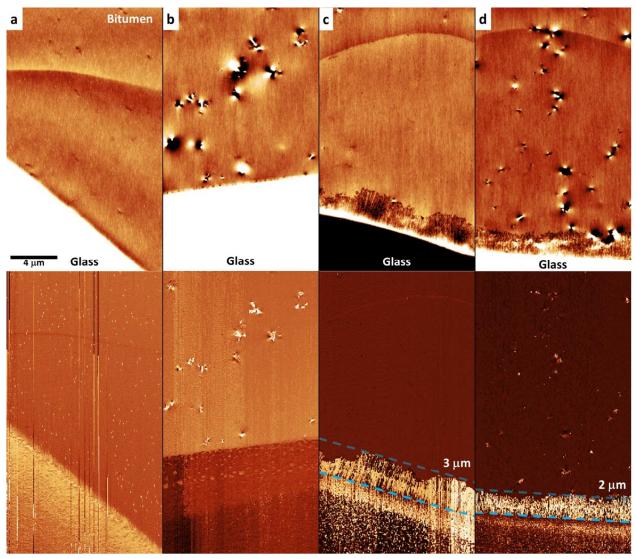


Figure S3. AFM height images (top row) and phase images (bottom row) of cross-sections of the bitumen-glass interface for bitumen samples (a) undoped or doped with (b) 1% Amide, (c) 1% Acid, or (d) 1% of each additive. The images are larger area scans of the same areas shown in main text Figures 3e-h. Topology is artificially flattened to highlight fine features of the bitumen surface. False color height scale for all height images is 10 nm.

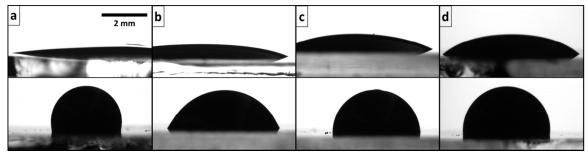


Figure S4. Bitumen droplets on glass before (top) and after (bottom) annealing in water at 80 °C for 2 h. Samples are (a) undoped bitumen and bitumen doped with (b) 1% Amide, (c) 1% Acid, or (d) both 1% Amide and 1% Acid.

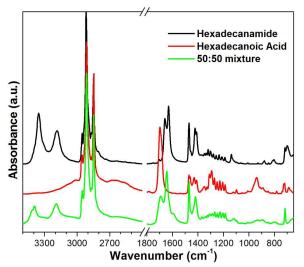


Figure S5. ATR-FTIR of pure hexadecanamide ("Amide"), pure palmitic acid ("Acid"), and the 50:50 w/w mixture of the two compounds used to dope bitumen samples.

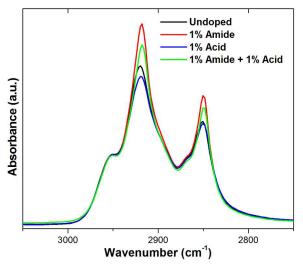


Figure S6. Plot showing the same spectra presented in main text Fig. 4 of undoped and doped bitumens focusing on the alkane stretching vibrations. Because the spectra are normalized to the peak near 1455 cm⁻¹ (mostly a mixture of the CH₂ scissor and CH₃ antisymmetric deformations), the elevated peaks at 2920 and 2850 cm⁻¹ (CH₂ antisymmetric and symmetric stretching, respectively) indicate that the original bitumen contains a lower ratio of CH₂ to CH₃ groups than hexadecanamide.