Electronic Supplementary Material (ESI) for Soft Matter.

Deciphering pressure-induced nanoarchitectonics in a monolayer of heterocoronene-based discotics at air-water and air-solid interfaces

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S1: Molecular structure and Maximal and Minimal Projection Area of the heterocoronene core

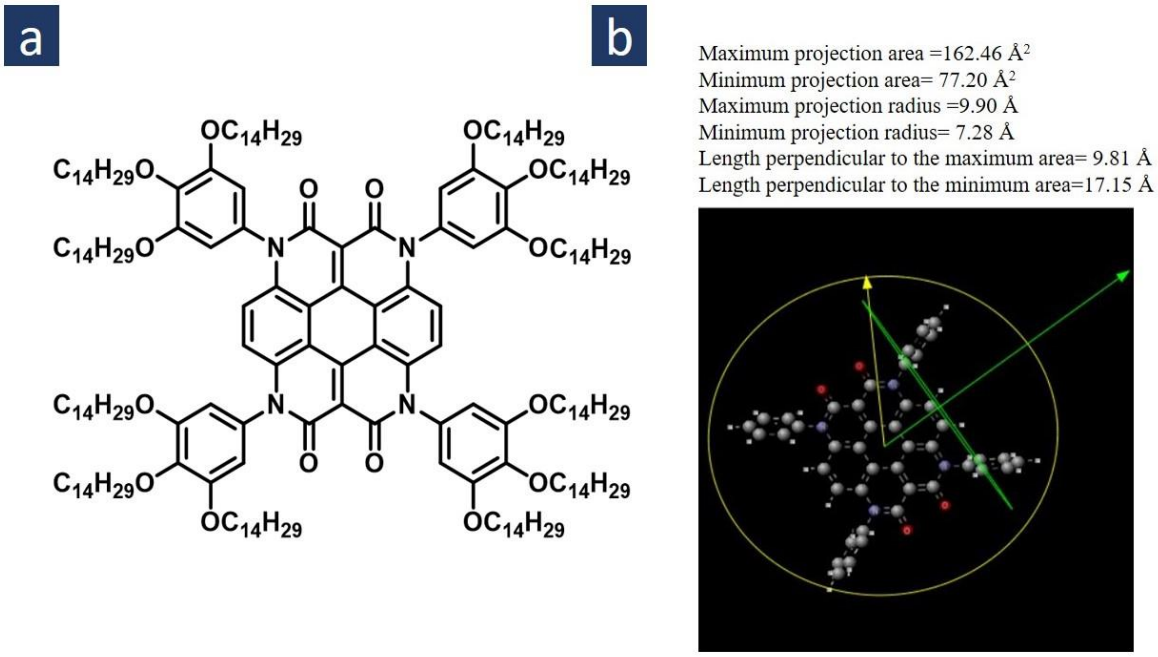

Figure S1: (a) Molecular structure of the DLC. (b) Projection area of discotic core.

S2: BAM and isotherms after changing the concentrations.

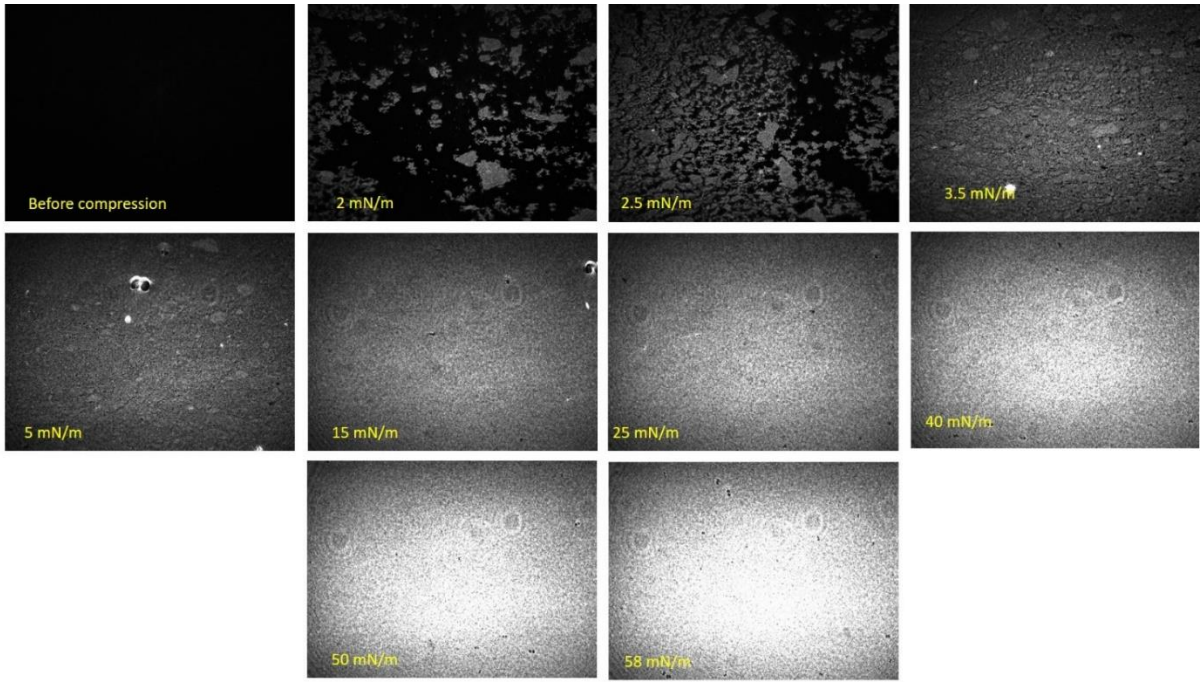

Figure S2: BAM images during isotherm at concentration 10µM.

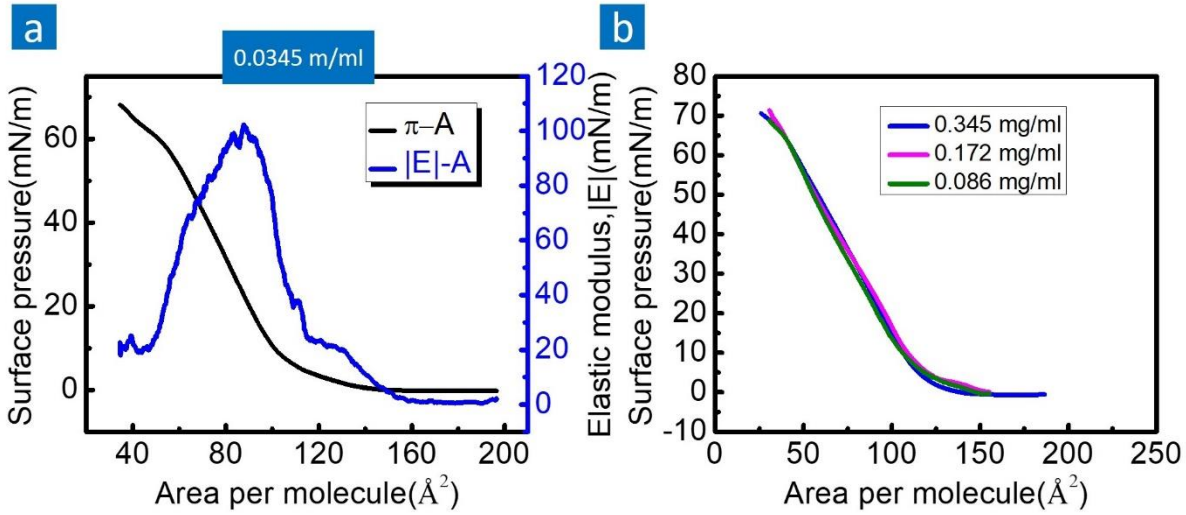

Figure S3: (a) Surface pressure vs area per molecule isotherm and correspondin elastic modulus plot at concentration 10 µM. (b) Surface pressure vs area per molecule isotherm at various concentrations.

S3: FTIR analysis

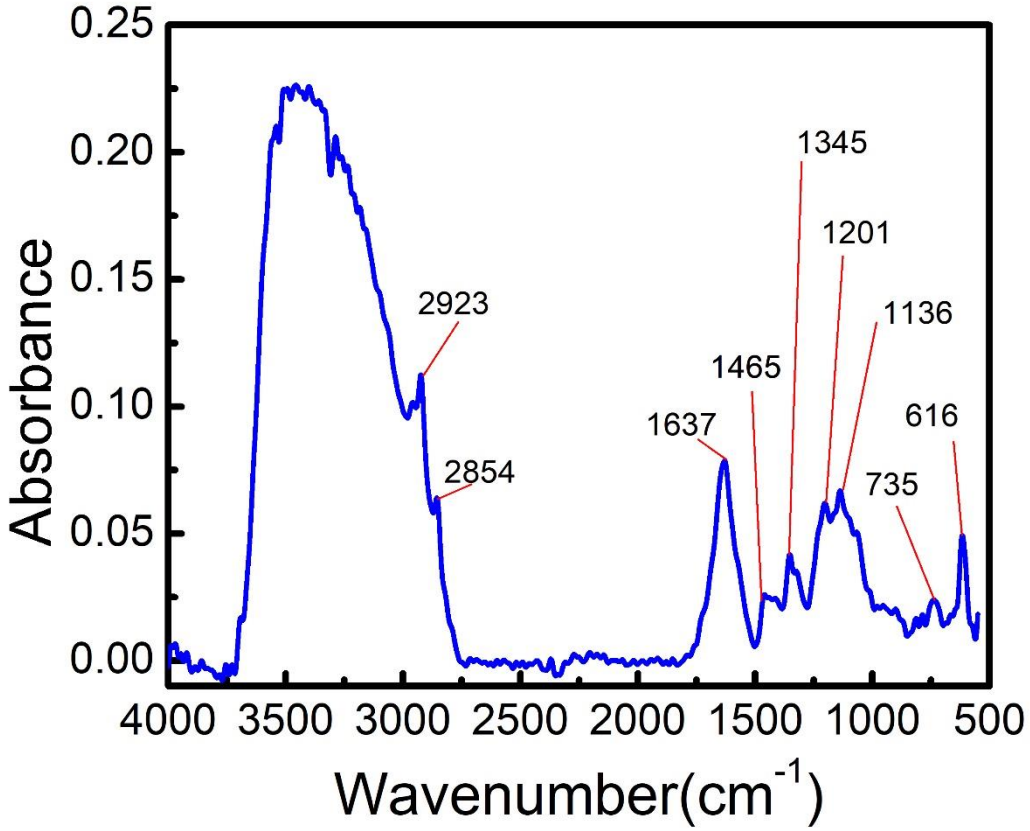

Figure S4: FTIR spectra of the transferred film at 50 mN/m in ATR mode.

Wavenumber(cm^{-1})	**Assignment**
2923	C-H stretching(aromatic)
2854	C-H stretching(aliphatic)
1637	C=O
1465	C-H bending(-CH_2-)
1345	C-N stretching(aromatic)
735	C-H bending

S4: Brewster Angle Microscopy during iso-cycle measurements

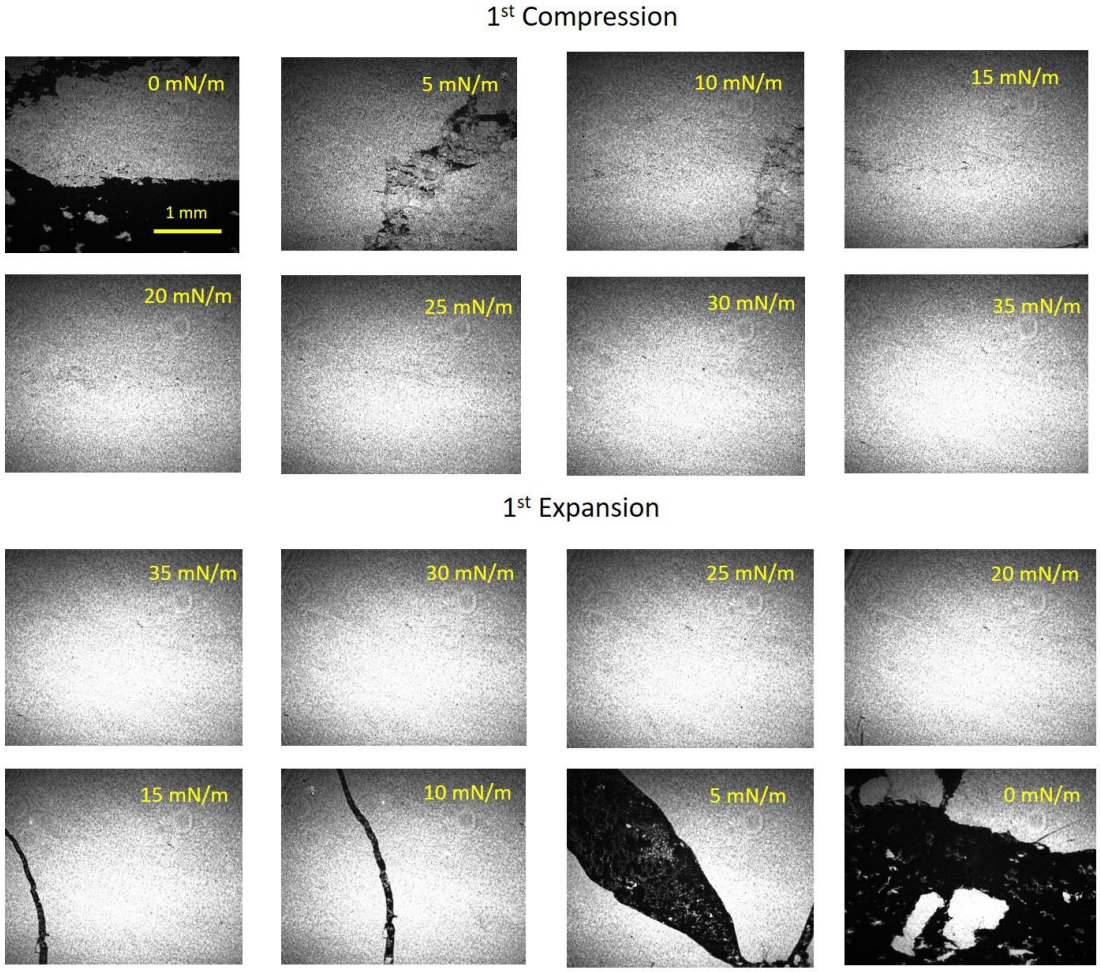

Figure S5: BAM image during iso-cycle up to 35 mN/m. First compression and expansion.

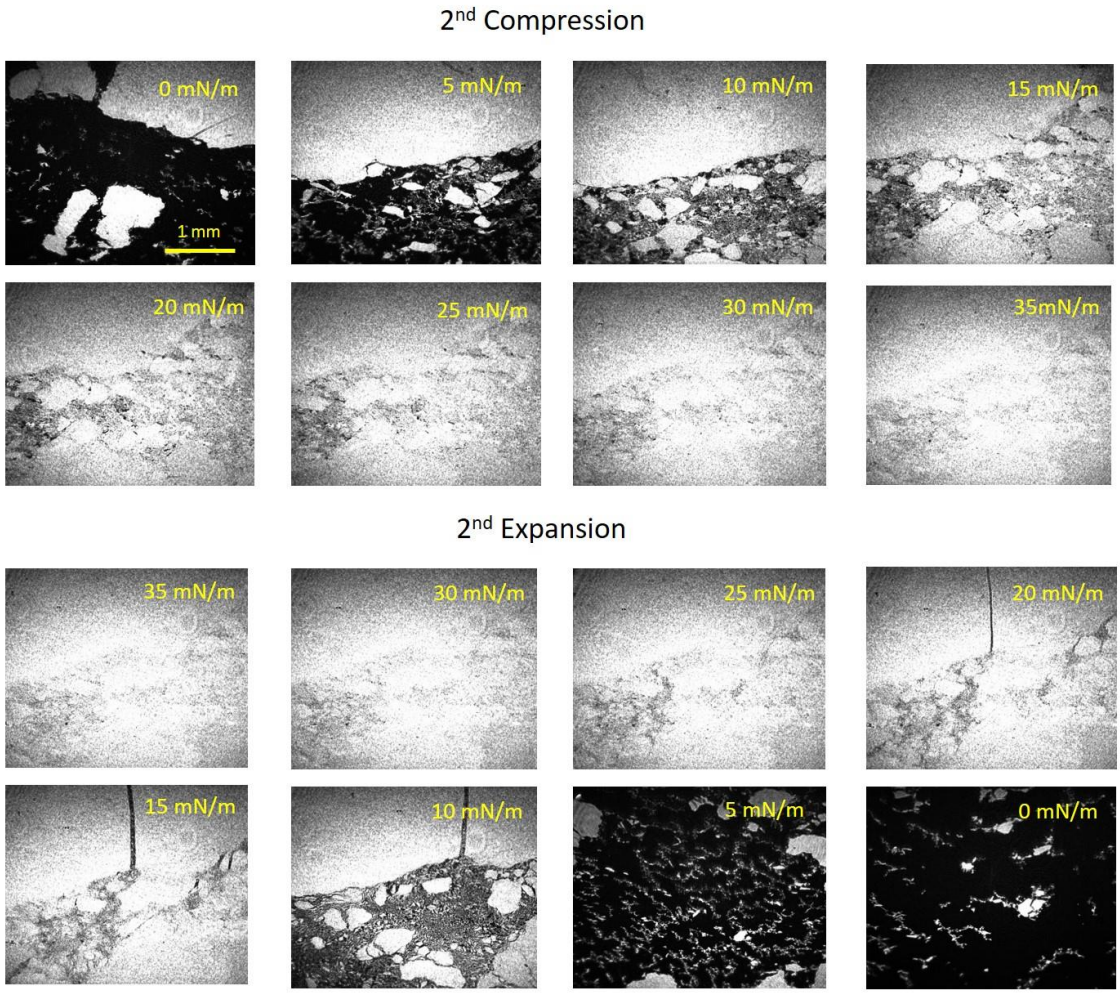

Figure S6: BAM image during iso-cycle up to 35 mN/m. Second compression and expansion.

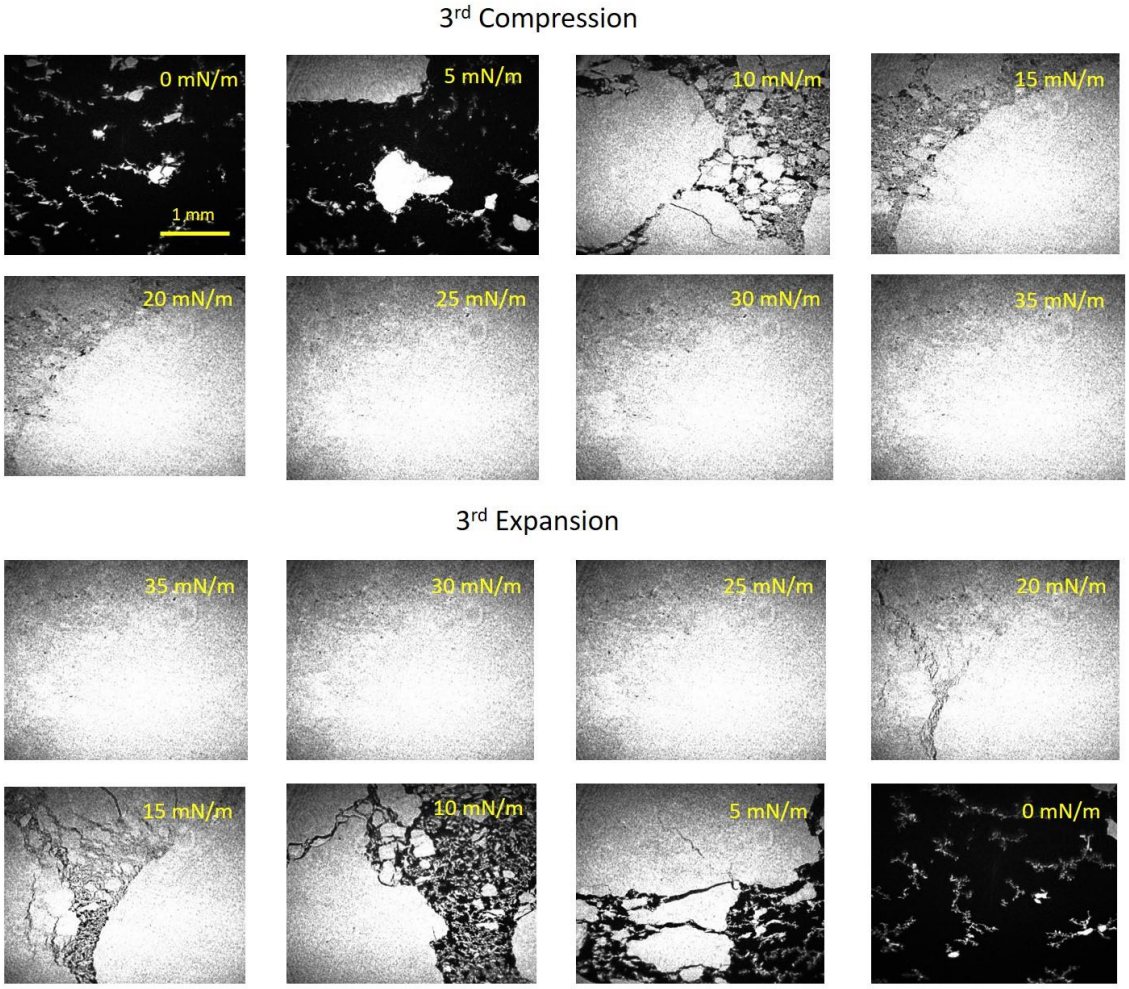

Figure S7: BAM image during iso-cycle up to 35 mN/m. Third compression and expansion.

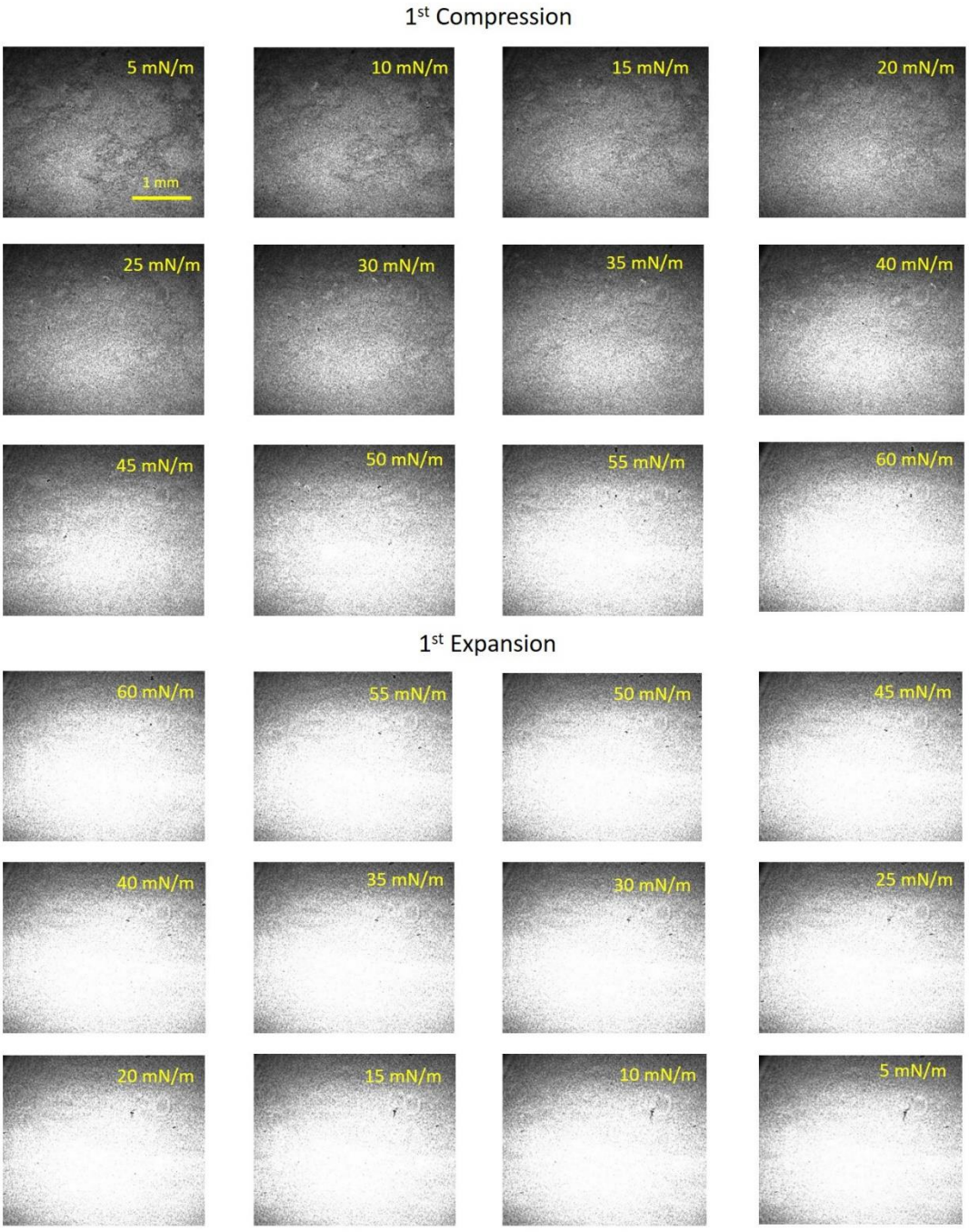

Figure S8: BAM image during iso-cycle up to 60 mN/m. First compression and expansion.

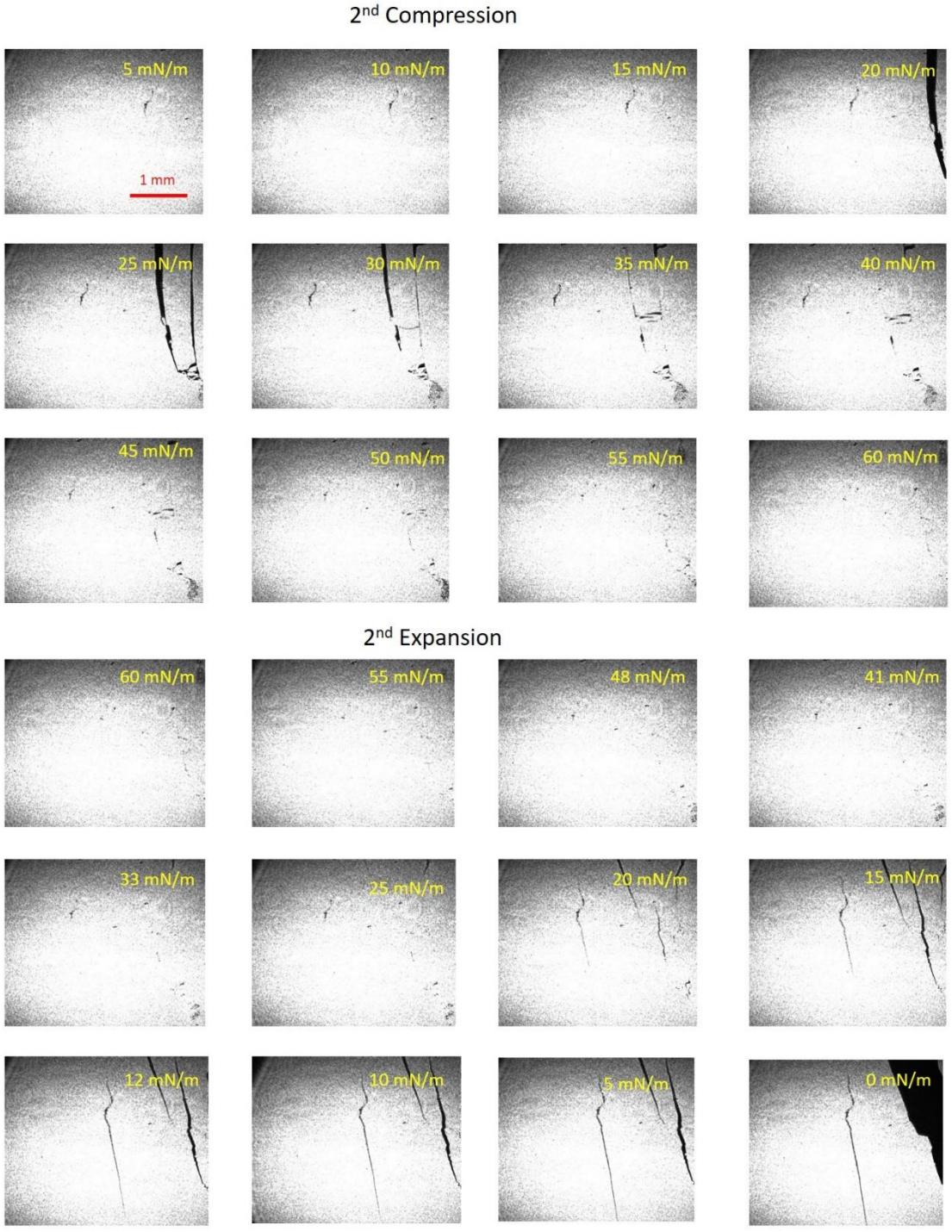

Figure S9: BAM image during iso-cycle up to 60 mN/m. Second compression and expansion.

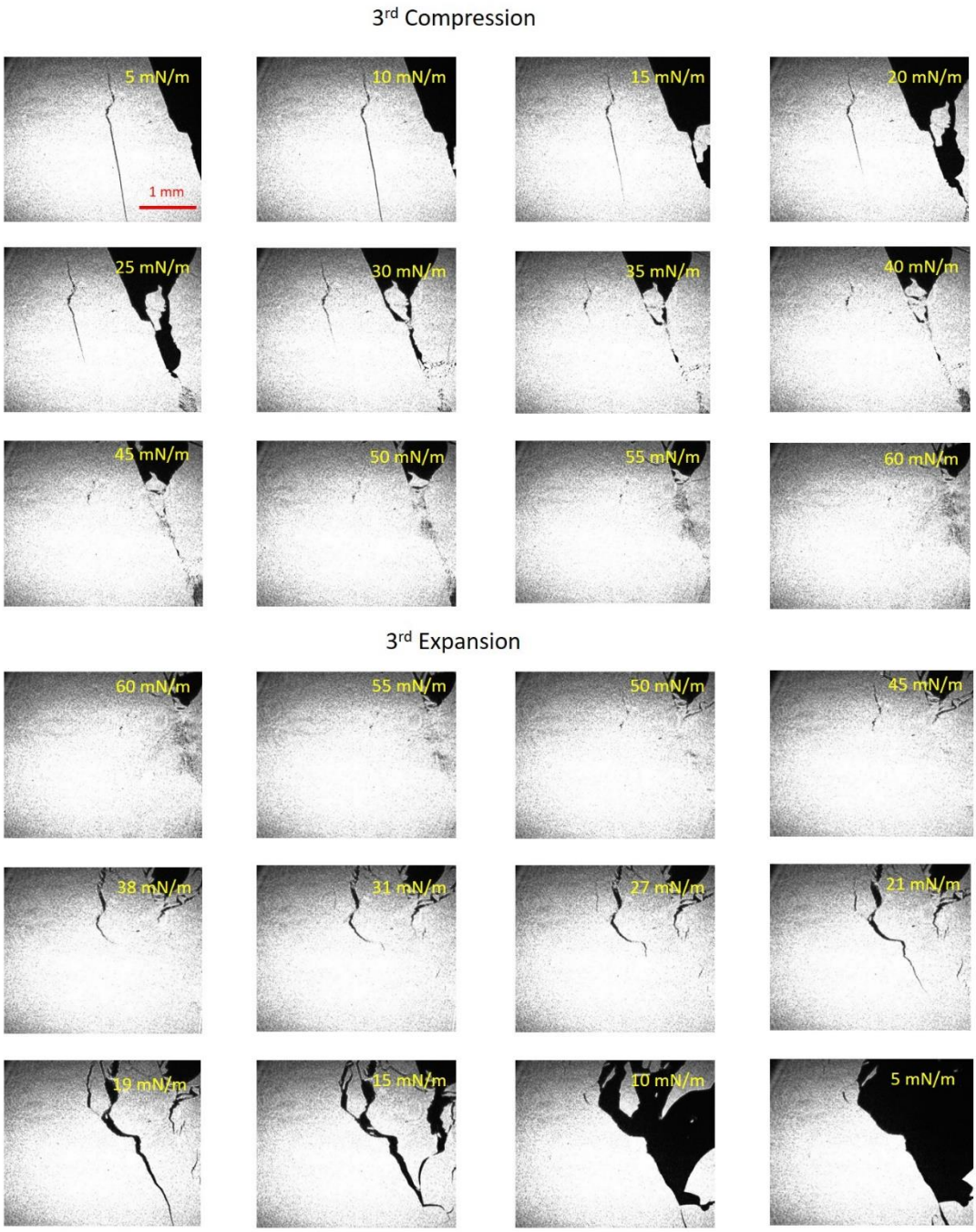

Figure S10: BAM image during iso-cycle up to 60 mN/m. Third compression and expansion.

S5. Spontaneous spreading from chloroform solution at different concentrations.

The equilibrium spreading pressure (π_e) is surface-pressure spontaneously generated when an excess of a surfactant molecule or its solution is placed at the air/aqeuous interface. For the heterocoronene molecules studied here, $\pi_e$was observed to be below 0.5 mN/m even when sufficient amount of molecular crystals were put on the air/water interface. When a chloroform solution of the molecule at a concentration of 0.3454 mg/ml was spread, the surface-pressure saturated at \$5.0\pm 0.1\$ mN/m. Just after spreading the solution of lower concentration the molecules spreads and makes islands(at this concentration all the experiments have been performed) which have been already observed in BAM images. Interestingly, π_e reduced to 2 mN/m when the concentration of solution was increased to 5.5 mg/ml. For high concentration(5.5 mg/ml) spread at the air-water interface, a visual inspection revealed lack of spreading tendency indicating agglomeration or clustering of molecules. In order to know the morphology, we transferred the LB films at high concentration. Figure S8c shows the of molecular agglomeration during ESP(at higher concentration 5.5 mg/ml) we transfer the molecules on to solid substrate by LB technique and scan it using AFM. The AFM topography also reveals that during molecules spread at high concentration form micrometer sized globules or lenses which can be observed in Figure S8c.

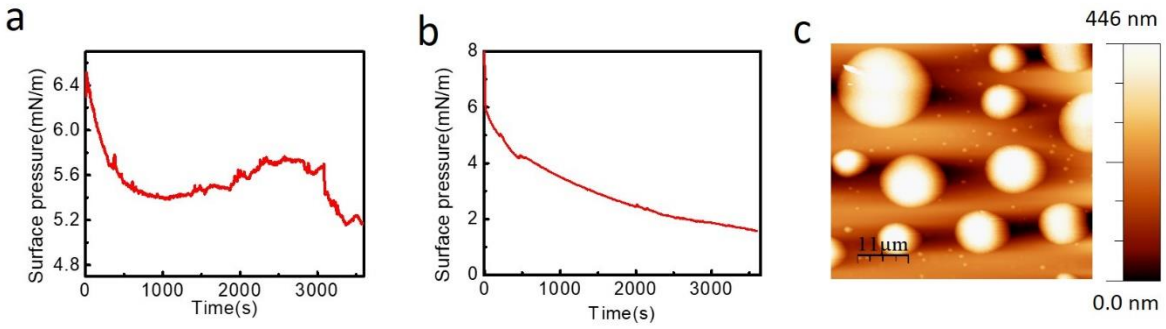

Figure S11: (a) Equilibrium spreading pressure(ESP) plot at concentration =0.3454 mg/ml (b) ESP plot at concentration = 5.5 mg/ml (c) AFM topography of the LB film of the molecules spread during ESP at concentration 5.5 mg/ml.

S6. Atomic Force Microscopy of Langmuir-Blodgett and Langmuir-Schaefer films

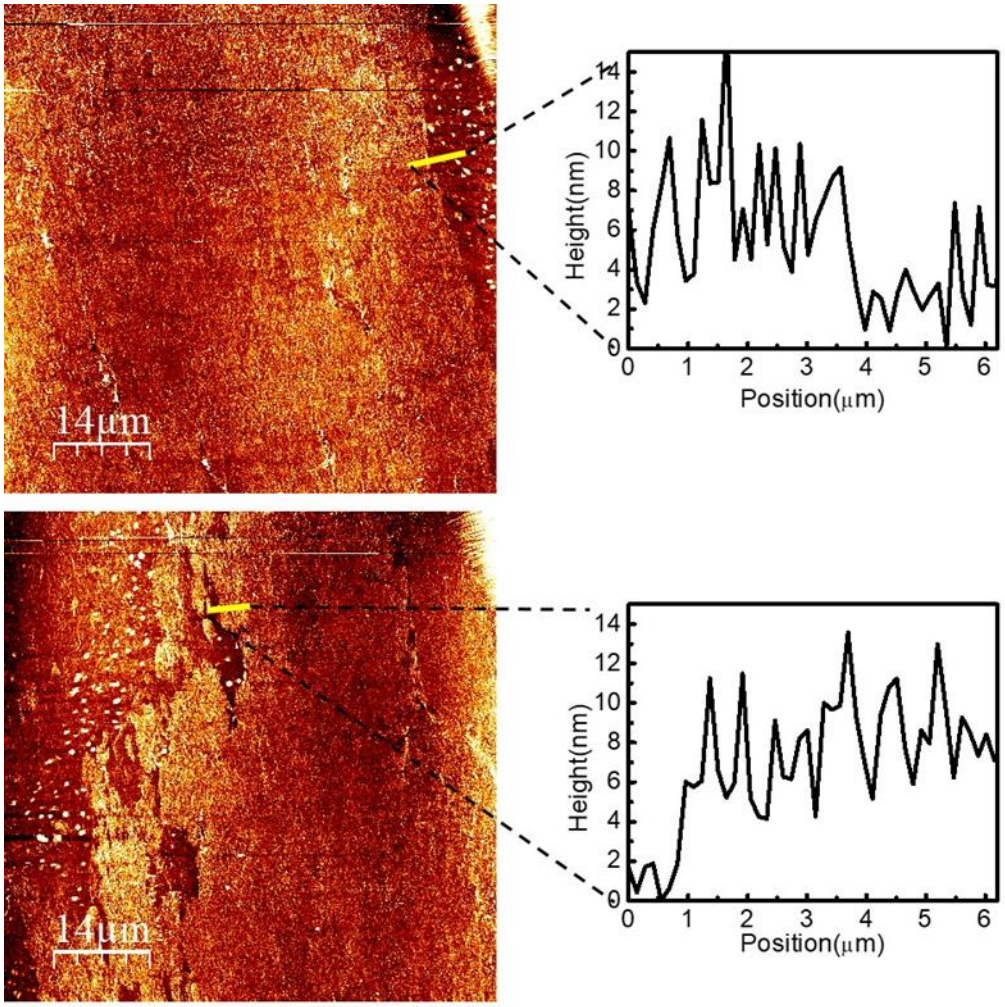

Figure S12: Large area(70 µm × 70 µm) AFM image of LB film transformed at 50 mN/m and its line profile shows height of the film from the substrate.

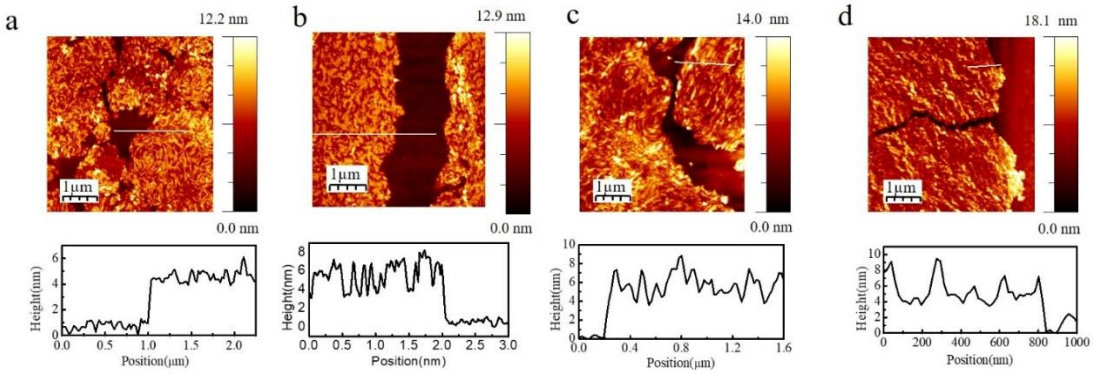

Figure S13: LB film thickness with reference to glass substrate for the film transferred at (a) 10 mN/m, (b) 30 mN/m, (c) 40 mN/m and (d) 50 mN/m

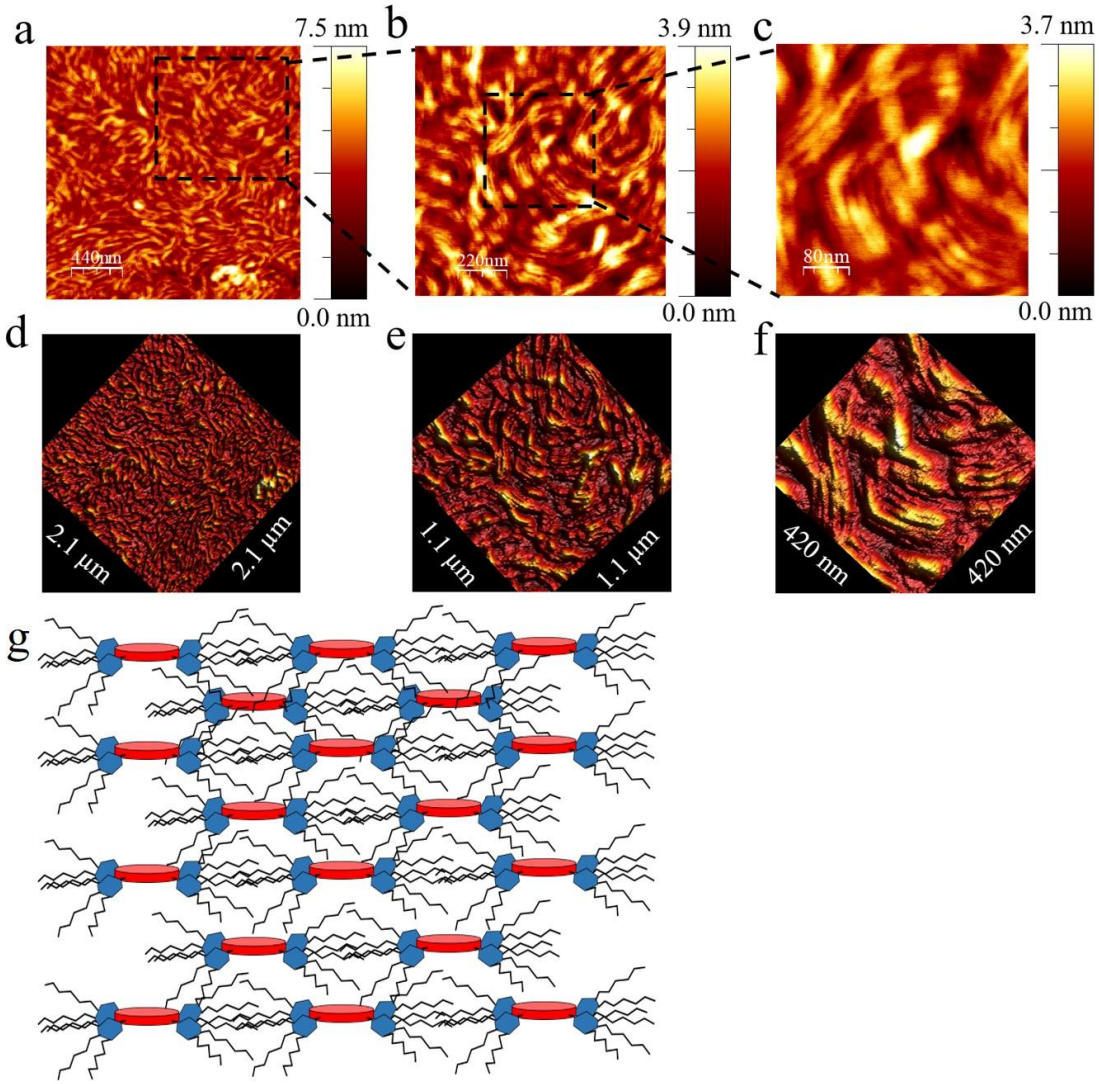

Figure S14: Visualization of nanowire like morphology in the LB films transferred at 10 mN/m. AFM images obtained over area (a) $2.1 \times 2.1\ \mu m^2$, (b) $1.1 \times 1.1\ \mu m^2$, (c) $420 \times 420\ nm^2$. (g) Schematic of J-aggregate.

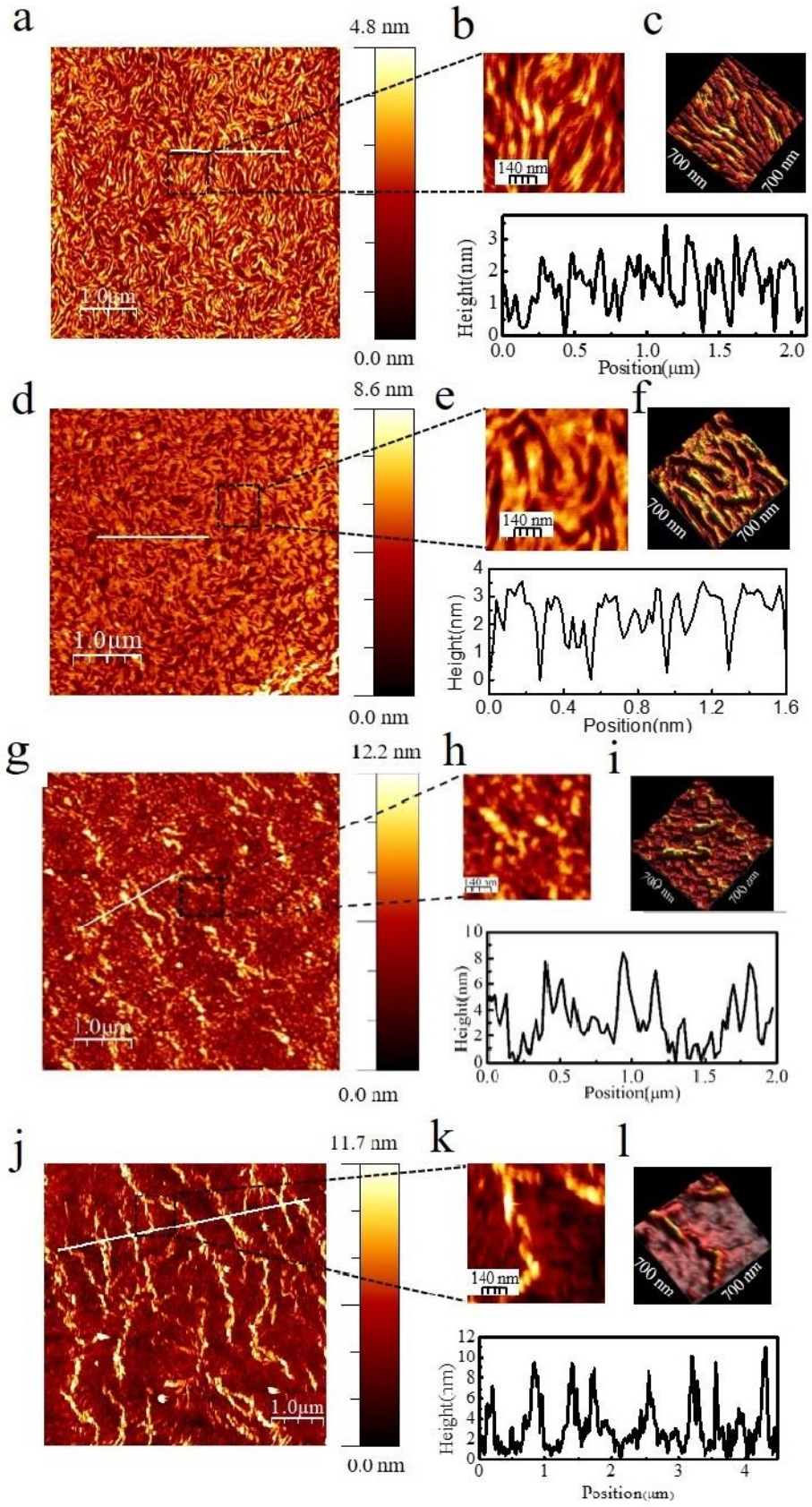

Figure S15: AFM topography images of LB film transferred at (a) 10 mN/m, 5 μm × 5 μm, (b) and (c) higher magnification 2D and 3D images of the area marked by dashed line in (a). Similarly (d) 30 mN/m, (g) 40 mN/m, (j) 50 mN/m and their corresponding line profile and higher magnification 2D and 3D images of area marked by dashed line.

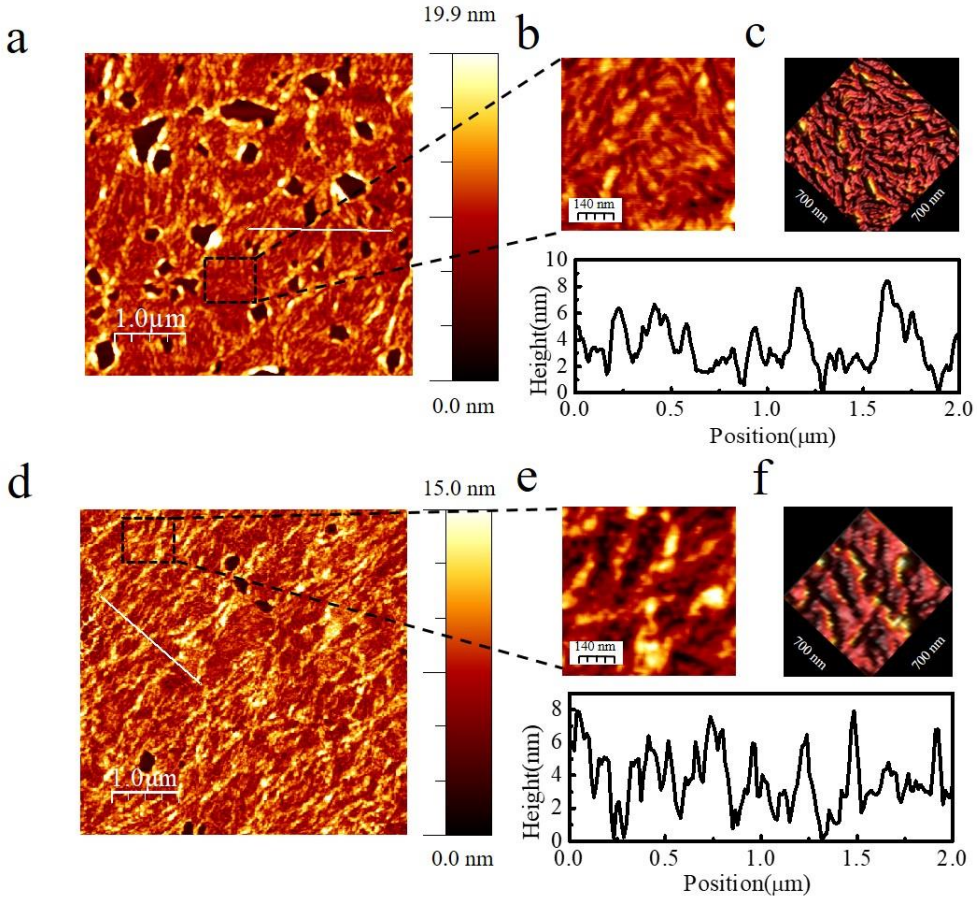

Figure S16: AFM topography images of Langmuir-Shaefer film transferred at (a) 35 mN/m, 5 μm × 5 μm scan area, (b) and (c) Higher magnification 2D and 3D images of the area marked by dashed line in (a). Similarly (d) 50 mN/m and its corresponding line profile and higher magnification 2D and 3D images of area marked by dashed line