Supplementary Data

Effect of Model Tear Film Lipid Layer on Water Evaporation

Xiaojie Xu,[1] Guangle Li,[1] Yi Y. Zuo[1,2]*

1. Department of Mechanical Engineering, University of Hawaii at Manoa, Honolulu, Hawaii 96822, United States

2. Department of Pediatrics, John A. Burns School of Medicine, University of Hawaii, Honolulu, Hawaii, 96826, United States

Corresponding Author

* 2540 Dole St, Holmes Hall 302, Honolulu, Hawaii, 96822, United States

Tel: 808-956-9650; Fax: 808-956-2373; Email: yzuo@hawaii.edu

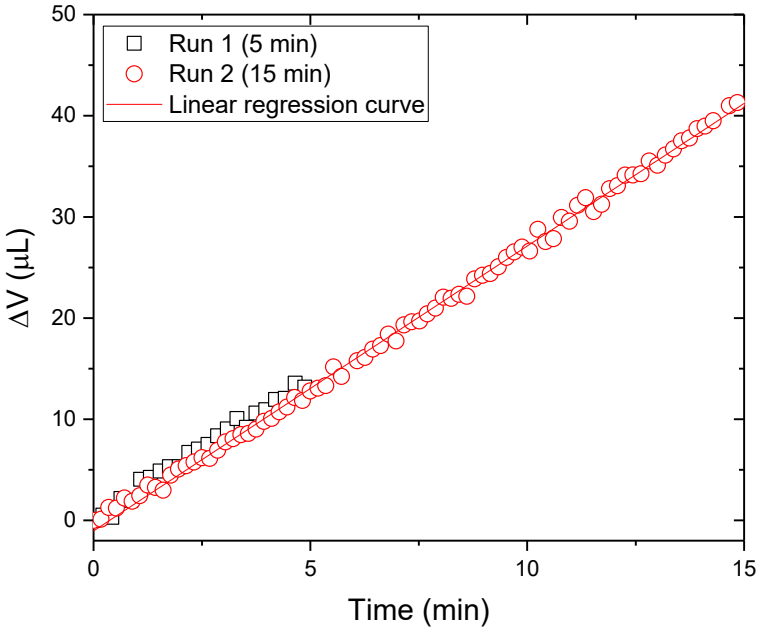


Figure S1. Volumetric rate of water evaporation studied over a time period of 5 min and 15 min at 34 °C.

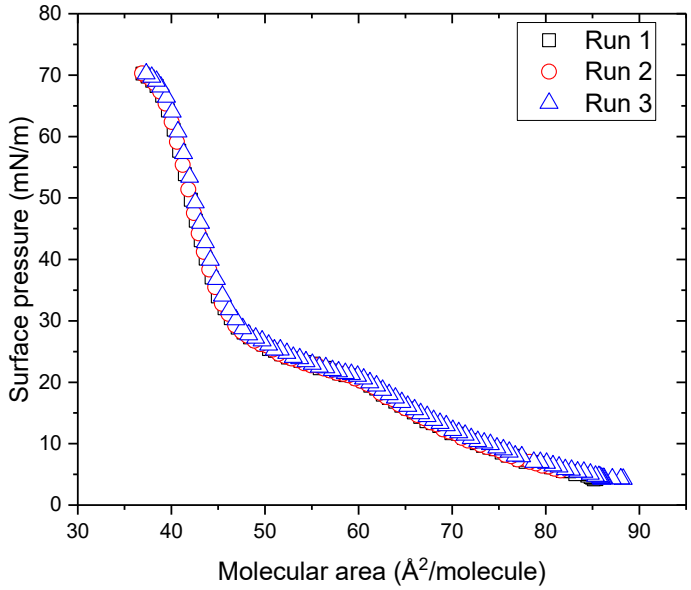


Figure S2. Reproducibility of the DPPC isotherm at 34 °C.

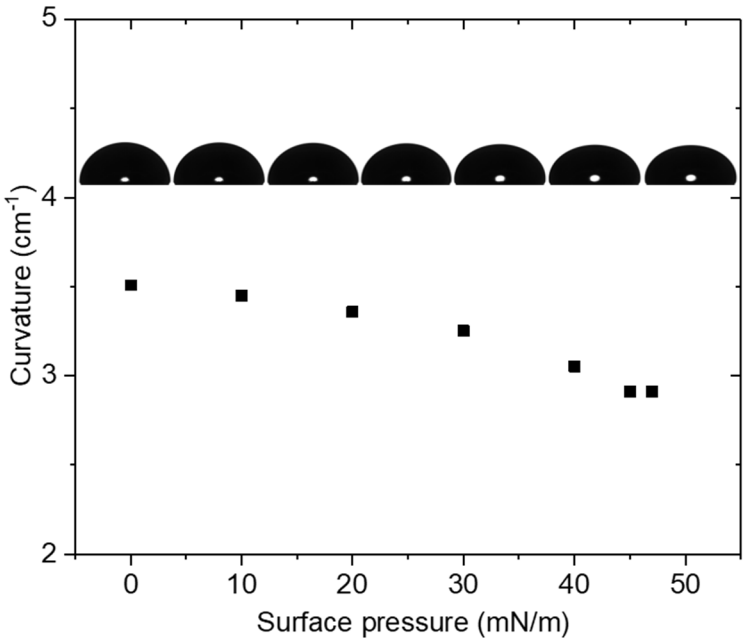


Figure S3. Curvature of the constrained sessile drop, with a constant surface area of 0.35 cm^2, covered with the model TFLL at increasing surface pressures. Insets show images of the droplet at various surface pressures.

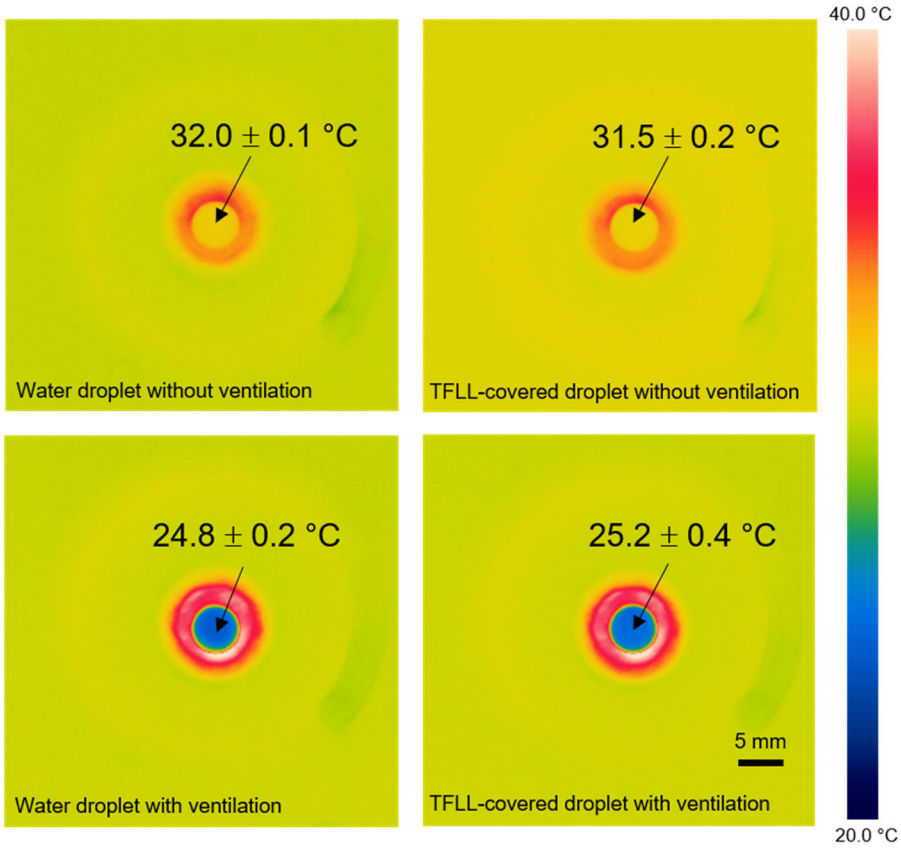


Figure S4. Surface temperatures of the droplet, either pure water or the TFLL-covered droplet, with/without ventilation of 1 m/s airflow, under controlled environmental temperature of 34 ºC. Temperature of the droplet surface was measured from the top using a high-resolution long-wave infrared (LWIR) camera (FLIR, SC600, Wilsonville, OR).

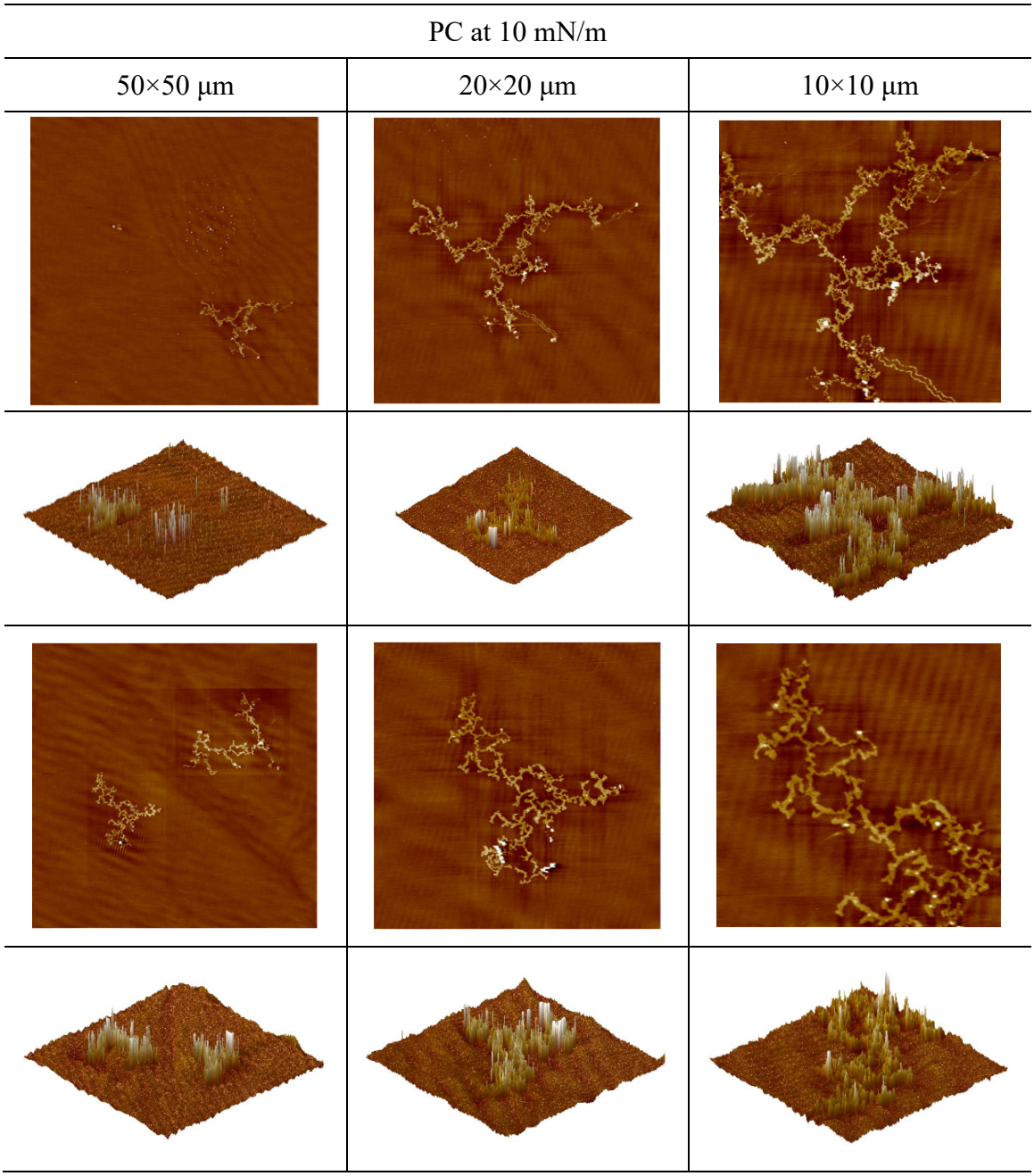


Figure S5. Lateral structure and molecular organization of the PC film at 34 °C with the surface pressure of 10 mN/m. The AFM images were acquired at three different scanning sizes, i.e., 50×50, 20×20, and 10×10 μm, and have a constant z range of 5 nm. 3D images are provided beneath lateral structure images to give a contrast perspective of the height difference.

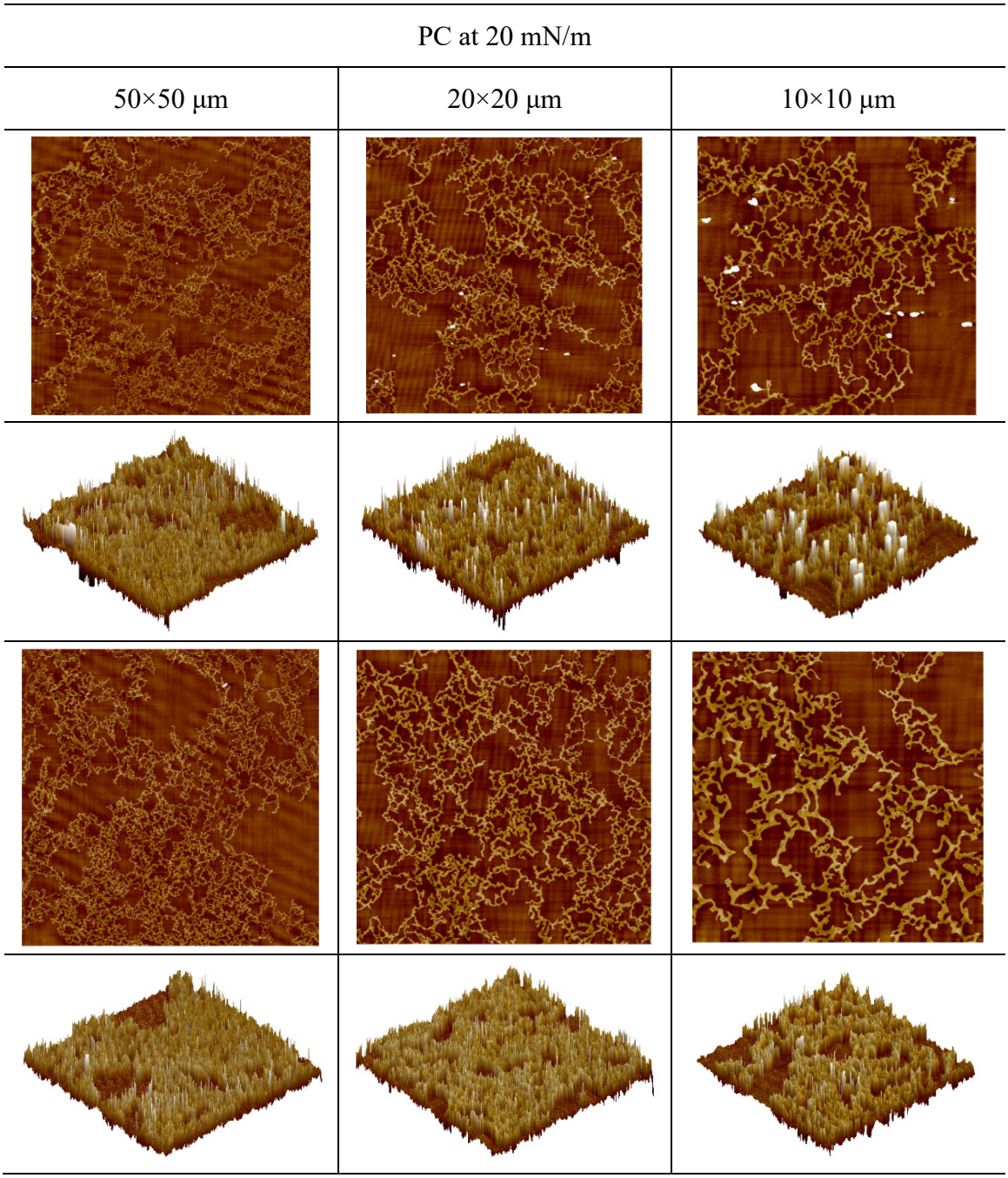


Figure S6. Lateral structure and molecular organization of the PC film at 34 °C with the surface pressure of 20 mN/m. The AFM images were acquired at three different scanning sizes, i.e., 50×50, 20×20, and 10×10 μm, and have a constant z range of 5 nm. 3D images are provided beneath lateral structure images to give a contrast perspective of the height difference.

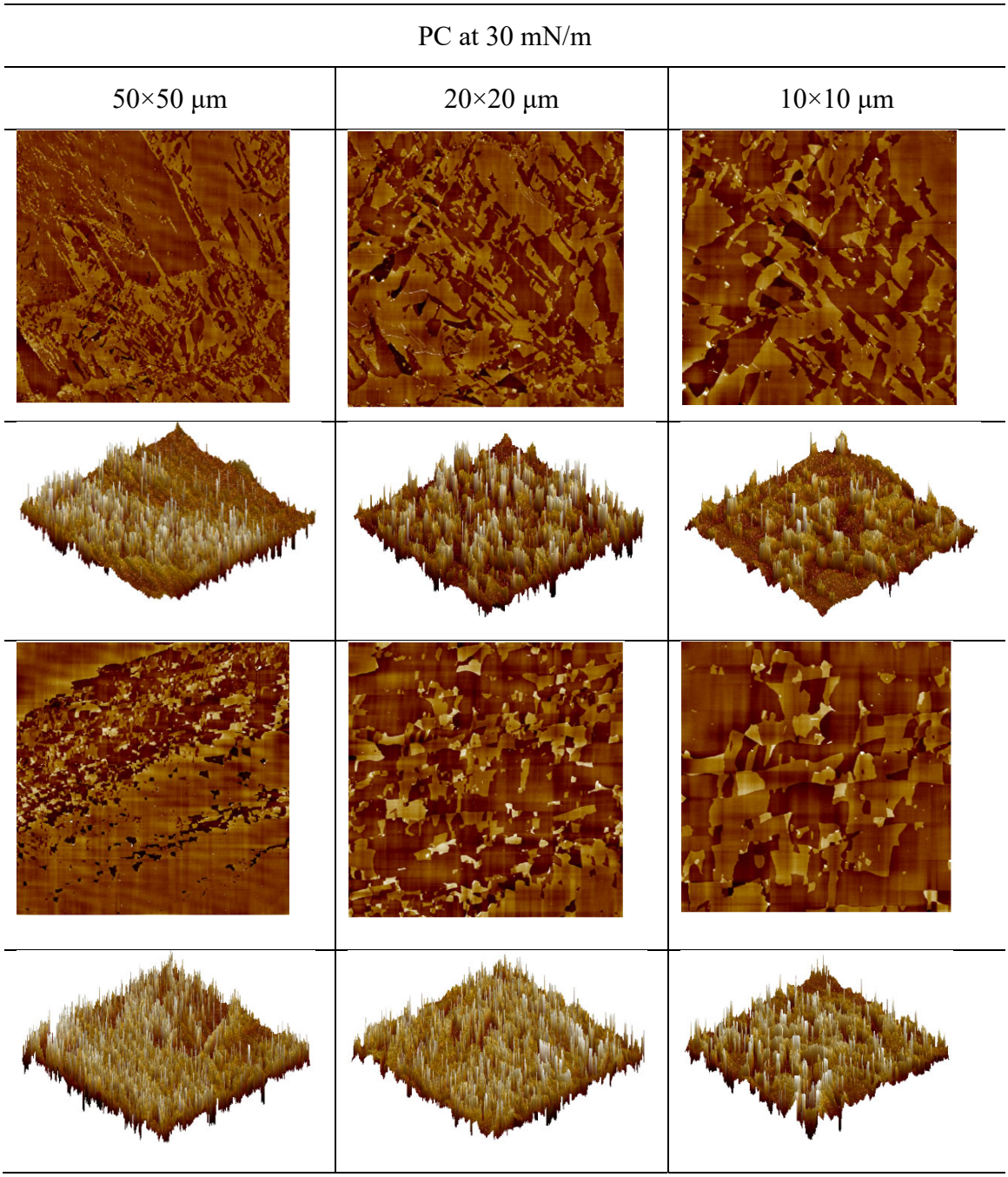


Figure S7. Lateral structure and molecular organization of the PC film at 34 °C with the surface pressure of 30 mN/m. The AFM images were acquired at three different scanning sizes, i.e., 50×50, 20×20, and 10×10 μm, and have a constant z range of 5 nm. 3D images are provided beneath lateral structure images to give a contrast perspective of the height difference.

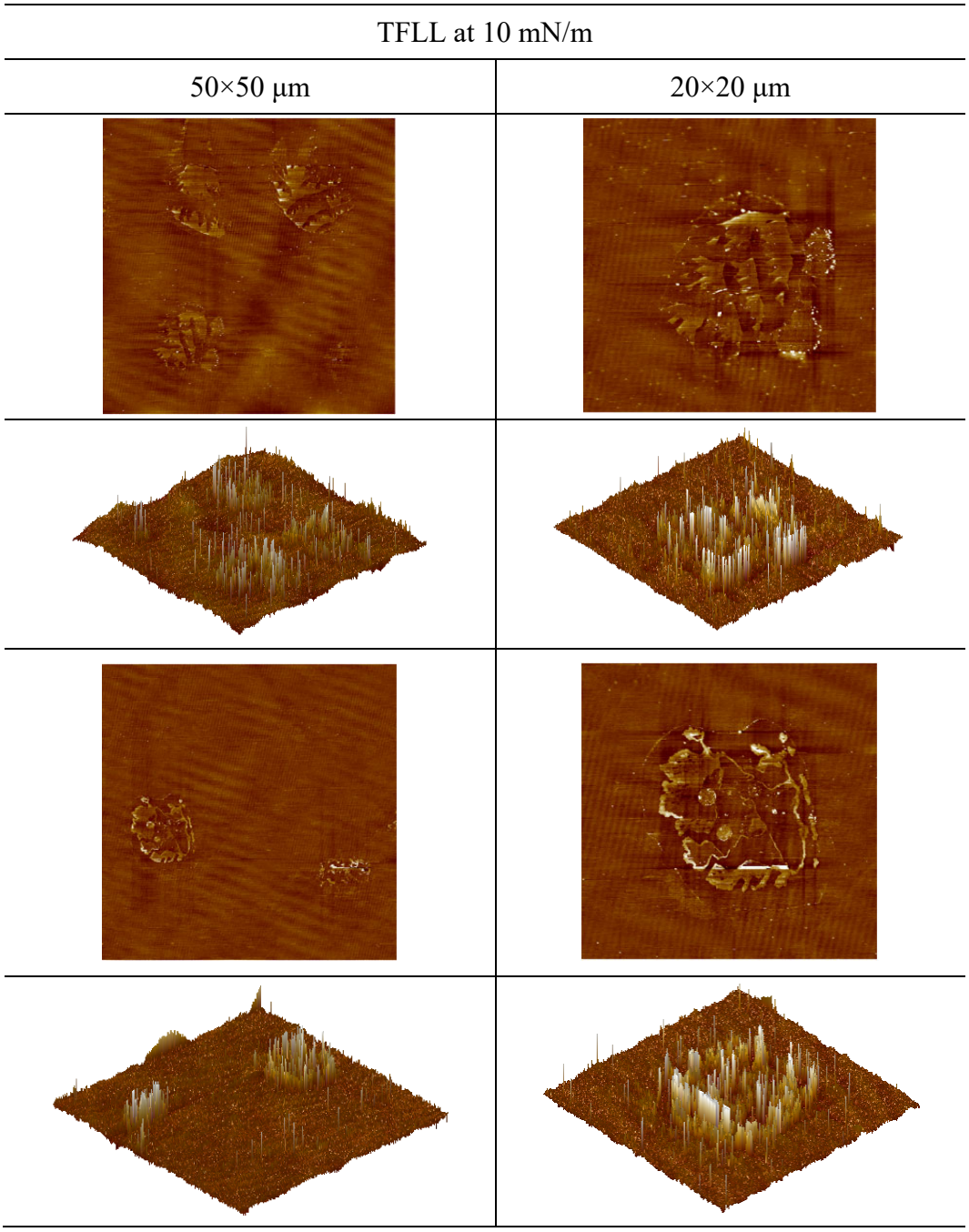


Figure S8. Lateral structure and molecular organization of the TFLL film at 34 °C with the surface pressure of 10 mN/m. The AFM images were acquired at three different scanning sizes, i.e., 50×50, and 20×20 µm, and have a constant z range of 5 nm. 3D images are provided beneath lateral structure images to give a contrast perspective of the height difference.

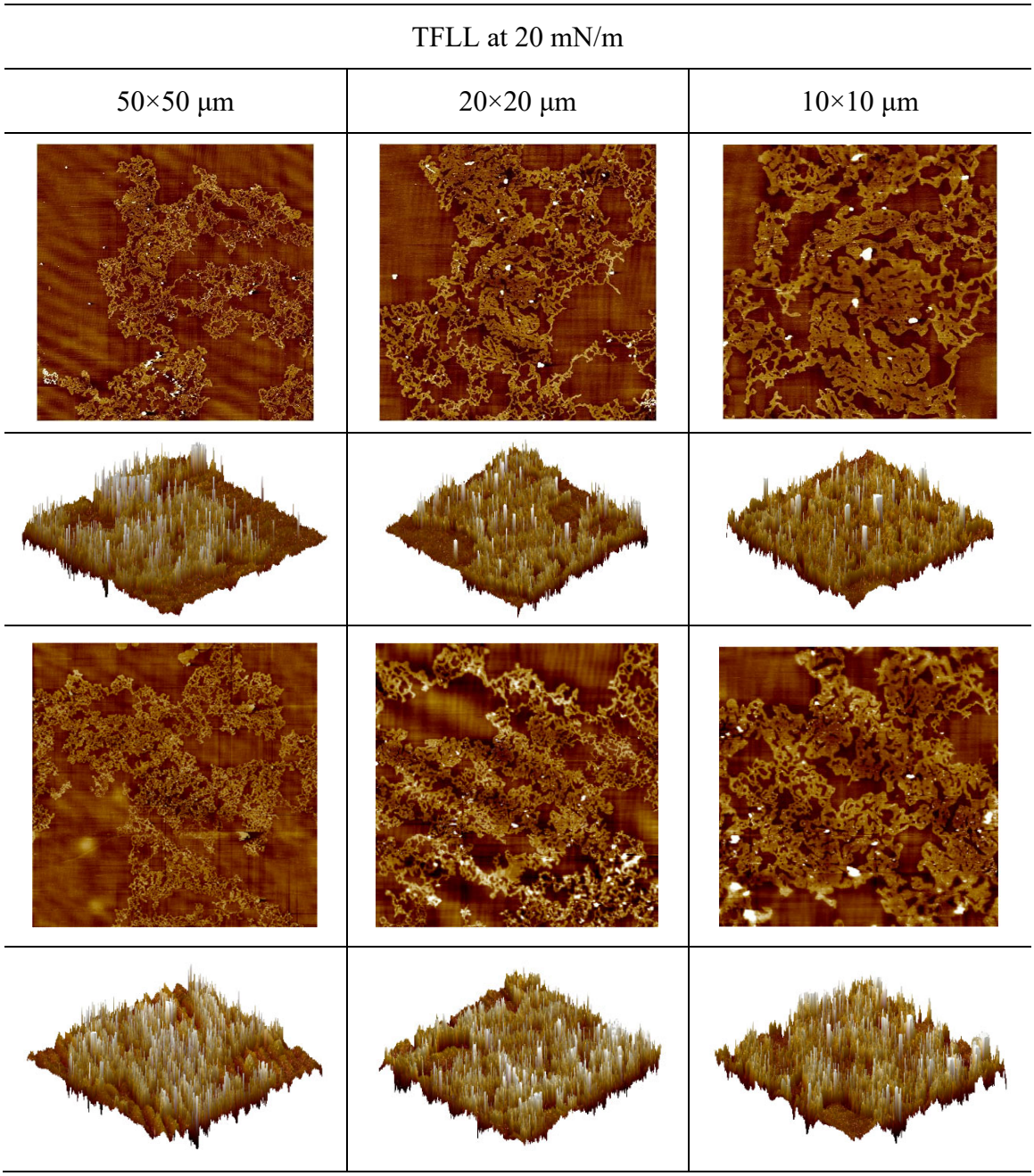


Figure S9. Lateral structure and molecular organization of the TFLL film at 34 °C with the surface pressure of 20 mN/m. The AFM images were acquired at three different scanning sizes, i.e., 50×50, 20×20, and 10×10 μm, and have a constant z range of 5 nm. 3D images are provided beneath lateral structure images to give a contrast perspective of the height difference.

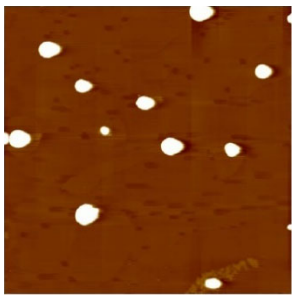
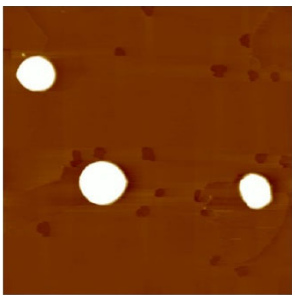
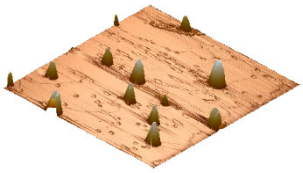
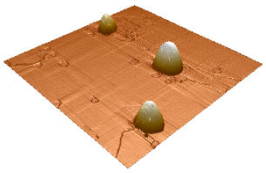
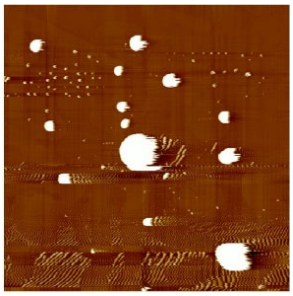
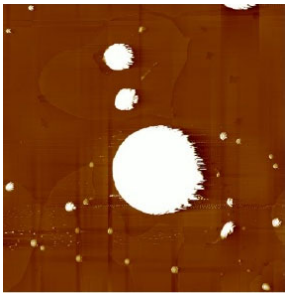
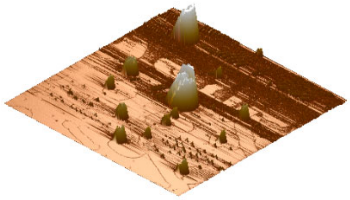
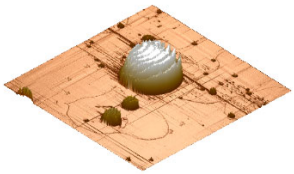
TFLL at 40 mN/m	
50×50 μm	20×20 μm
	
	
	
	

Figure S10. Lateral structure and molecular organization of the TFLL film at 34 °C with the surface pressure of 40 mN/m. The AFM images were acquired at three different scanning sizes, i.e., 50×50, and 20×20 μm, and have a constant z range of 100 nm. 3D images are provided beneath lateral structure images to give a contrast perspective of the height difference.

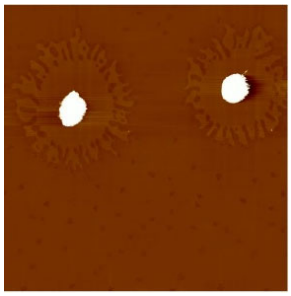
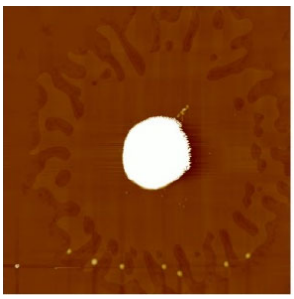
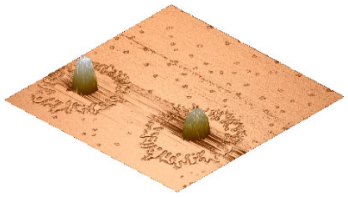
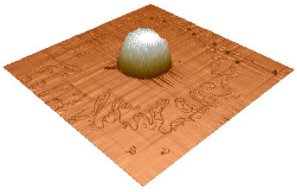
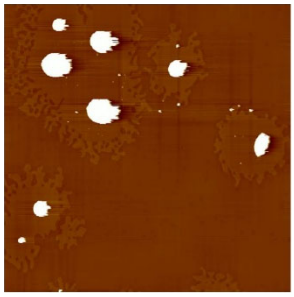
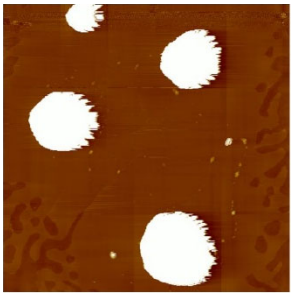
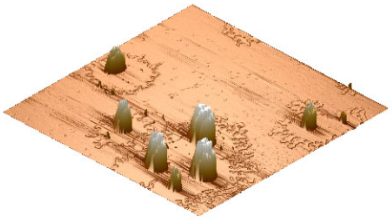
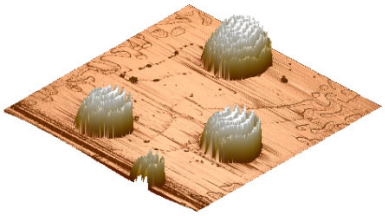
TFLL at 47 mN/m	
50×50 μm	20×20 μm
	
	
	
	

Figure S11. Lateral structure and molecular organization of the TFLL film at 34 °C with the surface pressure of 47 mN/m. The AFM images were acquired at three different scanning sizes, i.e., 50×50, and 20×20 μm, and have a constant z range of 100 nm. 3D images are provided beneath lateral structure images to give a contrast perspective of the height difference.

Supplementary Video Clips

Movie S1. Measurement of water evaporation from a water droplet for a time period of 5 min, while maintaining a constant surface area of the droplet at 0.35 cm^2.