

Supporting Information

Spontaneous Spreading of a Droplet: The Role of Solid Continuity and Advancing Contact Angle

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Table S1. Spreading forces and contact angles of a water droplet on microstructured PDMS surfaces.

Pattern	Spec.	Circular shape						Square shape		
Pillar	Solid fraction (Φ)	0.03	0.07	0.10	0.13	0.16	0.17	0.44	0.64	0.83
	F_S (μN)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	θ_S ($^\circ$)	170	171	173	172	169	169	171	170	169
	θ_A ($^\circ$)	172	169	169	171	168	172	168	169	166
	θ_C ($^\circ$)	180	180	180	180	180	180	180	180	180
	r (mm)	0.17	0.16	0.18	0.17	0.21	0.19	0.20	0.19	0.20
Pore	Solid fraction (Φ)	0.50	0.76	0.78	0.80	0.93	0.99	0.17	0.36	0.56
	F_S (μN)	34	60	65	63	79	90	10	23	38
	θ_S ($^\circ$)	142	131	133	133	122	119	158	152	145
	θ_A ($^\circ$)	146	133	134	134	125	120	157	151	145
	θ_C ($^\circ$)	137	127	126	125	120	119	155	144	135
	r (mm)	0.52	0.64	0.66	0.67	0.75	0.78	0.30	0.39	0.52

Note:

- A smooth PDMS surface gives an advancing contact angle of 118° and spreading force of $97 \mu\text{N}$.
- The measurement error of the contact angle, spreading force, and contact radius are $\sim 2^\circ$, and less than $5 \mu\text{N}$, and less than 0.1 mm , respectively.

Table S2. Dimensions of PDMS Microstructures.

Pattern	Spec.	Circular shape						Square shape		
Pillar	Size (d, μm)	4.5	4.5	4.5	7.0	16.5	46.0	10.0	20.0	50.0
	Pitch (λ , μm)	10.0	15.0	25.0	20.0	40.0	100.0	15.0	25.0	55.0
	Solid fraction (Φ)	0.16	0.07	0.03	0.10	0.13	0.17	0.44	0.64	0.83
Pore	Size (d, μm)	8.0	7.5	7.5	7.5	21.0	55.0	10.0	20.0	50.0
	Pitch (λ , μm)	10.0	15.0	25.0	55.0	40.0	100.0	15.0	25.0	55.0
	Solid fraction (Φ)	0.50	0.80	0.93	0.99	0.78	0.76	0.56	0.36	0.17

Note:

- The height or depth of the structures was all fixed at 15 μm .
- The solid fractions (Φ , droplet-solid contact area normalized by the projected area) of the pillared and pored surfaces with a circular shape are estimated as $\pi d^2/4\lambda^2$ and $1 - \pi d^2/4\lambda^2$, respectively, while those of the surfaces with a square shape are d^2/λ^2 and $1 - d^2/\lambda^2$, respectively.

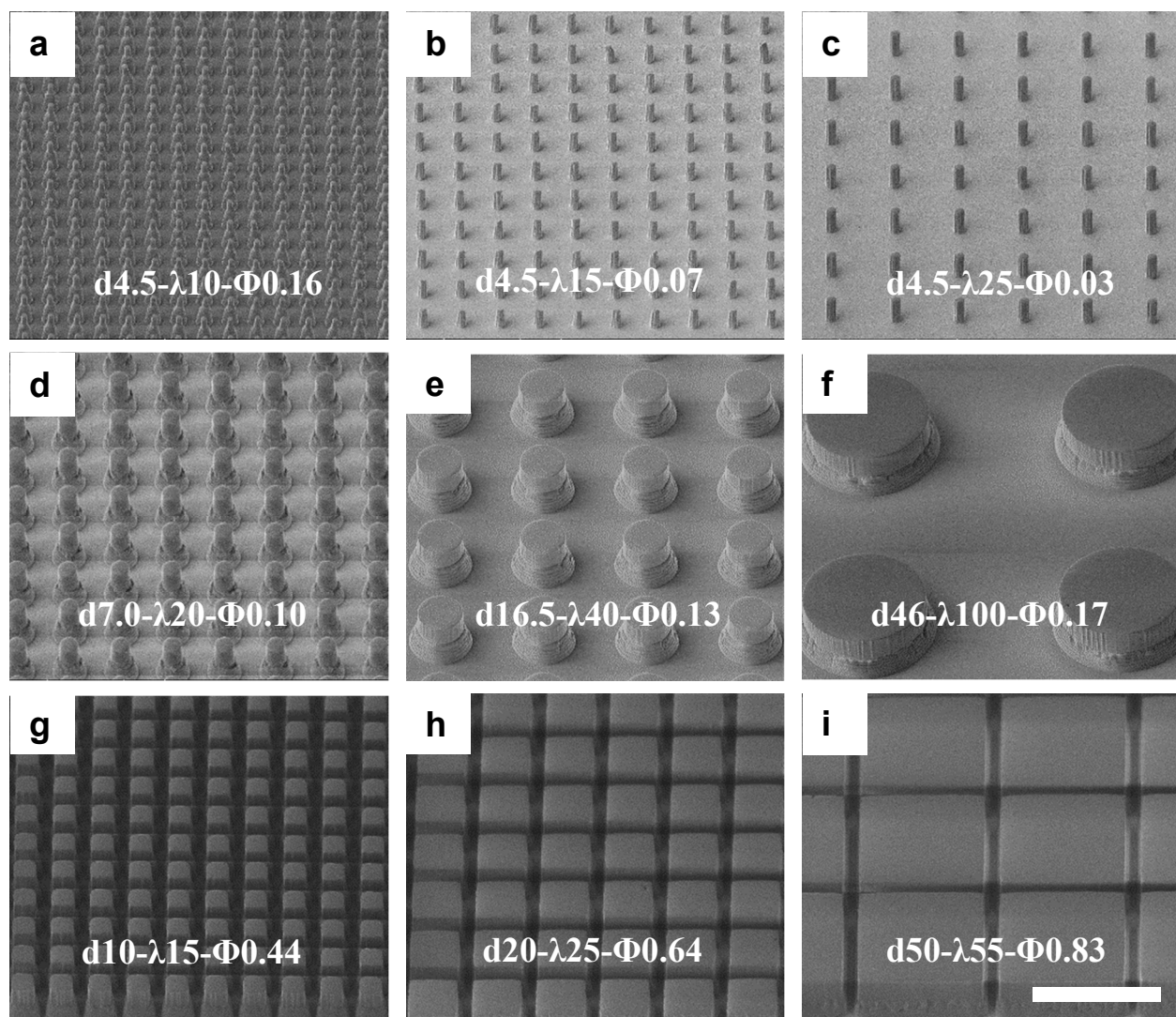


Figure S1. Scanning electron microscopy images of the pillared surfaces of PDMS tested in this work. The scale bar is 50 μm . Size (diameter or width), center-to-center pitch, and solid fraction are represented by d , λ , and Φ , respectively.

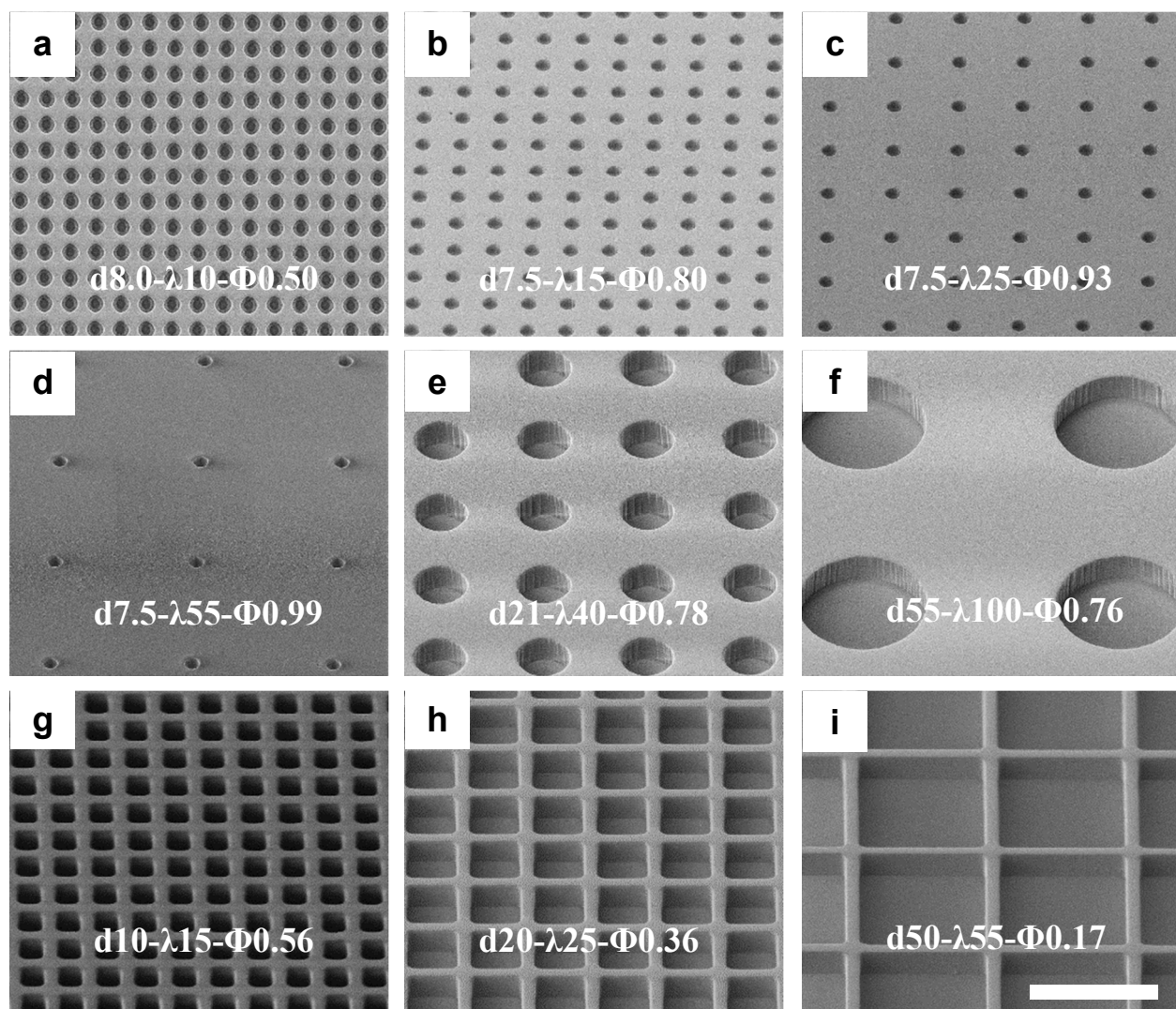


Figure S2. Scanning electron microscopy images of the pored surfaces of PDMS tested in this work. The scale bar is 50 μm . Size (diameter or width), center-to-center pitch, and solid fraction are represented by d , λ , and Φ , respectively.

Table S3. The surface roughness parameters, advancing contact angles, spreading contact angles, and the measured spreading forces of polymeric films of relatively smooth surfaces

Sample	r_{RMS} (nm)	r_{Ra} (nm)	φ	θ_A (°)	θ_S (°)	F_S (μN)
EVA	340 ± 200	260 ± 150	1.12 ± 0.08	100 ± 2	110 ± 5	116 ± 12
PET	4 ± 1	3 ± 1	1.000 ± 0.000	77 ± 1	83 ± 3	206 ± 15
Nylon	11 ± 6	8 ± 5	1.005 ± 0.002	63 ± 1	72 ± 3	374 ± 9

Note:

- Ref.: Y. Sun, Y. Jiang, C.-H. Choi, G. Xie, Q. Liu, and J. W. Drelich, Surface Innovations **6**, 93 (2018).