Supporting Information

Temperature-Responsive Anisotropic Slippery Surface for Smart Control of the Droplet Motion

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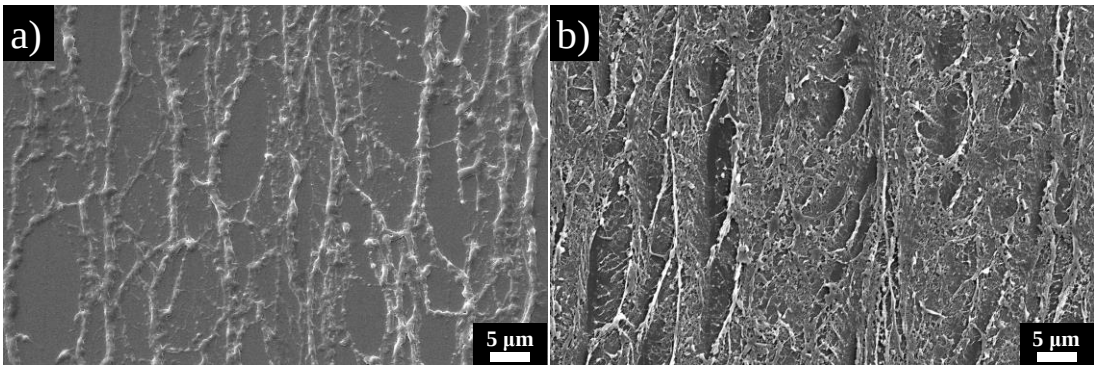

Figure S1. SEM images of PS films prepared by directional freeze-dying, using different concentrations of PS solutions: (a) 1 mg mL^{-1} and (b) 3 mg mL^{-1}.

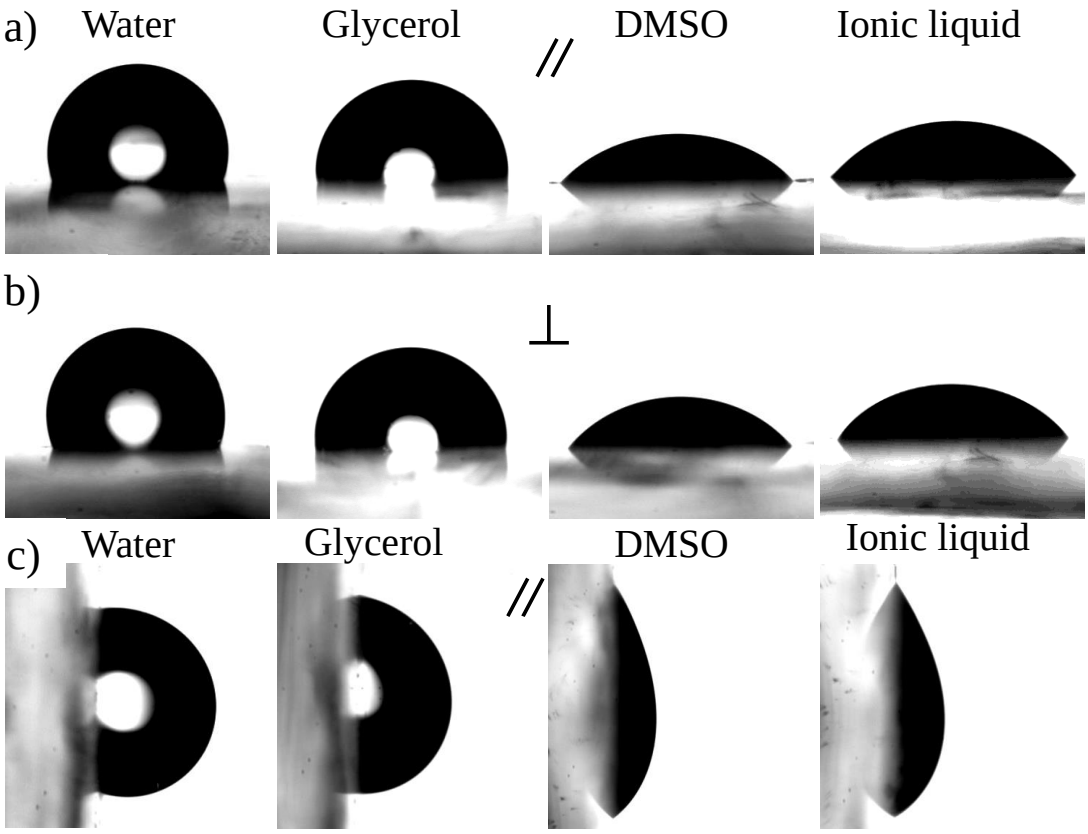

Figure S2. Anisotropic CA photographs of various liquid droplets (2 μμL) on the directional porous PS films without paraffin: (a) parallel to the fiber direction (//) and (b) perpendicular to the fiber direction (⊥). (c) Various liquid droplets (2 μL) on the directional porous PS films without paraffin did not slide even when the surfaces were tilted 90° in the parallel direction (//).

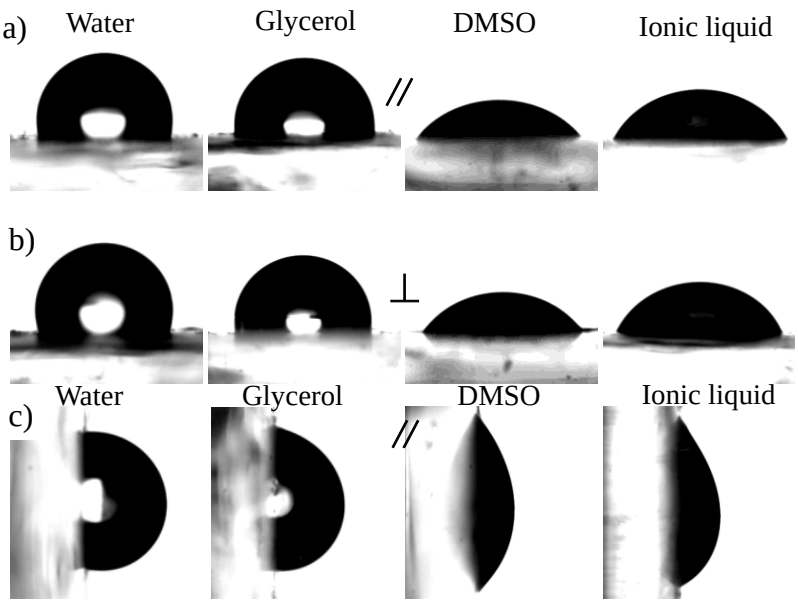

Figure S3. Anisotropic CA photographs of various liquid droplets (2 μL) on the directional porous PS films coated with paraffin at 25 °C ($T < T_m$): (a) parallel to the fiber direction (//) and (b) perpendicular to the fiber direction (⊥). (c) Various liquid droplets (2 μL) on the directional porous PS films coated with paraffin at 25 °C ($T < T_m$) did not slide even when the surfaces were tilted 90° in the parallel direction (//).

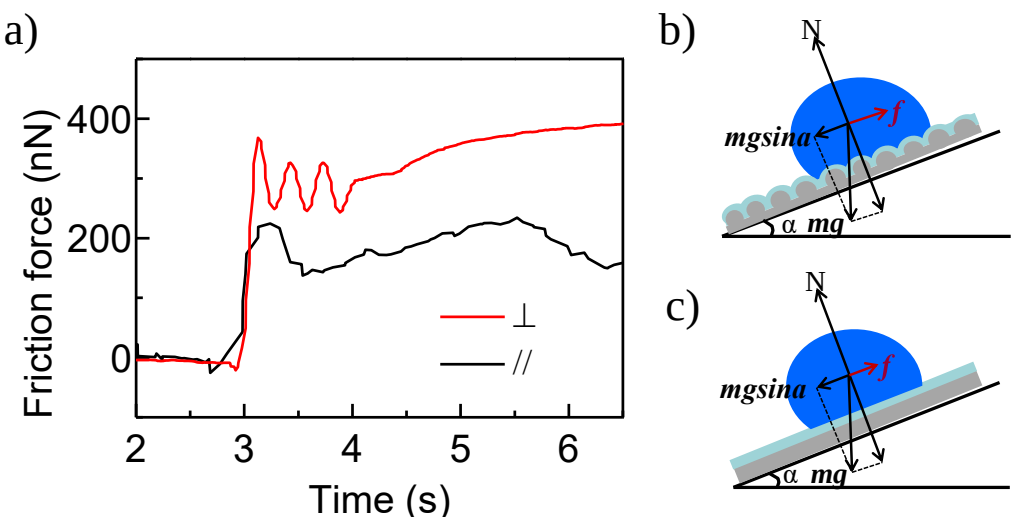

Figure S4. (a) Friction forces of the water drop in the perpendicular direction (⊥) and the parallel direction (//) at 55 °C. The forces loaded on the droplet in (b) the perpendicular direction and (c) the parallel direction. The resistance f in the perpendicular direction is larger than that in the parallel direction, resulting in the larger SA in the perpendicular direction.

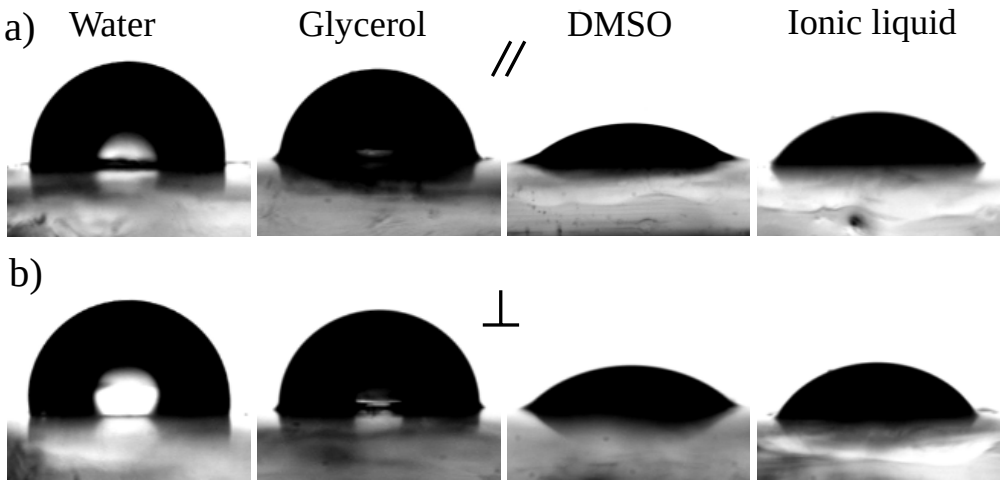

Figure S5. Anisotropic CA photos of various liquid droplets (2 μL) on the directional porous PS films coated with paraffin at 55 °°°C ($T > T_m$): (a) parallel to the fiber direction (//) and (b) perpendicular to the fiber direction (⊥).

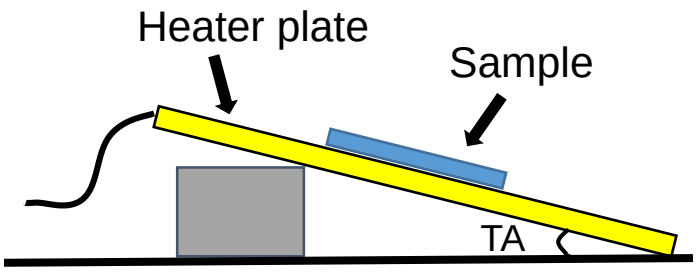

Figure S6. Schematic side-view depiction of the sample (glass slide or glass tube) on the heater plate.

Table S1. Anisotropic CAs of various liquid droplets (2 μL) on the porous PS films without paraffin.

Liquid type	CA //	CA ⊥	Surface tension (mN/m)	Viscosity coefficient (mPa·m)
Water	107.6 ± 2.0°	113.7 ± 1.6°	72.1	0.89
Glycerol	97.3 ± 1.2°	99.9 ± 0.9°	62.7	704.72
DMSO	47.2 ± 1.0°	51.2 ± 1.1°	43.6	1.69
Ionic liquid	51.6 ± 1.7°	56.2 ± 1.5°	32.8	55.40

Table S2. Anisotropic CAs of various liquid droplets (2 μL) on the porous PS films coated with paraffin at 25 °C.

Liquid type	CA //	CA ⊥
Water	105.5 ± 1.8°	110.2 ± 2.9°
Glycerol	97.8 ± 2.8°	99.5 ± 1.7°
DMSO	51.6 ± 1.5°	54.7 ± 2.0°
Ionic liquid	63.7 ± 1.7°	66.6 ± 1.9°

Table S3. CAs and surface tensions of various test liquids and liquid paraffin and the calculated ΔE in the parallel direction at 55 °C.

Liquid A	**Liquid B**	R	γ_A	γ_B	γ_{AB}	θ_A	θ_B	ΔE_1	ΔE_2
Water	Liquid paraffin	2.8	66.6	26.5	38.3	93.8°	20.3°	43.7	122.1
Glycerol	Liquid paraffin	2.8	59.2	26.5	32.4	91.2°	20.3°	40.7	105.8
DMSO	Liquid paraffin	2.8	35.9	26.5	6.1	76.1°	20.3°	37.3	56.1
Ionic liquid	Liquid paraffin	2.8	30.5	26.5	2.8	77.2°	20.3°	47.9	54.7

Table S4. The calculated ΔE in the perpendicular direction at 55 °C.

Liquid A	Liquid B	R	γ_A	γ_B	γ_{AB}	θ_A	θ_B	ΔE_1	ΔE_2
Water	Liquid paraffin	3.7	66.6	26.5	38.3	93.8°	20.3°	70.1	148.5
Glycerol	Liquid paraffin	3.7	59.2	26.5	32.4	91.2°	20.3°	64.2	129.3
DMSO	Liquid paraffin	3.7	35.9	26.5	6.1	76.1°	20.3°	51.3	70.1
Ionic liquid	Liquid paraffin	3.7	30.5	26.5	2.8	77.2°	20.3°	64.2	71.0