Supporting Information

Stretchable, adhesive and ultra-conformable elastomer thin films

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Supporting Figures

Table S1. Supplier information in the tape test section

Product name	Supplier	Adhesive strength (N/cm)
Cellophane tape® CT-24	Nichiban Co., Ltd.	4.01
214-3MNE	3M Japan Co., Ltd.	2.59
2142		1.18
244		1.06
2305		0.78
331		0.29
332		0.22
9491	Teraoka Co., Ltd.	0.18
945		0.08

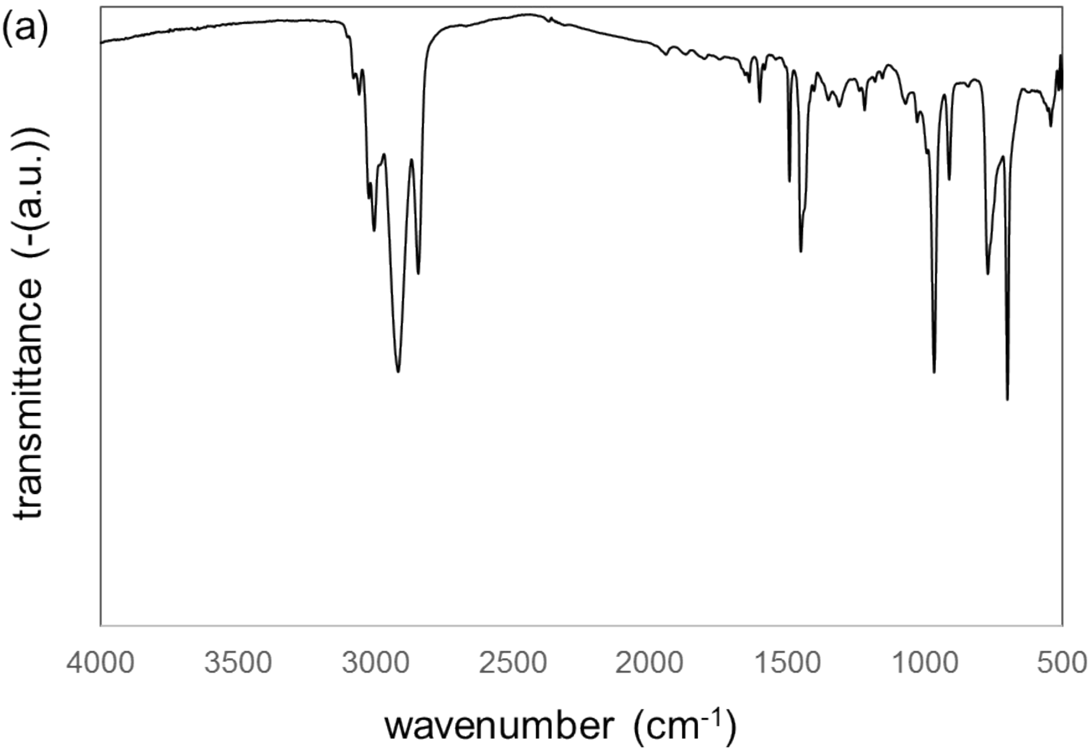
Table S2. Mechanical properties of the SBS thin films with different thicknesses by a tensile test

Polymer	Thickness (nm)	Tensile strength (MPa)	Elongation (%)	Young's modulus (MPa)
SBS	212±16	0.96±0.05	146± 8	5.7±1.2
SBS	690±79	0.99±0.02	186±22	4.9±0.8

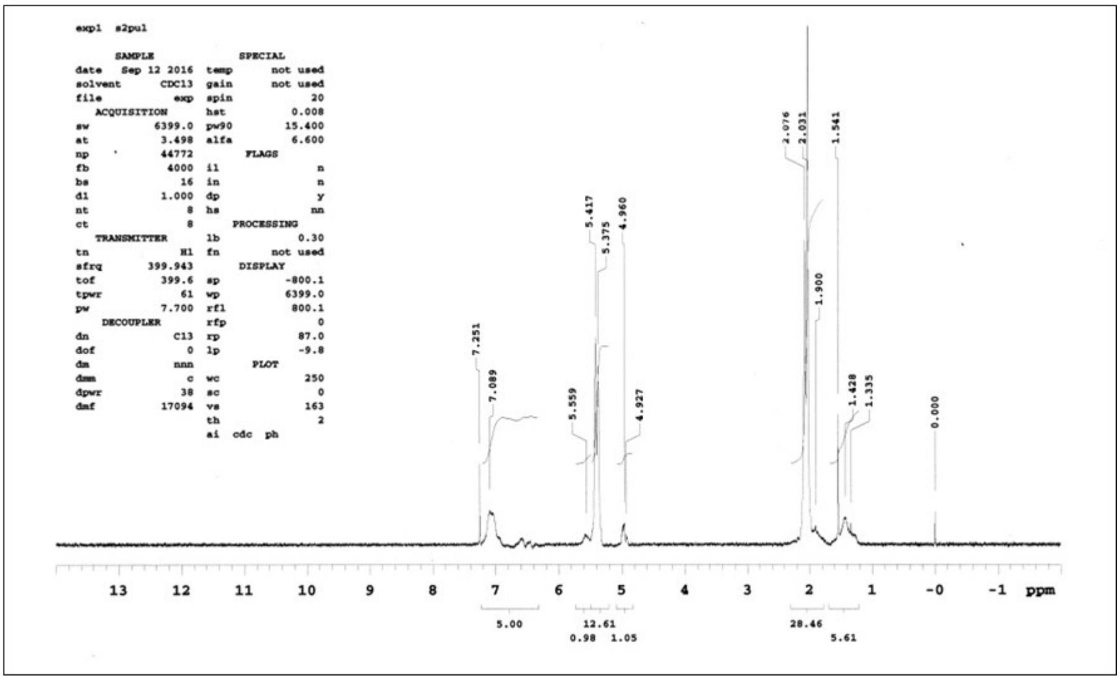
Table S3. Static contact angle and work of adhesion of PS and SBS thin films with different thicknesses

Polymer	Thickness (nm)	Contact angle (deg.)	Work of adhesion between water and thin films (mJ/m^2)
PS	127±10	77±2	89
PS	217±5	76±1	89
PS	697±7	78±2	88
SBS	212±16	82±1	83
SBS	690±79	83±1	82

(a)


transmittance (-(a.u.))
4000
3500
3000
2500
2000
1500
1000
500
wavenumber (cm-1)

(b)


exp1 s2pul
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date Sep 12 2016
solvent CDCl3
file exp
ACQUISITION
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at 3.498
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fb 4000
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nt 8
ct 8
TRANSMITTER
tn H1
sfrq 399.943
tof 399.6
tpwr 61
pw 7.700
DECOUPLER
dn C13
dof 0
dm nnn
dmm c
dpwr 38
dmf 17094
SPECIAL
temp not used
gain not used
spin 20
hst 0.008
pw90 15.400
alfa 6.600
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il n
in n
dp y
hs nn
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lb 0.30
fn not used
DISPLAY
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wp 6399.0
rfl 800.1
rfp 0
rp 87.0
lp -9.8
PLOT
wc 250
sc 0
vs 163
th 2
ai cdc ph
7.251
7.089
5.559
5.417
5.375
4.960
4.927
2.076
2.031
1.900
1.541
1.428
1.335
0.000
13
12
11
10
9
8
7
6
5
4
3
2
1
-0
-1
ppm
5.00
12.61
0.98
1.05
28.46
5.61

Figure S1. FT/IR and NMR spectra of SBS

(a) SBS was dissolved in chloroform (20 mg/mL). The SBS solution dropped to NaCl substrate and dried at room temperature. Then, FT/IR spectra of SBS was measured by IR spectroscopy (FT/IR-4100, JASCO Corp., Tokyo, Japan). The peaks at 2843 – 3059 cm^{-1} are characteristic of aliphatic and aromatic C-H stretching. The band at 967 cm^{-1} corresponds to C-H out of plane bending vibrations and 694 cm^{-1} to C=C stretching vibration. (b) SBS was dissolved in $CDCl_3$ (20 mg/mL). ^{1}H NMR spectra of SBS was recorded using OXFORD MMR AS 400. ^{1}H NMR (400 MHz, d-$CDCl_3$): δ1.34 – 1.43 (-CH_2-, 4H), 2.03 (-CH_2-, 4H), 4.97(-CH_2, 2H), 5.41 (-CH-, 2H), 5.56 (-CH-, 1H), 6.57 (ArH, 2H), 7.09 (ArH, 3H).

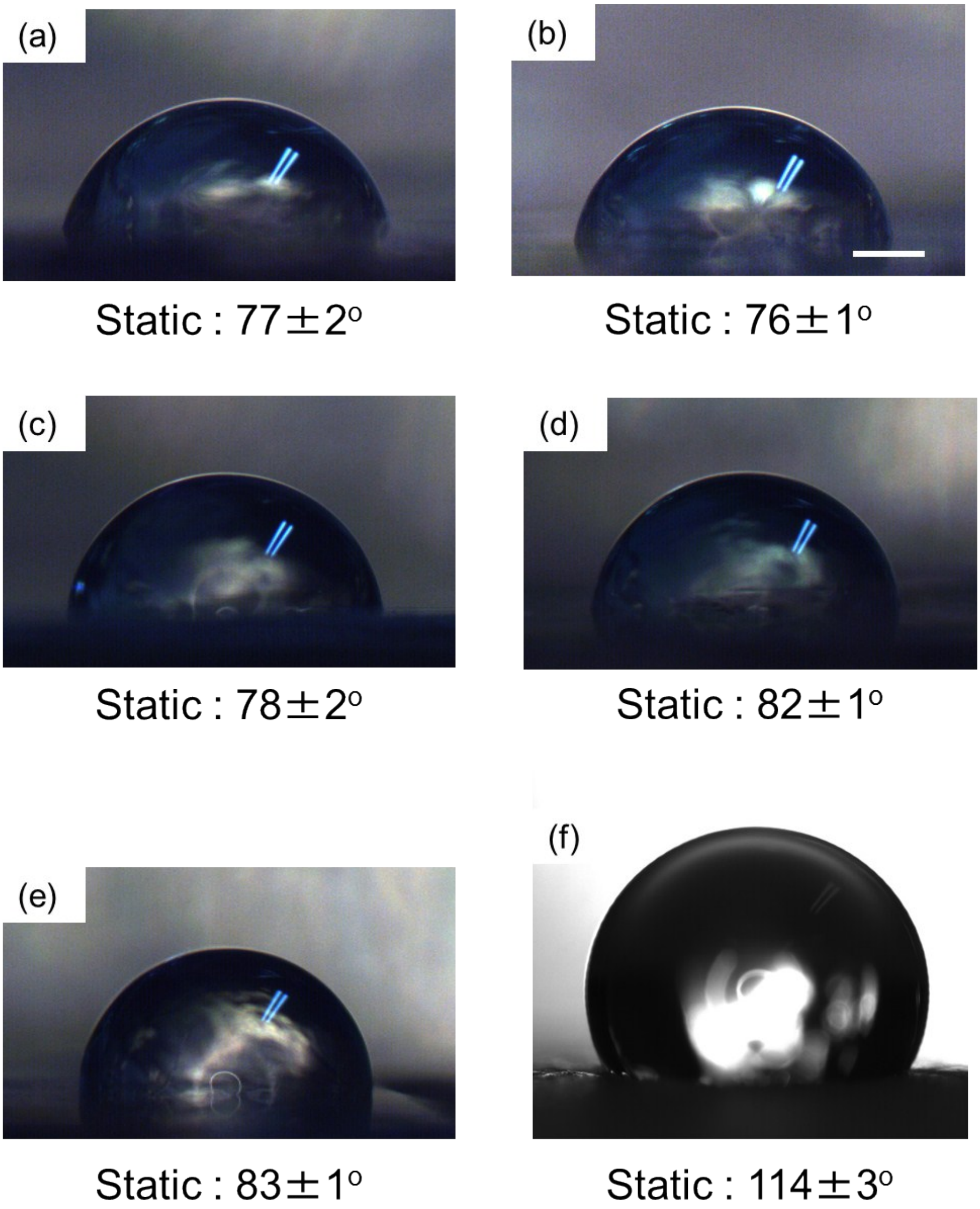

Figure S2. Contact angles of PS thin films with thicknesses of 127 nm (a), 217 nm (b), and 697 nm (c), and SBS thin films with thicknesses of 212 nm (d) and 690 nm (e) on SiO_2 substrates. Contact angle of the artificial skin model (f) scale bar: 500 μm.

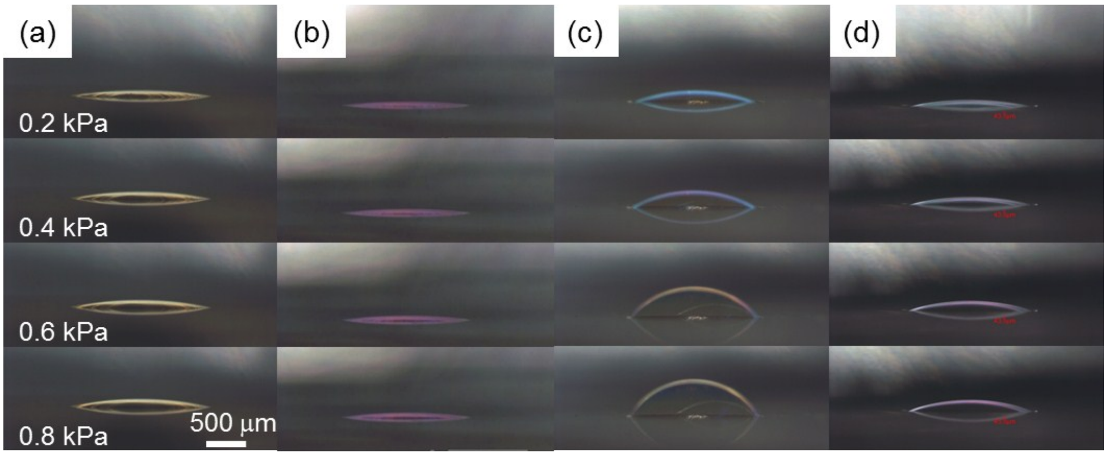

Figure S3. Sequential cross-sectional views of the deflection of the PS thin films with thicknesses of 127 nm (a) and 217 nm (b), and the SBS thin films with thicknesses of 212 nm (c) and 690 nm (d).

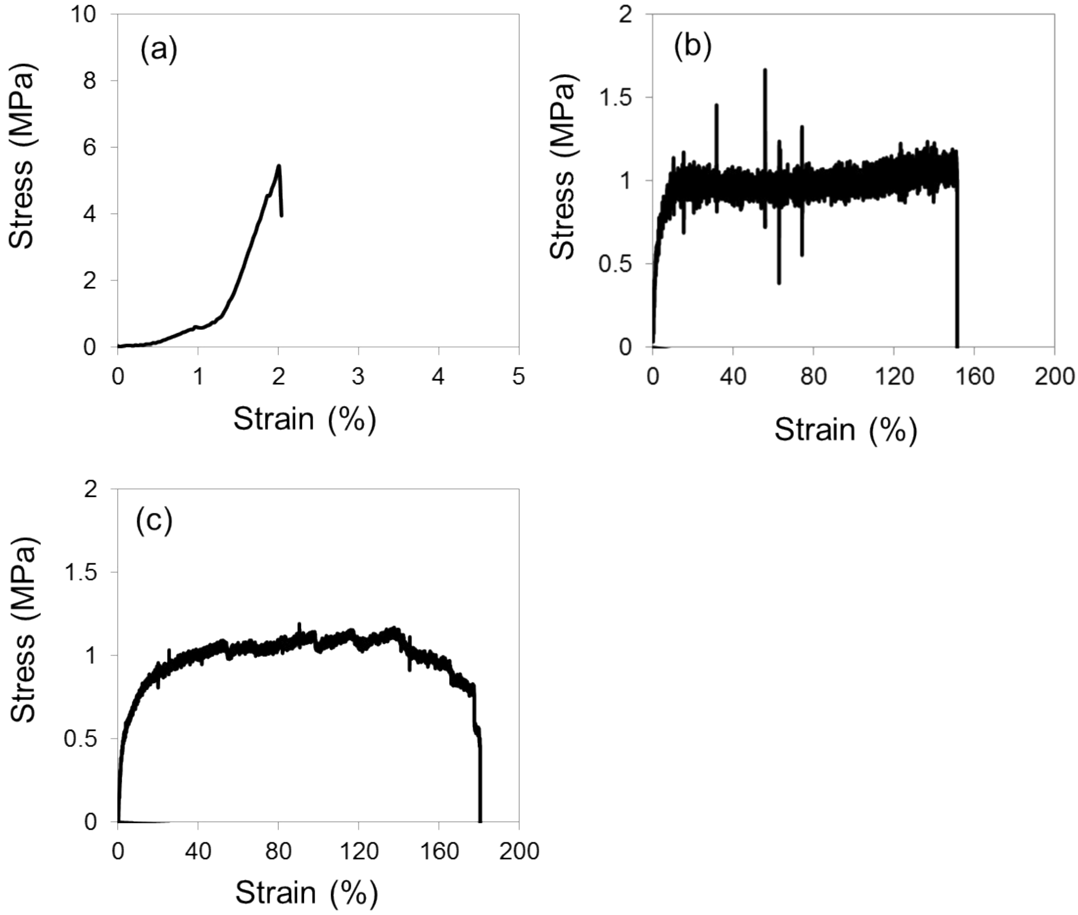

Figure S4. Evaluation of mechanical properties of the thin films by a tensile test. Stress-strain curve by tensile test of the PS thin films with thicknesses of 697 nm (a), and the SBS thin films with thicknesses of 212 nm (b) and 690 nm (c).

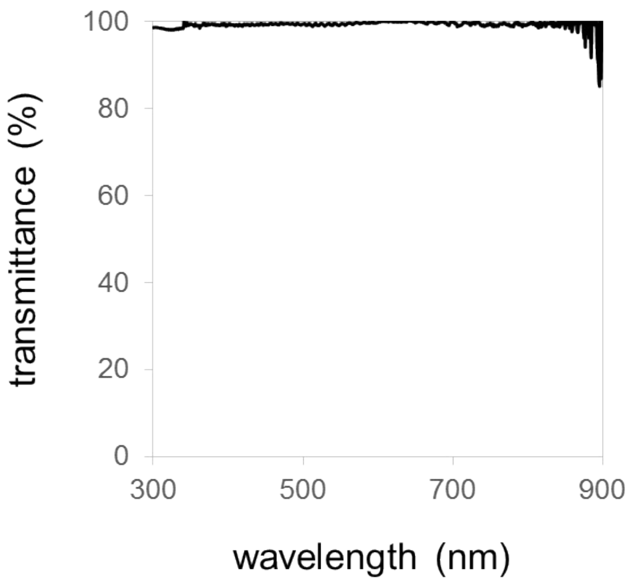

Figure S5. Transmittance of SBS thin film with a thickness of 690 nm using an ultraviolet-visible absorption spectrophotometer.

Supporting Movies

Movie S1. SBS thin film prepared by a gravure-coating method with a PVA sacrificial layer to release the thin film on the water. Stretching of a 212 nm-thick SBS thin film (3 cm × 3 cm). Paper tapes were attached onto both sides of the thin film to capture the thin film with tweezers.

Movie S2. Example of a tensile test (× 32 speed). A 690 nm-thick SBS thin film was elongated by a tensile tester. Tensile speed: 10 mm/min

Movie S3. A cover glass (2.2 cm × 2.2 cm, 0.12 mm thick) was smashed with a hammer (a). Cover glasses covered with 697 nm PS (b) and 690 nm SBS (c) thin films were smashed with a hammer in the same way as (a).