Electronic Supplementary Material (ESI) for Soft Matter

Re-writable and shape-memory soft matter with dynamically tunable microchannel geometry in a biological temperature range

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Supporting Information

Table S1. Thermal, mechanical and bulk shape-memory properties of cross-linked PCL films.

Mixing ratio of	T_m	ΔH	X_c [a]	Elastic modulus[b]		R_r [c]	R_f [d]
4b10/2b20PCL	(°C)	(mJ/mg)	(%)	at 30 °C (MPa)	at 45 °C (MPa)	(%)	(%)
100/0	—	—	-	1.4 ± 0.4	1.5 ± 0.1	—	—
50/50	33.0 ± 0.1	32.0 ± 1.0	22.5	43.0 ± 4.3	1.0 ± 0.1	89.8	98.1
30/70	37.8 ± 0.1	35.8 ± 0.8	25.2	87.9 ± 11.5	0.9 ± 0.2	90.5	99.5
0/100	43.7 ± 0.3	43.0 ± 0.8	30.3	147.0 ± 9.0	9.4 ± 2.7	94.9	99.7

[a] $X_c = [\Delta H_m]/142 \times 100$, where 142 ($J\ g^{-1}$) is the melting enthalpy of a perfect PCL crystal.

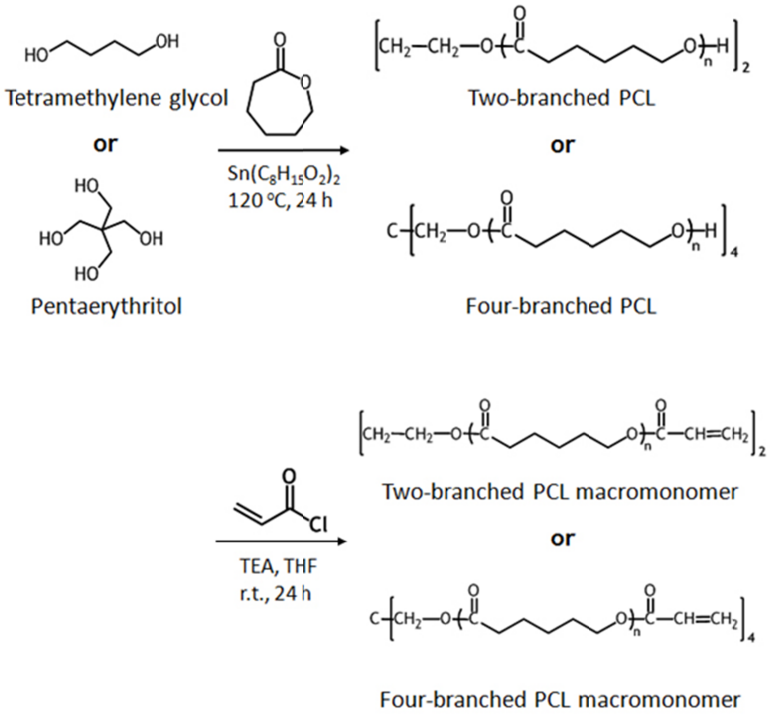
[b] Elastic modulus was calculated from the initial slope of strain-stress curve at 30 °C and 45 °C.

[c] $R_f(N) = e_u(N)/e_m \times 100$

where N is the cycle number, $e_u(N)$ is the strain in the stress-free state after the retraction of the tensile stress in the Nth cycle, and e_m is the maximum strain.

[d] $R_r(N) = (e_m - e_p(N))/(e_m - e_p(N-1)) \times 100$

where N is the cycle number, e_m is the maximum strain, $e_p(N)$ is the strain of the sample in two successively passed cycles in the stress-free state before yield stress is applied.



Scheme S1. Synthesis of two or four branched PCL macromonomers.

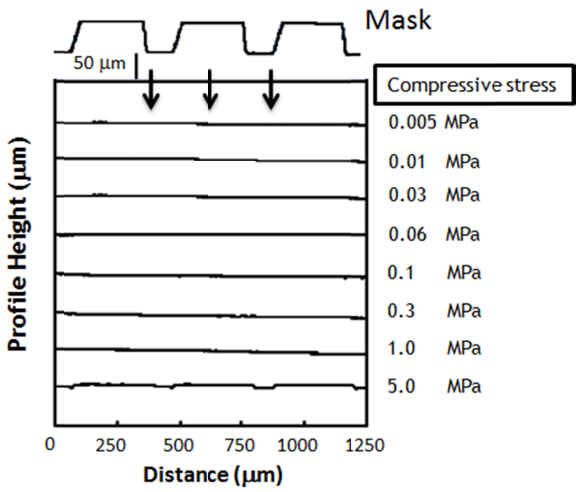


Figure S1: Surface profiles of cross-sections of surface patterns. The temporal "patterned" shape with width of 300 µm and a height of 50 µm were programmed on the original "flat" surfaces by mechanical deformation at various compression stress below T_m.

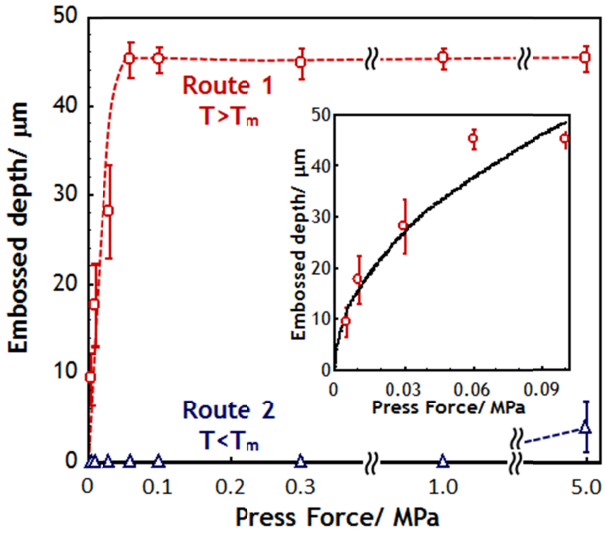


Figure S2: Embossed depths of PCL films calculated from the cross-sectional images (plot) and actual compressed distance of the fixture of compress machine (line). The temporary shape was embossed at above (circle) and below T_m (triangle).