Electronic Supplementary Material (ESI) for Journal of Materials Chemistry B.
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Journal of Materials Chemistry B

Electric Supplementary information

Biodegradable shape memory polymers functionalized with anti-biofouling interpenetrating polymer networks

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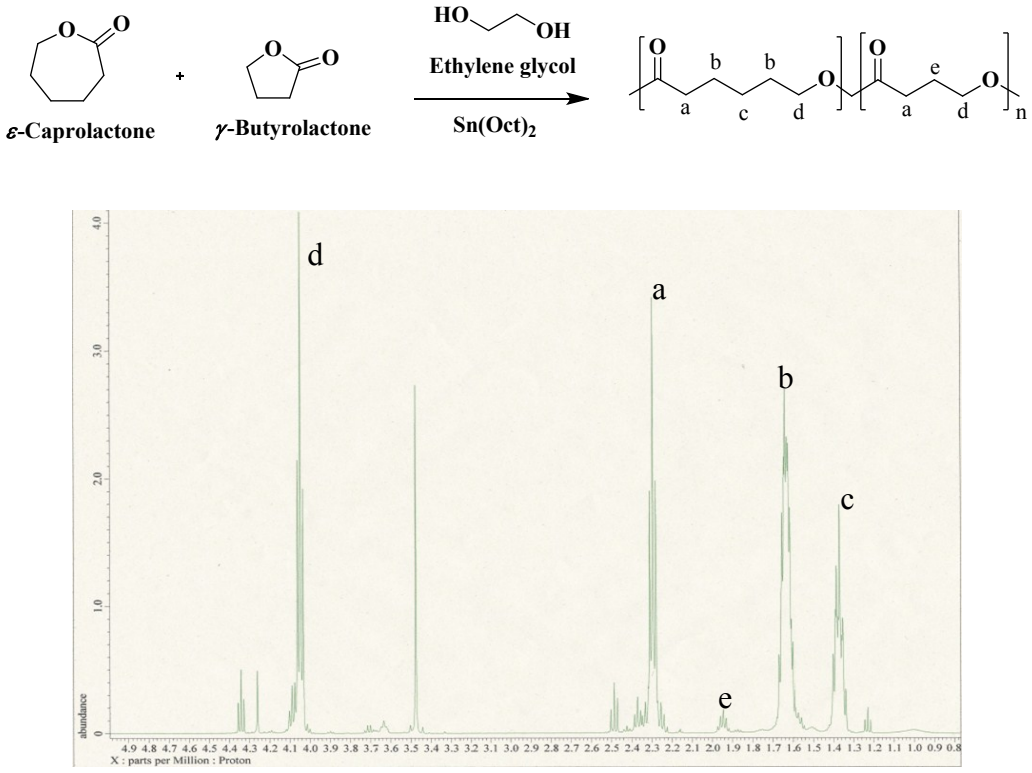

Fig. S1. Synthesis scheme and ^{1}H-NMR spectrum of the PCLBL copolymer.

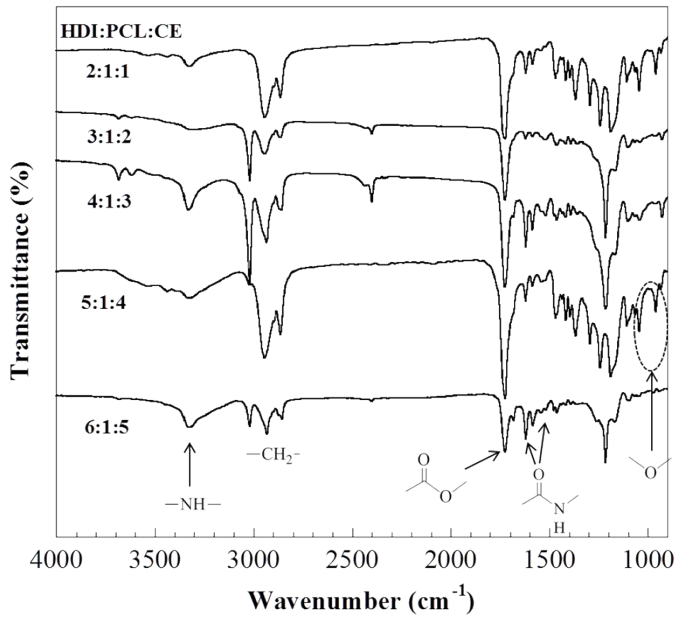

Fig. S2. FT-IR spectra of PCL-PU constructed using NH_2-CE.

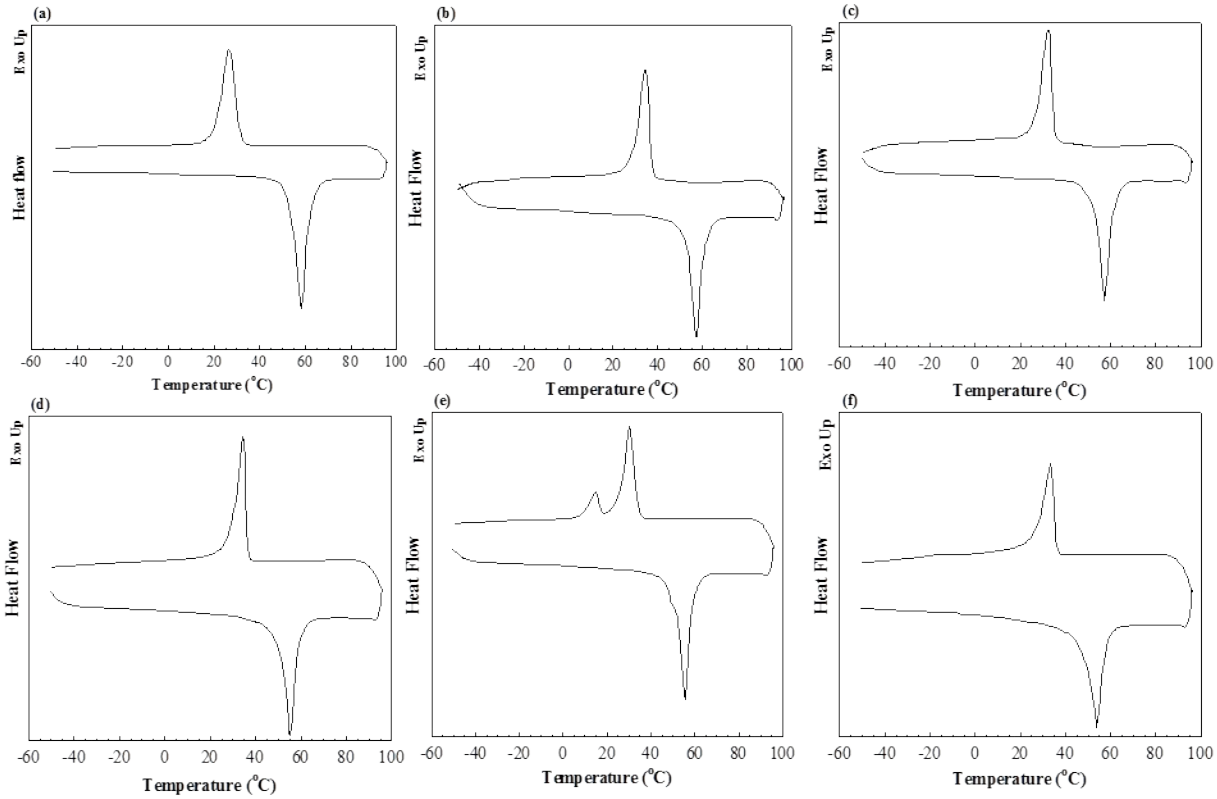

Fig. S3. DSC thermograms of (a) PCL and PCL-PU at different molar ratios of HDI:PCL:CE (b) 2:1:1 (c) 3:1:2 (d) 4:1:3 (e) 5:1:4, and (f) 6:1:5.

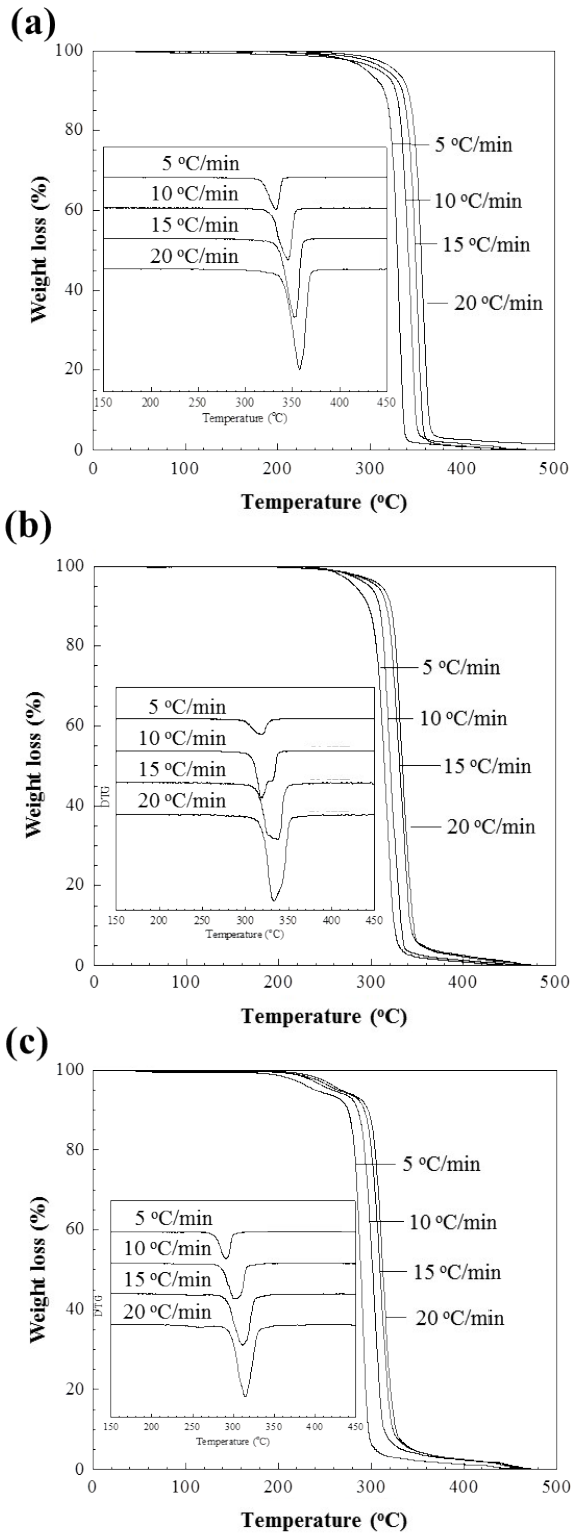

Fig. S4. Weight loss curves and corresponding DTG curves (inset) of (a) PCLBL-PU1, (b) PCLBL-PU2, and (c) PCLBL-PU3 at different heating rates (5–20 °C min^{-1}).

Evaluation of Activation Energy by Ozawa-Flynn-Wall (OFW) Method

The degradation of PCLBL-PUs was studied through non-isothermal measurements at different heating rates. The mass loss and its derivative at different heating rates (β) for PCLBL-PU1, PCLBL-PU2 and PCLBL-PU3 are presented in Fig. S4(a)-(c), respectively.

The OFW plots of $\ln \beta$ vs. $1000/T$ were created using Eq. S1.

$$\ln \beta = \ln\left(\frac{A \times E_a}{R}\right) - \ln g(\alpha) - 5.3305 + 1.052\frac{E_a}{RT} \qquad (S1)$$

where α is the conversion, A is frequency factor (s^{-1}), R is the universal gas constant (8.314×10^{-3} kJ/mol.K), and $g(\alpha)$ is the kinetic model function. Figs. S5(a) – (c) show the OFW plots of $\ln \beta$ vs. $1000/T$ for the thermal degradation of PCLBL-PU1, PCLBL-PU2 and PCLBL-PU3, respectively. The straight lines fitting the data were nearly parallel, especially for PCLBL-PU1, which indicated that the activation energies at different conversions were similar. In addition, the straight line data suggests that this method could be applied to study these samples.

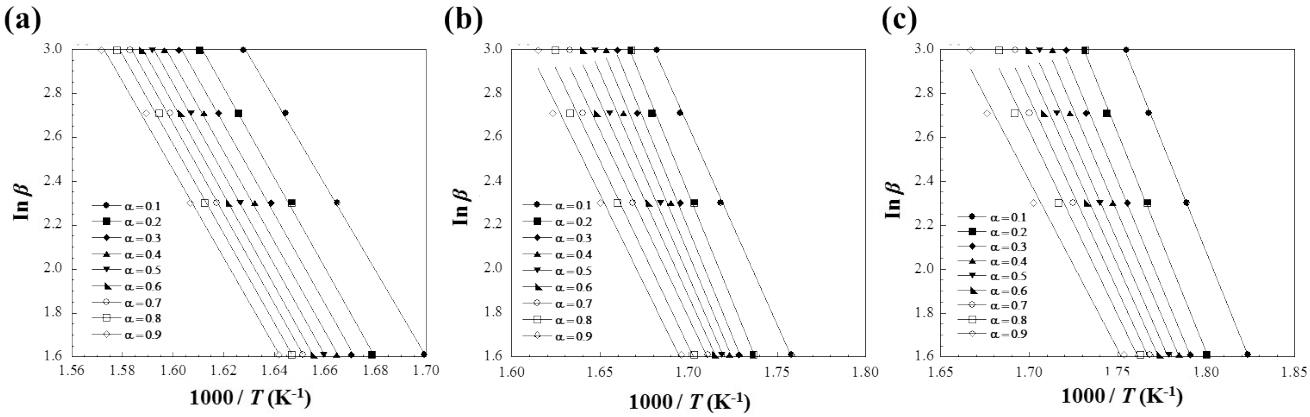

Fig. S5. OFW plots of logarithm β versus $1000T$ for thermal degradation of (a) PCLBL-PU1, (b) PCLBL-PU2, and (c) PCLBL-PU3.

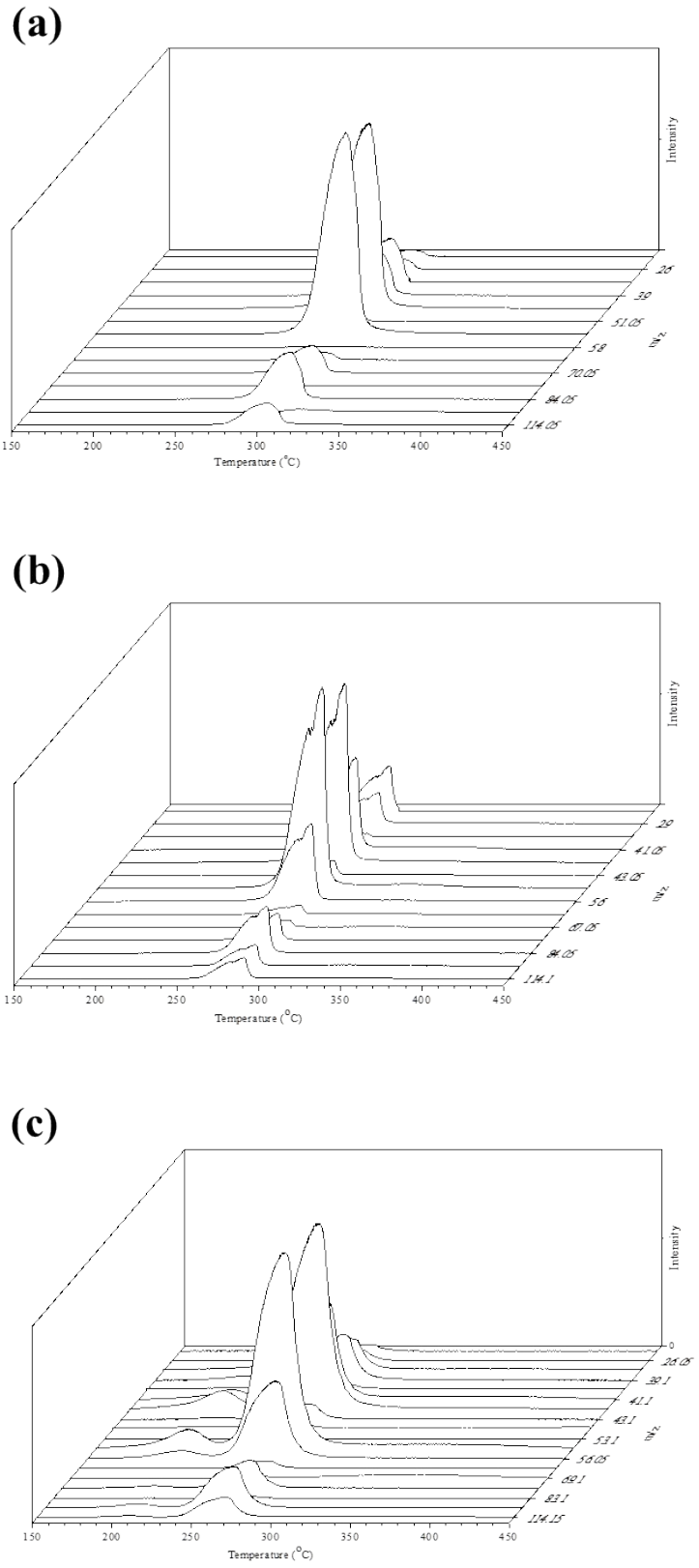

Fig. S6. Mass spectra (*m/z*) of the degradation products obtained by heating (a) PCLBL-PU1, (b) PCLBL-PU2, and (c) PCLBL-PU3 at 150–450 ºC.

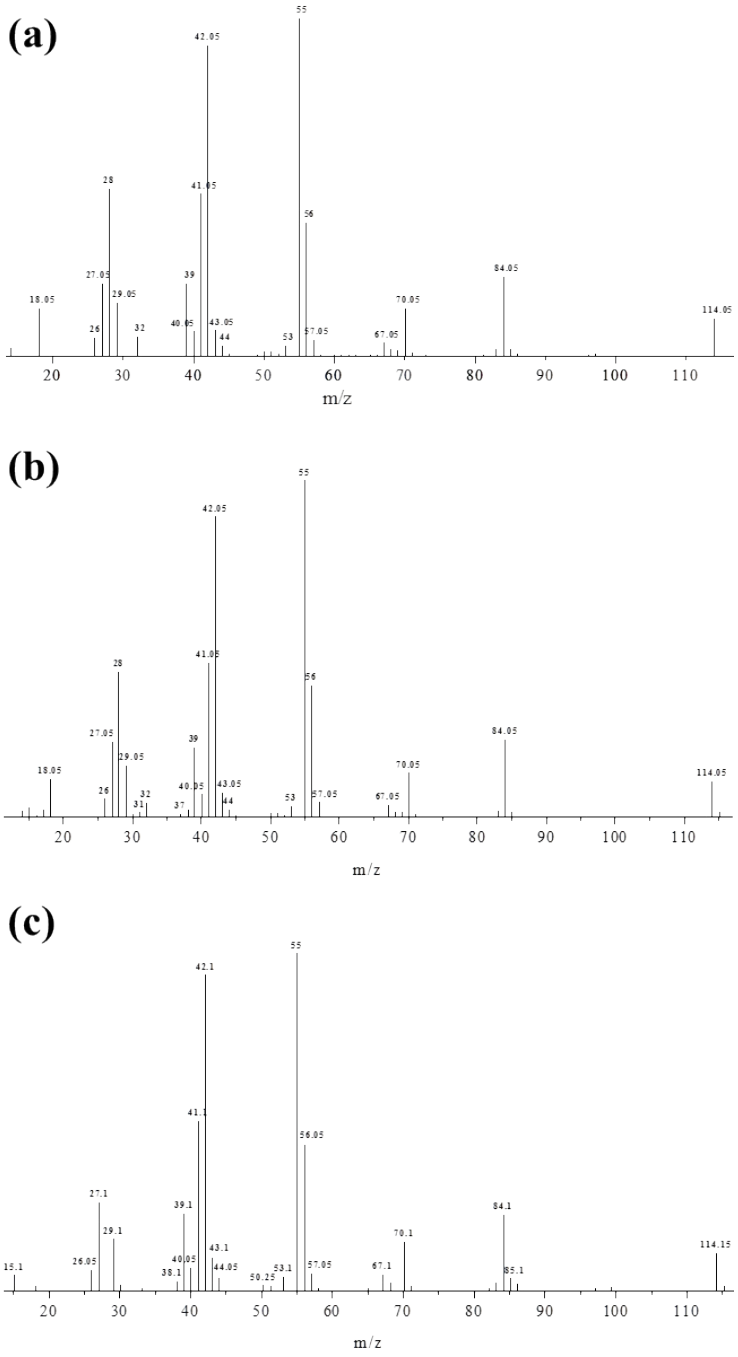

Fig. S7. Mass spectra of the volatile products from (a) PCLBL-PU1 at 302 ºC, (b) PCLBL-PU2 at 287 ºC, and (c) PCLBL-PU3 at 280 ºC.

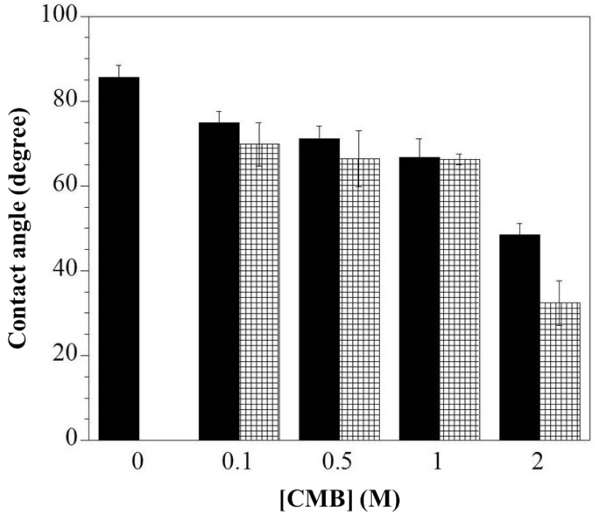

Fig. S8. Contact angles of the surface of the IPN films constructed with PCLBL-PU1 and PCMB. The CMB was polymerized at a concentration of 0, 0.1, 0.5, 1, and 2 M. IPN films obtained after drying (black bar) and immersion in water for 24 h (grid bar) were measured (n = 3).

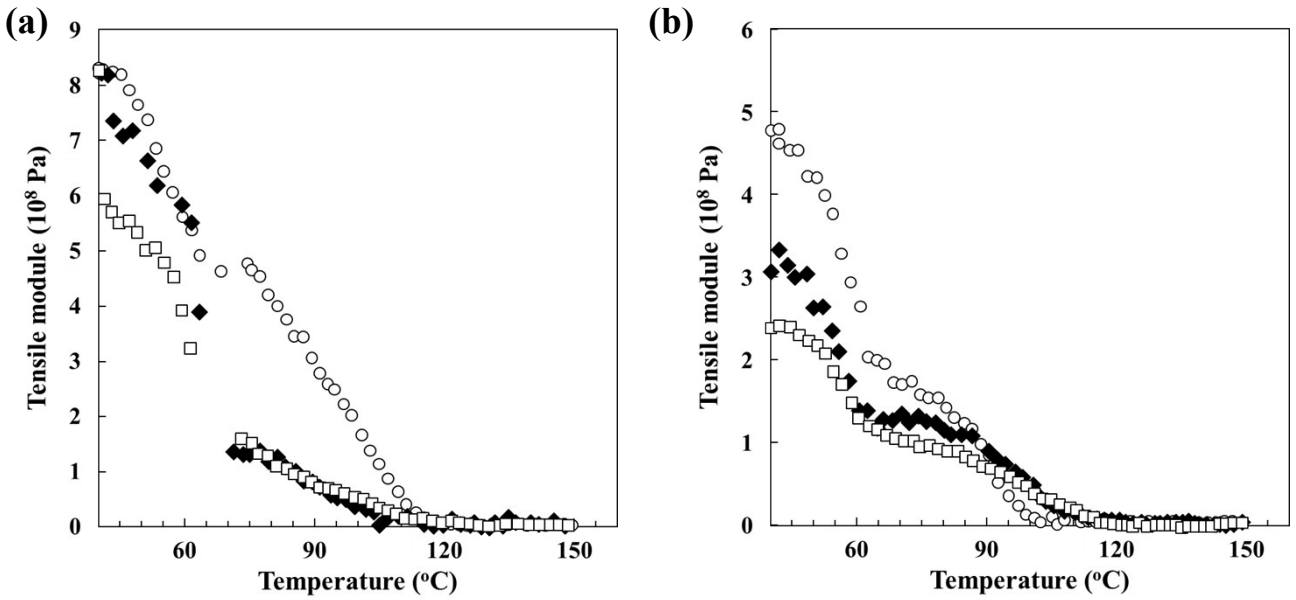

Fig. S9. Rheological properties of PCLBL-PU sheets interpenetrated (a) without and (b) with PCMB (○ PCLBL-PU1, ♦ PCLBL-PU2, □ PCLBL-PU3).