Electronic Supplementary Material (ESI) for Soft Matter.

A Biomass Approach to Mendable Bio-Elastomers

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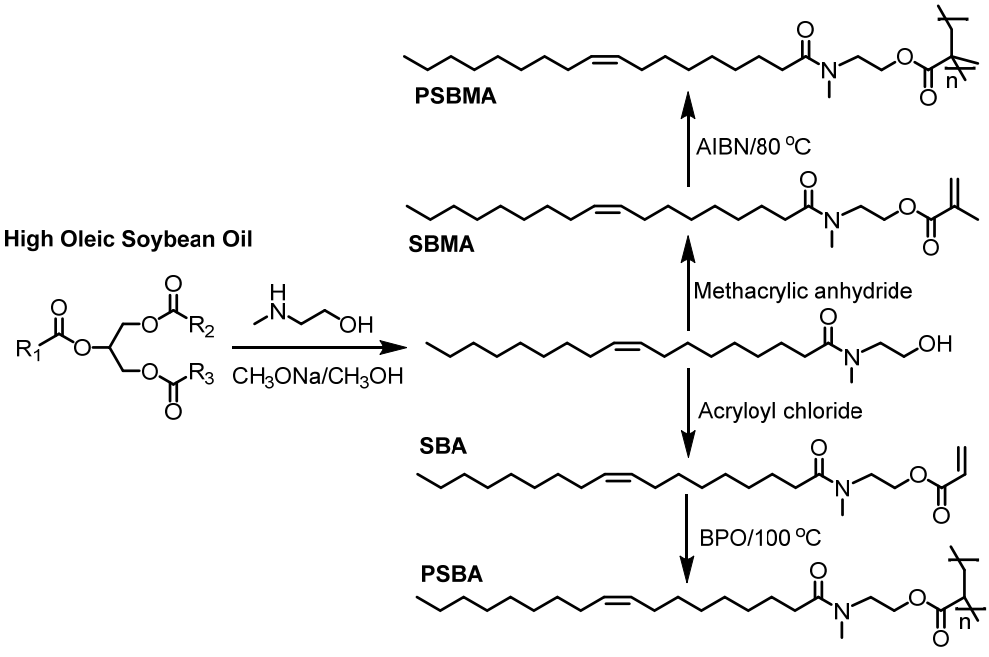
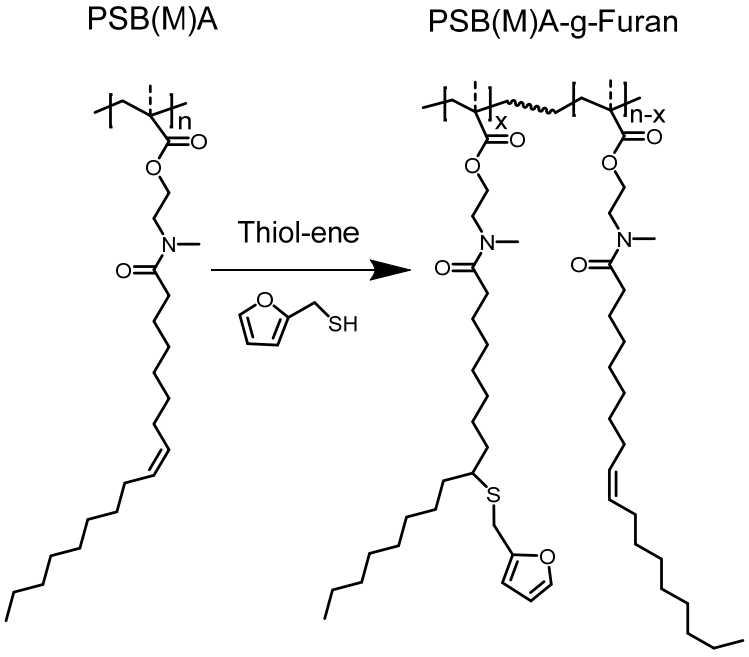
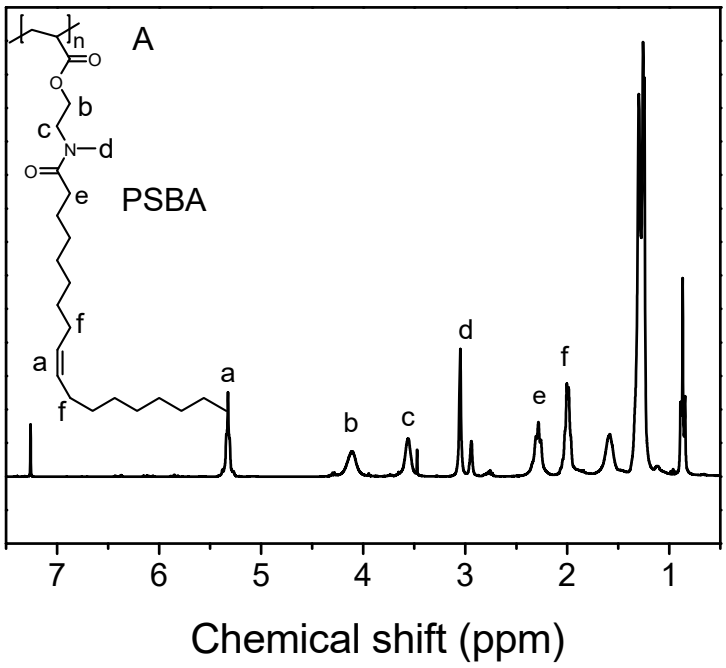
Supporting information

Scheme S1. Preparation of PSBA and PSBMA from high oleic soybean oil.



Scheme S2. Modification of PSB(M)A with furan groups via thiol-ene coupling.





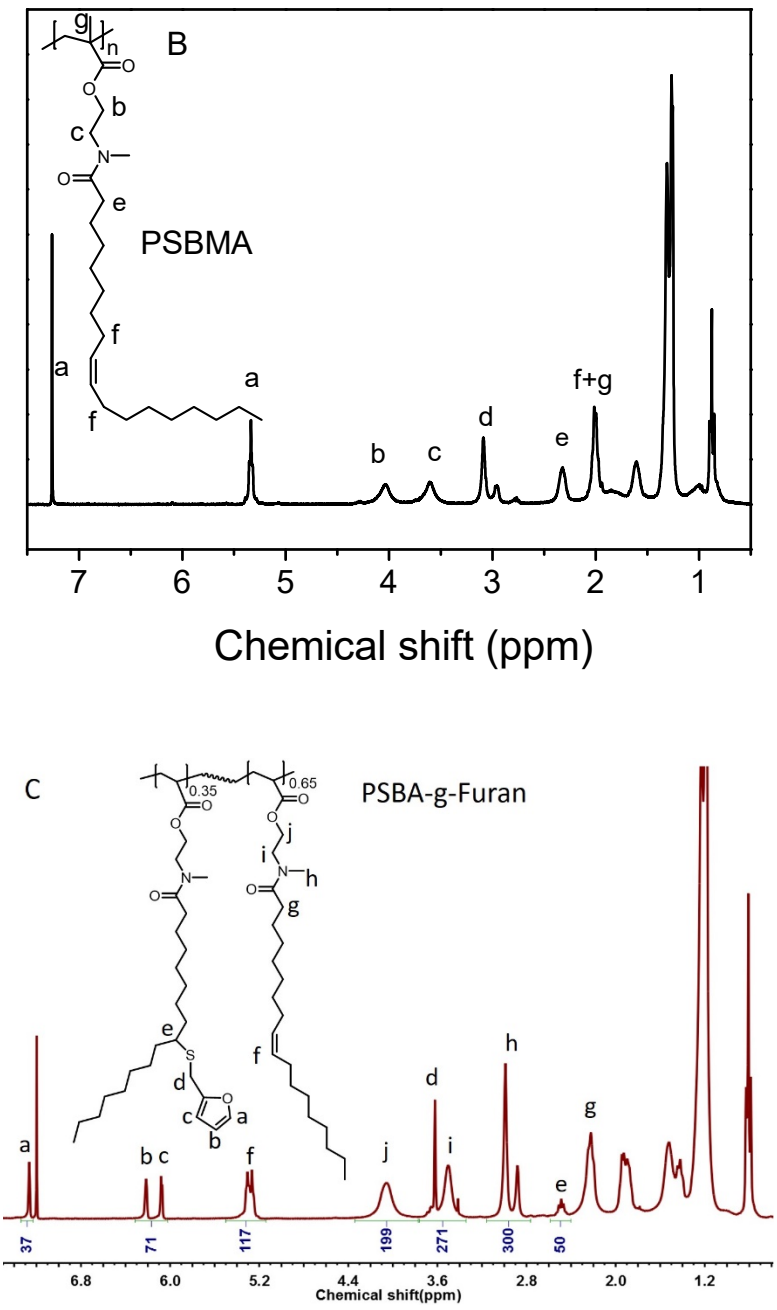


Figure S1. [1]H NMR spectra of (A) PSBA, (B) PSBMA and (C) PSBA-g-Furan.

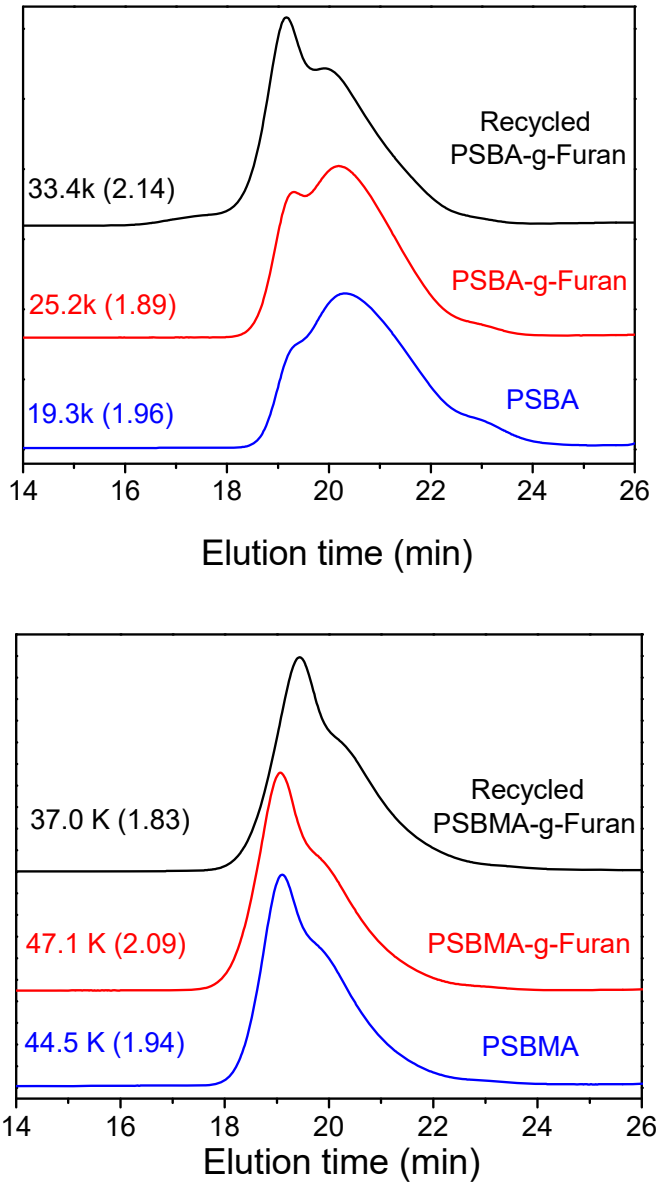


Figure S2. GPC traces of PSBA, PSBMA, PSBA-g-Furan, PSBMA-g-Furan, recycled PSBA-g-Furan and recycled PSBMA-g-Furan with molecular weight (M_n in g/mol) and dispersity ($Đ$).

Table S1. The ratios of polymer precursor and cross-linker for preparing cross-linked bio-elastomers.

Cross-linked film	Polymer precursor	Cross-linker amount
PSBA-2	PSBA-furan (1.0 g, 0.80 mmol furan group)	0.02 g (0.056 mmol)
PSBA-4		0.04 g (0.112 mmol)
PSBA-6		0.06 g (0.168 mmol)
PSBA-8		0.08 g (0.224 mmol)
PSBA-10		0.10 g (0.280 mmol)
PSBA-12		0.12 g (0.336 mmol)
PSBMA-2	PSBMA-g-Furan (1.0 g, 0.56 mmol furan group)	0.02 g (0.056 mmol)
PSBMA-4		0.04 g (0.112 mmol)
PSBMA-6		0.06 g (0.168 mmol)
PSBMA-8		0.08 g (0.224 mmol)
PSBMA-10		0.10 g (0.280 mmol)

Table S2. Resilience and elastic recovery (ER) results of PSBA-12, PSBMA-10, PSBA-12R and PSBMA-10R from cyclic tensile test.

Entries	1st Cycle	2nd Cycle	3rd Cycle	4th Cycle	5th Cycle
Resilience of PSBA-12	91.2 %	93.5 %	93.6 %	93.8 %	93.8 %
ER of PSBA-12	96.6 %	99.6 %	99.5 %	100 %	99.9 %
Resilience of PSBMA-10	47.2 %	58.5 %	58.5 %	59.5 %	57.7 %
ER of PSBMA-10	73.9 %	96.2 %	97.6 %	100 %	97.9 %
Resilience of PSBA-12R	86.0 %	90.0 %	90.4 %	90.7 %	90.9 %
ER of PSBA-12R	94.3 %	99.2 %	100 %	99.5 %	99.6 %
Resilience of PSBMA-10R	39.2 %	51.8 %	54.4 %	54.1 %	51.2 %
ER of PSBMA-10R	66.4 %	92.7 %	97.9 %	98.0 %	98.6 %

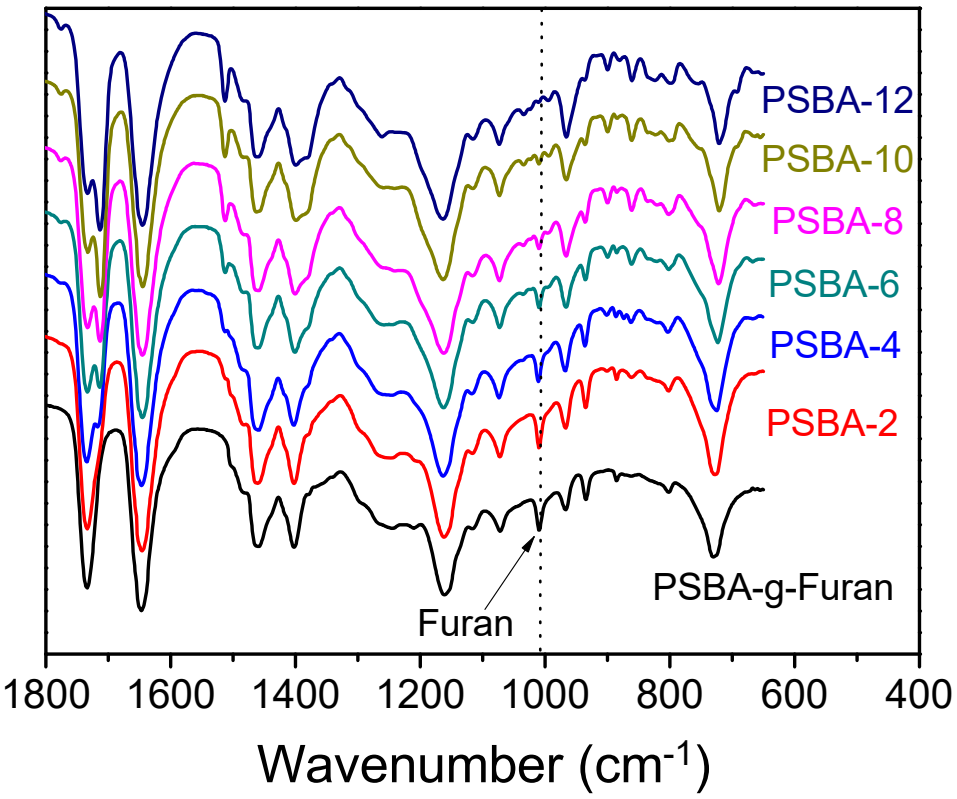
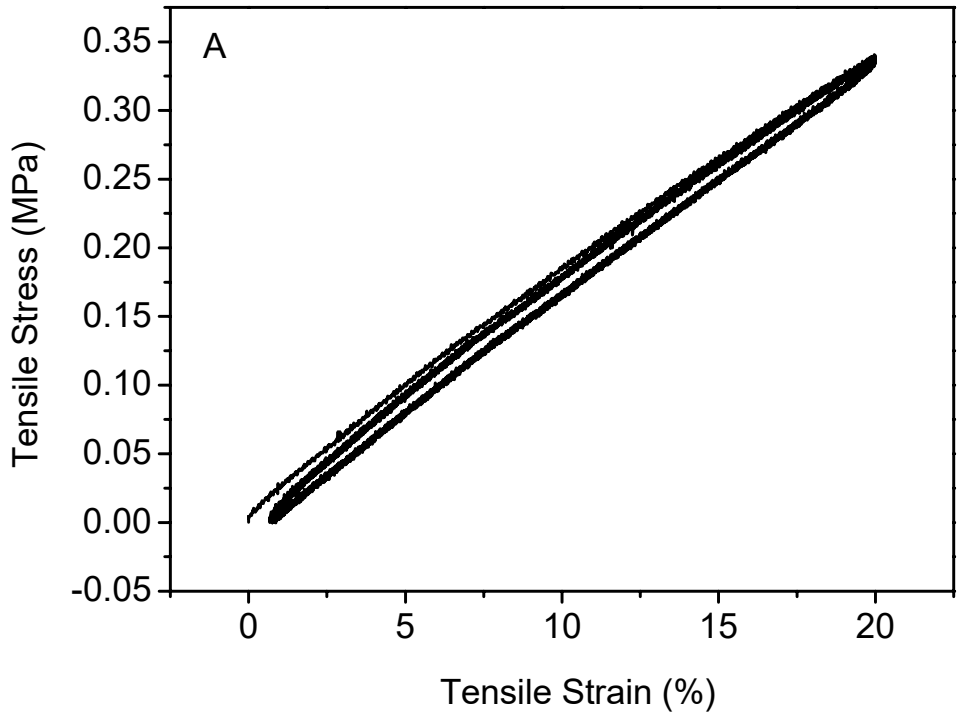


Figure S3. FT-IR spectra of PSBA-g-Furan and cross-linked films PSBA-X.



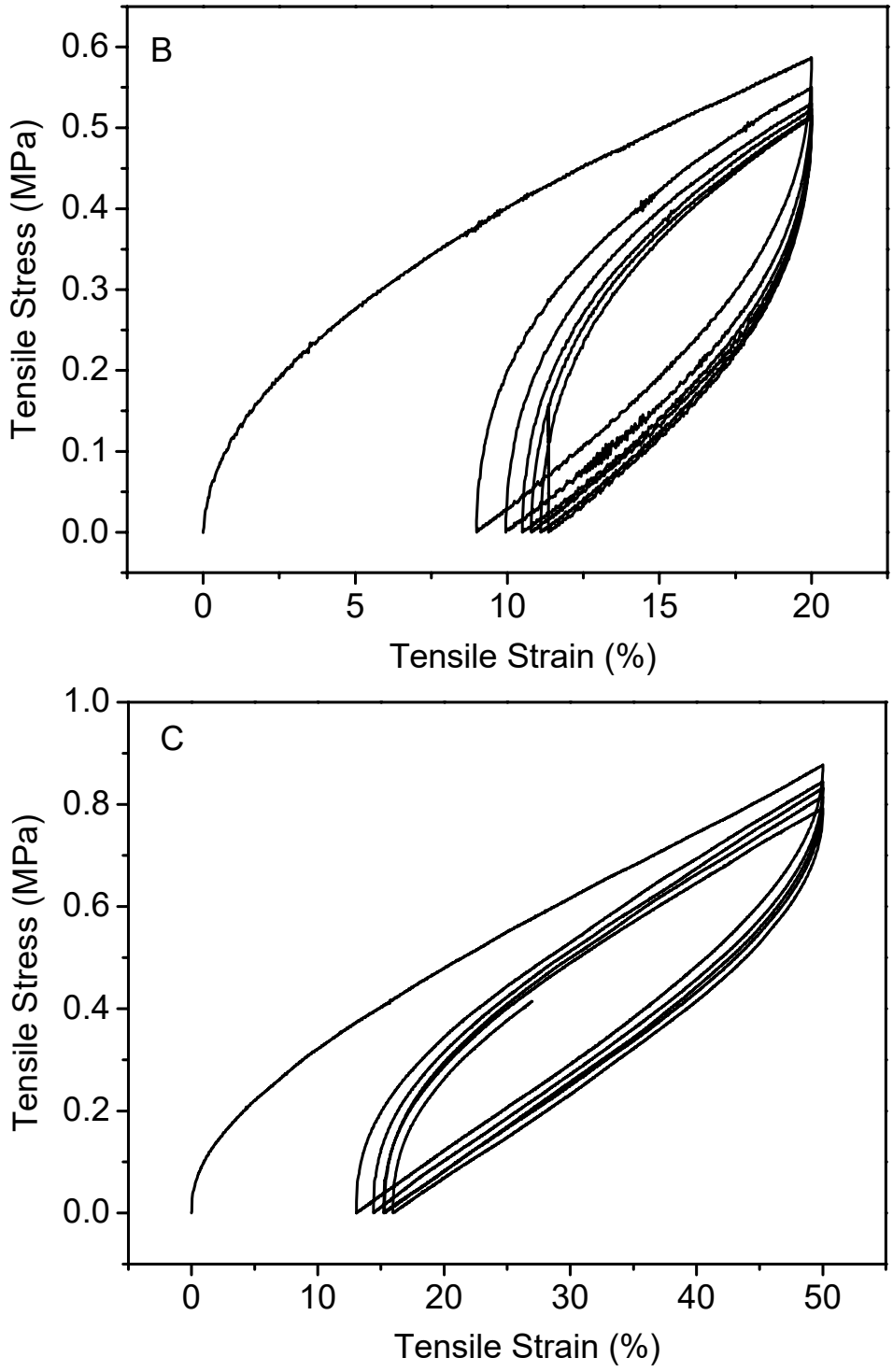


Figure S4. Cyclic tensile test of (A) PSBA-12 with maximum strain of 20%, (B) PSBMA-10 with maximum strain of 20%; and (C) PSBMA-10 with maximum strain of 50%.

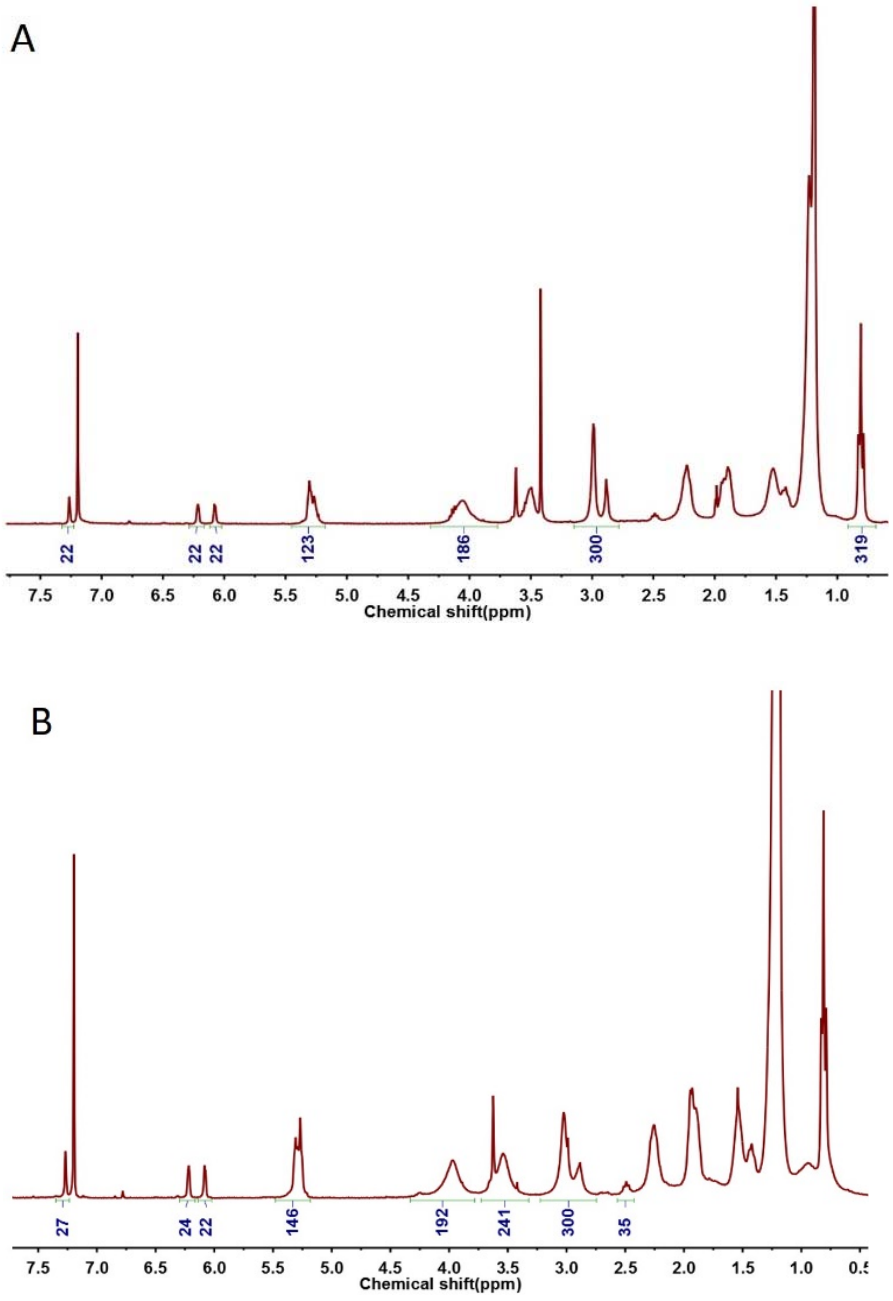


Figure S5. ^{1}H NMR spectra of recycled (A) PSBA-g-Furan and (B) PSBMA-g-Furan.

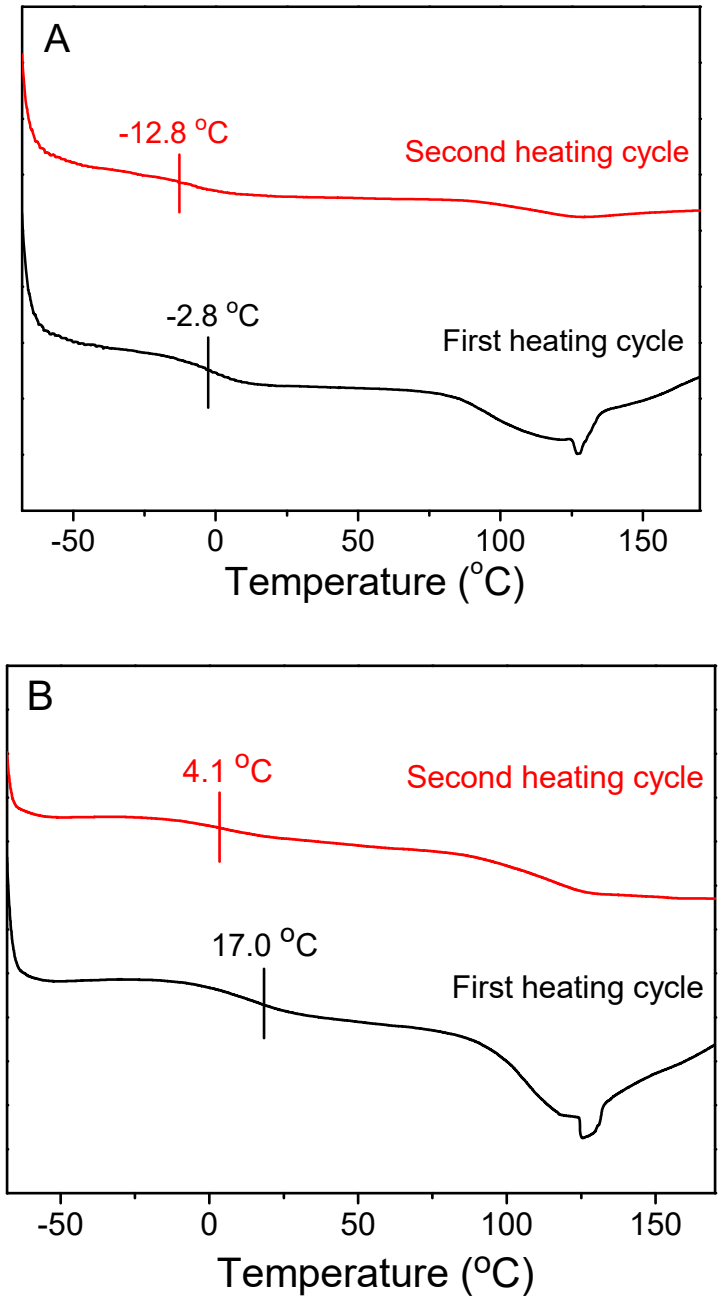


Figure S6. The first and the second heating cycles of DSC curves for films (A) PSBA-12 and (B) PSBMA-10.