Supplementary Information

Amidation of Triglycerides by Amino Alcohols and Their Impact on Plant Oil-Derived Polymers

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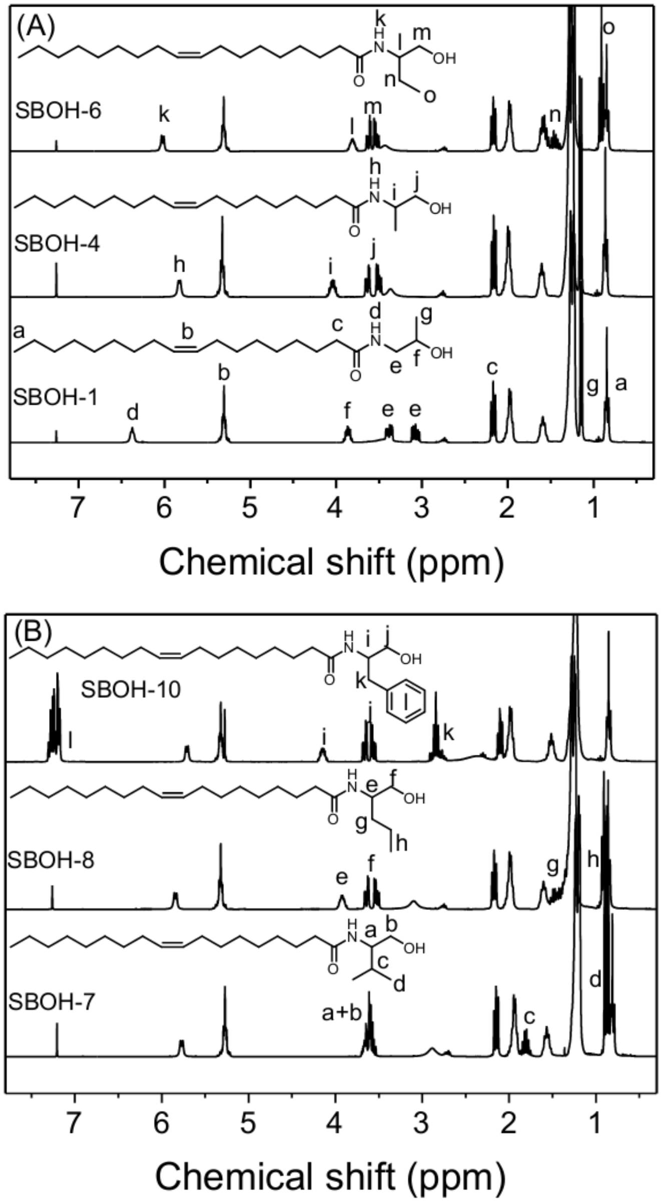


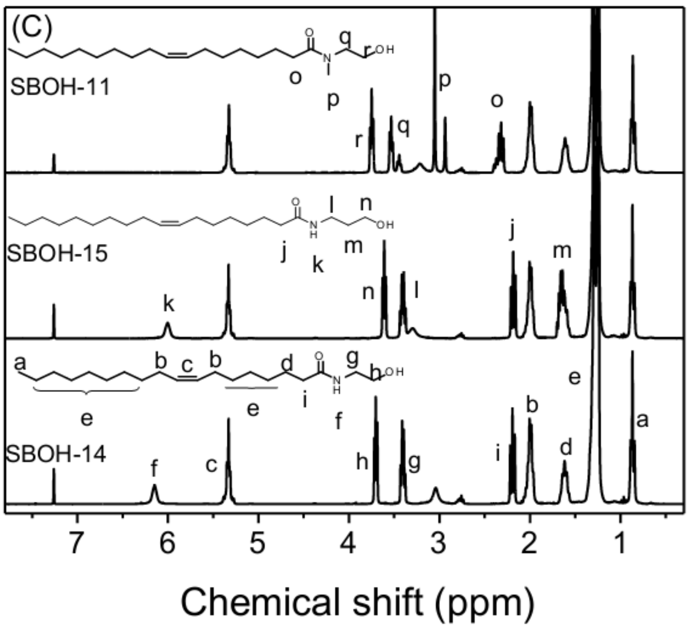
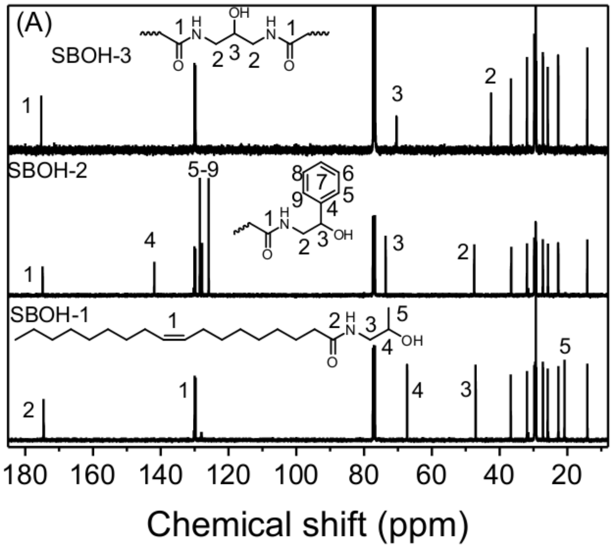
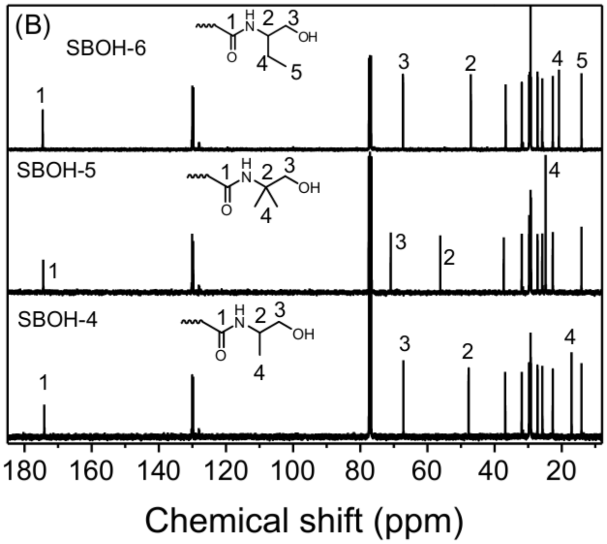
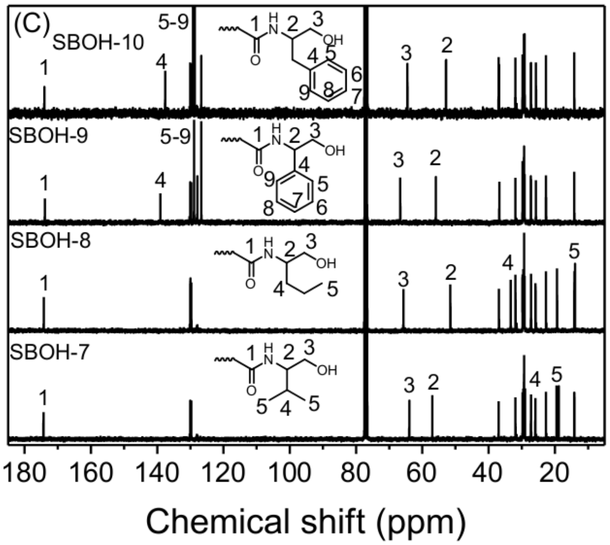
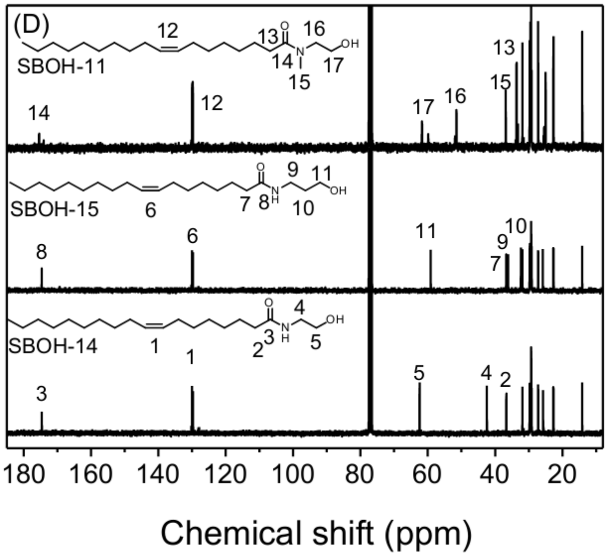


Fig. S1 ^{1}H NMR spectra of (A) SBOH-1, SBOH-4 & SBOH-6 and (B) SBOH-7, SBOH-8 & SBOH-10. (C) SBOH-11, SBOH-14 & SBOH-15.




(B)
SBOH-6
SBOH-5
SBOH-4
1
2
3
4
5
OH
O
H
N
180
160
140
120
100
80
60
40
20
Chemical shift (ppm)


(C)
SBOH-10
SBOH-9
SBOH-8
SBOH-7
5-9
1
2
3
4
5
6
7
8
9
OH
O
H
N
180
160
140
120
100
80
60
40
20
Chemical shift (ppm)


(D)
SBOH-11
SBOH-15
SBOH-14
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
OH
O
H
N
180
160
140
120
100
80
60
40
20
Chemical shift (ppm)

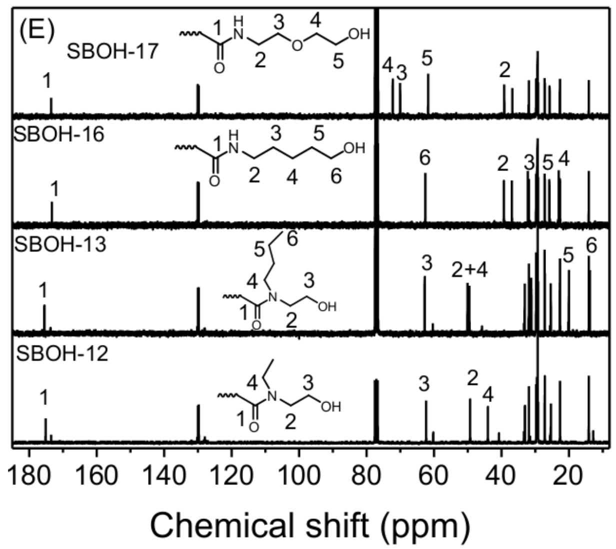
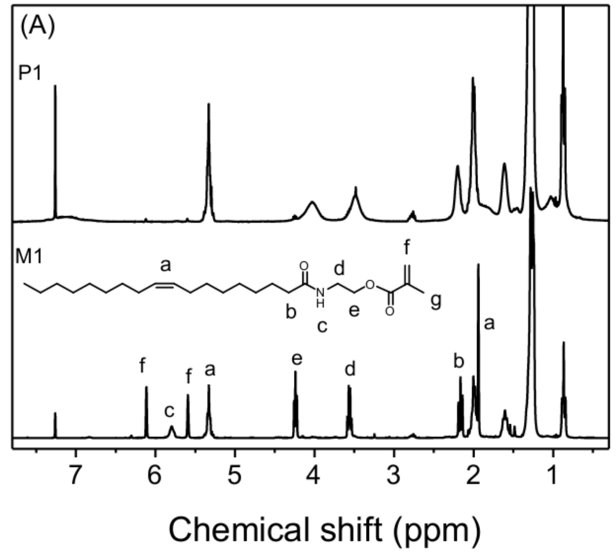
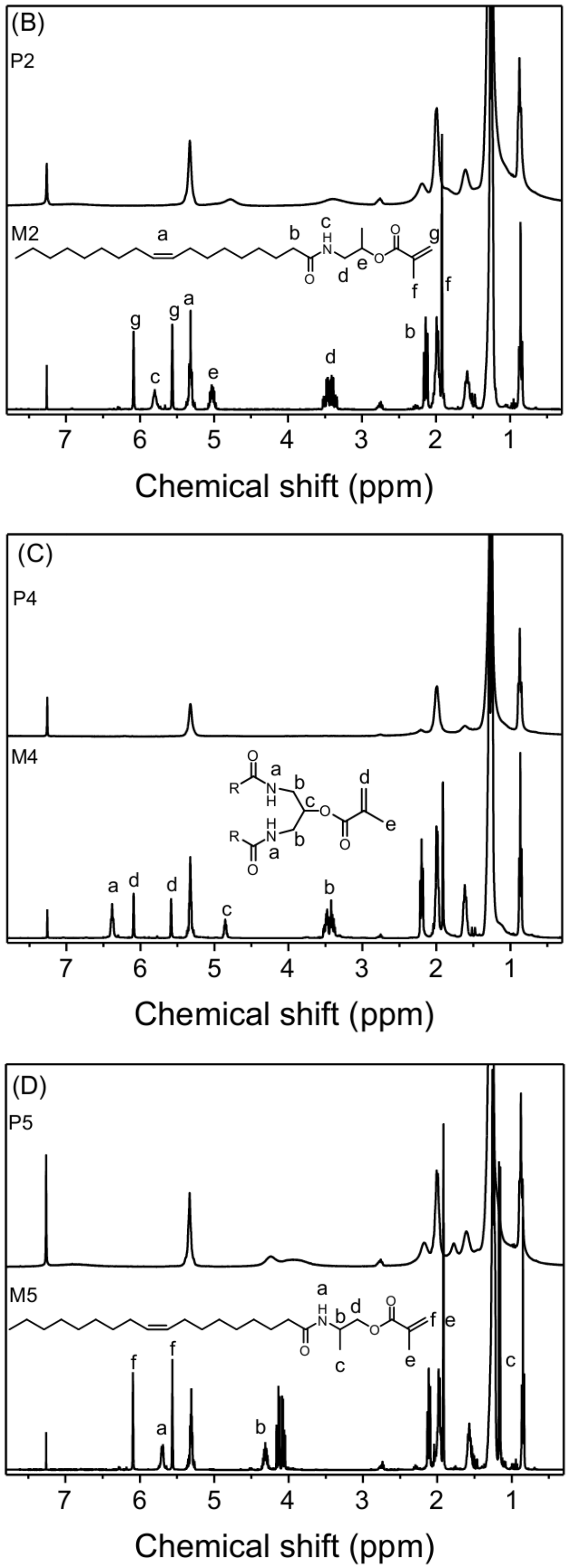
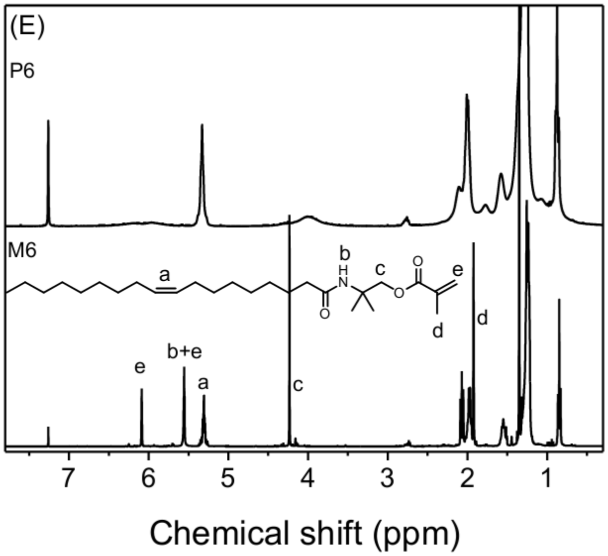
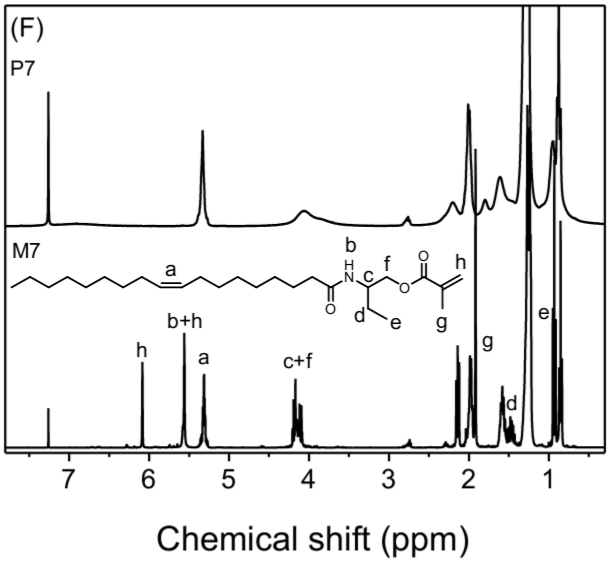


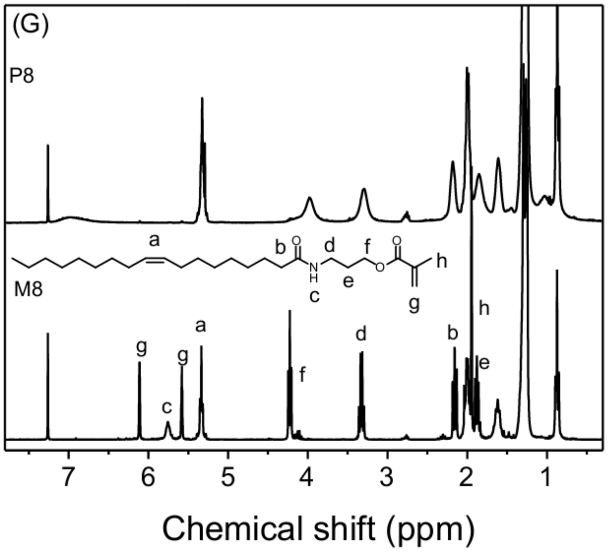
Fig. S2 ^{13}C NMR spectra of (A) SBOH-1, SBOH-2 & SBOH-3; (B) SBOH-4, SBOH-5 & SBOH-6; (C) SBOH-7, SBOH-8, SBOH-9 & SBOH-10; (D) SBOH-11, SBOH-14 & SBOH-15; (E) SBOH-12, SBOH-13, SBOH-16 & SBOH-17.

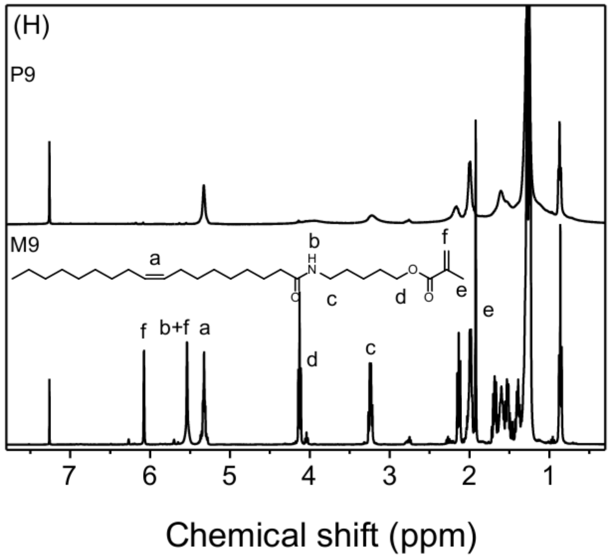


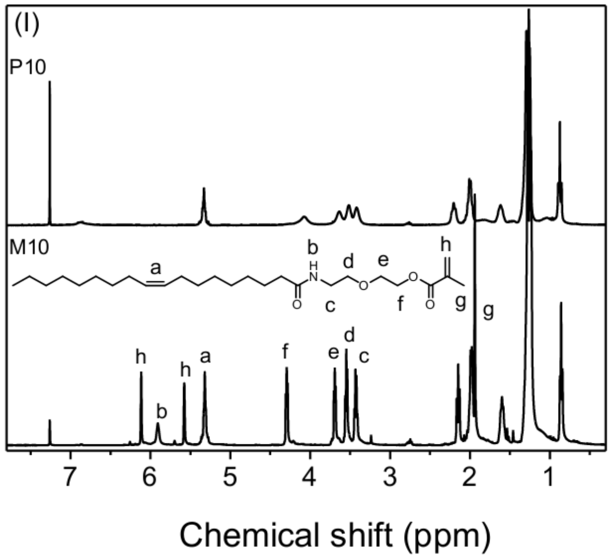

(B)
P2
M2
a
b
c
H
N
d
e
O
O
O
g
f
g
g
a
c
e
d
b
f
7
6
5
4
3
2
1
Chemical shift (ppm)
(C)
P4
M4
O
R
N
H
a
b
c
O
d
e
O
H
N
R
O
b
a
a
d
d
c
b
7
6
5
4
3
2
1
Chemical shift (ppm)
(D)
P5
M5
a
H
N
b
d
O
O
O
f
e
c
e
f
f
a
b
c
7
6
5
4
3
2
1
Chemical shift (ppm)

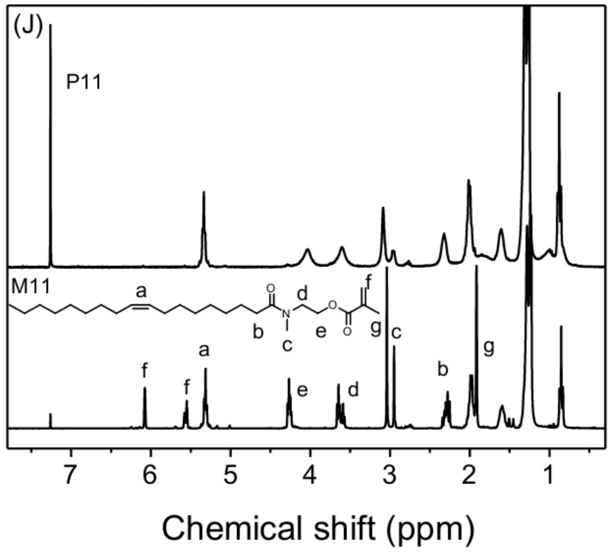

(E)
P6
M6
a
b
c
e
d
e
b+e
a
c
d
7
6
5
4
3
2
1
Chemical shift (ppm)

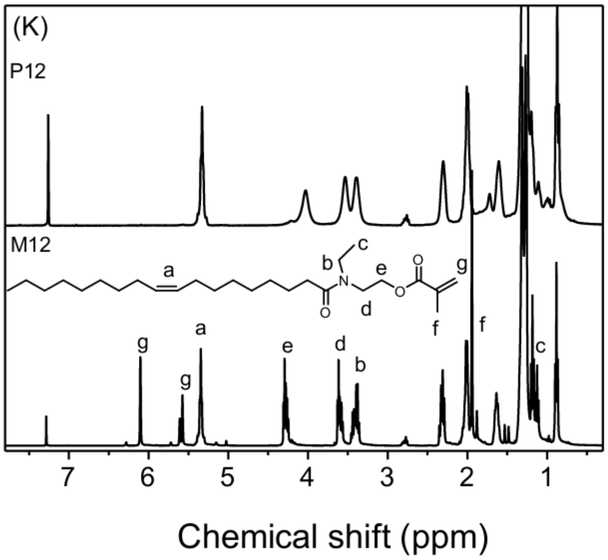

(F)
P7
M7
a
b
f
h
c
d
e
g
h
b+h
a
c+f
g
e
d
7
6
5
4
3
2
1
Chemical shift (ppm)

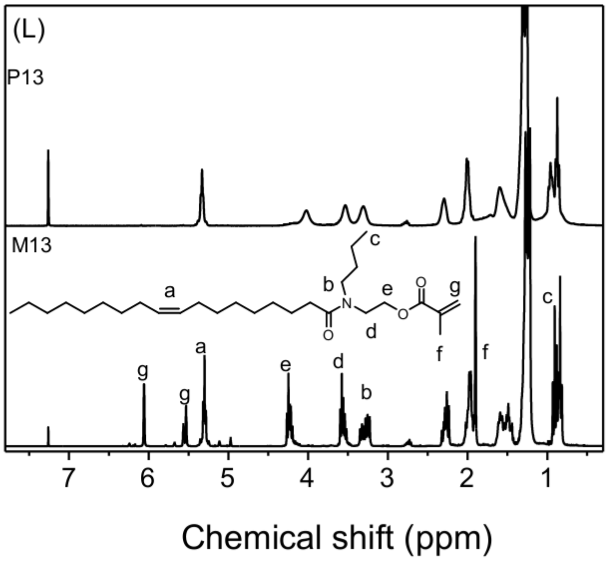

(G)
P8
a
b
d
f
h
c
e
g
M8
g
a
g
c
f
d
b
h
e
7
6
5
4
3
2
1
Chemical shift (ppm)

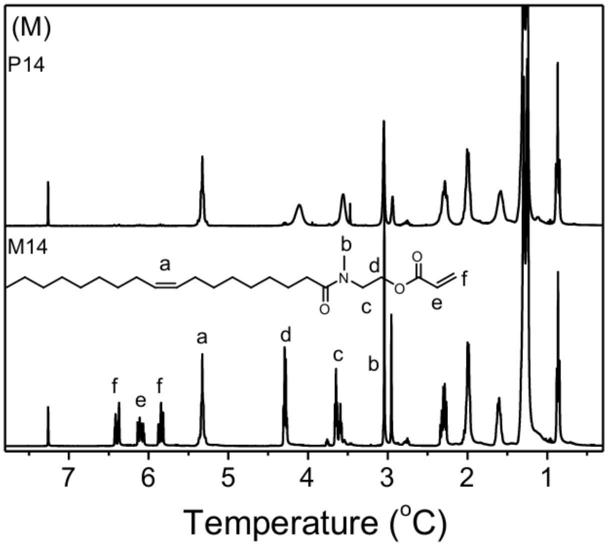

(H)
P9
M9
a
b
H
c
d
f
e
O
f
b+f
a
d
c
e
7
6
5
4
3
2
1
Chemical shift (ppm)


(I)
P10
M10
a
b
H
d
e
h
O
c
f
g
g
h
h
a
b
f
e
d
c
7
6
5
4
3
2
1
Chemical shift (ppm)


(J)
P11
M11
a
O
d
N
f
b
c
e
g
c
f
f
a
e
d
b
g
7
6
5
4
3
2
1
Chemical shift (ppm)


(K)
P12
M12
a
b
c
d
e
g
f
g
a
e
d
b
g
f
c
7
6
5
4
3
2
1
Chemical shift (ppm)


(L)
P13
M13
c
b
a
e
g
d
f
g
a
e
d
b
g
f
c
7
6
5
4
3
2
1
Chemical shift (ppm)


(M)
P14
M14
b
a
d
f
c
e
a
d
c
b
f
e
f
7
6
5
4
3
2
1
Temperature (°C)

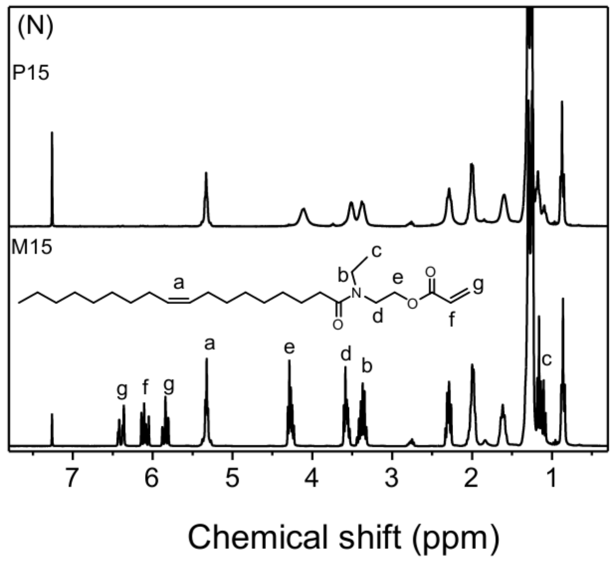
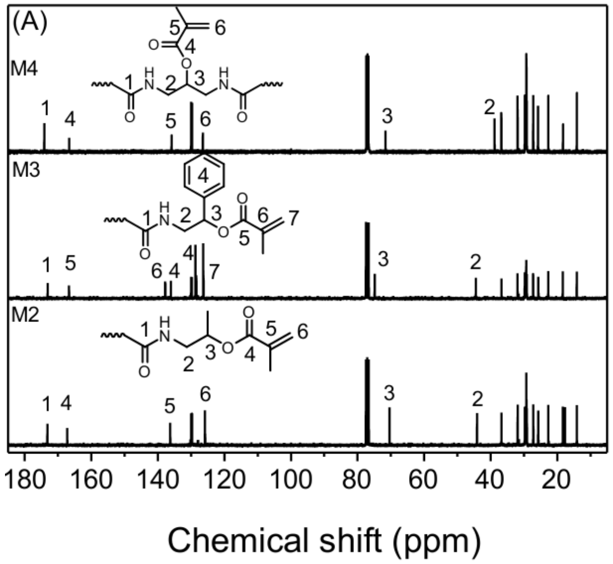
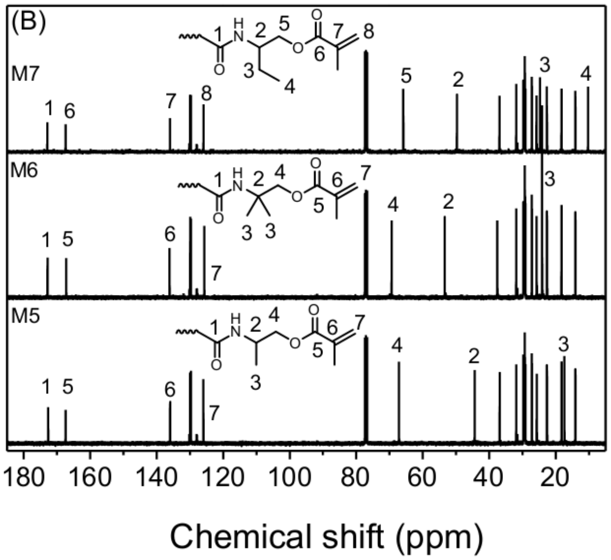
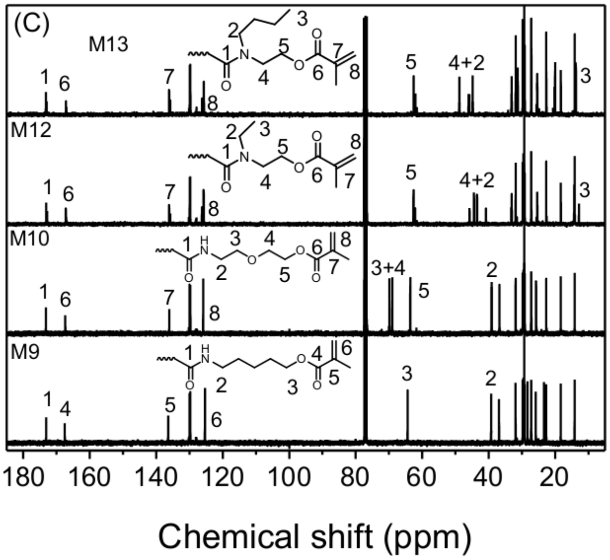
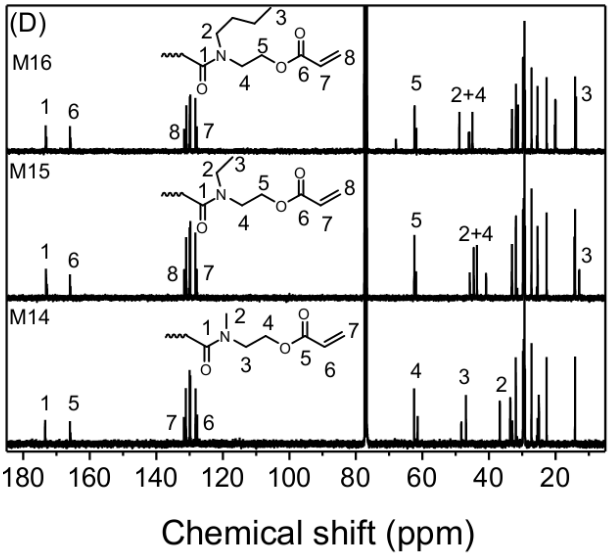


Fig. S3 ^{1}H NMR spectra of polymers paired with their corresponding precursor monomers: (A) M1 & P1; (B) M2 & P2; (C) M4 & P4; (D) M5 & P5; (E) M6 & P6; (F) M7 & P7; (G) M8 & P8; (H) M9 & P9; (I) M10 & P10; (J) M11 & P11; (K) M12 & P12; (L) M13 & P13; (M) M14 & P14 and (N) M15 & P16.




(B)
M7
M6
M5
180 160 140 120 100 80 60 40 20
Chemical shift (ppm)


(C)
M13
M12
M10
M9
180 160 140 120 100 80 60 40 20
Chemical shift (ppm)


(D)
M16
M15
M14
180 160 140 120 100 80 60 40 20
Chemical shift (ppm)

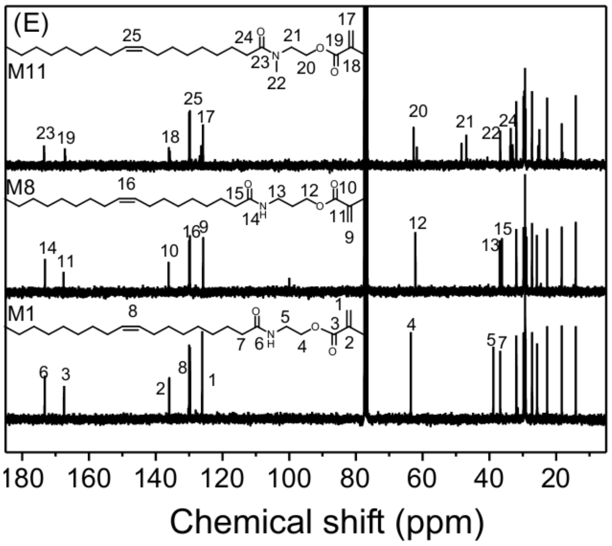


Fig. S4 ^{13}C NMR spectra of all the synthesized monomers: (A) M2, M3 & M4; (B) M5, M6 & M7; (C) M9, M10, M12 & M13; (D) M14, M15 & M16; (E) M1, M8 & M11.

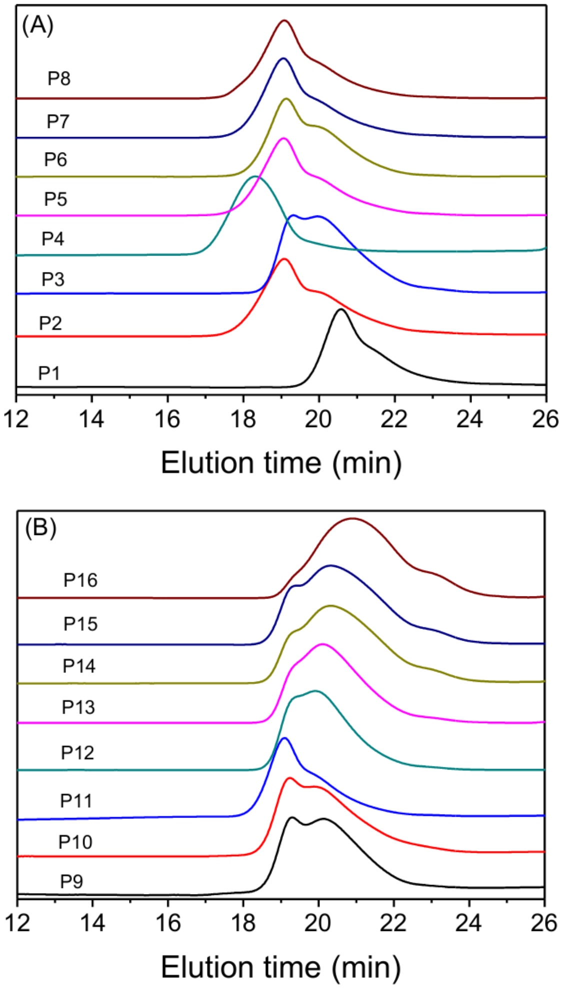


Fig. S5 GPC traces of all the synthesized polymers, (A) P1-P8 and (B) P9-P16.

Table S1 Reaction conditions for polymerization of M1-M16.

Monomer	Monomer amount	Toluene (mL)	Initiator Amount [a]	Temperature (°C)	Time (h)
M1	3.14 g (8.0 mmol)	3.6	13.2 mg (0.08 mmol)	80	12
M2	3.0 g (7.4 mmol)	6.0	12.0 mg (0.074 mmol)	75	4.5
M3	2.0 g (4.3 mmol)	4.0	10.0 mg (0.061 mmol)	75	6
M4	4.0 g (5.8 mmol)	12.0	13.0 mg (0.079 mmol)	70	2
M5	2.0 g (4.9 mmol)	5.0	10.0 mg (0.061 mmol)	75	5.5
M6	2.3 g (5.4 mmol)	5.0	10.0 mg (0.061 mmol)	75	5.5
M7	2.0 g (4.8 mmol)	4.0	8.0 mg (0.052 mmol)	80	5.5
M8	3.26 (8 mmol)	3.6	13.2 mg (0.08 mmol)	80	12
M9	2.4 g (5.5 mmol)	6.0	7.4 mg (0.048 mmol)	80	2.5
M10	4.4 g (10 mmol)	6.0	16.4 mg (0.1 mmol)	80	3.5
M11	5.0 g (12 mmol)	9.0	20 mg (0.12 mmol)	80	20.0
M12	2.0 g (4.7 mmol)	4.0	10 mg (0.061 mmol)	75	6
M13	2.0 g (4.4 mmol)	4.0	10 mg (0.061 mmol)	75	6
M14	2.0 g (5.1 mmol)	2.0	10 mg (0.041 mmol)	100	7
M15	2.0 g (4.9 mmol)	2.0	10 mg (0.041 mmol)	100	7
M16	2.2 g (5.1 mmol)	2.2	10 mg (0.041 mmol)	100	7

[a] For entries 1-13, the initiator is azobisisobutyronitrile (AIBN). For entries 14-16, the initiator is benzoyl peroxide (BPO).

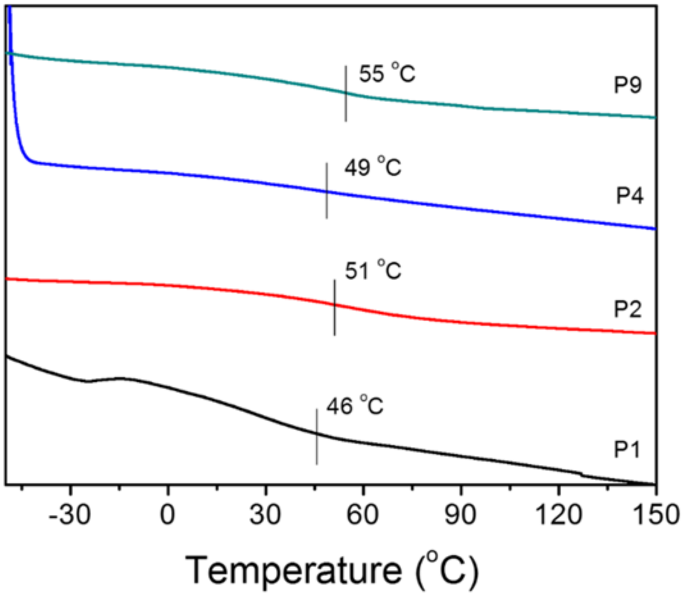


Fig. S6 DSC curves of polymers P1, P2, P4, and P9.

Table S2 Experimental parameters for the hydrogenation of polymer P8 and molecular weight of the obtained polymers with varied degree of hydrogenation.

Entry	TSH (%)	Time (h)	Hydrogenation degree	M_n (g/mol)[a]	Đ
P8	N/A	N/A	0%	60,600	2.2
P8-H12	30	2.5	12%	55,600	2.0
P8-H30	200	0.5	30%	58,700	2.0
P8-H40	45	2.5	40%	59,000	2.0
P8-H56	60	2.5	56%	52,400	1.9
P8-H83	90	2.5	83%	53,300	1.8
P8-H100	200	2.0	100%	41,200	1.7

[a] The molecular weight is based on polystyrene standards from GPC characterization. The absolute molecular weight should increase with hydrogenation. The changes of molecular weight reflect variations in polymer hydrodynamic volume before and after hydrogenation.

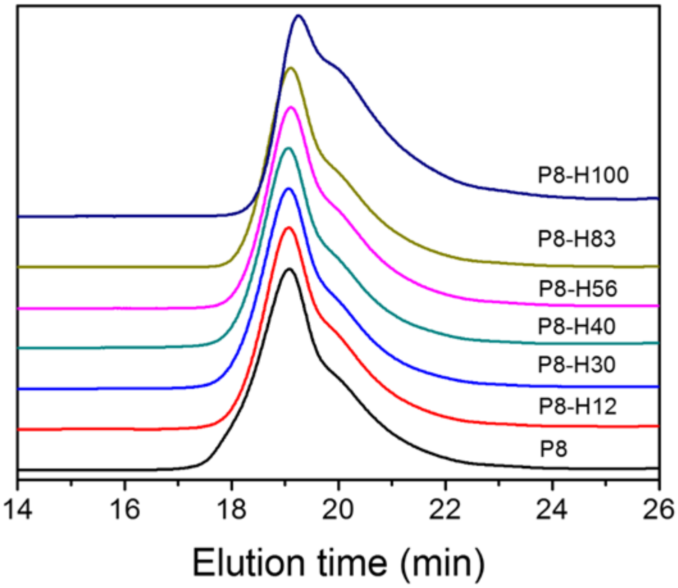


Fig. S7 GPC traces of hydrogenated P8 with varied degree of hydrogenation.

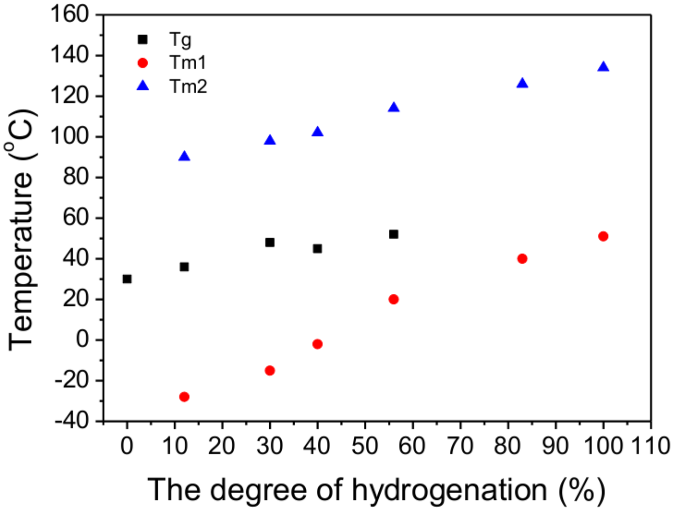


Fig. S8 The change of T_g and T_m as a function of the degree of hydrogenation (determined from DSC analysis).

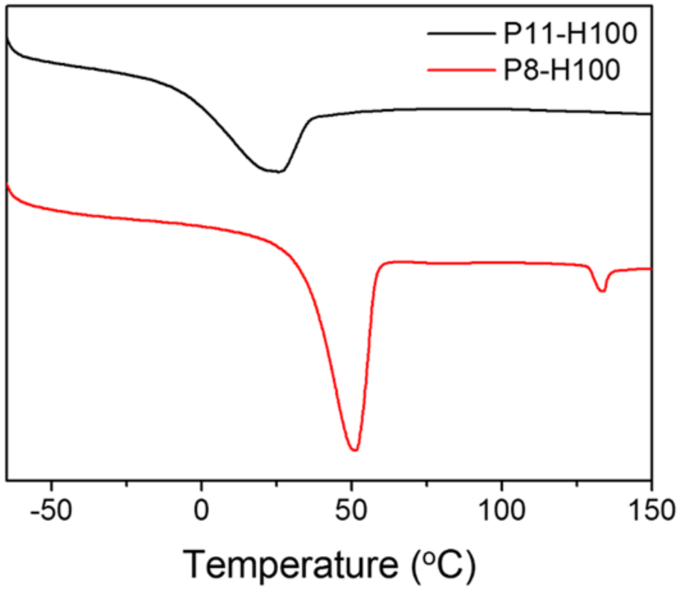
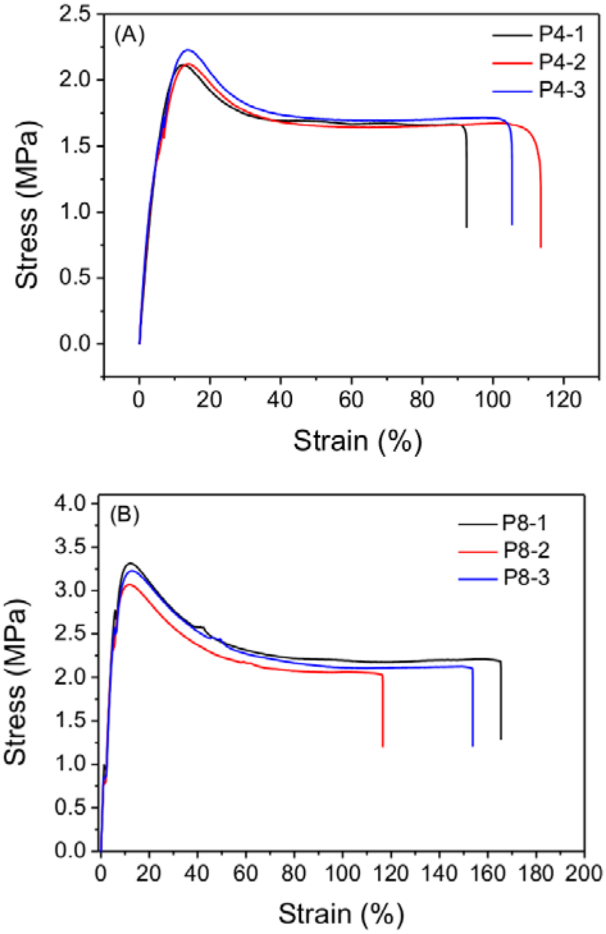
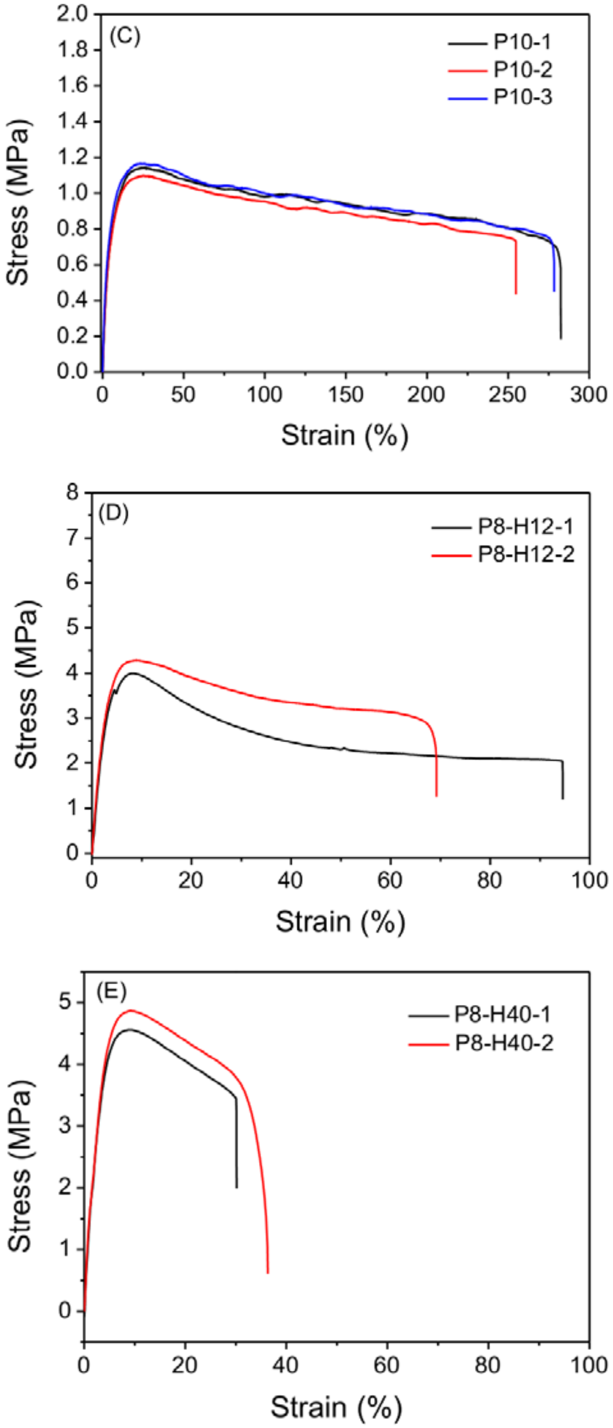


Fig. S9 DSC curves of 100% hydrogenated P8 and P11.




(C)
P10-1
P10-2
P10-3
Stress (MPa)
2.0
1.8
1.6
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
0
50
100
150
200
250
300
Strain (%)
(D)
P8-H12-1
P8-H12-2
Stress (MPa)
8
7
6
5
4
3
2
1
0
0
20
40
60
80
100
Strain (%)
(E)
P8-H40-1
P8-H40-2
Stress (MPa)
5
4
3
2
1
0
0
20
40
60
80
100
Strain (%)

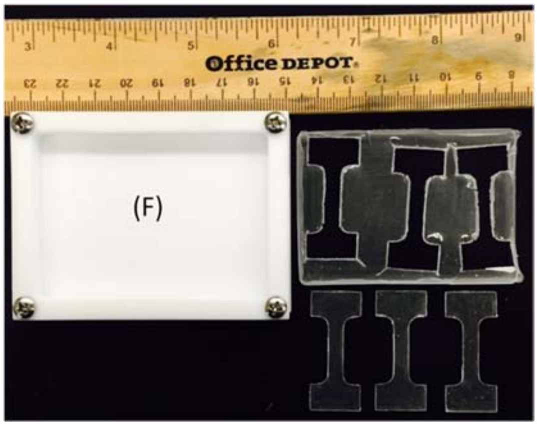


Fig. S10 Tensile stress-strain curves for (A) P4, (B) P8, (C) P10, (D) P8-H12, (E) P8-H40; and (F) a picture of a PTFE mold and dog-bone samples from P4.