Supporting Information

Diaziridyl Ether of Bisphenol A

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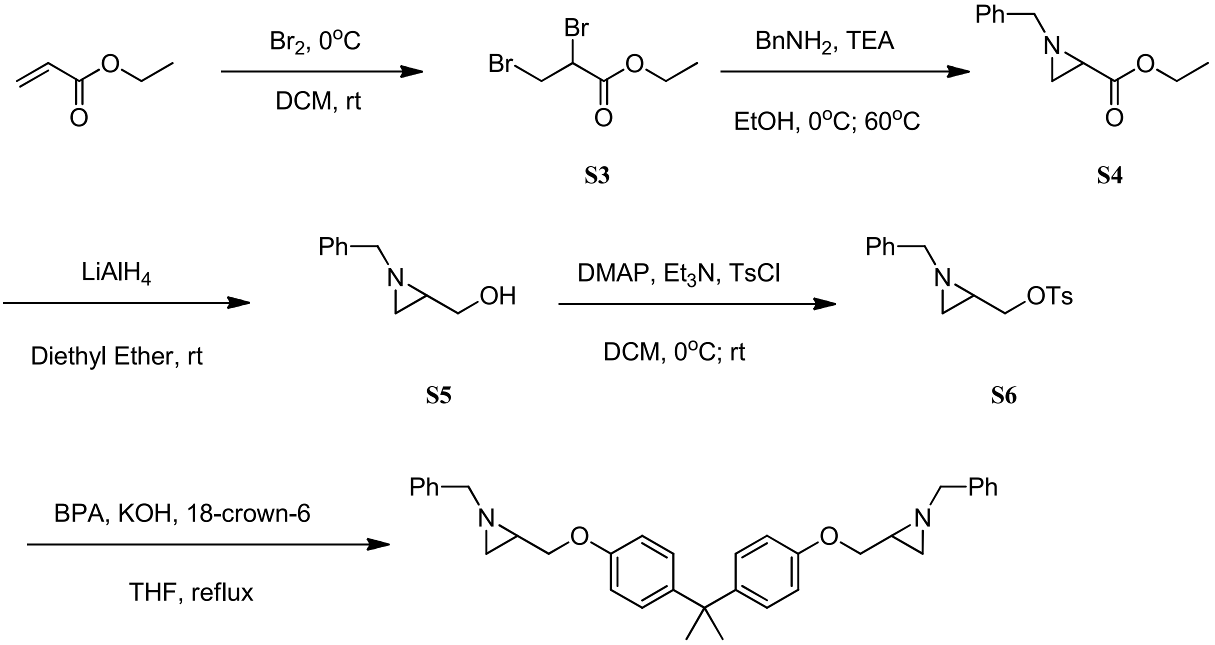
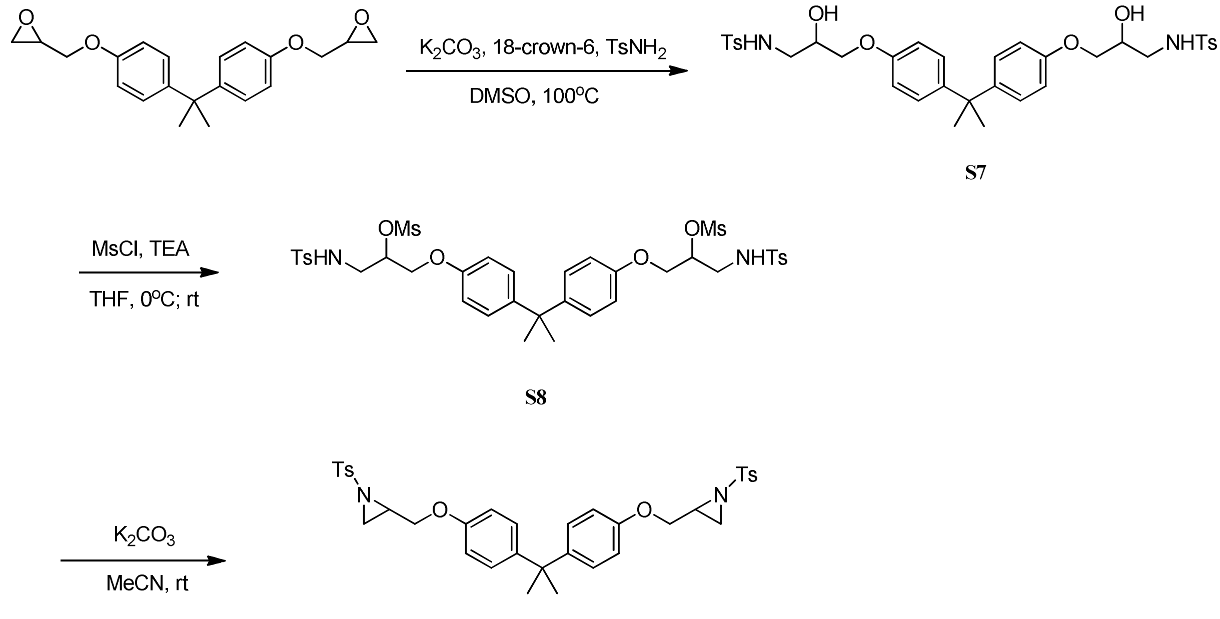


S1

Benzyl Diaziridyl Ether of Bisphenol A (Bn-DzEBA)

Scheme S1. Synthetic scheme for the preparation of 2,2'-(((propane-2,2-diylbis(4,1-phenylene))bis(oxy))bis(methylene))bis(1-benzylaziridine) (**S1**).



S2
Tosyl Diaziridyl Ether of Bisphenol A (Ts-DzEBA)

Scheme S2. Synthetic scheme for the preparation of 2,2'-(((propane-2,2-diylbis(4,1-phenylene))bis(oxy))bis(methylene))bis(1-tosylaziridine) (**S2**).

Figure S1. (a) Photos of three types of resins (Bn-DzEBA, DGEBA, and Ts-DzEBA) (b) UV-vis absorbance spectra of Bn-DzEBA, DGEBA, and Ts-DzEBA in EtOH solution. The both DzEBAs exhibited two significant absorbance peaks for the wavelength range 200 – 250 nm resulting from phenyl rings. The optical properties of DzEBAs can be easily tuned by choosing different *N*-substituents.

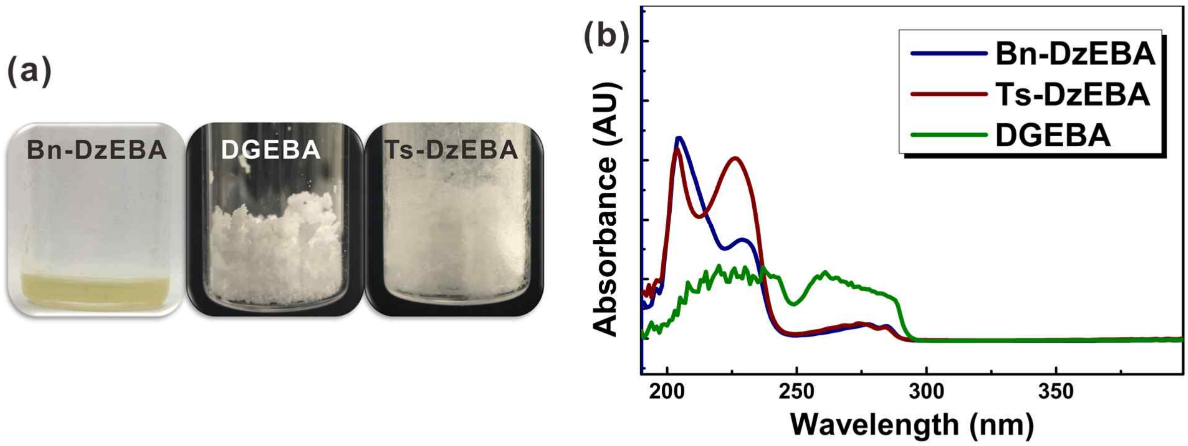


Figure S2. (a) Reaction scheme of Bn-DzEBA and dodecanedioic acid (DDDA). (b) ^{1}H NMR spectra measured at different reaction times. (c) The corresponding plot of conversion ratio against reaction time.

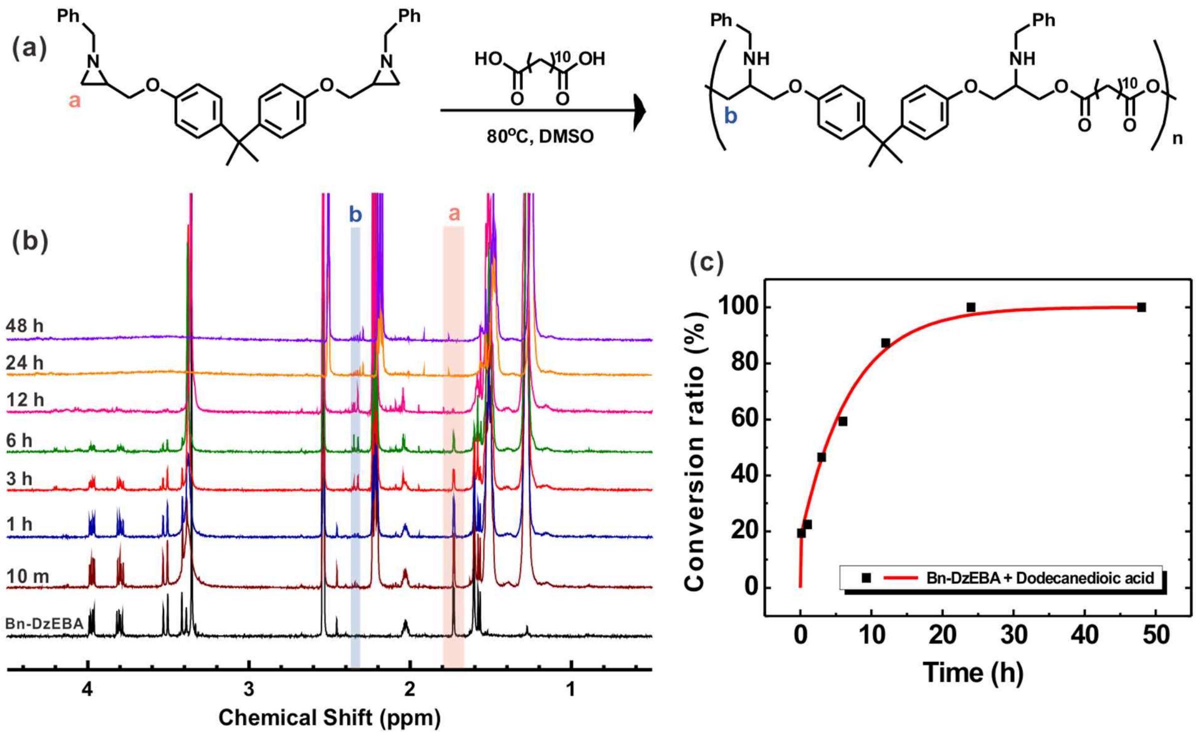


Figure S3. (a) Reaction scheme of DGEBA and DDDA (b) ^{1}H NMR spectra measured at different reaction times. (c) The corresponding plot of conversion ratio against reaction time.

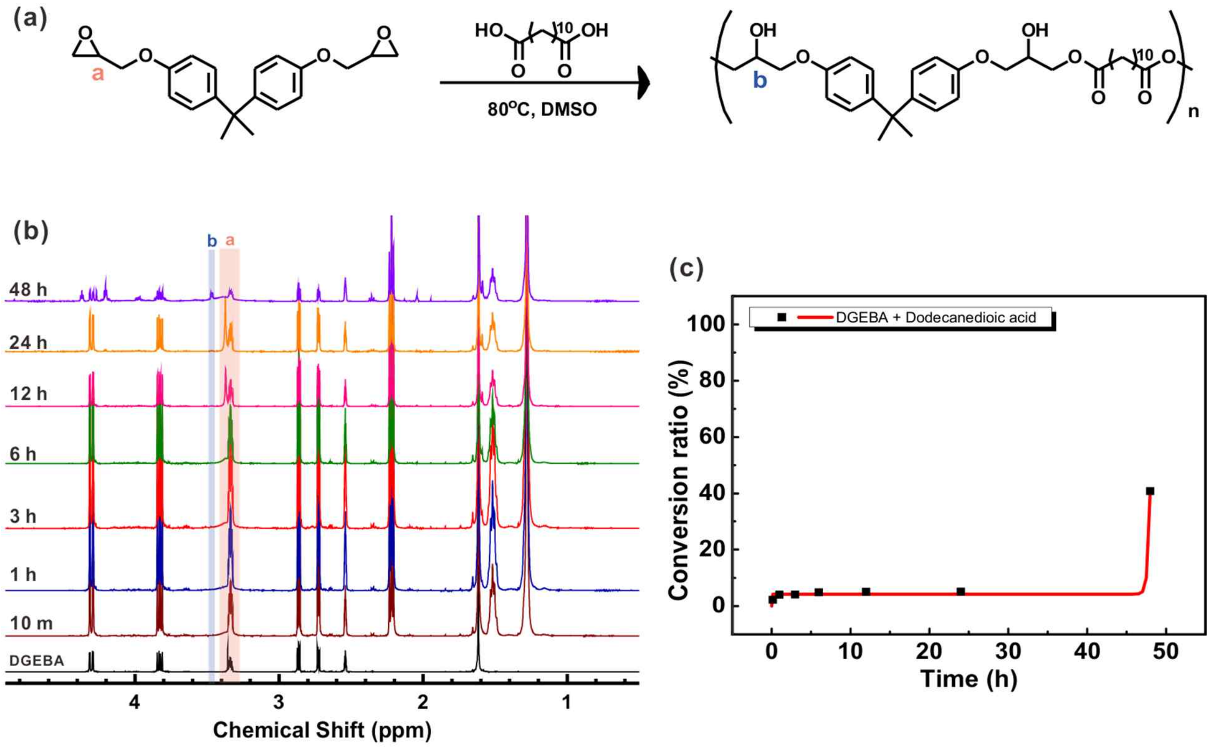


Figure S4. (a) Reaction scheme of Ts-DzEBA and DDDA. (b) [1]H NMR spectra measured at different reaction times. (c) The corresponding plot of conversion ratio against reaction time.

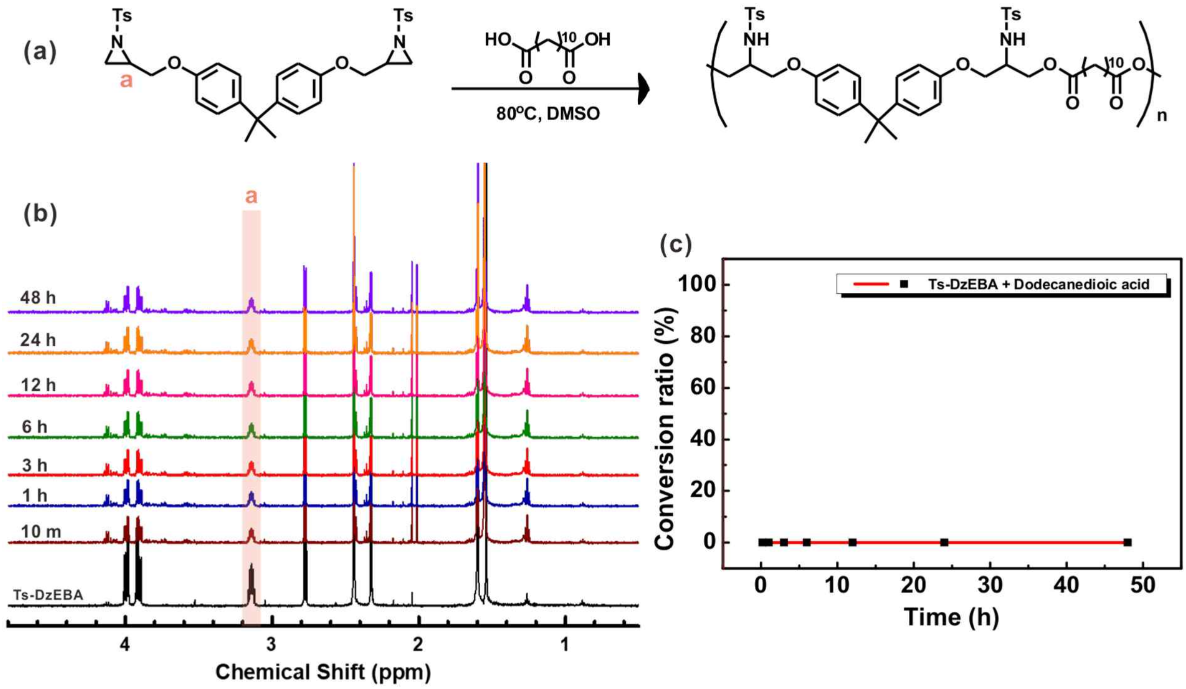


Figure S5. (a) Reaction scheme of Bn-DzEBA and terephthalic acid (TPA). (b) ^{1}H NMR spectra measured at different reaction times. (c) The corresponding plot of conversion ratio against reaction time.

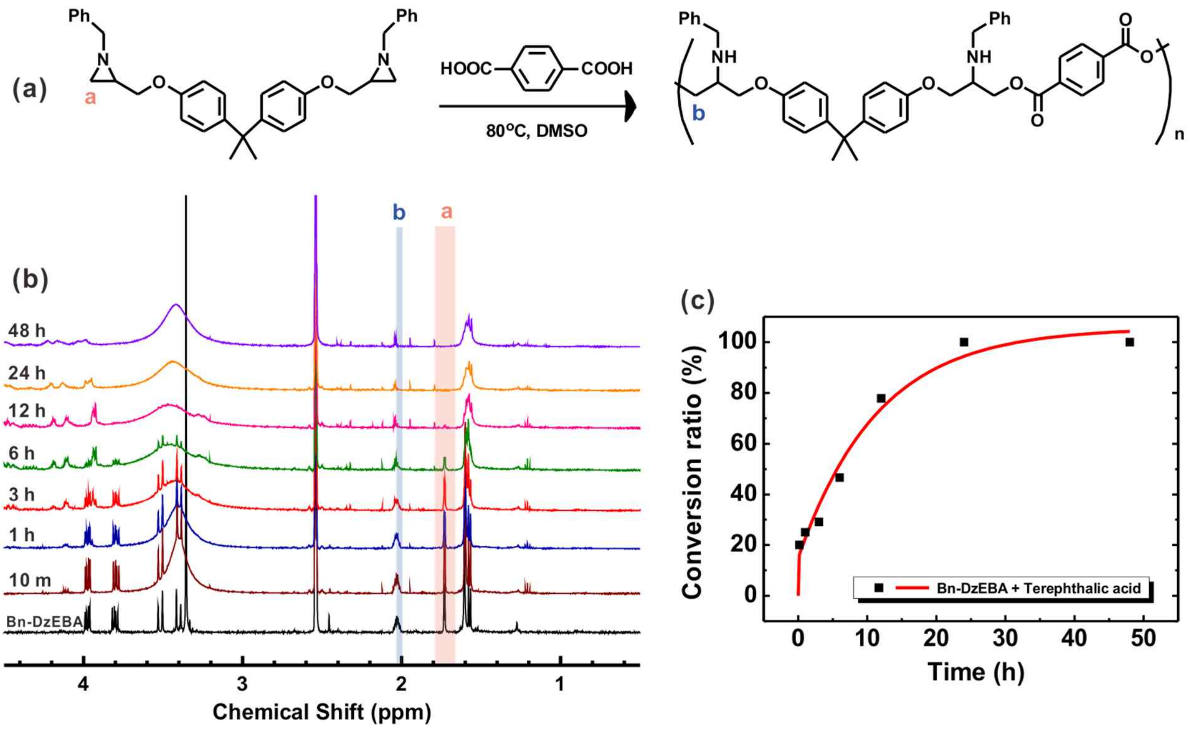


Figure S6. (a) Reaction scheme of DGEBA and TPA. (b) ^{1}H NMR spectra measured at different reaction times. (c) The corresponding plot of conversion ratio against reaction time.

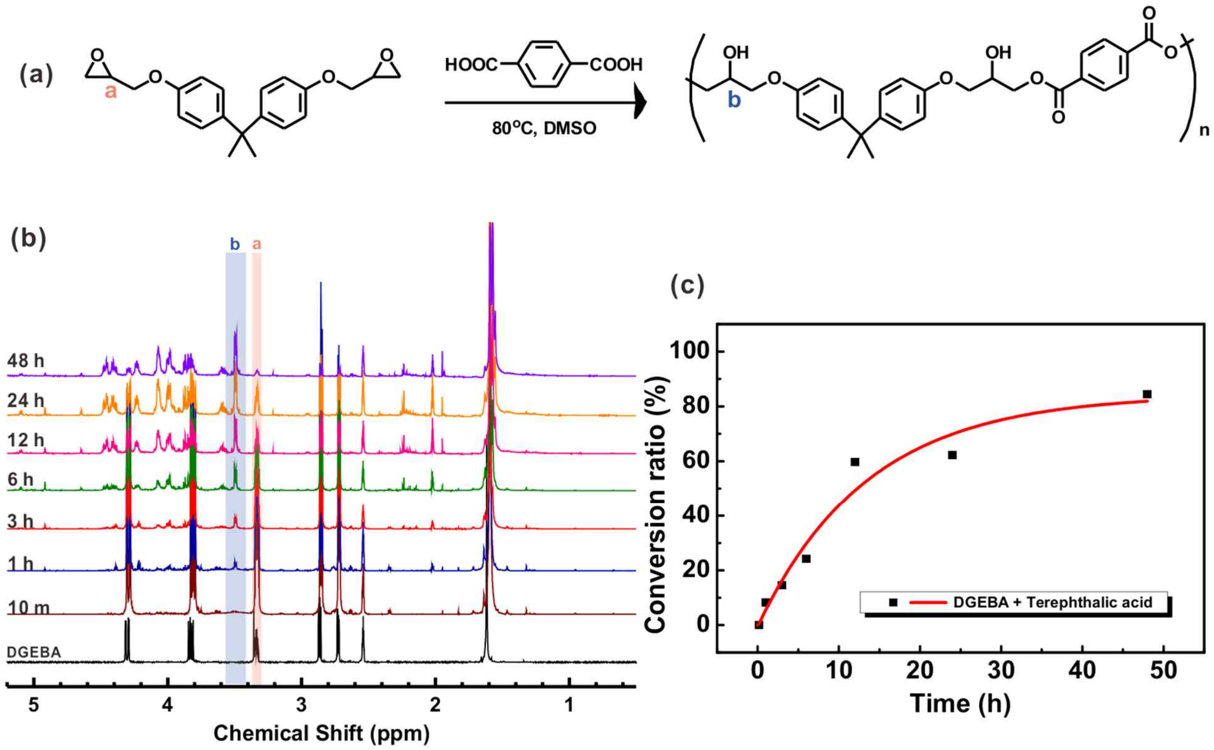


Figure S7. (a) Reaction scheme of Ts-DzEBA and TPA. (b) ^{1}H NMR spectra measured at different reaction times. (c) The corresponding plot of conversion ratio against reaction time.

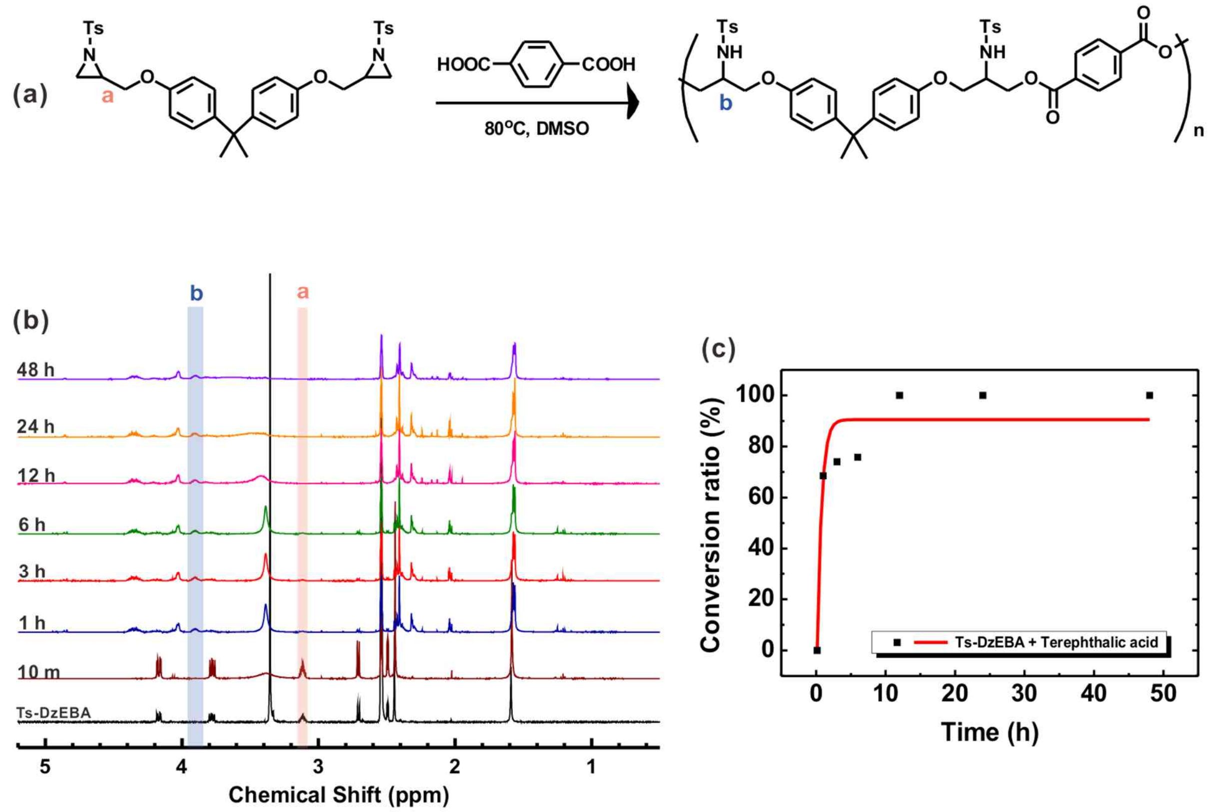


Figure S8. (a) Reaction scheme of Bn-DzEBA and ethylenediamine (EDA). (b) ^{1}H NMR spectra measured at different reaction times. (c) The corresponding plot of conversion ratio against reaction time.

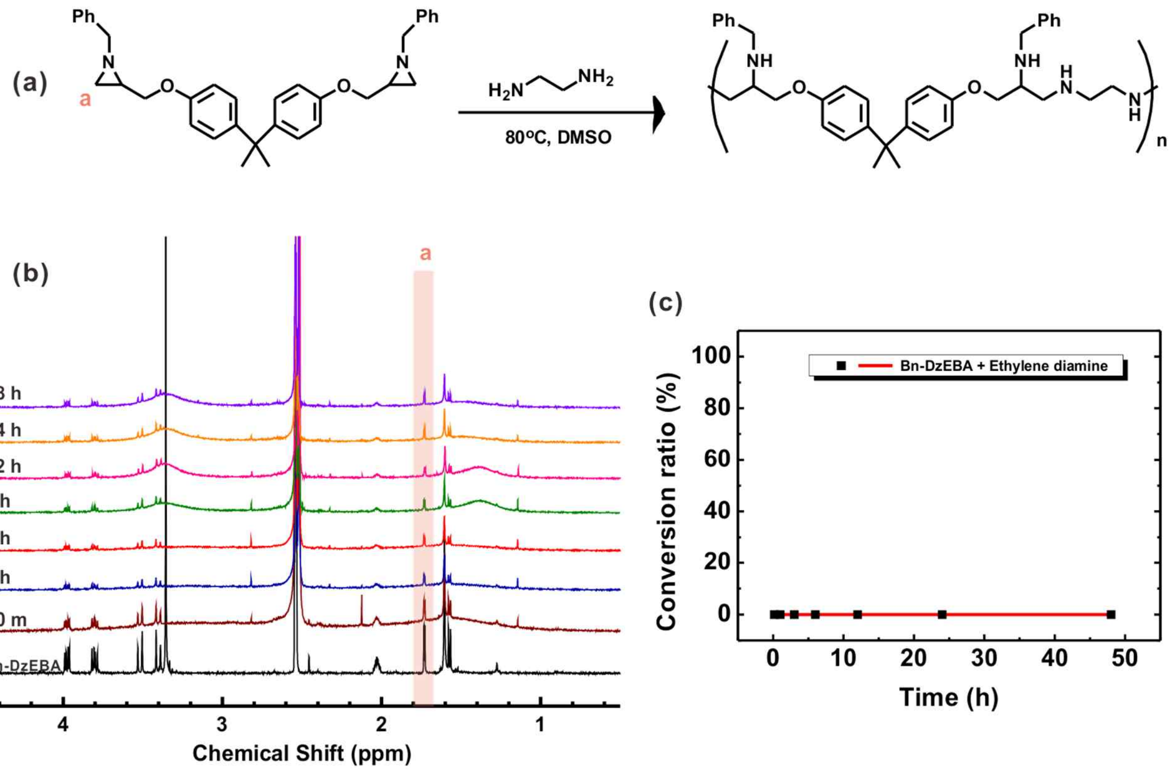


Figure S9. (a) Reaction scheme of DGEBA and EDA. (b) ^{1}H NMR spectra measured at different reaction times. (c) The corresponding plot of conversion ratio against reaction time.

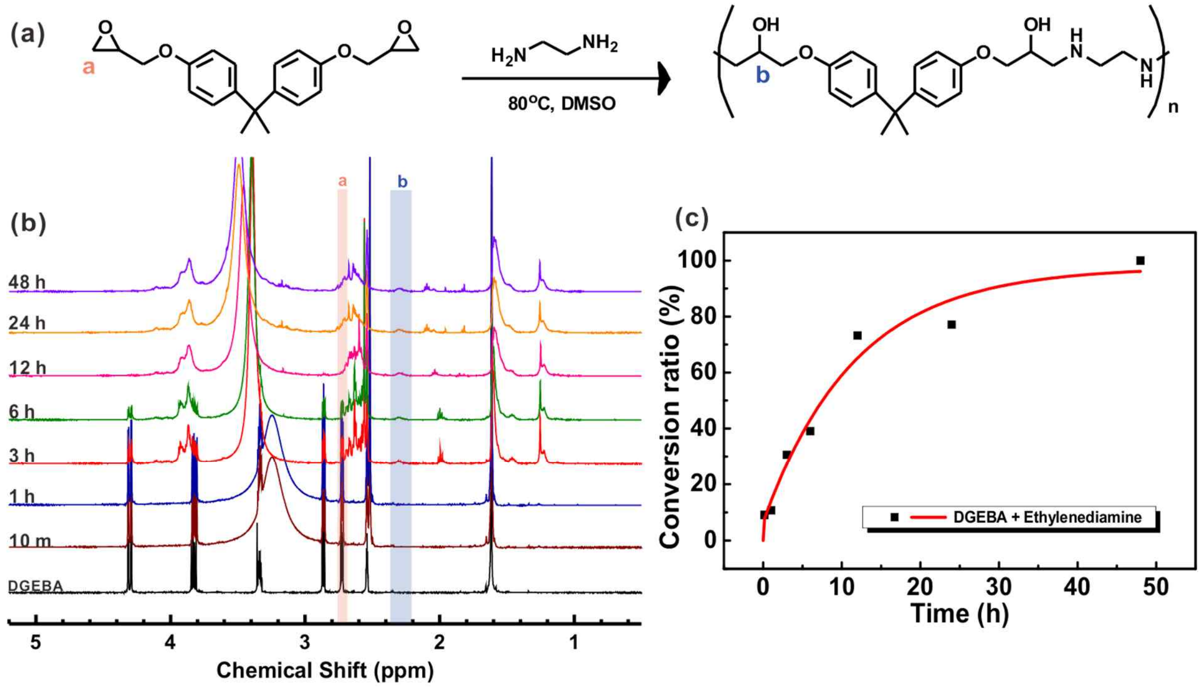


Figure S10. (a) Reaction scheme of Ts-DzEBA and EDA. (b) ^1H NMR spectra measured at different reaction times. (c) The corresponding plot of conversion ratio against reaction time.

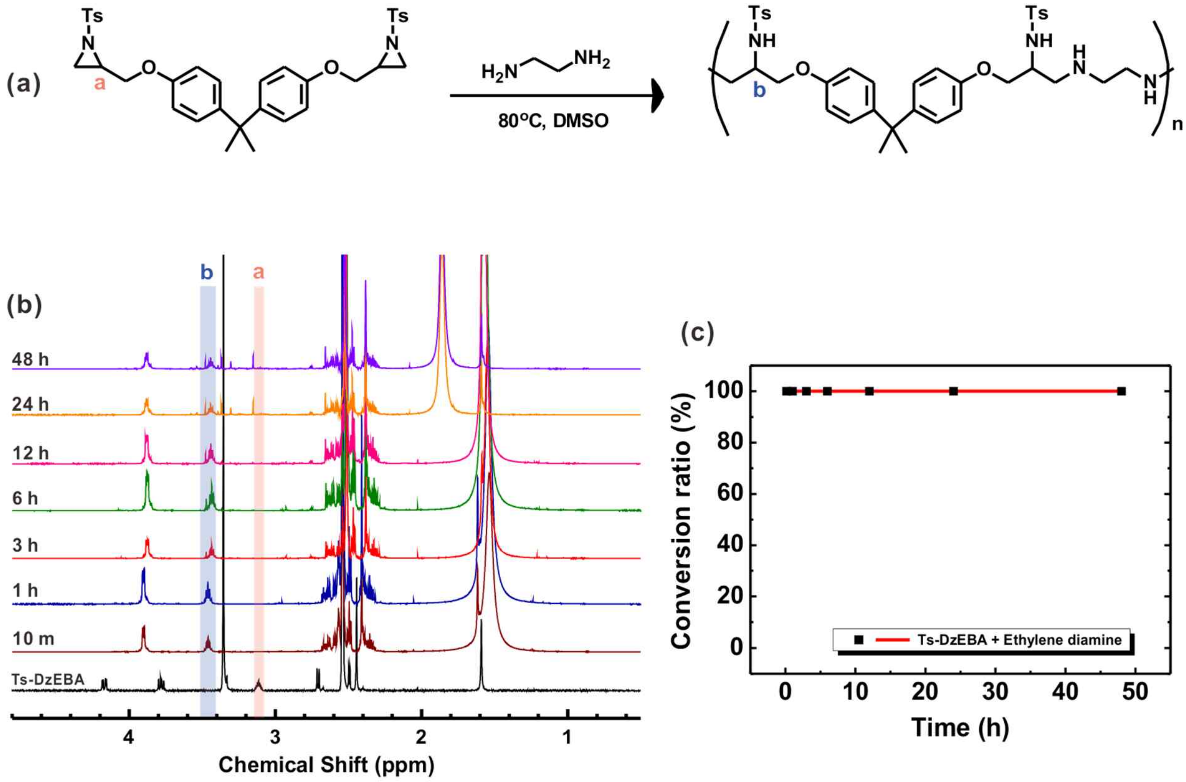


Figure S11. (a) Reaction scheme of Bn-DzEBA and *p*-phenylenediamine (PDA). (b) ^{1}H NMR spectra measured at different reaction times. (c) The corresponding plot of conversion ratio against reaction time.

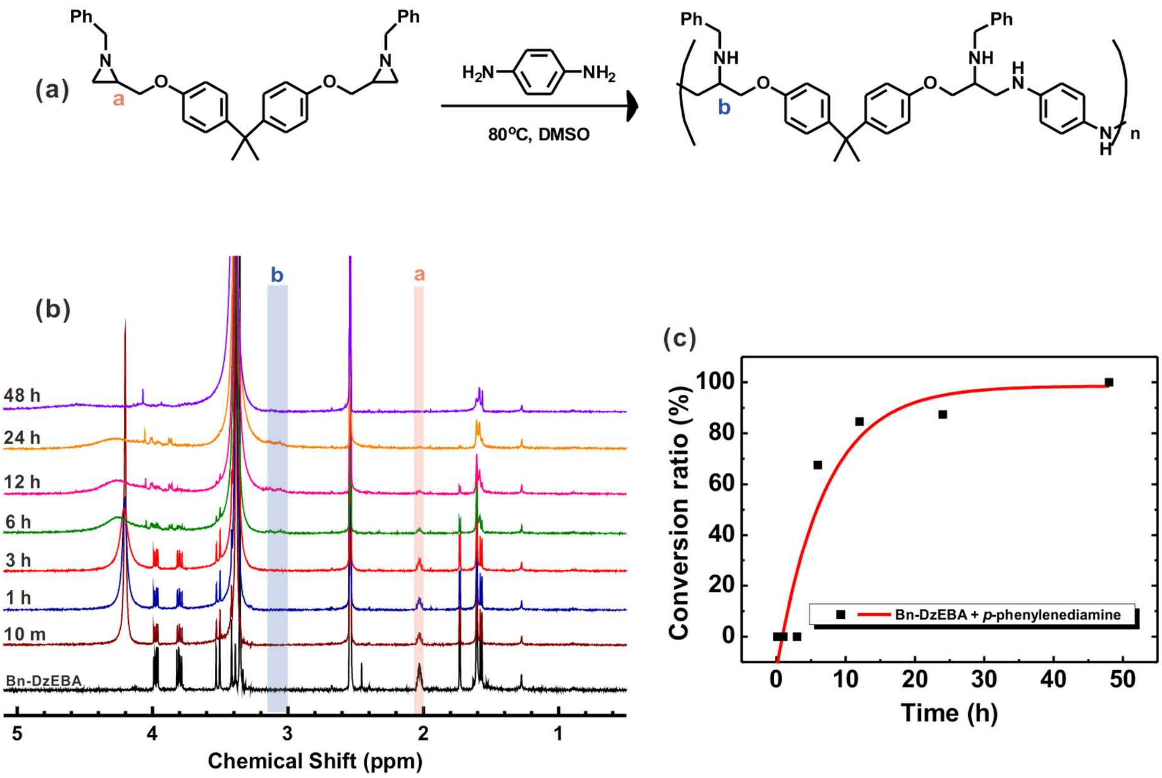


Figure S12. (a) Reaction scheme of DGEBA and PDA. (b) ^{1}H NMR spectra measured at different reaction times. (c) The corresponding plot of conversion ratio against reaction time.

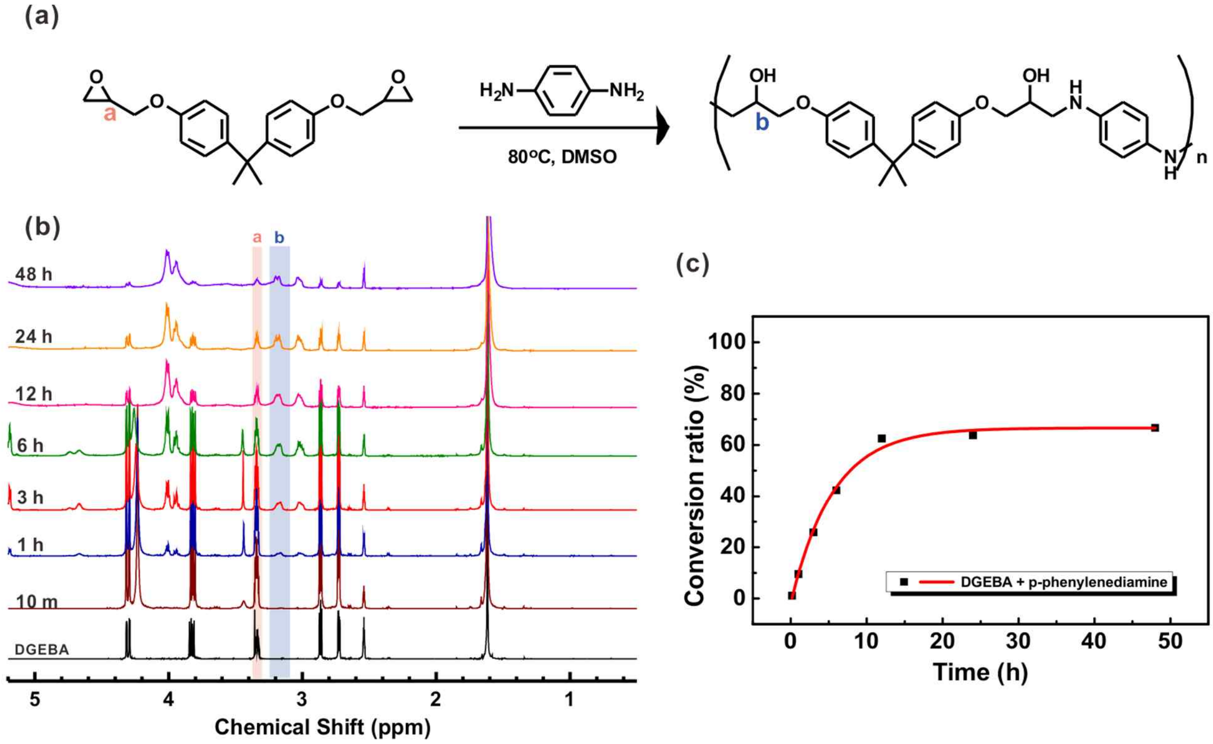


Figure S13. (a) Reaction scheme of Ts-DzEBA and PDA. (b) ^{1}H NMR spectra measured at different reaction times. (c) The corresponding plot of conversion ratio against reaction time.

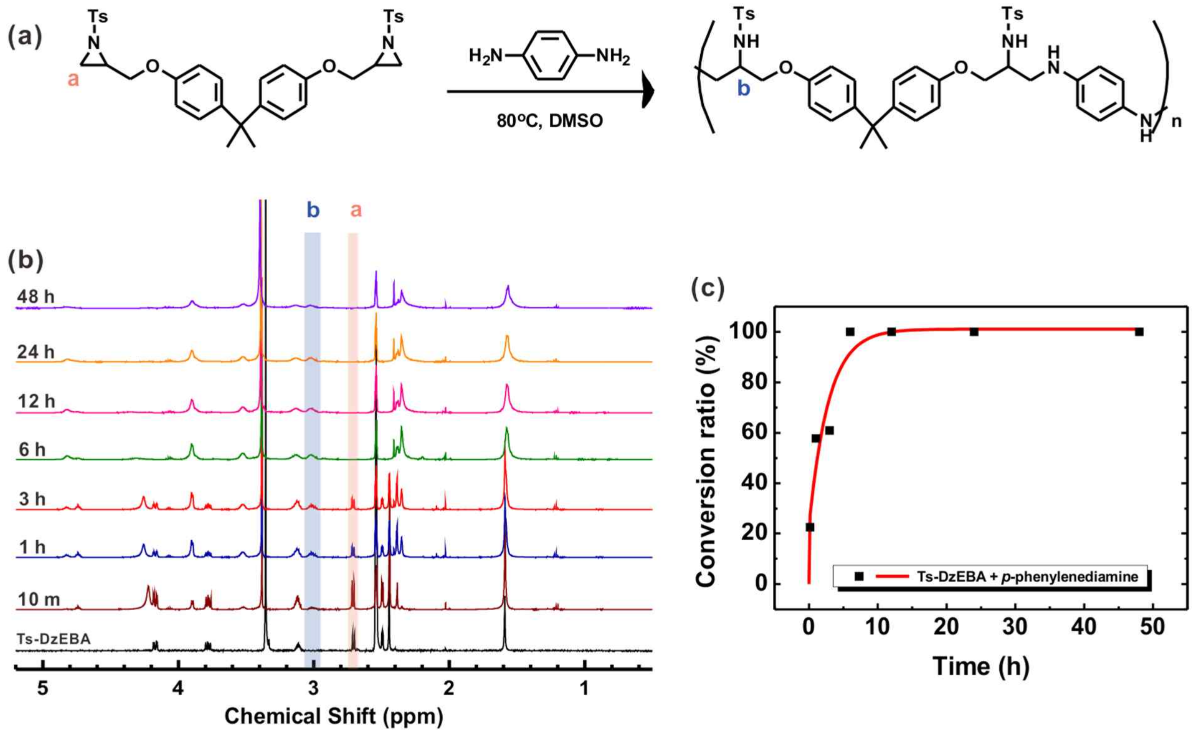


Figure S14. (a) Reaction scheme of Bn-DzEBA and ethylenediol (EDO). (b) ^{1}H NMR spectra measured at different reaction times. (c) The corresponding plot of conversion ratio against reaction time.

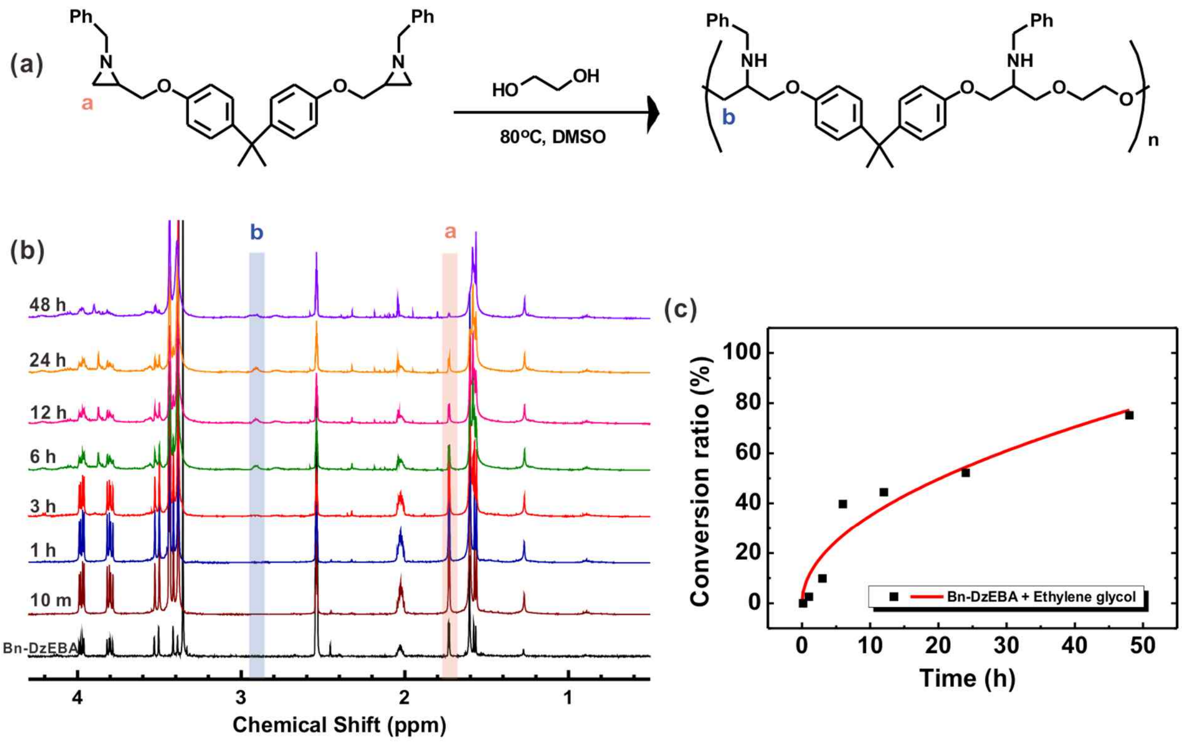


Figure S15. (a) Reaction scheme of DGEBA and EDO. (b) ^{1}H NMR spectra measured at different reaction times. (c) The corresponding plot of conversion ratio against reaction time.

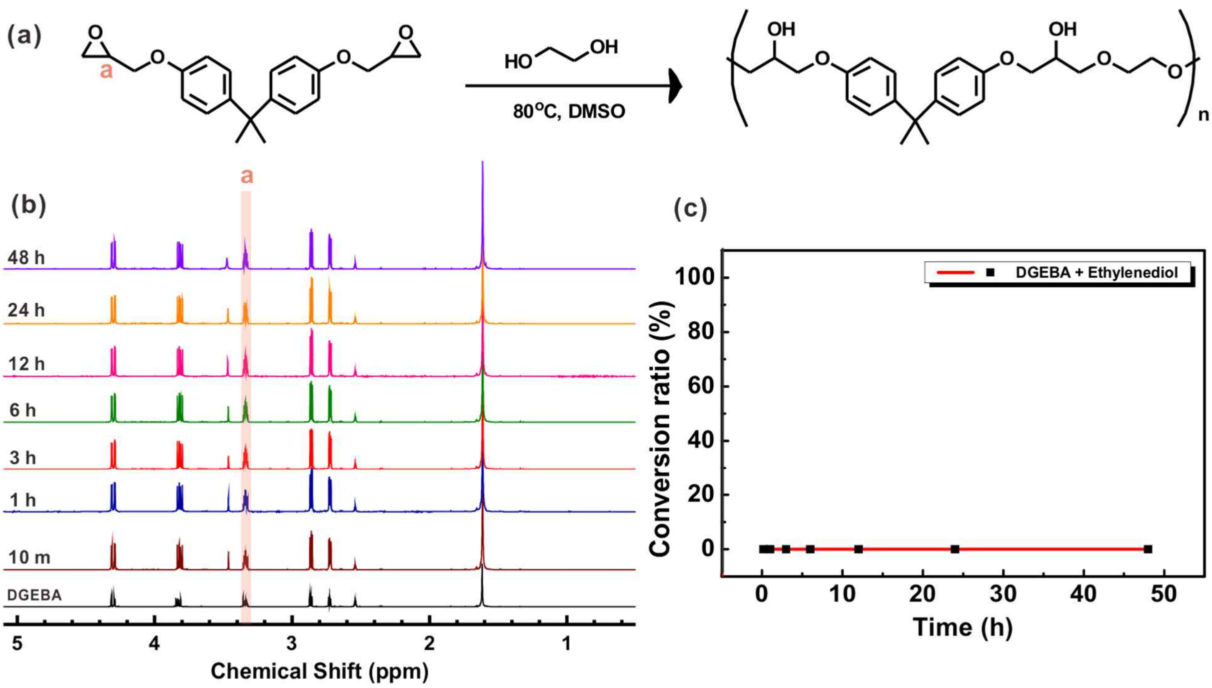


Figure S16. (a) Reaction scheme of Ts-DzEBA and EDO. (b) ^{1}H NMR spectra measured at different reaction times. (c) The corresponding plot of conversion ratio against reaction time.

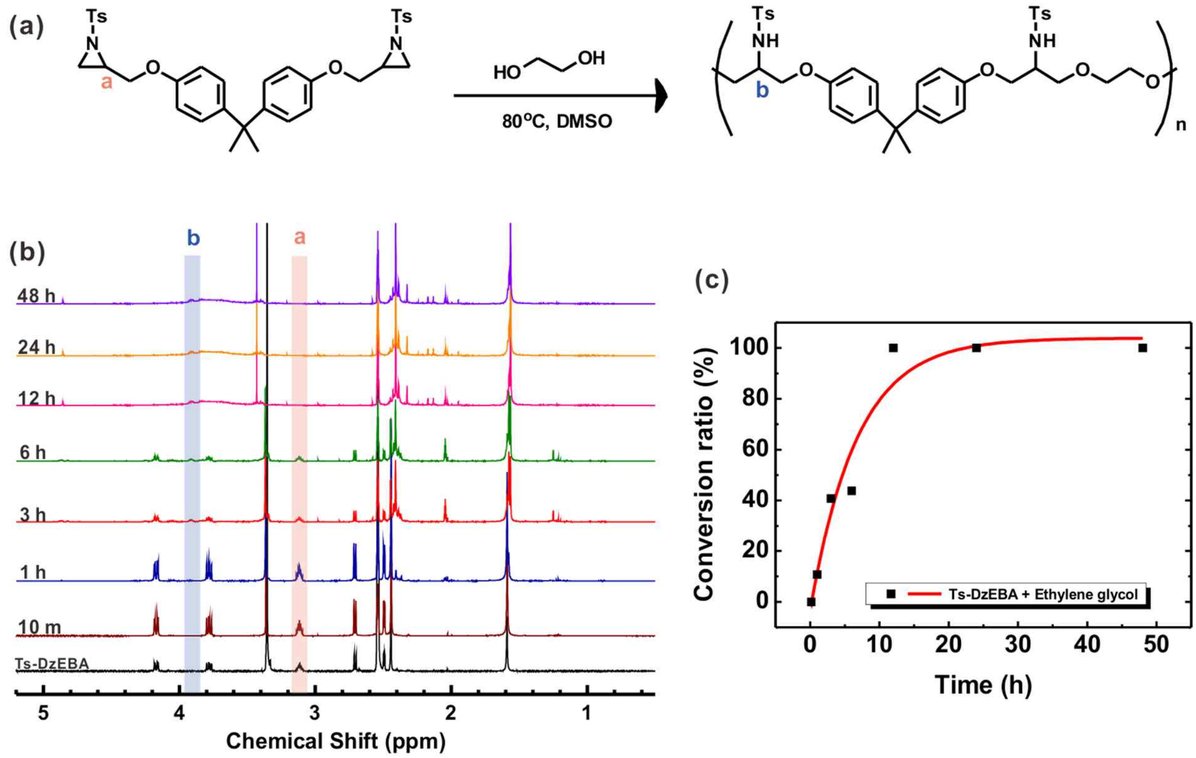


Figure S17. (a) Reaction scheme of Bn-DzEBA and hydroquinone (HQ). (b) ^{1}H NMR spectra measured at different reaction times. (c) The corresponding plot of conversion ratio against reaction time.

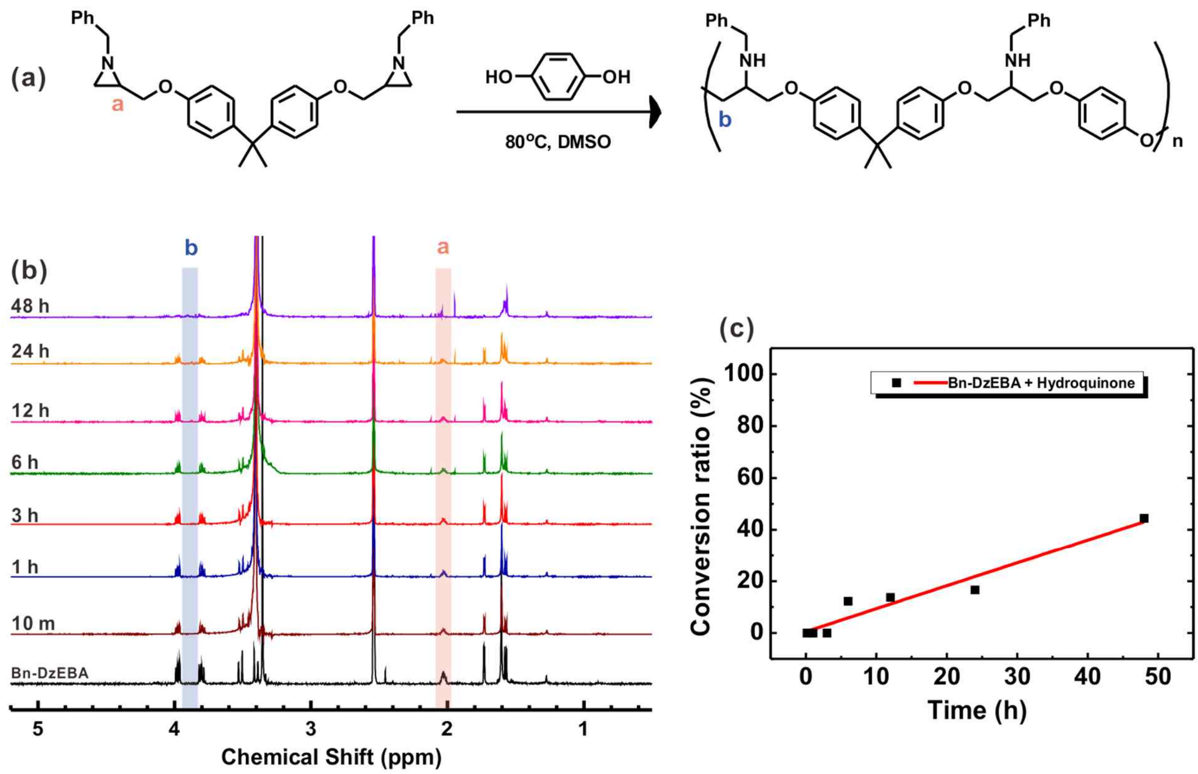


Figure S18. (a) Reaction scheme of DGEBA and HQ. (b) ^{1}H NMR spectra measured at different reaction times. (c) The corresponding plot of conversion ratio against reaction time.

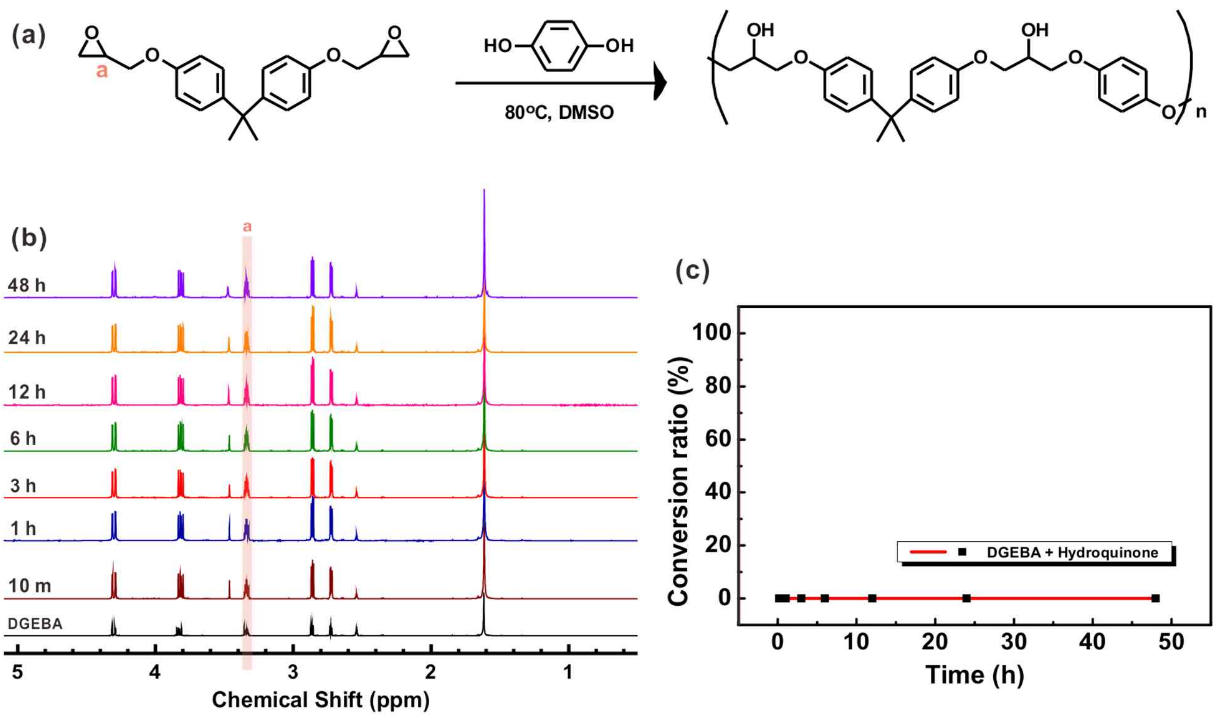


Figure S19. (a) Reaction scheme of Ts-DzEBA and HQ. (b) ^{1}H NMR spectra measured at different reaction times. (c) The corresponding plot of conversion ratio against reaction time.

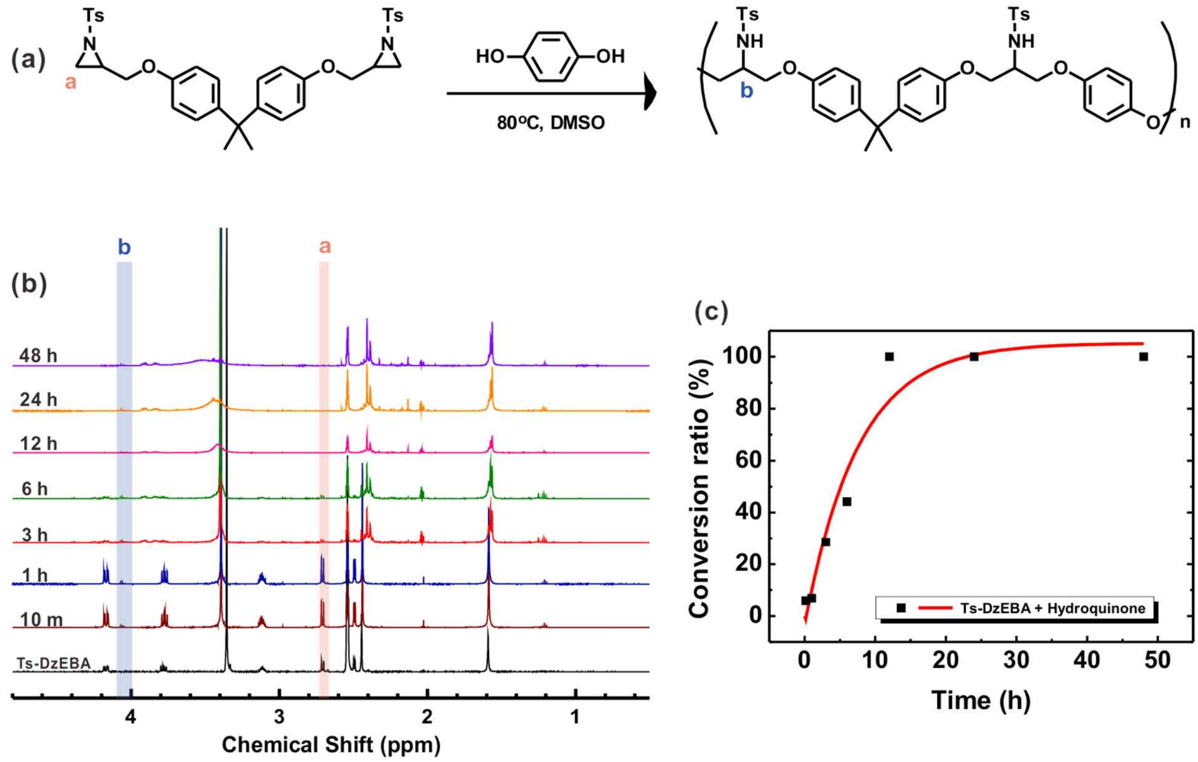


Figure S20. (a) Reaction scheme of Bn-DzEBA and 1,3-propanedithiol (PDT). (b) ^{1}H NMR spectra measured at different reaction times. (c) The corresponding plot of conversion ratio against reaction time.

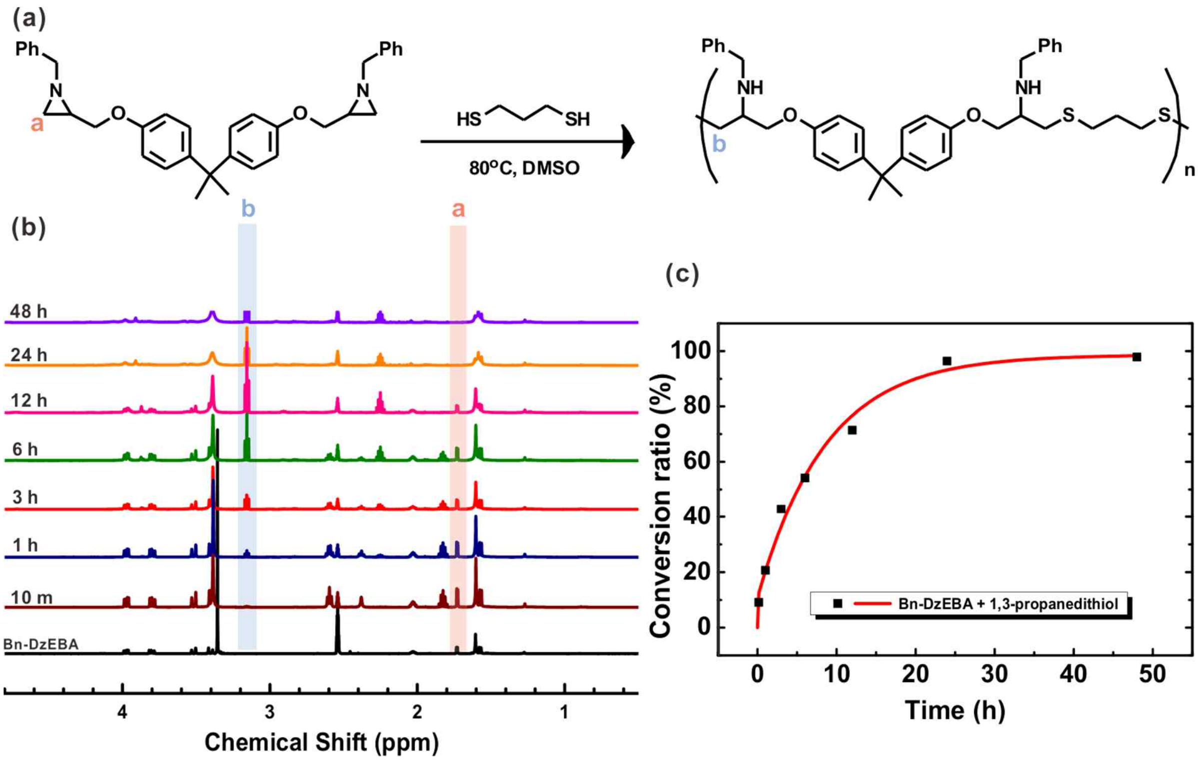


Figure S21. (a) Reaction scheme DGEBA and PDT. (b) ^{1}H NMR spectra measured at different reaction times. (c) The corresponding plot of conversion ratio against reaction time.

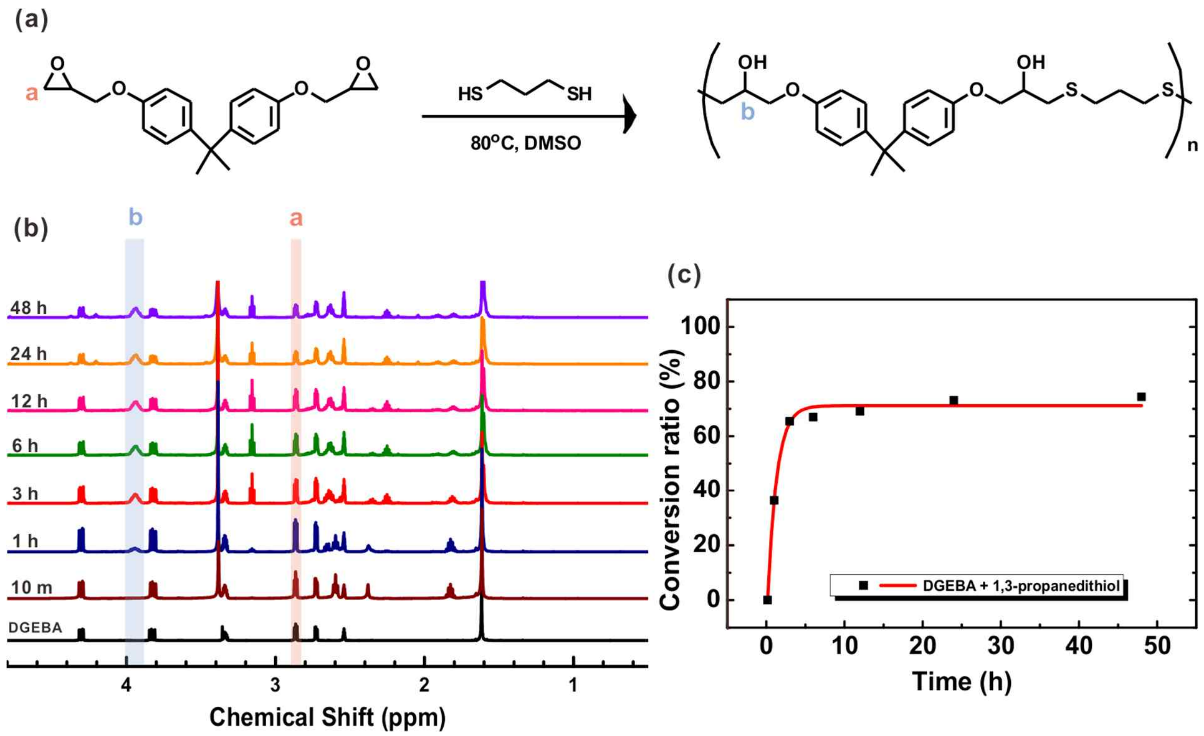


Figure S22. (a) Reaction scheme of Ts-DzEBA and PDT. (b) ^{1}H NMR spectra measured at different reaction times. (c) The corresponding plot of conversion ratio against reaction time.

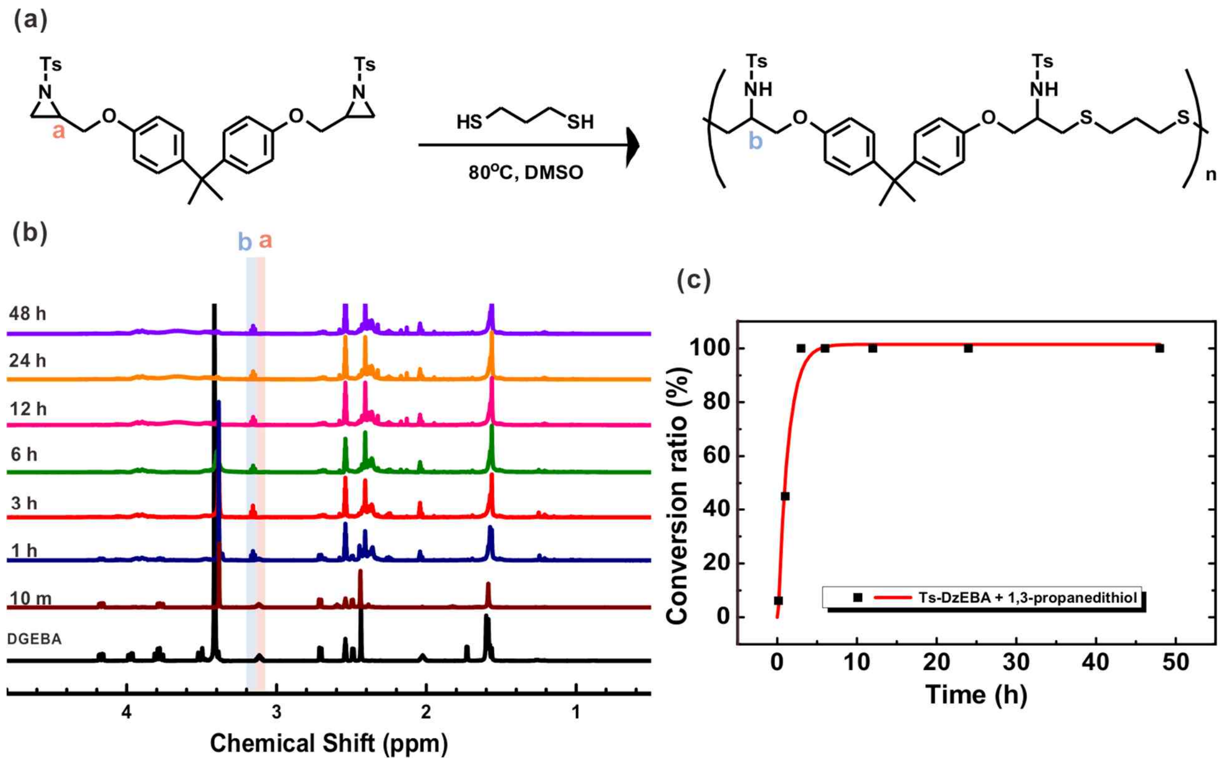


Figure S23. (a) Reaction scheme of Bn-DzEBA and 1,4-benzenedithiol (BDT). (b) ^{1}H NMR spectra measured at different reaction times. (c) The corresponding plot of conversion ratio against reaction time.

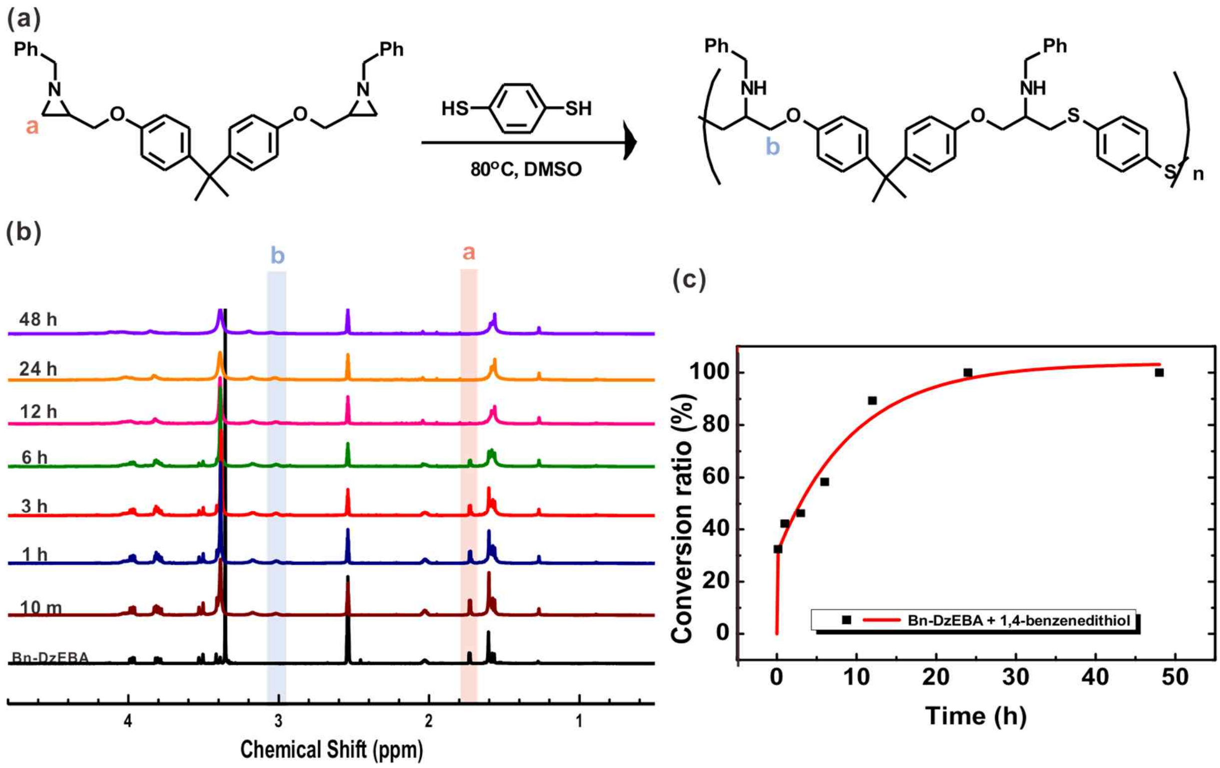


Figure S24. (a) Reaction scheme of DGEBA and BDT. (b) ^{1}H NMR spectra measured at different reaction times. (c) The corresponding plot of conversion ratio against reaction time.

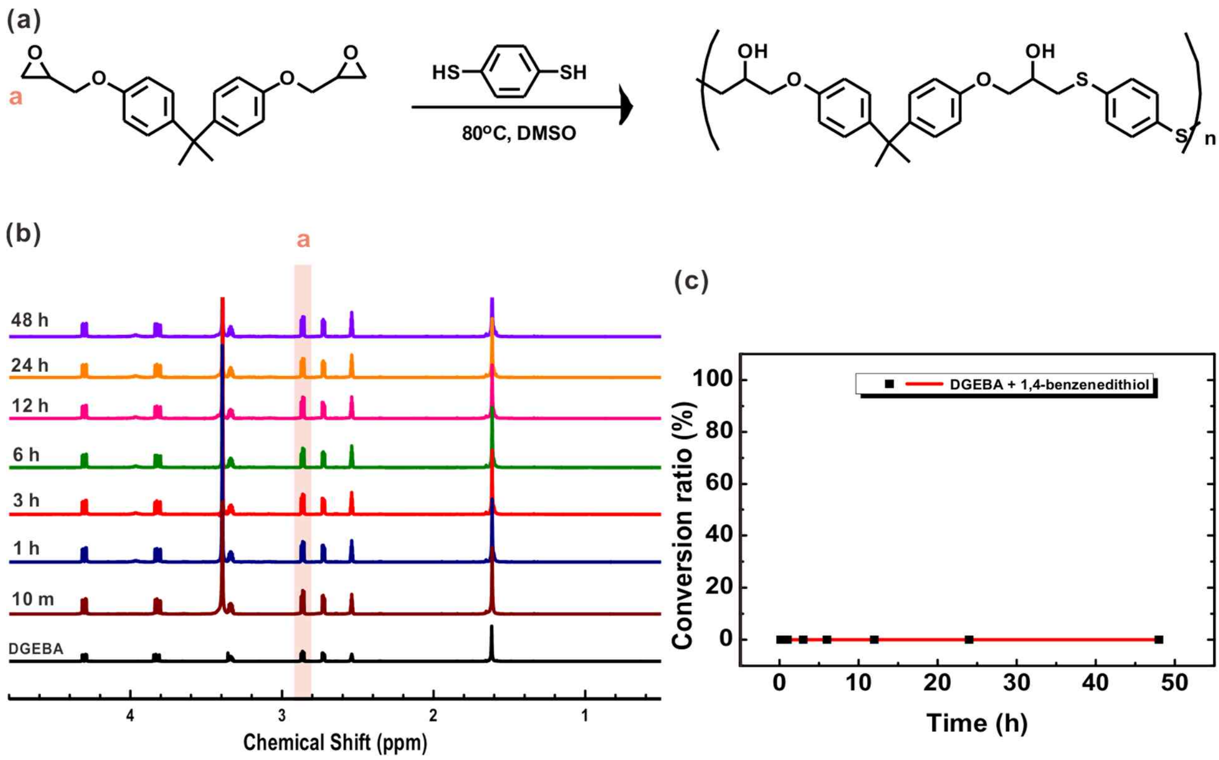


Figure S25. (a) Reaction scheme of Ts-DzEBA and BDT. (b) ^{1}H NMR spectra measured at different reaction times. (c) The corresponding plot of conversion ratio against reaction time.

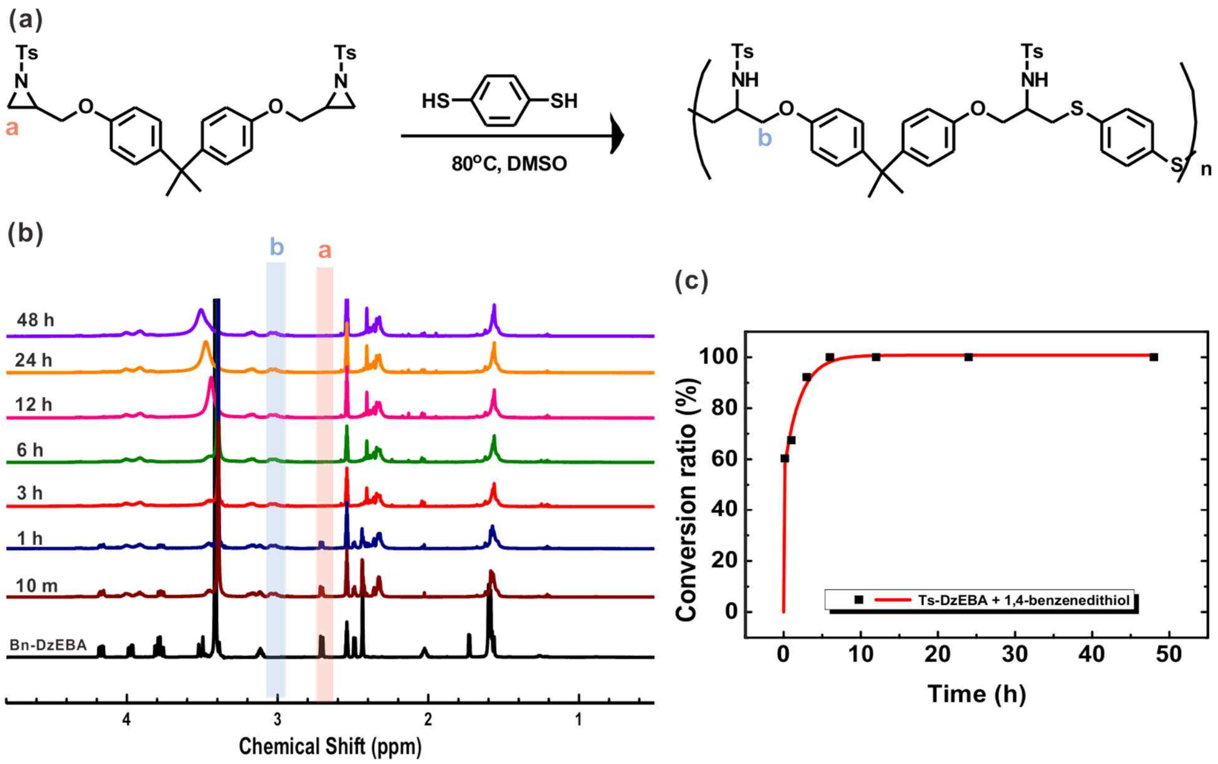


Figure S26. Dependence of ring-opening polymerization (ROP) of Bn-DzEBA in the presence of DDDA on reaction temperature.

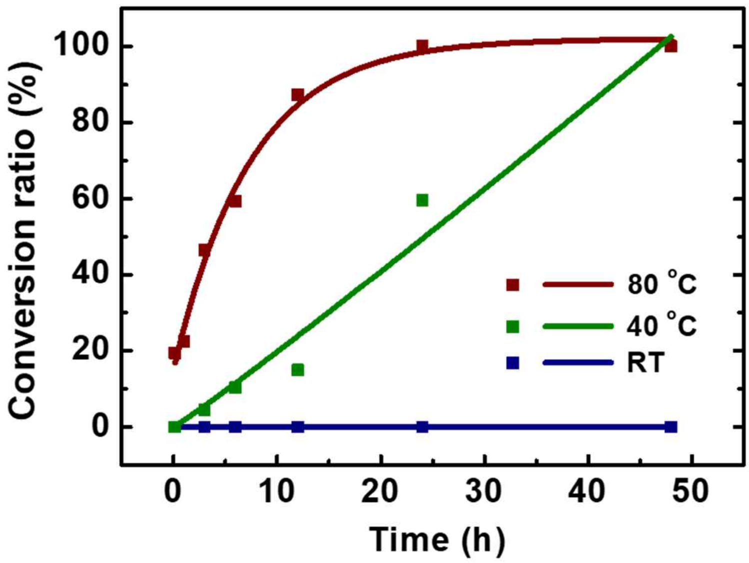


Table S1. The structures and properties of curing agents used for DSC study

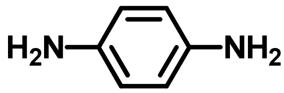
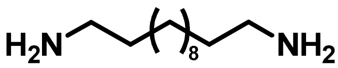
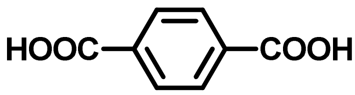
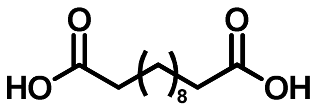
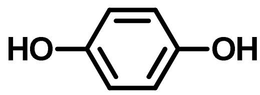
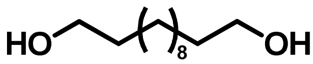
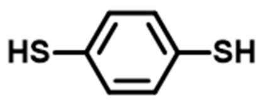
	Curing agent	Structure	Melting Point (ºC)
Amine	*p*-Phenylenediamine (PDA)		267
	1,12-Diaminododecane (DAD)		67-69
Acid	Terephthalic acid (TA)		300
	Dodecanedioic acid (DDDA)		127-129
Alcohol	Hydroquinone (HQ)		172
	1,12-dodecanediol (DDD)		79-81
Thiol	1,4-benzenedithiol (BDT)		92-97

Table S2. Curing characteristics of the resin-curing agent formulations we tested.

Sample Designation	β (K/min)	T_i (°C)	T_p (°C)	E_a (kJ/mol)	Standard error	ΔH (J/g)
Ts-DzEBA / PDA	2	69.4	75.5	113.4	0.8	8.6
	5	71.6	82.4			9.6
	10	76.3	87.9			15.1
	15	79.9	92.7			17.8
	20	84.3	96.3			20.1
DGEBA / PDA	2	92.3	100.6	78.4	0.2	265.0
	5	102.8	113.8			259.7
	10	110.7	125.0			345.7
	15	114.0	129.9			274.9
	20	122.7	134.9			386.3
DGEBA / DAD	2	74.1	89.2	58.2	0.1	323.3
	5	83.6	105.4			358.9
	10	92.5	117.8			396.3
	15	100.0	126.5			413.8
	20	104.6	133.1			425.0
Bn-DzEBA / DDDA	2	73.0	92.1	121.4	2.5	30.0
	5	77.1	96.8			43.6
	10	91.2	103.8			25.7
	15	86.4	105.0			27.7
	20	89.7	113.4			21.1

Bn-DzEBA / BDT	5	41.1	53.7	60.6	0.5	17.9
	10	50.9	63.6			16.2
	15	46.6	67.9			34.0
	20	52.3	74.0			46.8
Ts-DzEBA / BDT	2	120.9	131.4	91.5	0.7	110.0
	5	130.5	145.0			77.8
	10	134.3	152.2			42.2
	15	147.1	162.6			98.3
	20	140.6	165.4			136.2

Figure S27. Typical DSC thermogram of Bn-DzEBA cured with *p*-phenylenediamine (PDA)

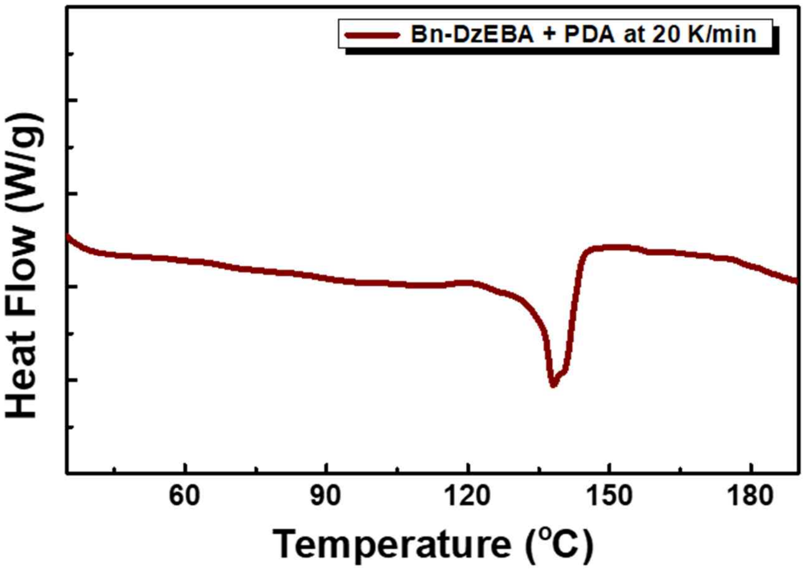


Figure S28. Typical DSC thermogram of Bn-DzEBA cured with 1,12-diaminododecane (DAD).

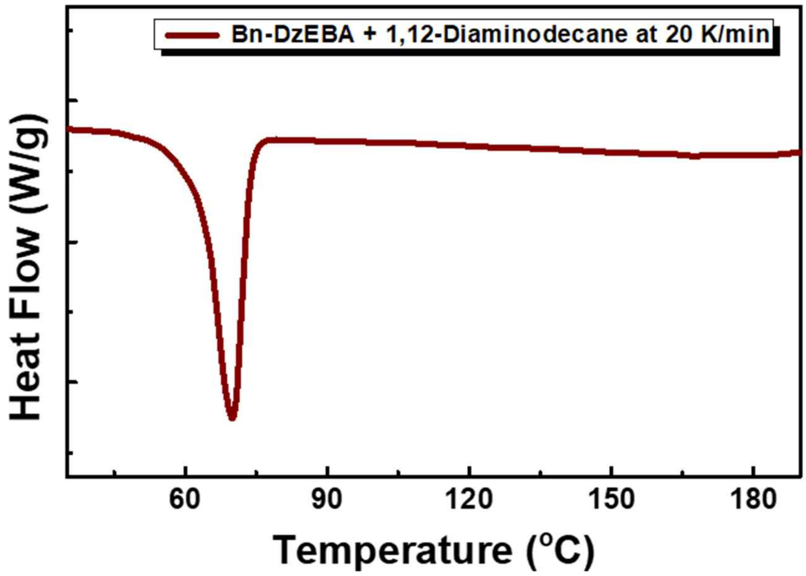


Figure S29. Typical DSC thermograms of Bn-DzEBA, DGEBA, and Ts-DzEBA cured with terephthalic acid (TPA).

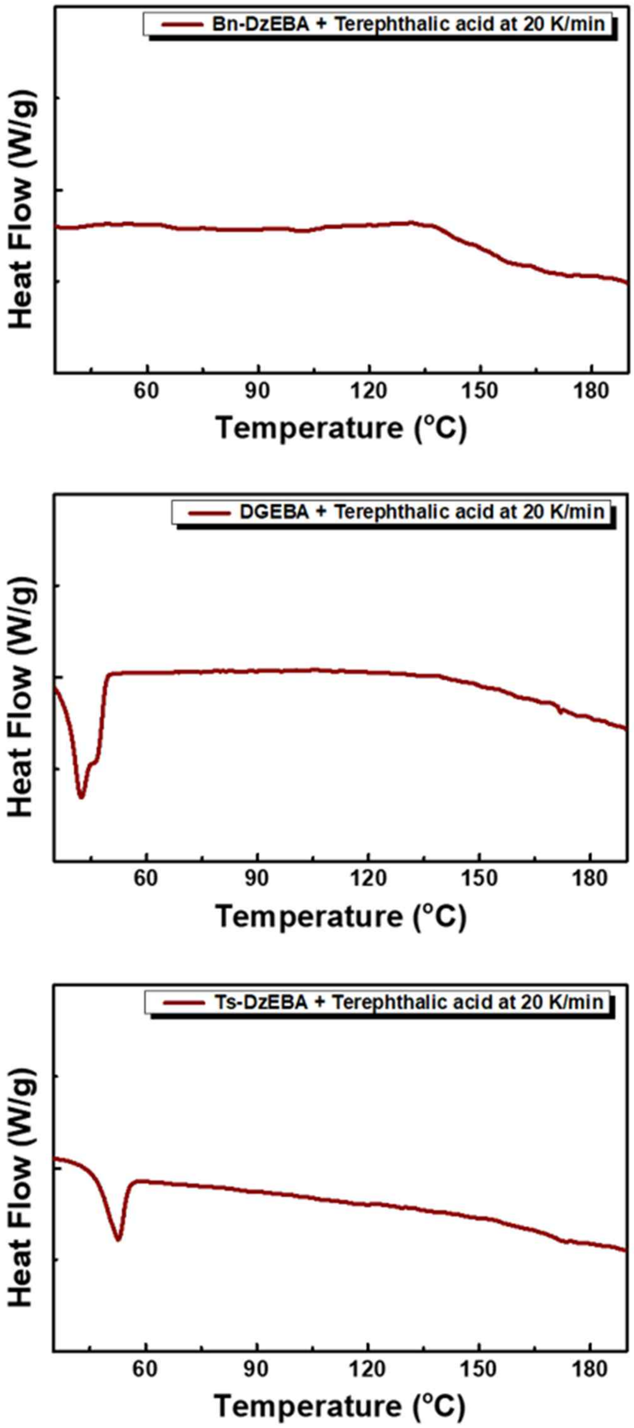


Figure S30. Typical DSC thermograms of DGEBA and Ts-DzEBA cured with dodecanedioic acid (DDDA).

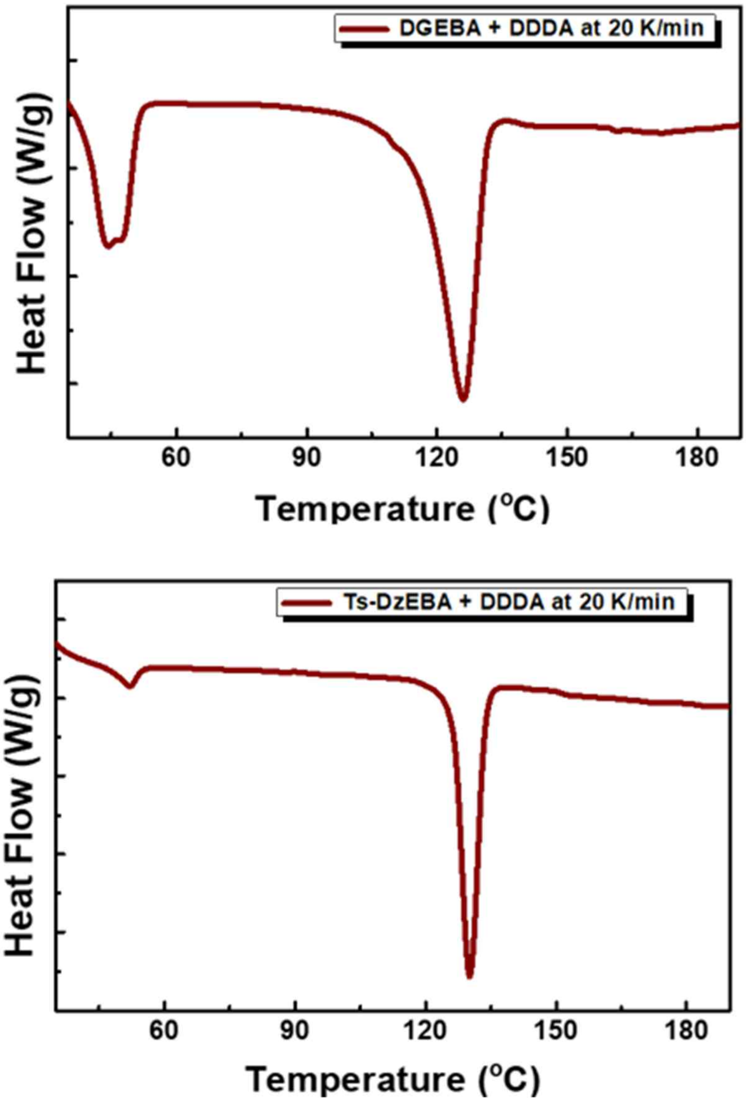


Figure S31. Typical DSC thermograms of Bn-DzEBA, DGEBA and Ts-DzEBA cured with hydroquinone (HQ).

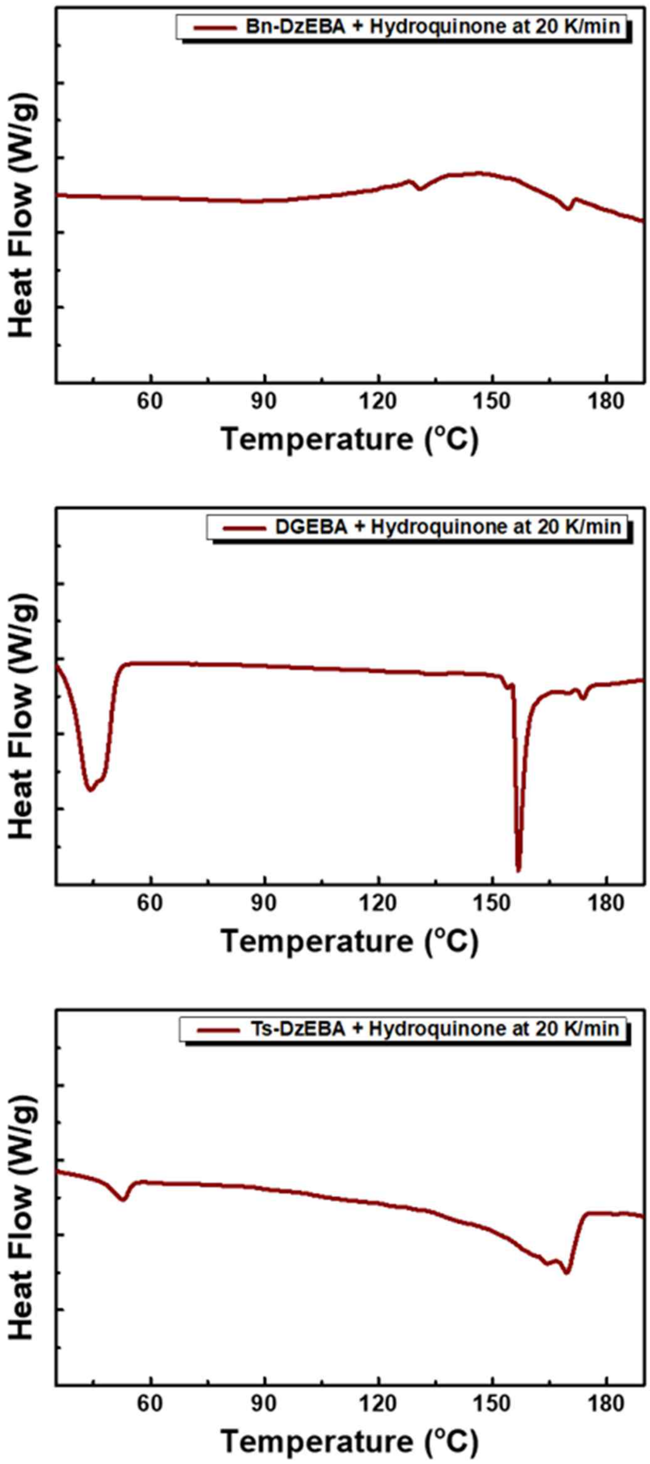


Figure S32. Typical DSC thermograms of Bn-DzEBA, DGEBA and Ts-DzEBA cured with 1,12-dodecanediol (DDD).

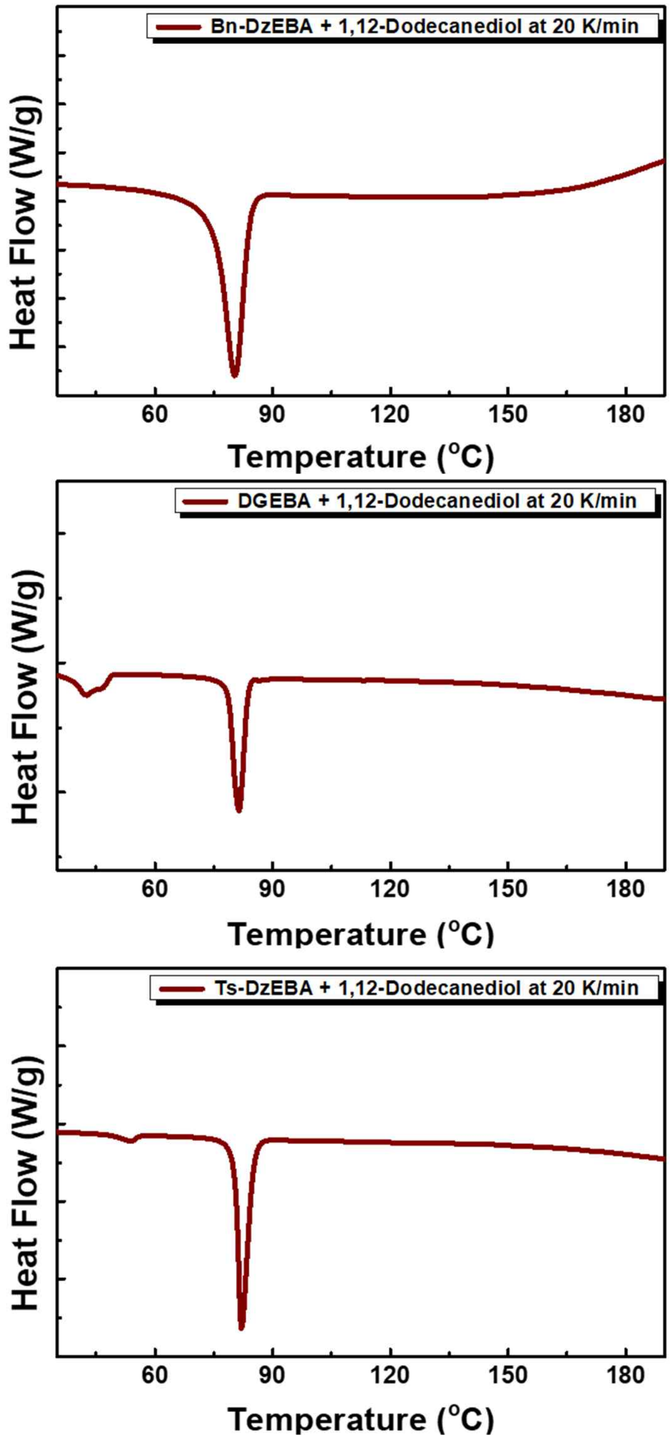


Figure S33. Typical DSC thermograms of Bn-DzEBA, DGEBA and Ts-DzEBA cured with 1,4-benzenedithiol (BDT).

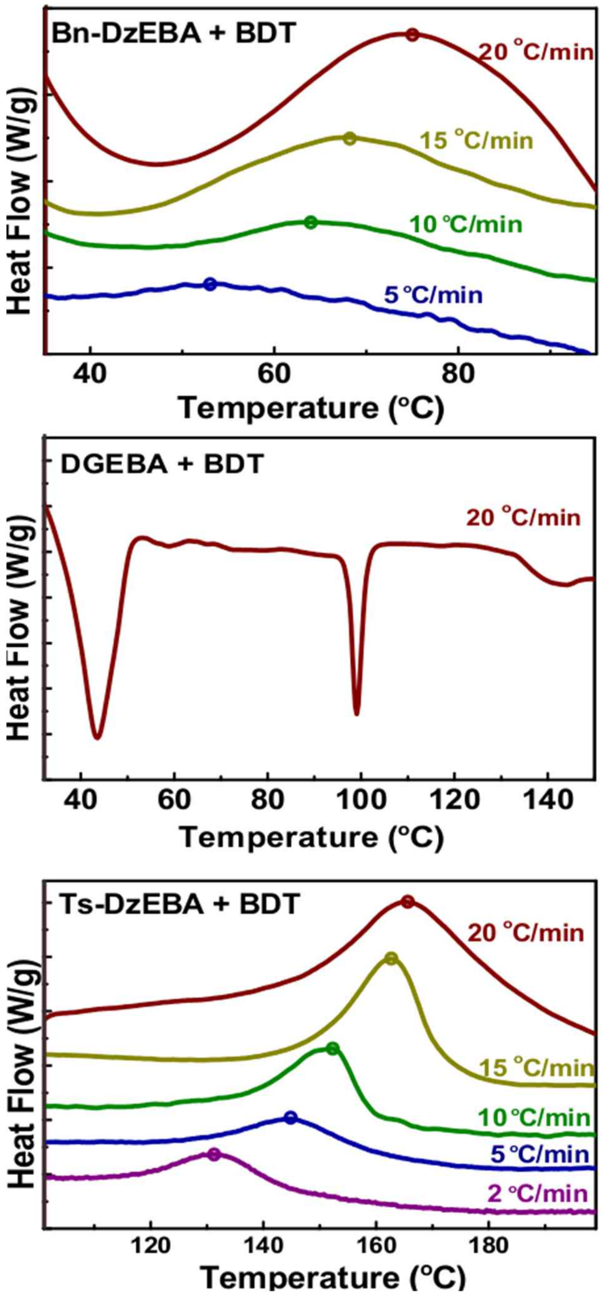


Figure S34. Typical shear strength-strain curves for Bn-DzEBA and poly(acrylic acid) (PA) at two different curing temperatures (curing time = 3 h).

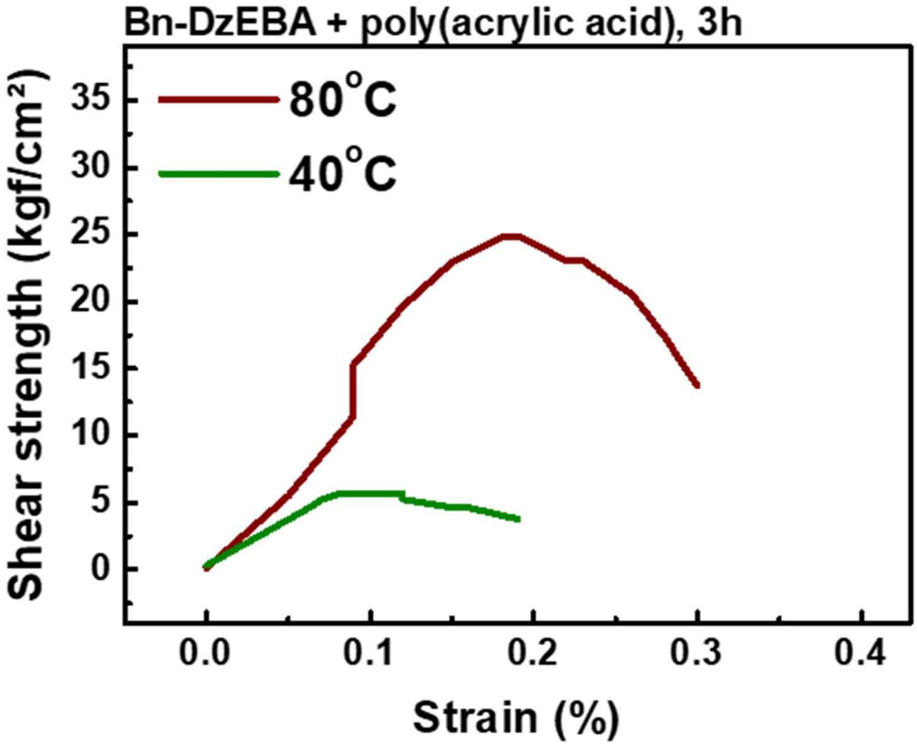


Figure S35. Typical shear strength-strain curves for Ts-DzEBA and triethylenetetramine (TETA) at two different curing temperatures (curing time = 3 h).

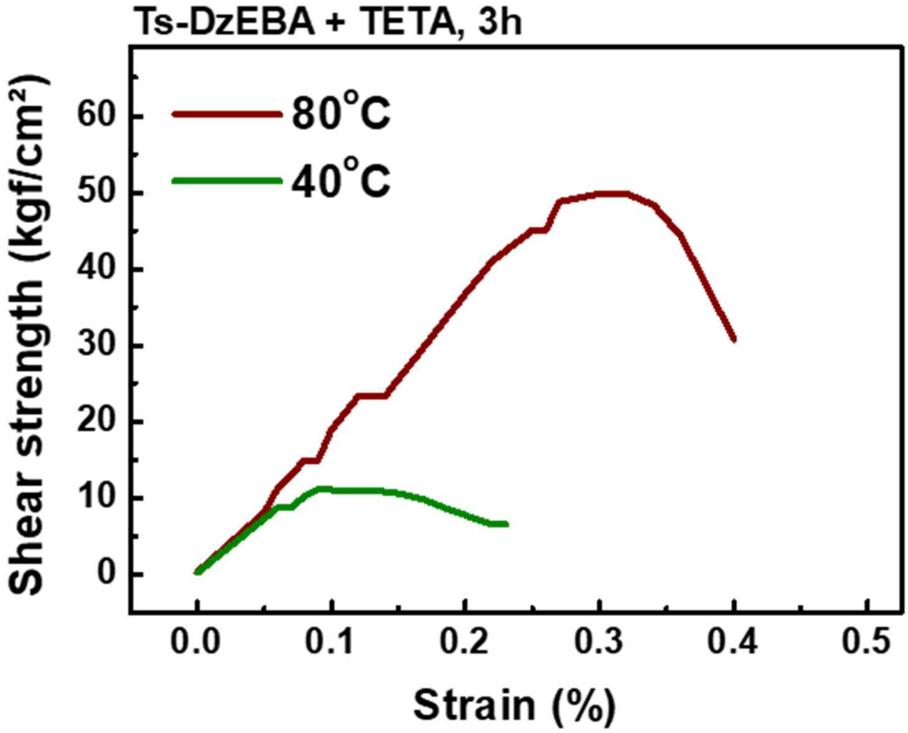


Figure S36. Typical shear strength-strain curves for Bn-DzEBA and poly(acrylic acid) (PA) at various curing times (curing temperature = 80 ^oC).

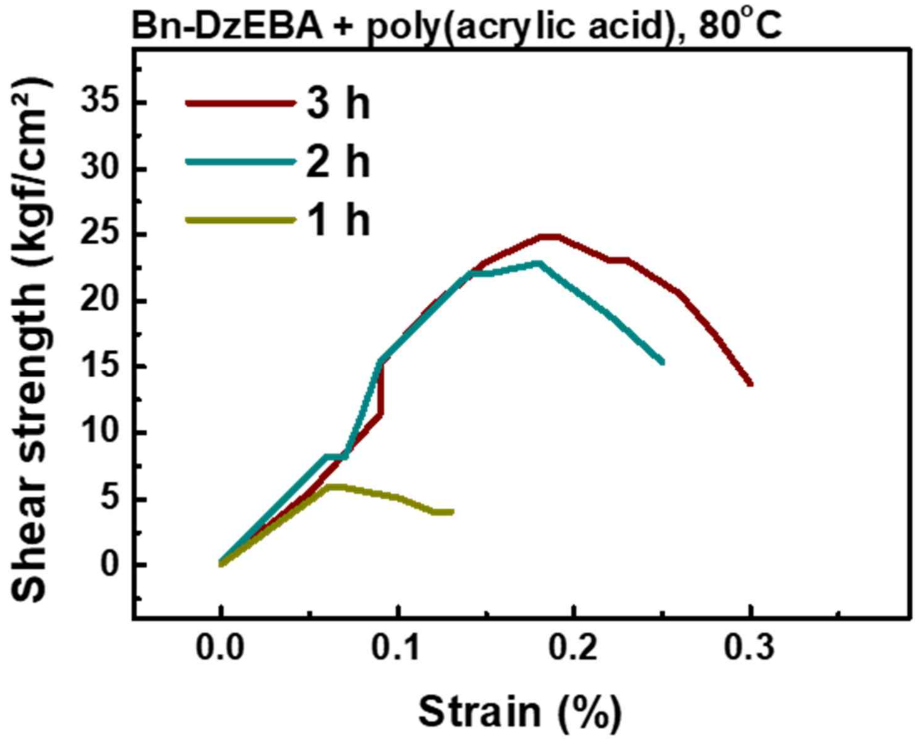


Figure S37. Typical shear strength-strain curves for DGEBA and triethylenetetramine (TETA) at various curing times (curing temperature = 80 °C).

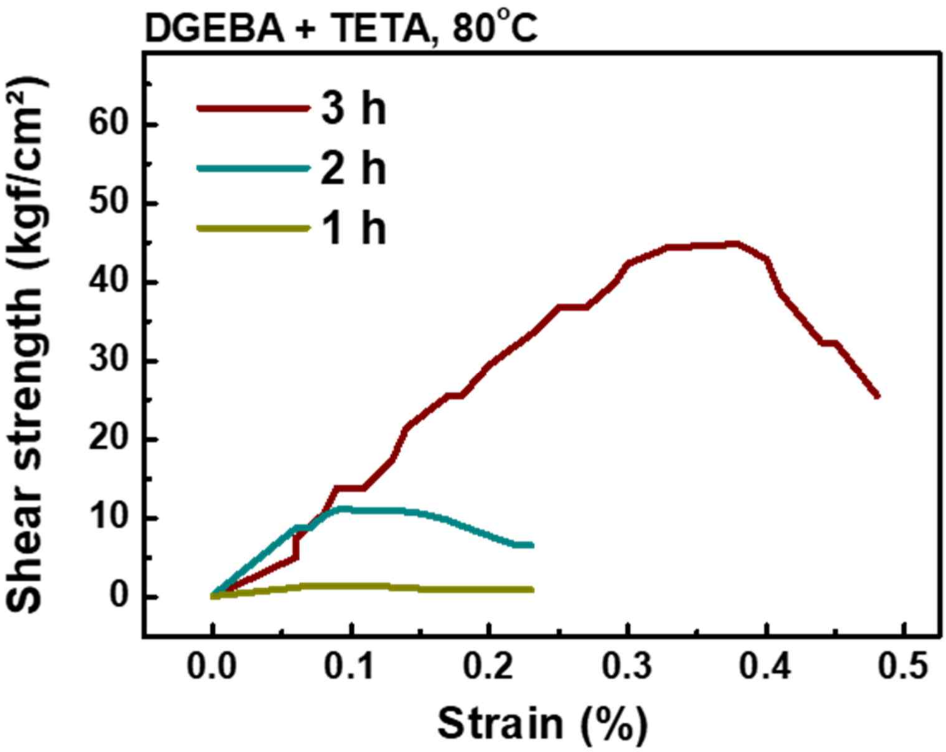


Figure S38. Typical shear strength-strain curves for Ts-DzEBA and triethylenetetramine (TETA) at various times (curing temperature = 80 °C).

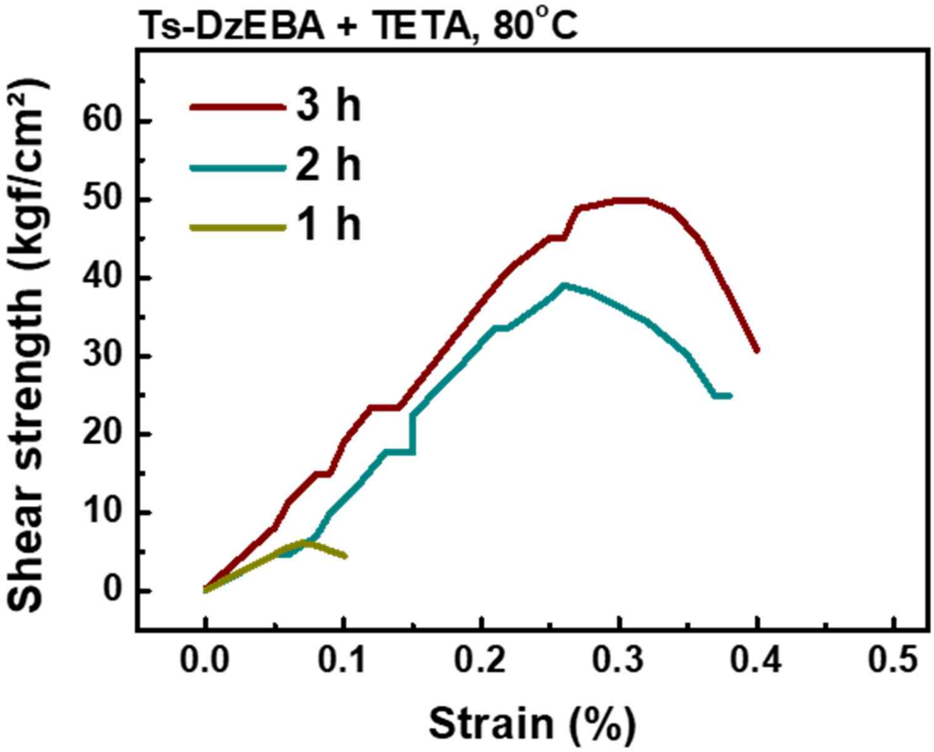
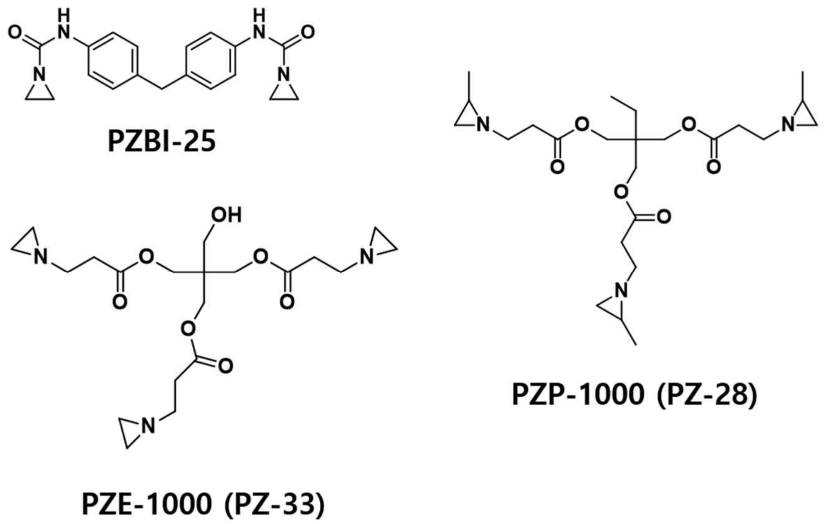


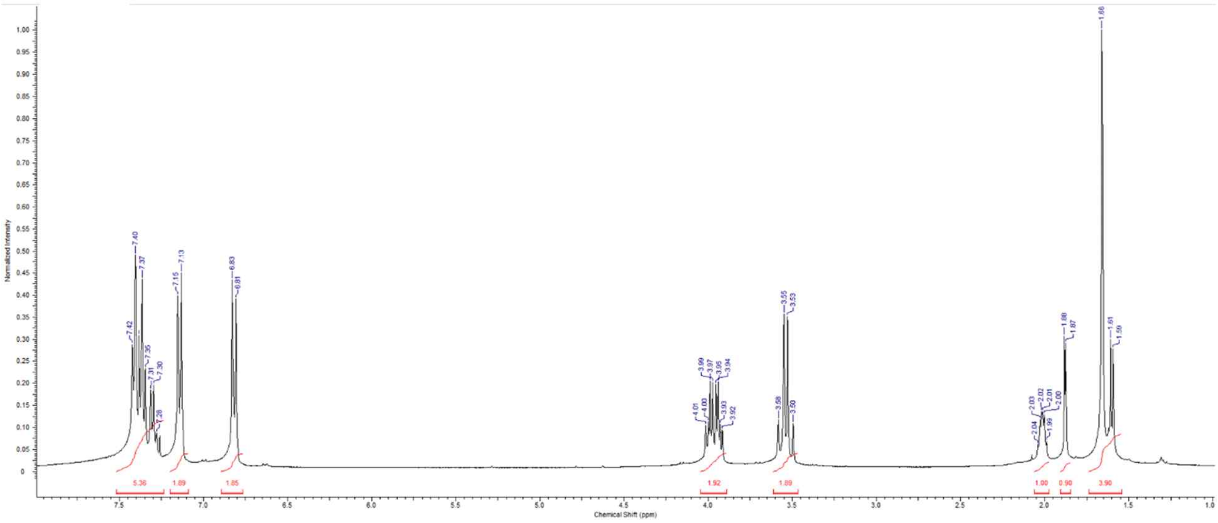
Figure S39. Examples of aziridine-based crosslinkers commercially available.



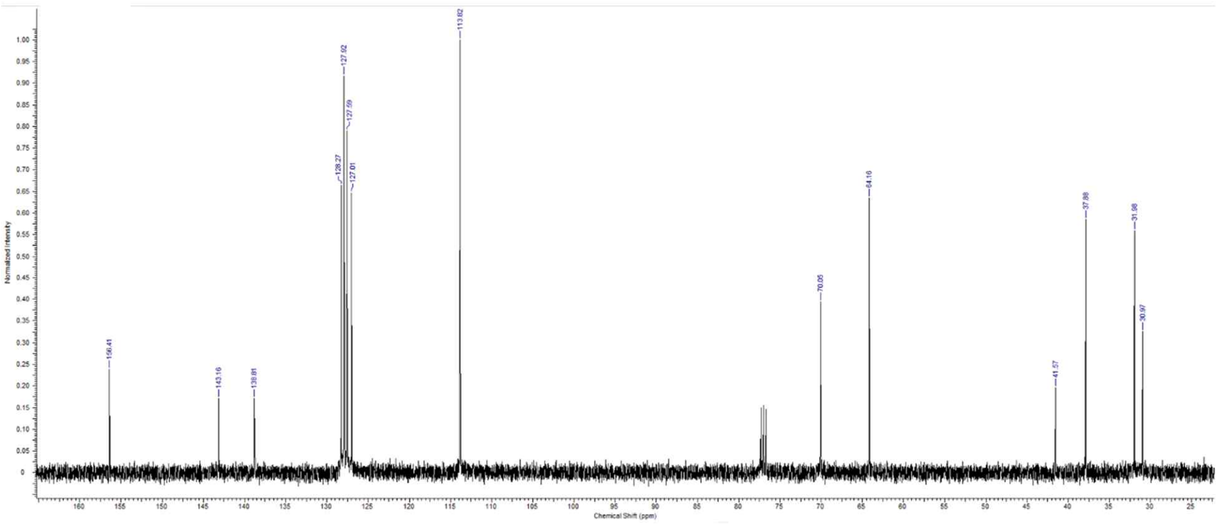
<^{1}H and ^{13}C NMR, HRMS and chiral HPLC Spectra>

1) 2,2'-(((propane-2,2-diylbis(4,1-phenylene))bis(oxy))bis(methylene))bis(1-benzylaziridine) **(S1)**

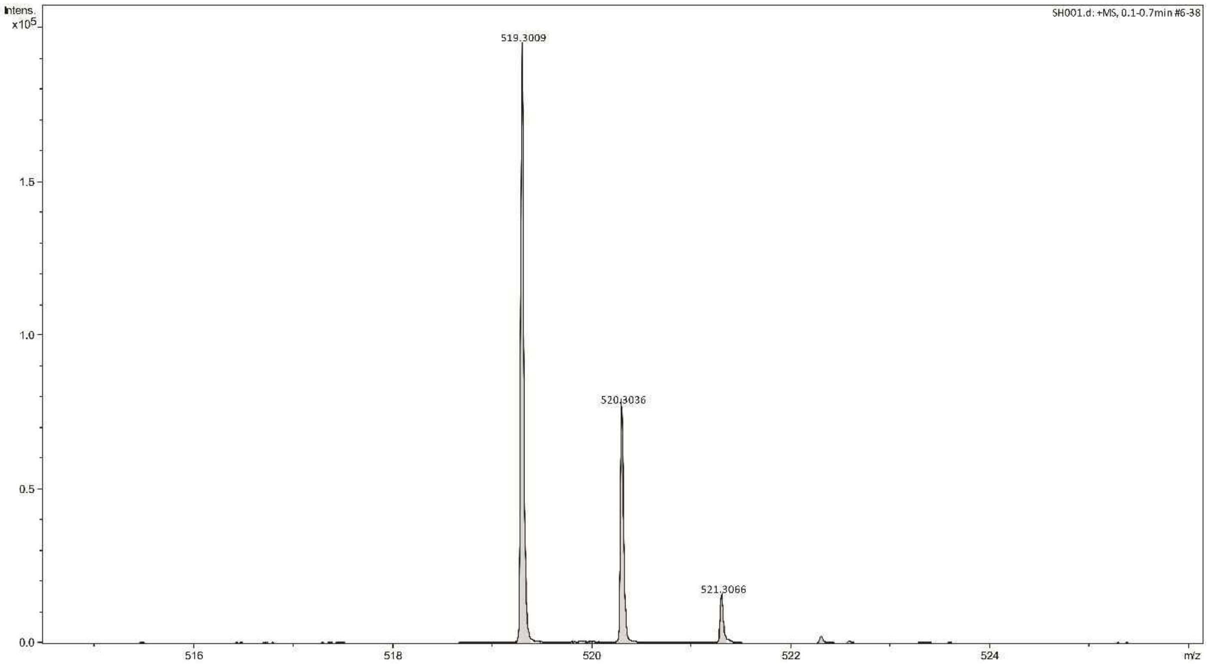
^{1}H NMR spectrum



^{13}C NMR spectrum



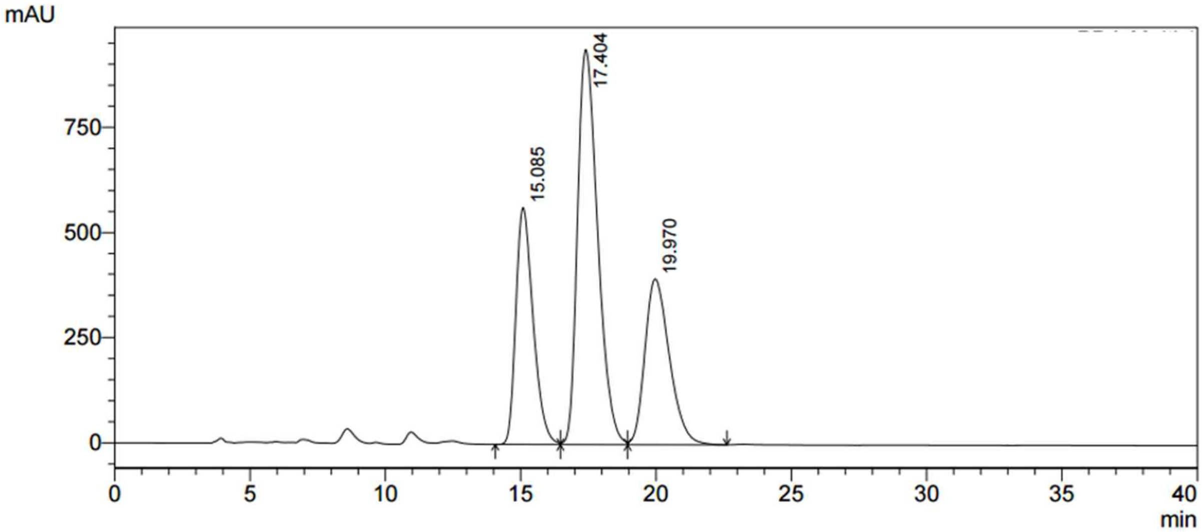
MS spectrum



Intens.
x10^5
SH001.d: +MS, 0.1-0.7min #6-38
519.3009
520.3036
521.3066
1.5
1.0
0.5
0.0
516
518
520
522
524
m/z

Chiral HPLC spectrum

Chiral resolution of Bn-DzEBA on OD column; isopropylalcohol:hexane (15:85, v/v) as a mobile phase at a flow rate of 0.8 mL/min; detection at 220nm.



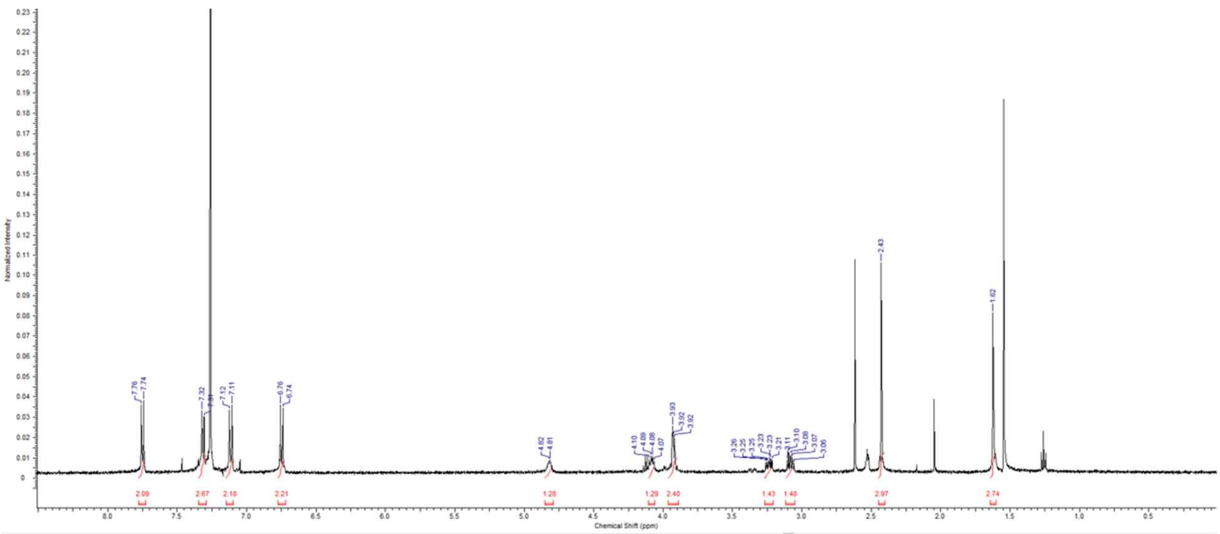
PeakTable

PDA Ch1 220nm 4nm

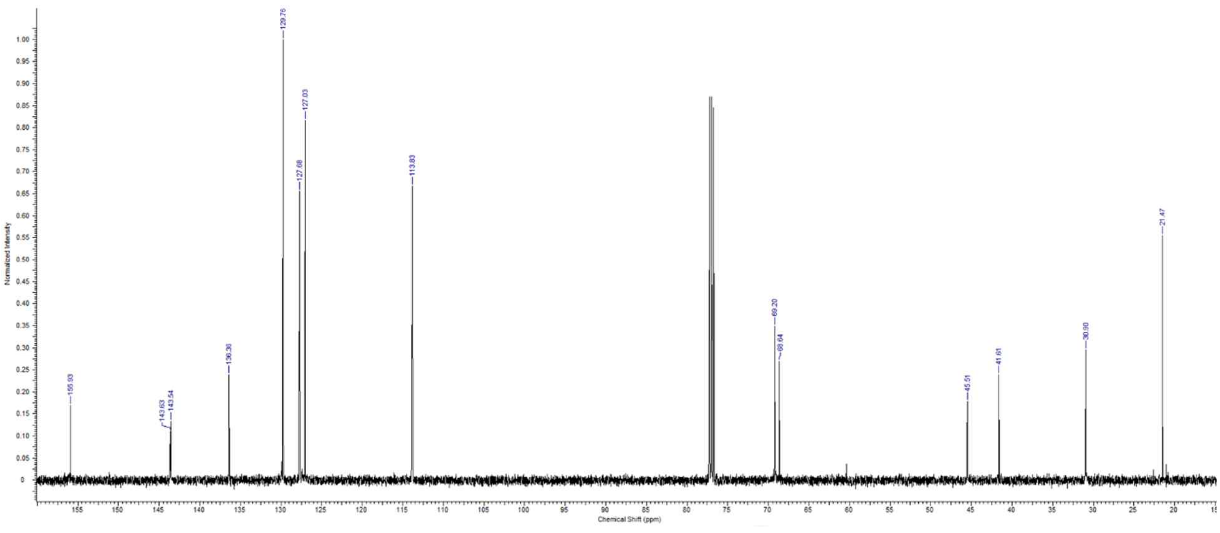
Peak#	Ret. Time	Area	Height	Area %	Height %
1	15.085	24939902	562946	25.316	29.717
2	17.404	48747651	938602	49.482	49.547
3	19.970	24827727	392815	25.202	20.736
Total		98515281	1894363	100.000	100.000

2) *N*,*N'*-(((propane-2,2-diylbis(4,1-phenylene))bis(oxy))bis(2-hydroxypropane-3,1-diyl))bis(4-methylbenzenesulfonamide) **(S7)**

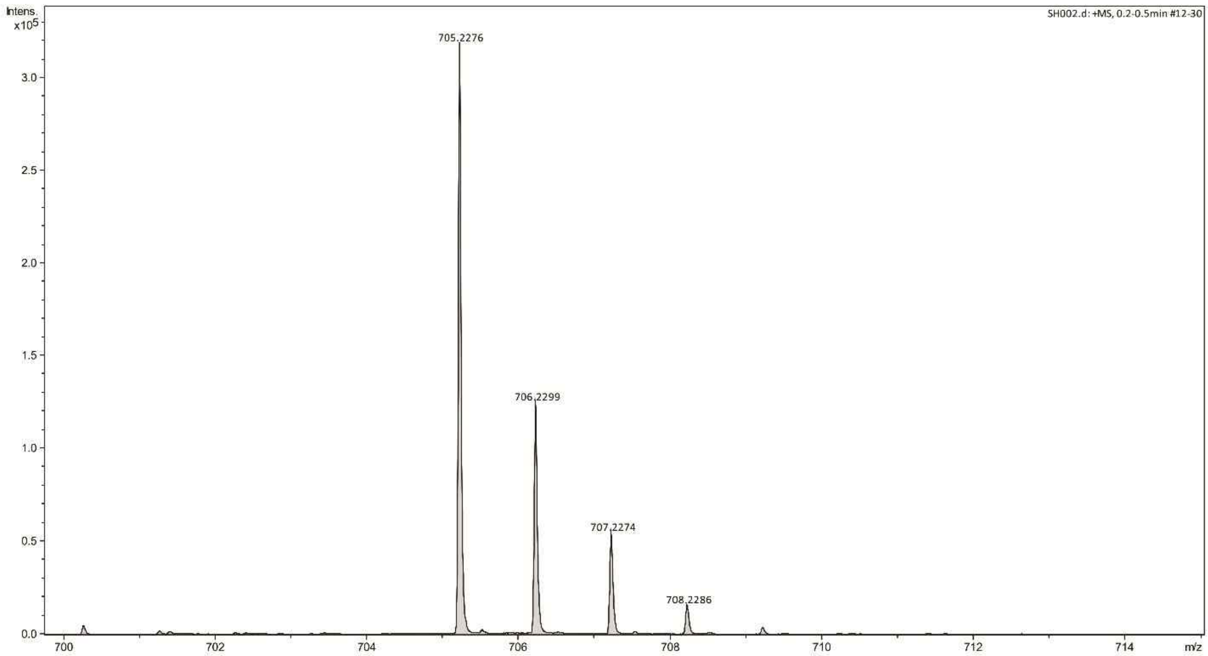
^{1}H NMR spectrum



^{13}C NMR spectrum



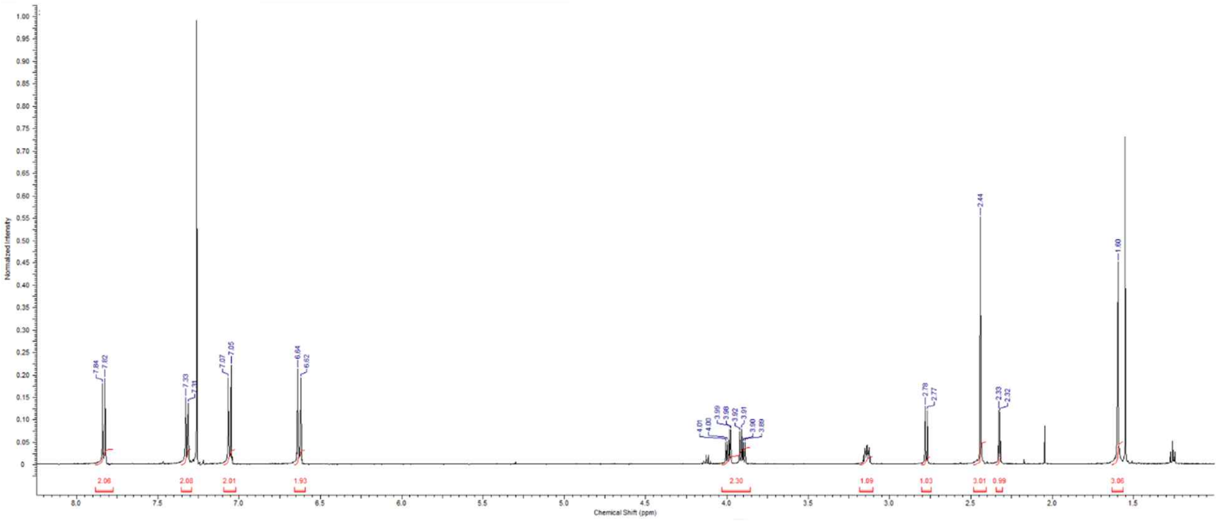
MS spectrum



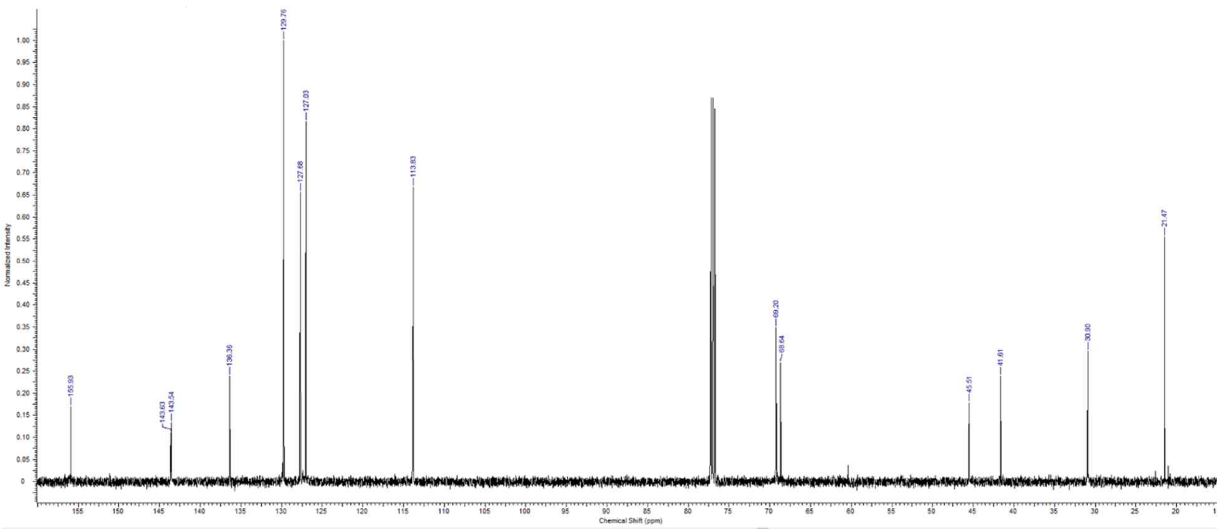
Intens.
x10^5
SH002.d: +MS, 0.2-0.5min #12-30
705.2276
706.2299
707.2274
708.2286
3.0
2.5
2.0
1.5
1.0
0.5
0.0
700
702
704
706
708
710
712
714
m/z

3) 2,2'-(((propane-2,2-diylbis(4,1-phenylene))bis(oxy))bis(methylene))bis(1-tosylaziridine) **(S2)**

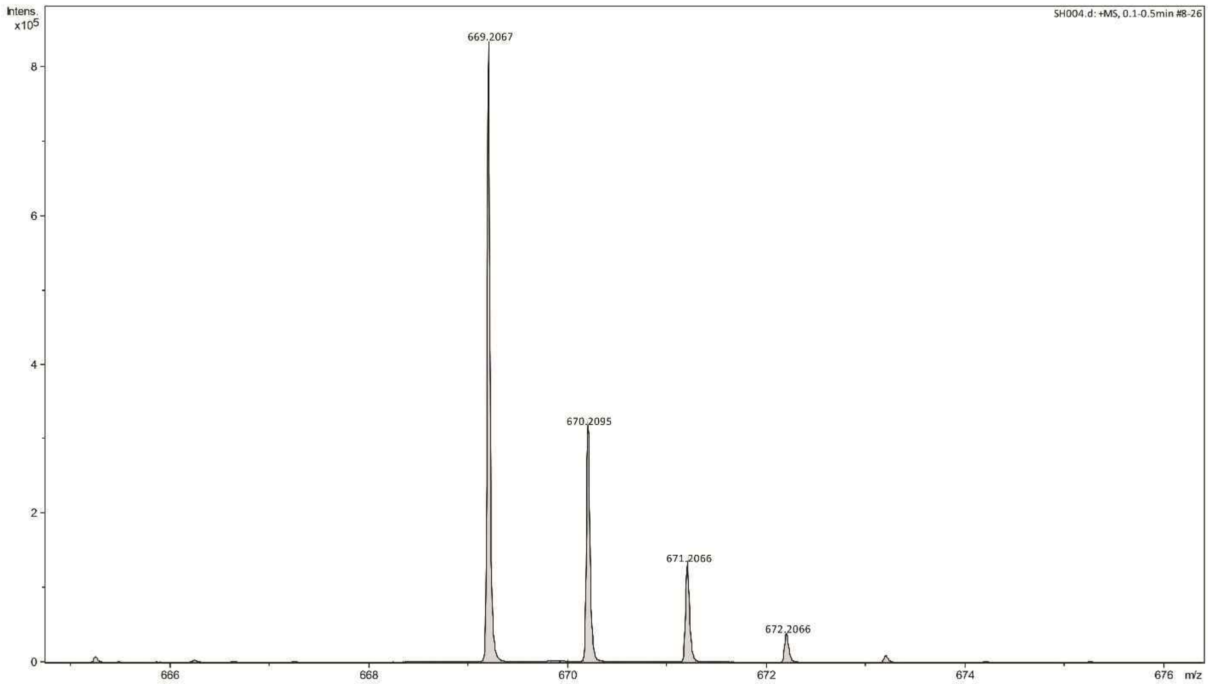
<u>^{1}H NMR spectrum</u>



<u>^{13}C NMR spectrum</u>



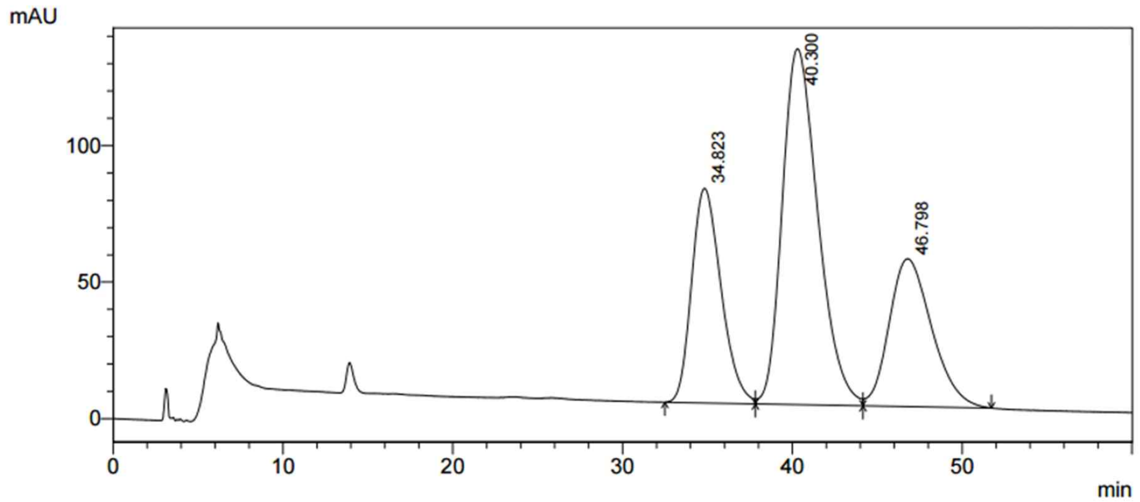
MS spectrum



Intens.
x10^5
SH004.d: +MS, 0.1-0.5min #8-26
669.2067
670.2095
671.2066
672.2066
8
6
4
2
0
666
668
670
672
674
676
m/z

Chiral HPLC spectrum

Chiral resolution of Bn-DzEBA on OD column; isopropylalcohol:hexane (40:60, v/v) as a mobile phase at a flow rate of 1 mL/min; detection at 220nm.



PeakTable

PDA Ch1 220nm 4nm

Peak#	Ret. Time	Area	Height	Area %	Height %
1	34.823	9489285	78666	24.971	29.901
2	40.300	19085345	130348	50.223	49.546
3	46.798	9426674	54071	24.806	20.553
Total		38001305	263085	100.000	100.000