

# Supplementary Materials

## Synthesis of Degradable Polyolefins Bearing Disulfide Units via Metathesis Copolymerization

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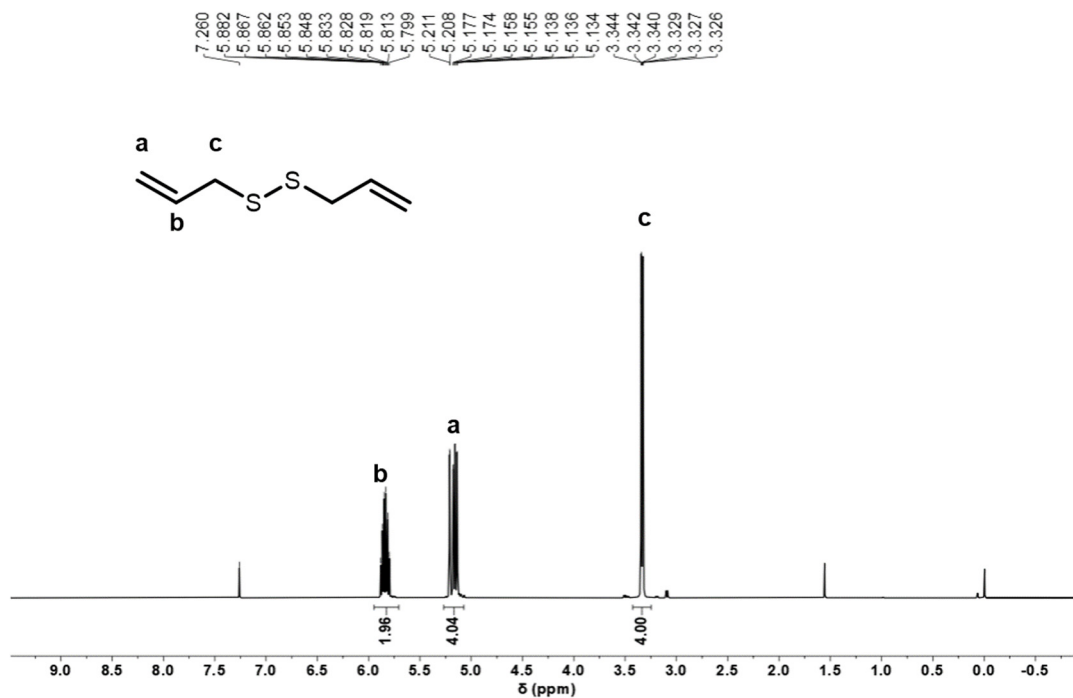
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† These authors contributed equally to this work.

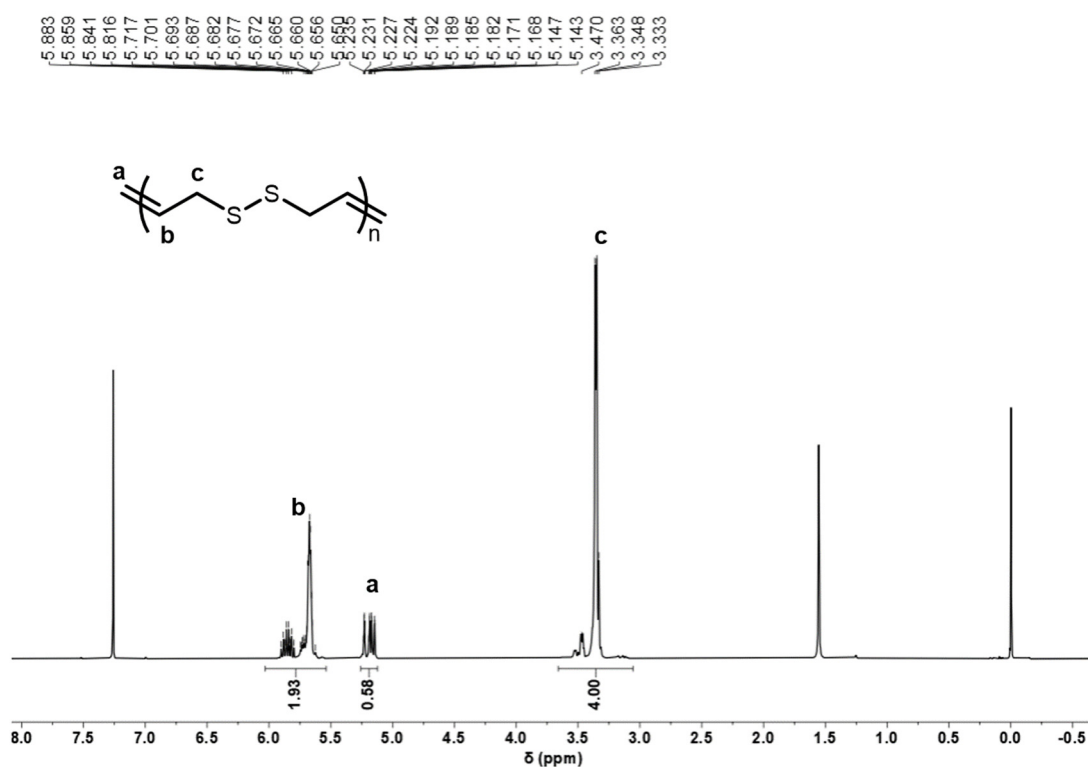
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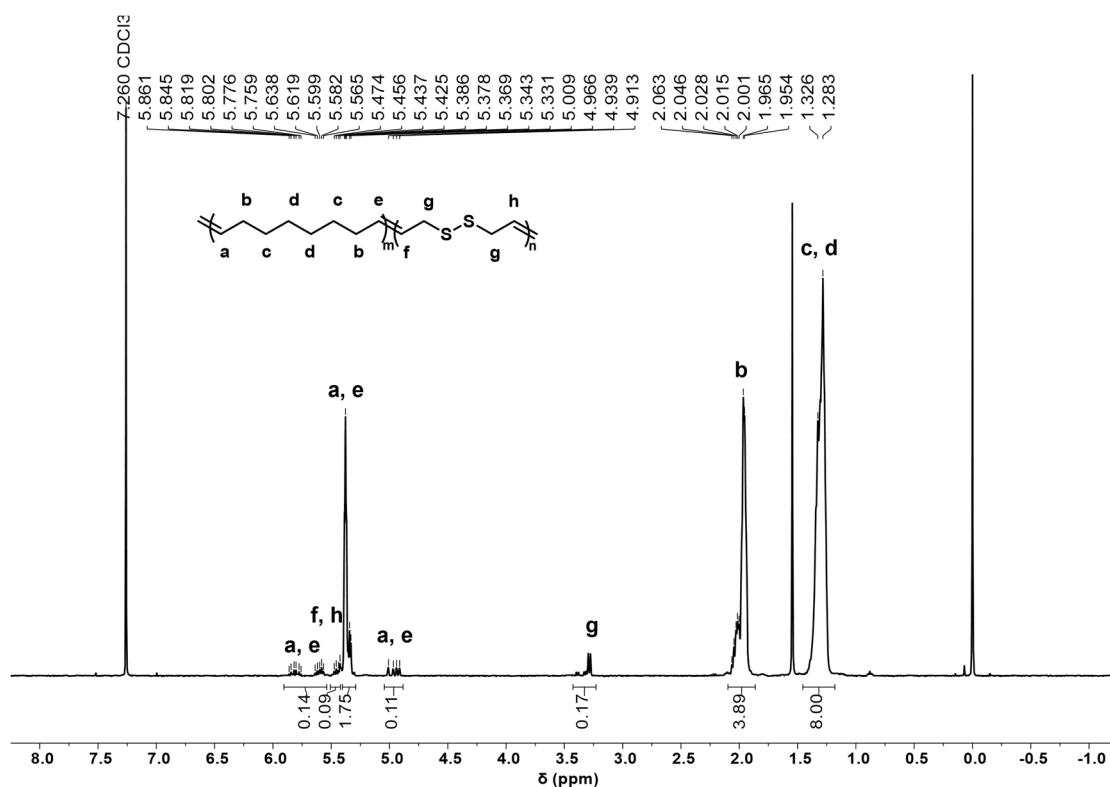
## 1. Copies of NMR spectra



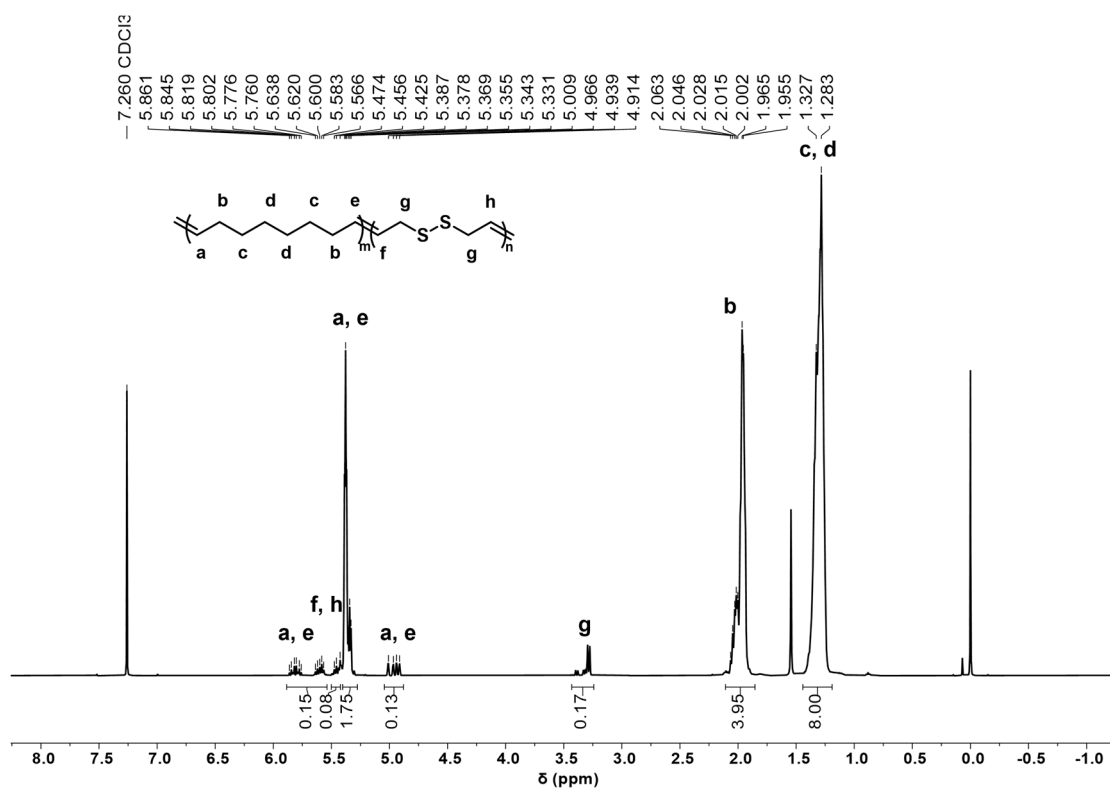
**Figure S1.** <sup>1</sup>H NMR spectrum of diallyl disulfide.



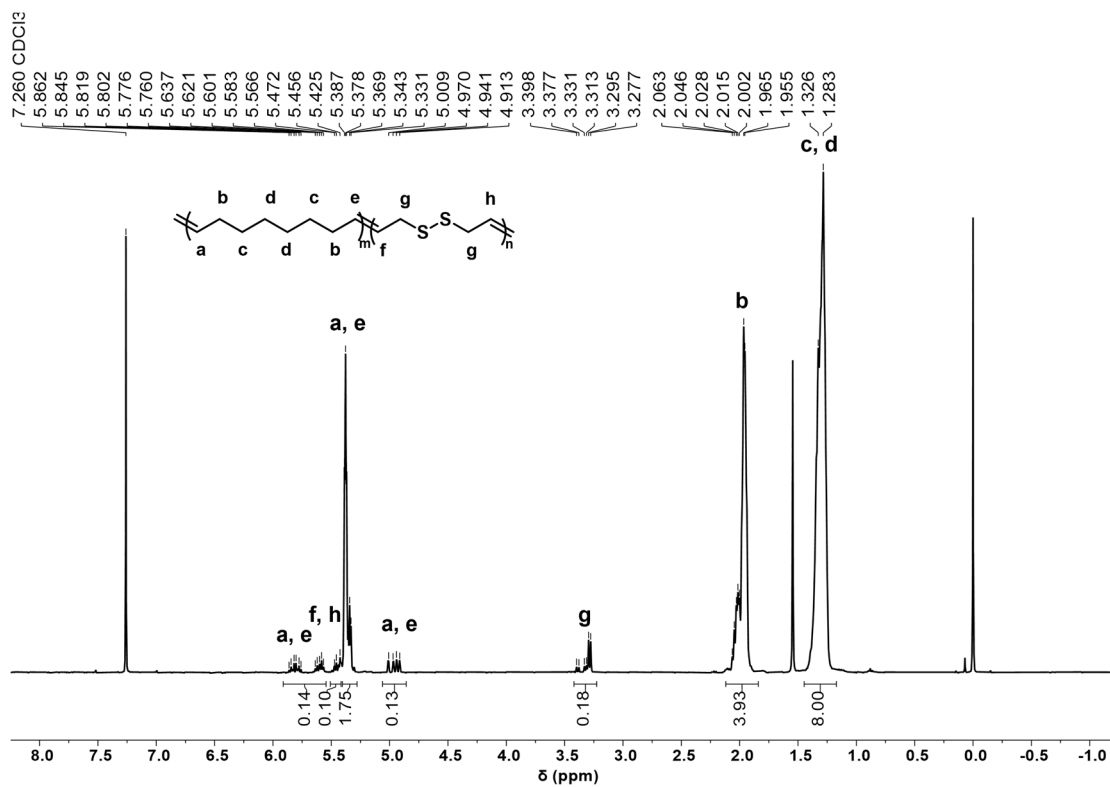
**Figure S2.** <sup>1</sup>H NMR spectrum of homopolymer of diallyl disulfide.



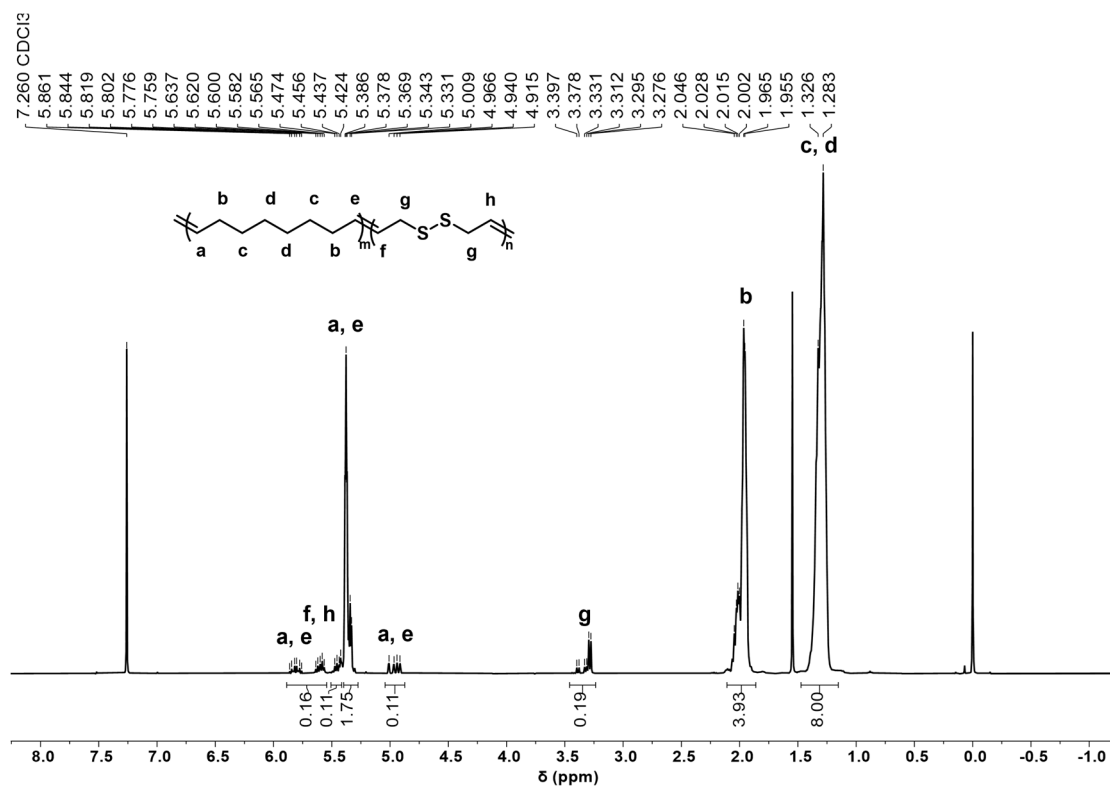
**Figure S3.** <sup>1</sup>H NMR spectrum of polymer obtained in Table 1, Entry 1.



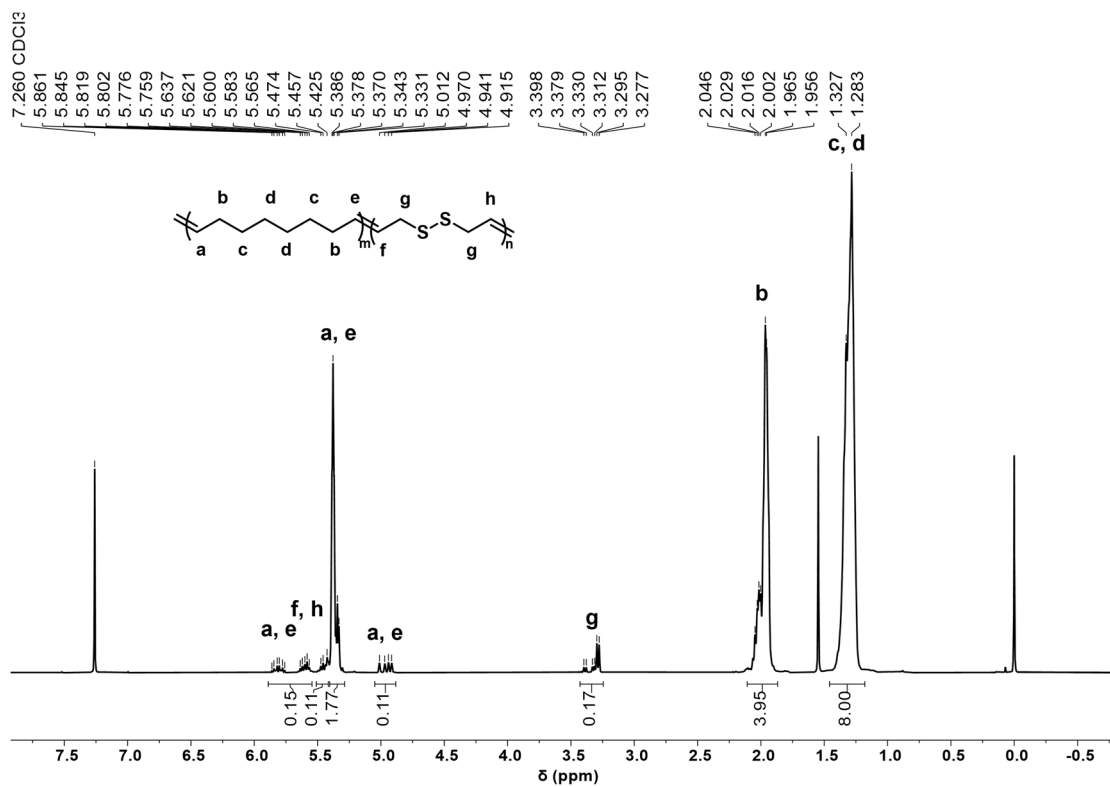
**Figure S4.** <sup>1</sup>H NMR spectrum of polymer obtained in Table 1, Entry 2.



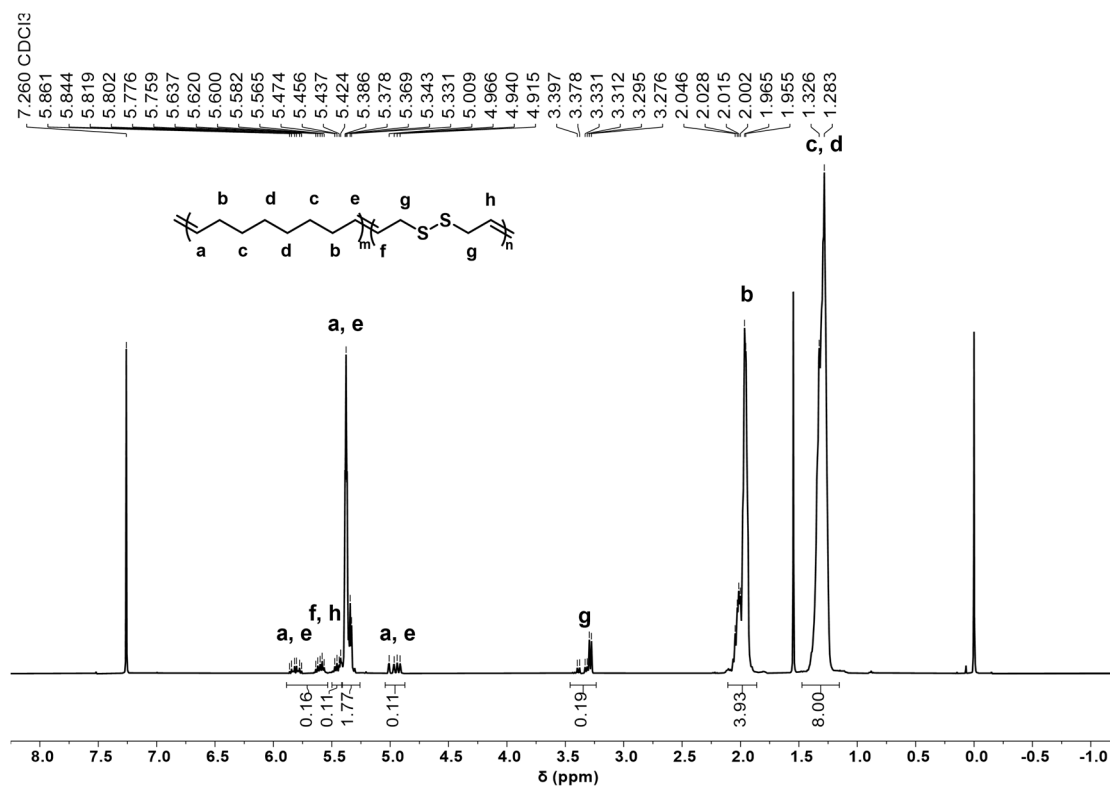
**Figure S5.** <sup>1</sup>H NMR spectrum of polymer obtained in Table 1, Entry 3.



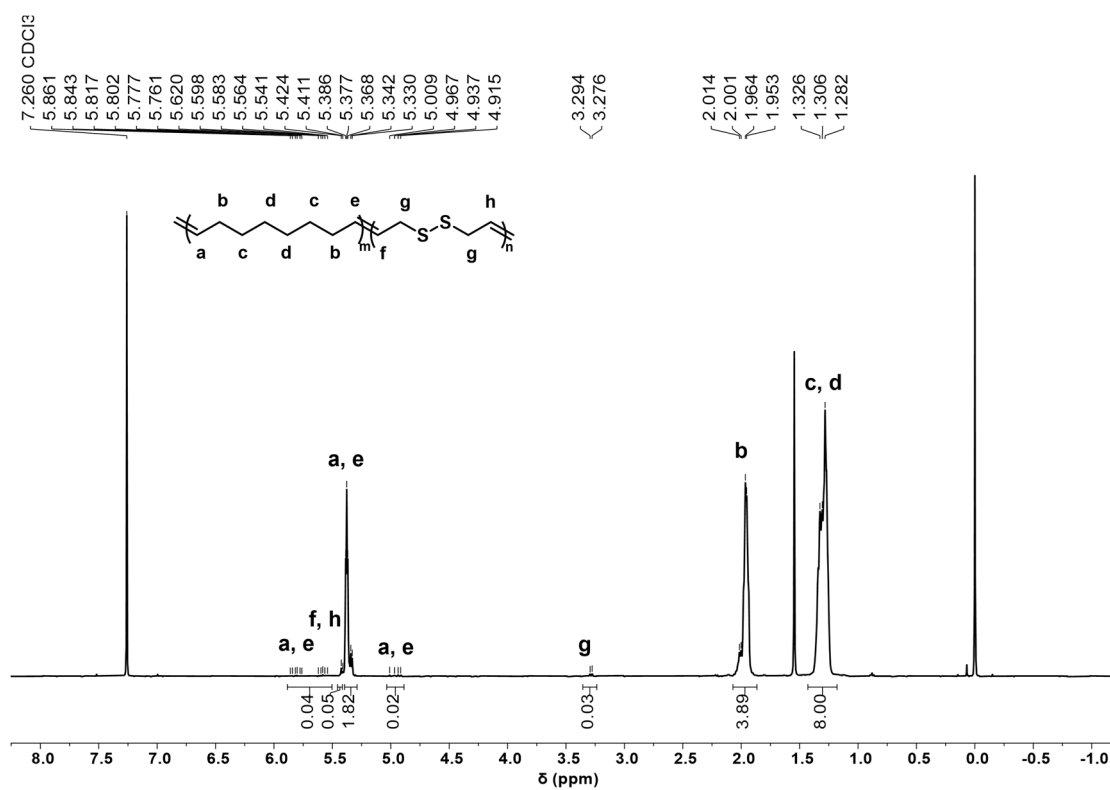
**Figure S6.** <sup>1</sup>H NMR spectrum of polymer obtained in Table 1, Entry 4.



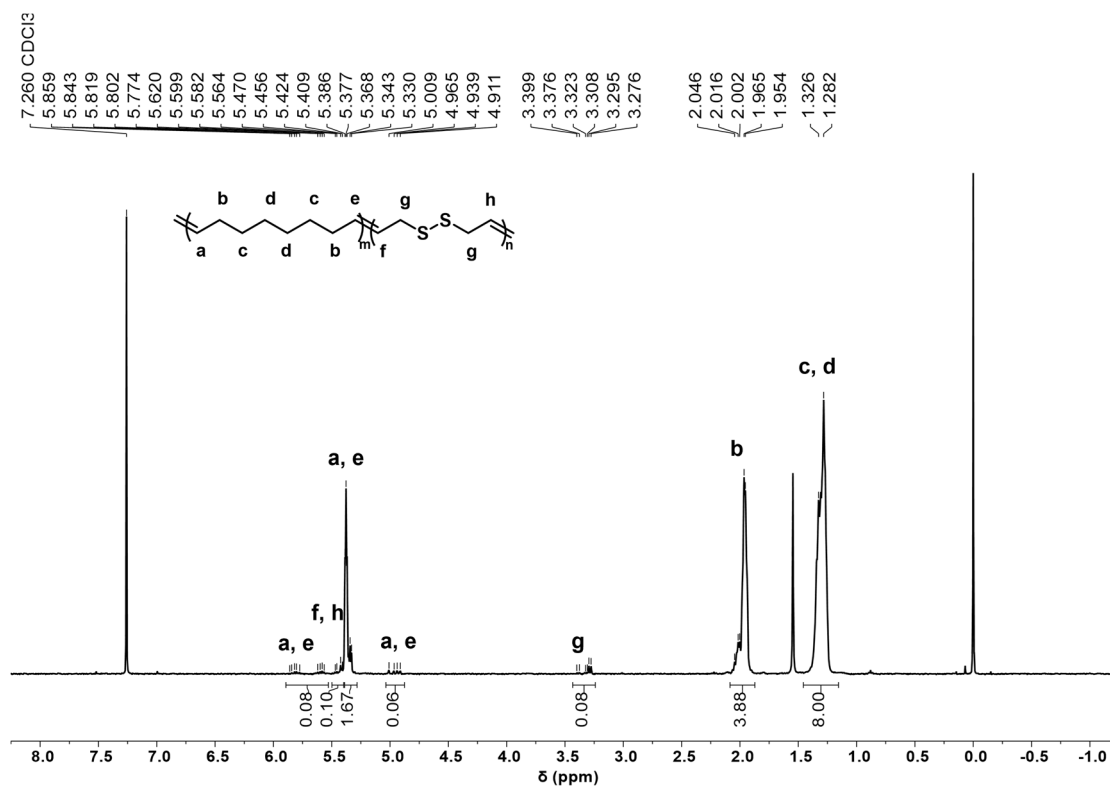
**Figure S7.** <sup>1</sup>H NMR spectrum of polymer obtained in Table 1, Entry 5.



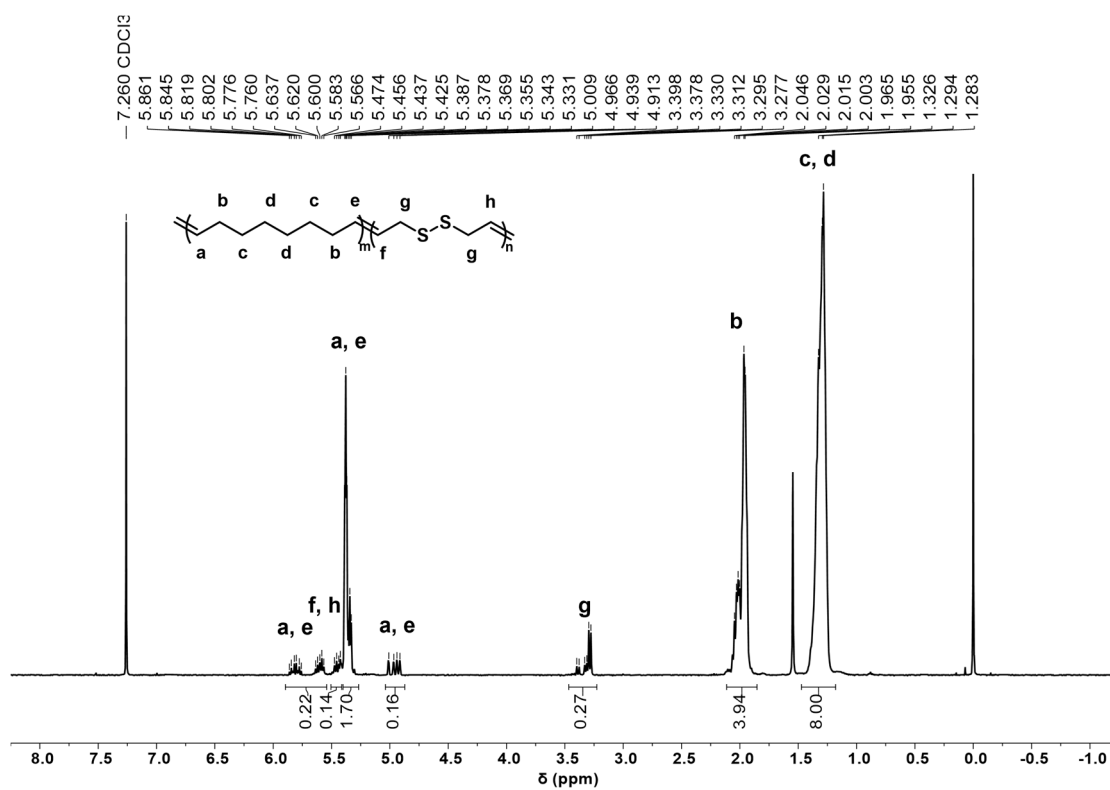
**Figure S8.** <sup>1</sup>H NMR spectrum of polymer obtained in Table 1, Entry 6.



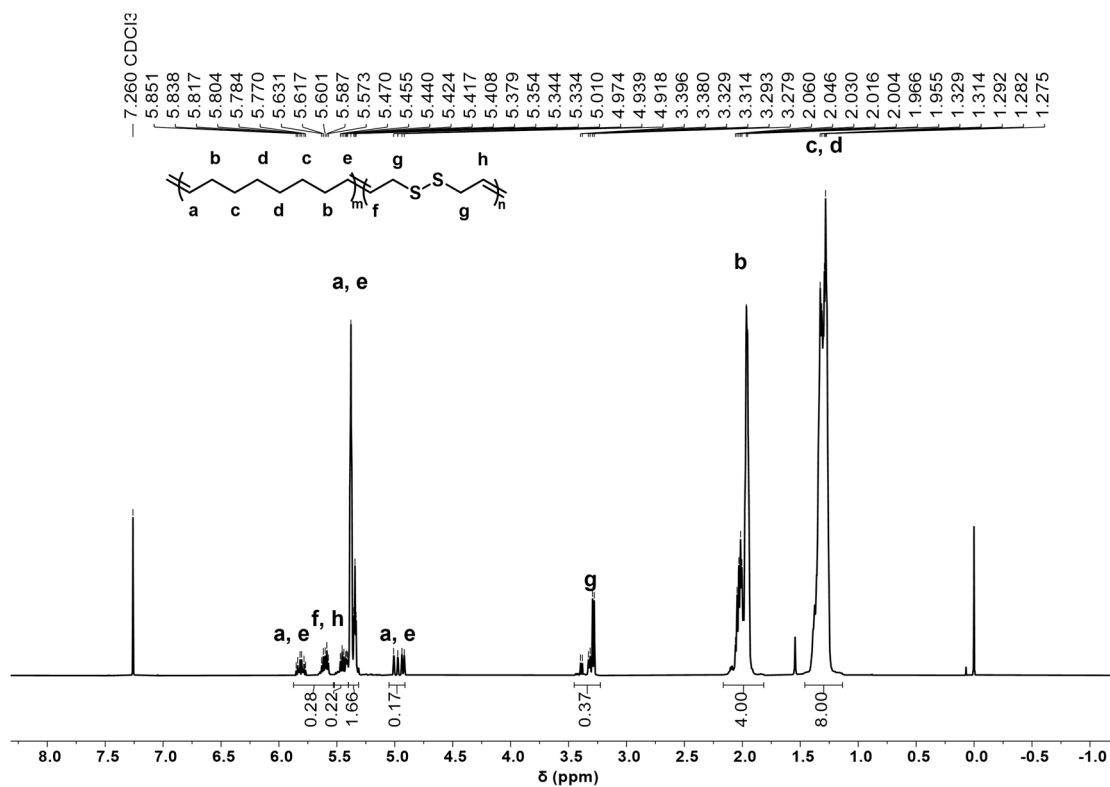
**Figure S9.**  $^1\text{H}$  NMR spectrum of polymer obtained in Table 1, Entry 7.



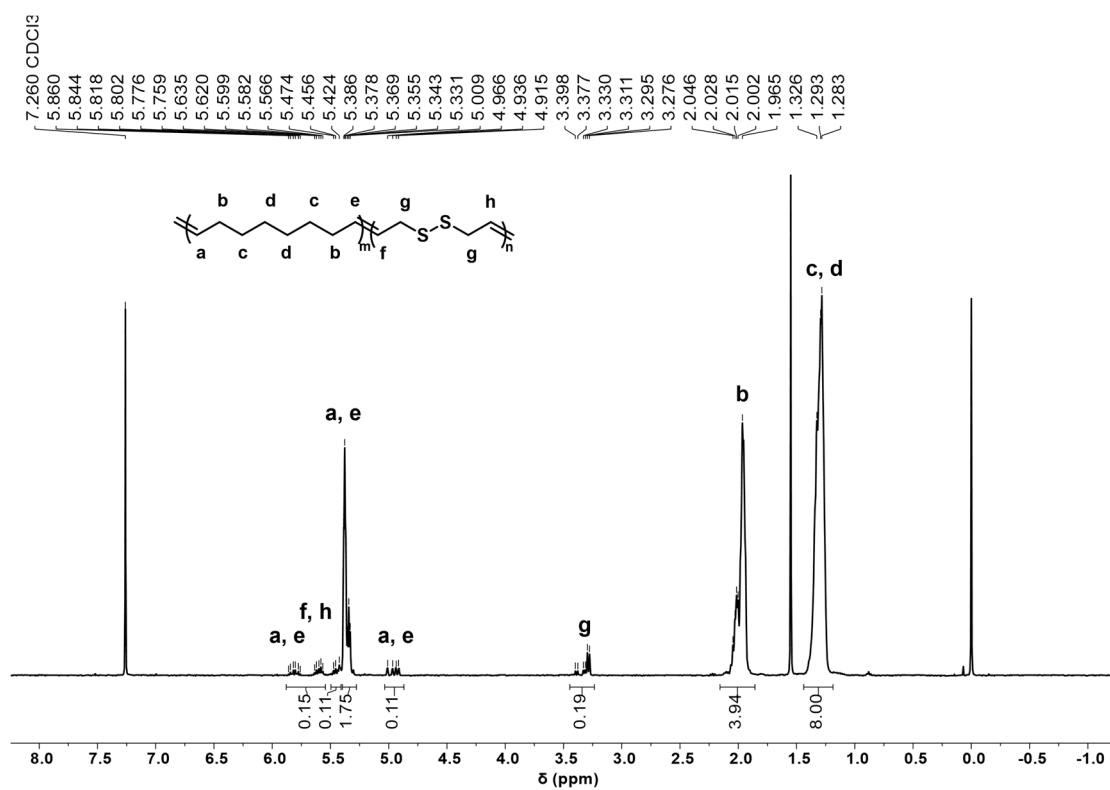
**Figure S10.**  $^1\text{H}$  NMR spectrum of polymer obtained in Table 1, Entry 8.



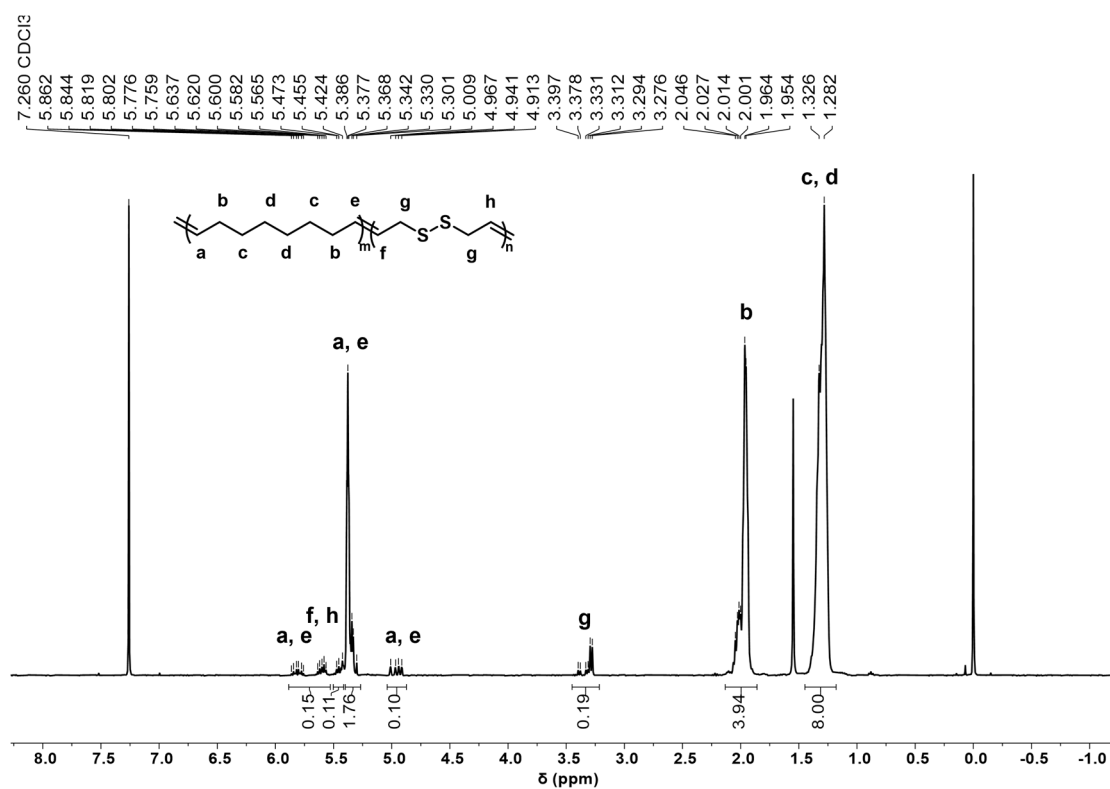
**Figure S11.**  $^1\text{H}$  NMR spectrum of polymer obtained in Table 1, Entry 9.



**Figure S12.**  $^1\text{H}$  NMR spectrum of polymer obtained in Table 1, Entry 10.

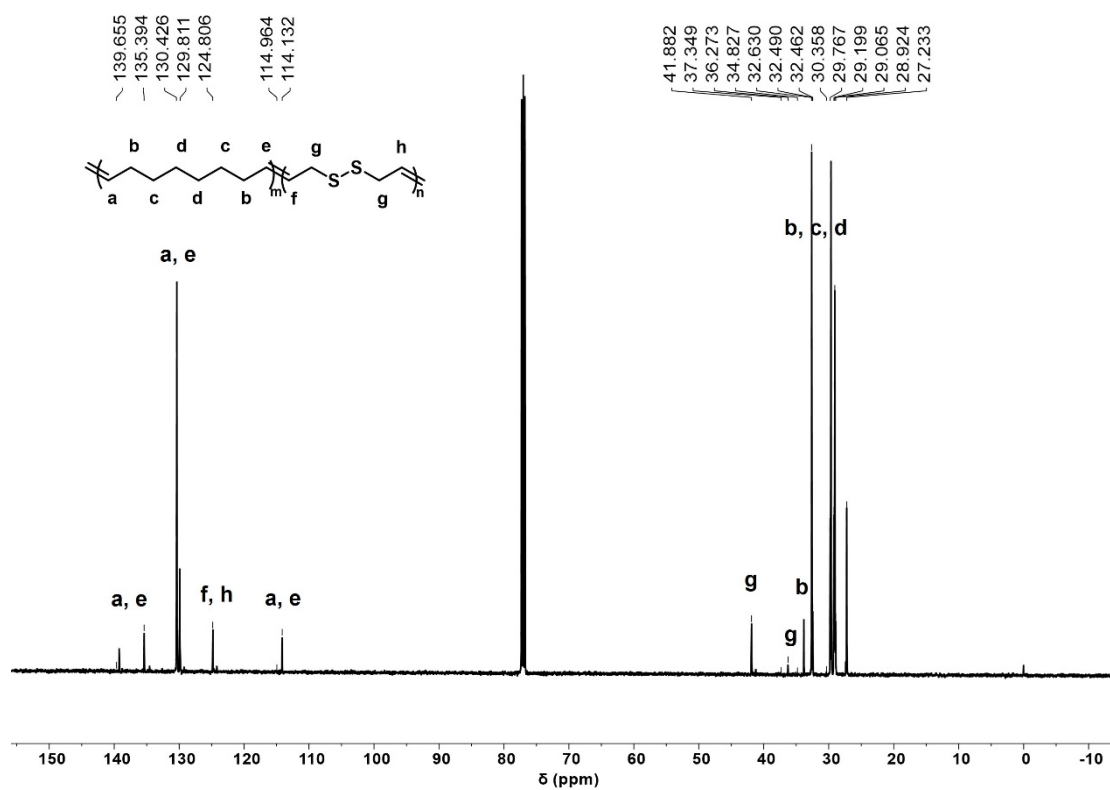


**Figure S13.** <sup>1</sup>H NMR spectrum of polymer obtained in Table 1, Entry 11.

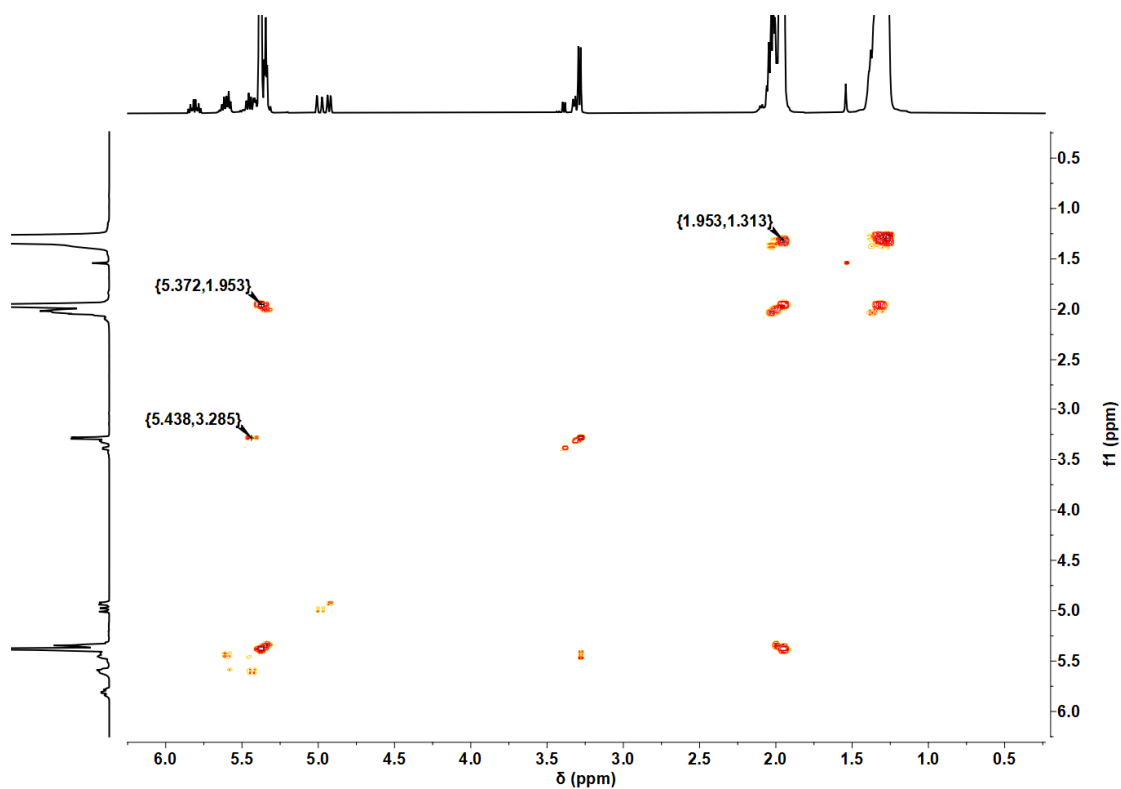


**Figure S14.** <sup>1</sup>H NMR spectrum of polymer obtained in Table 1, Entry 12.

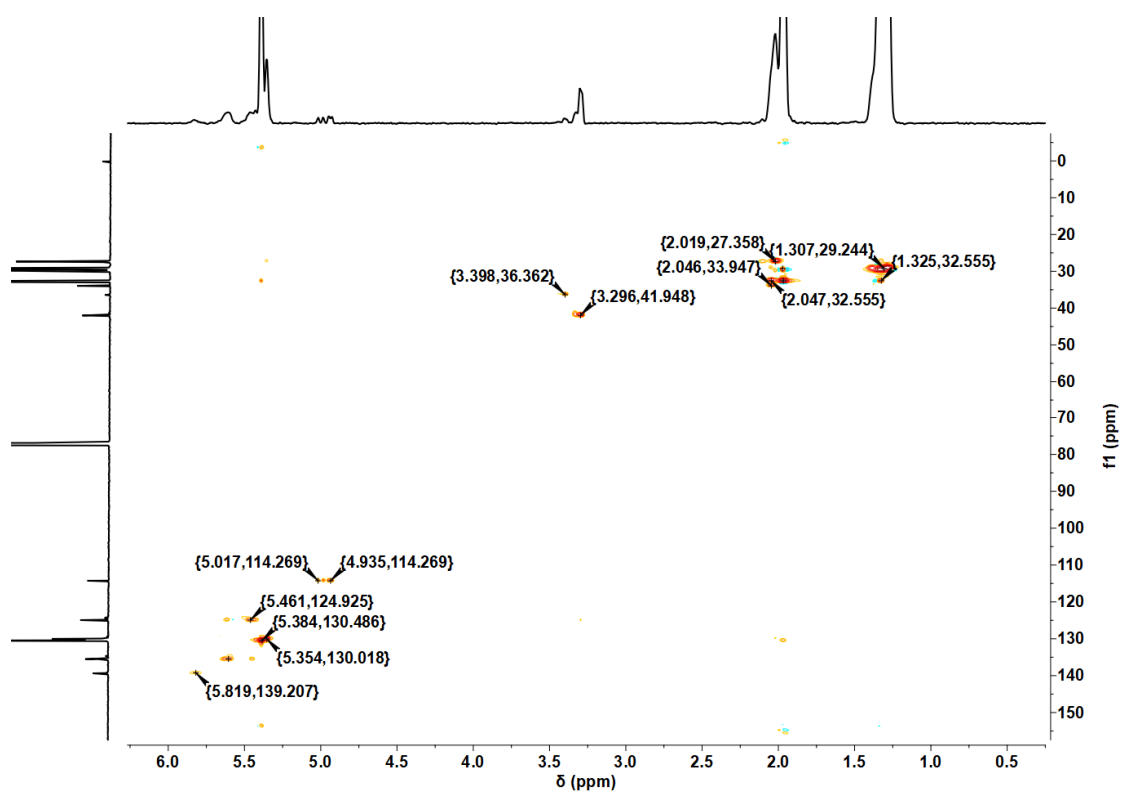




**Figure S15.**  $^{13}\text{C}$  NMR spectrum of polymer obtained in Table 1, Entry 10.

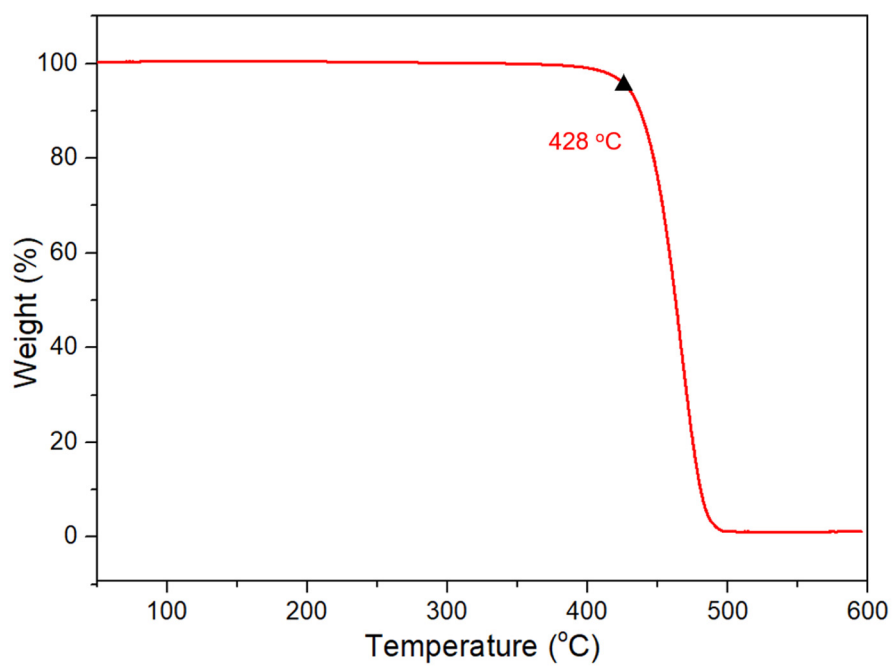


**Figure S16.** 2D  $^1\text{H}$ - $^1\text{H}$  COSY-NMR spectrum of polymer obtained in Table 1, Entry 10.

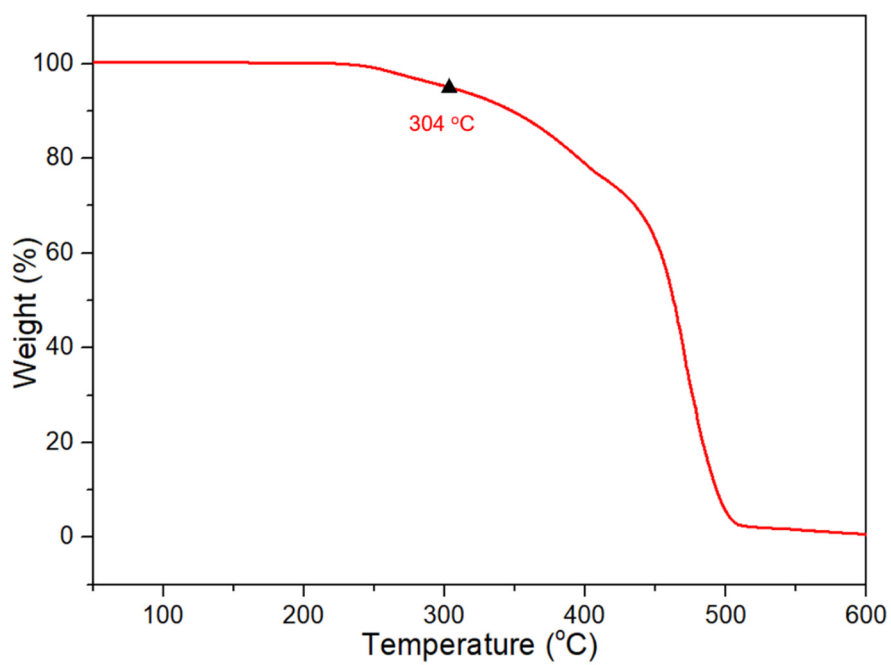


**Figure S17.** 2D  $^1\text{H}$ - $^{13}\text{C}$  HSQC NMR spectrum of polymer obtained in Table 1, Entry 10.

## 2. Copies of TGA curves

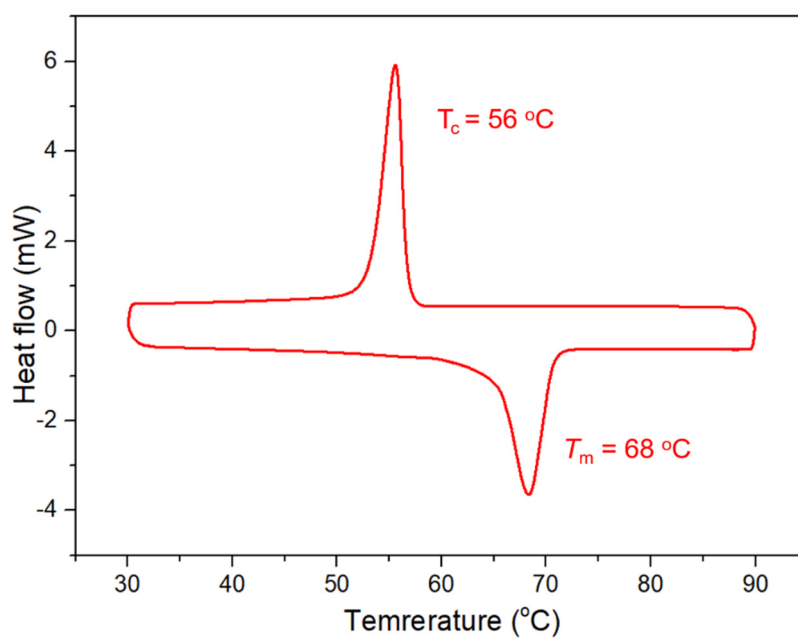


**Figure S18.** TGA curve of polymer obtained in Table 1, Entry 7.

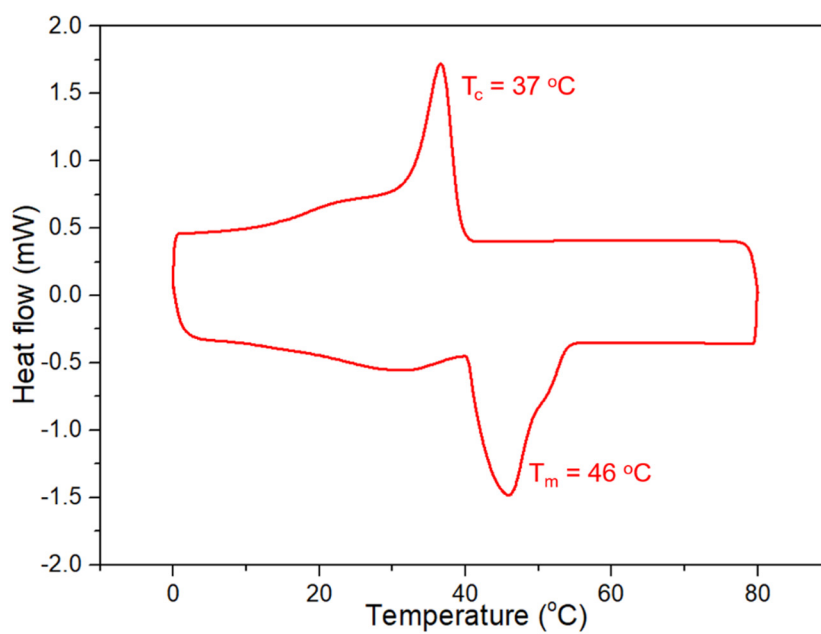


**Figure S19.** TGA curve of polymer obtained in Table 1, Entry 10.

### 3. Copies of DSC Trace



**Figure S20.** DSC trace of polymer obtained in Table 1, Entry 7.



**Figure S21.** DSC trace of polymer obtained in Table 1, Entry 10.

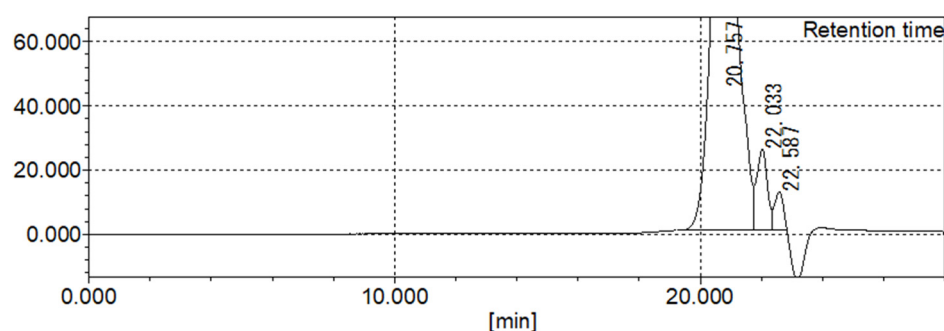
## 4. Copies of SEC Charts

### GPC TEST REPORT

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Sample name	ZFL-1-53-1	Calculation date and time	2022/08/17 20:13:27
Database name	22-0817.chd	Acquisition time [min]	0.000 - 28.000
Data name	RSLT0007	Sampling interval [msec]	100
Method name	PS-20220628	Cup number	7
Channel	RI	Calculation type	Molecular Weight

[mV]



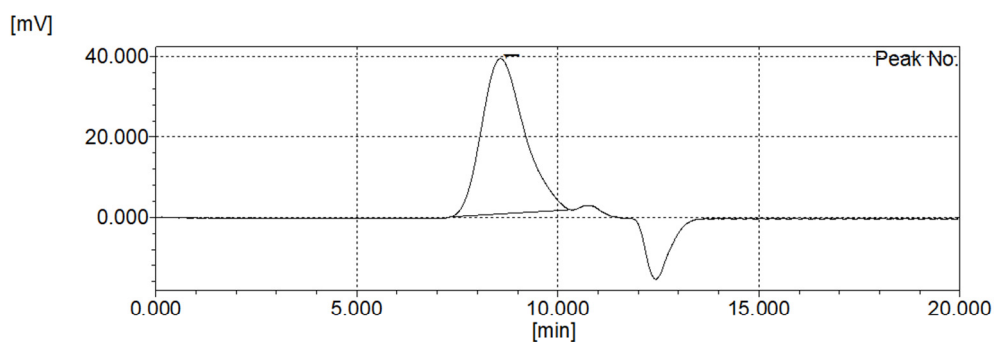
#### Result of molecular weight calculation (RI)

Peak 1 Base Peak

	[min]	[mV]	[mol]	Mn	790
Peak start	19.507	1.513	5.626	Mw	1,095
Peak top	20.757	176.375	1,029	Mz	1,429
Peak end	21.750	15.110	180	Mz+1	1,794
				Mv	1,095
Height [mV]			174.889	MP	1,057
Area [mV*sec]			8530.908	Mz/Mw	1.305
Height% [%]			82.553	Mw/Mn	1.386
[eta]			1095.20093	Mz+1/Mw	1.638

**Figure S22.** SEC chart of the homopolymer of diallyl disulfide ( $M_n = 790 \text{ g}\cdot\text{mol}^{-1}$ ,  $M_w/M_n = 1.39$ )

Header			
Title		Data acquisition date and time	2023/03/14 21:03:17
Sample name	GRH-YP202312717-XY-69-1	Calculation date and time	2023/03/23 10:22:28
Database name	2023-03-14.chd	Acquisition time [min]	0.000 - 20.000
Data name	RSLT4535	Sampling interval [msec]	100
Method name	PS-20230320	Cup number	9
Channel	RI	Calculation type	Molecular Weight

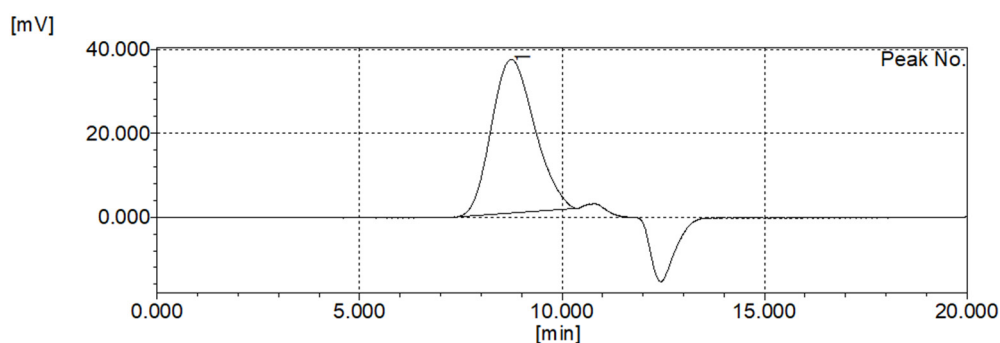


#### Result of molecular weight calculation (RI)

Peak 1 Base Peak					
	[min]	[mV]	[mol]	Mn	7,947
Peak start	7.312	0.094	95,185	Mw	14,513
Peak top	8.572	39.603	13,343	Mz	22,677
Peak end	10.305	1.887	894	Mz+1	31,364
				Mv	14,513
Height [mV]			38.754	Mp	13,344
Area [mV*sec]			2857.613	Mz/Mw	1.563
Area% [%]			100.000	Mw/Mn	1.826
[eta]			14512.61128	Mz+1/Mw	2.161

**Figure S23.** SEC chart of the polymer obtained in Table 1, entry 1. ( $M_n = 7.9 \text{ kg} \cdot \text{mol}^{-1}$ ,  $M_w/M_n = 1.83$ )

Header			
Title		Data acquisition date and time	2023/03/14 21:23:19
Sample name	GRH-YP202312717-XY-69-2	Calculation date and time	2023/03/23 10:22:57
Database name	2023-03-14.chd	Acquisition time [min]	0.000 - 20.000
Data name	RSLT4536	Sampling interval [msec]	100
Method name	PS-20230320	Cup number	10
Channel	RI	Calculation type	Molecular Weight

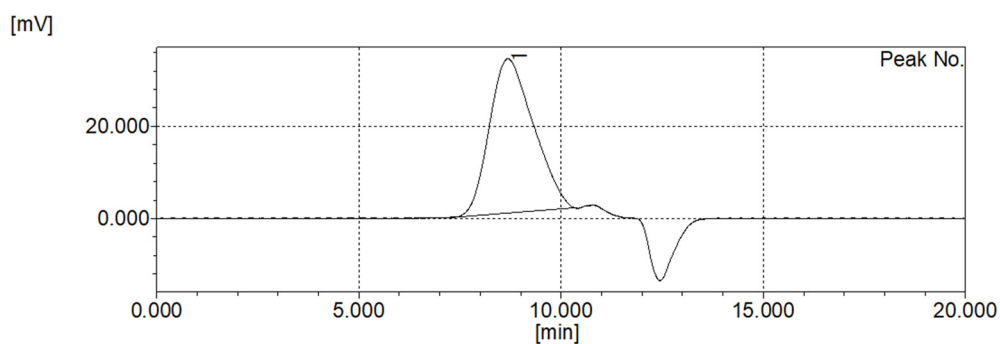


#### Result of molecular weight calculation (RI)

Peak 1 Base Peak					
	[min]	[mV]	[mol]		
Peak start	7.417	0.090	80,809	Mn	6,634
Peak top	8.747	37.691	10,157	Mw	11,624
Peak end	10.332	2.093	857	Mz	18,235
				Mz+1	25,610
				Mv	11,624
Height [mV]			36.687	Mp	10,157
Area [mV*sec]			2713.487	Mz/Mw	1.569
Area% [%]			100.000	Mw/Mn	1.752
[eta]			11624.41022	Mz+1/Mw	2.203

**Figure S24.** SEC chart of the polymer obtained in Table 1, entry 2. ( $M_n = 6.6 \text{ kg} \cdot \text{mol}^{-1}$ ,  $M_w/M_n = 1.75$ )

Header				
Title		Data acquisition date and time	2023/03/14 21:43:20	
Sample name	GRH-YP202312717-XY-70-1	Calculation date and time	2023/03/23 10:23:23	
Database name	2023-03-14.chd	Acquisition time [min]	0.000 - 20.000	
Data name	RSLT4537	Sampling interval [msec]	100	
Method name	PS-20230320	Cup number	11	
Channel	RI	Calculation type	Molecular Weight	



#### Result of molecular weight calculation (RI)

Peak 1 Base Peak

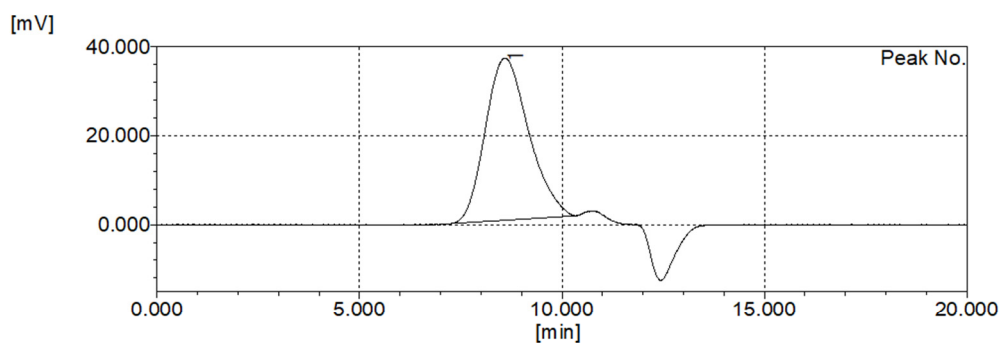
	[min]	[mV]	[mol]		
Peak start	7.440	0.359	77,922	Mn	6,536
Peak top	8.692	34.691	11,066	Mw	11,790
Peak end	10.313	2.374	882	Mz	18,593
				Mz+1	25,906
				Mv	11,790
Height [mV]			33.454	Mp	11,067
Area [mV*sec]			2532.876	Mz/Mw	1.577
Area% [%]			100.000	Mw/Mn	1.804
[eta]			11790.45198	Mz+1/Mw	2.197

**Figure S25.** SEC chart of the polymer obtained in Table 1, entry 3. ( $M_n = 6.5 \text{ kg} \cdot \text{mol}^{-1}$ ,  $M_w/M_n = 1.80$ )



## Header

Title		Data acquisition date and time	2023/03/14 22:03:21
Sample name	GRH-YP202312717-XY-71-1	Calculation date and time	2023/03/23 10:23:50
Database name	2023-03-14.chd	Acquisition time [min]	0.000 - 20.000
Data name	RSLT4538	Sampling interval [msec]	100
Method name	PS-20230320	Cup number	12
Channel	RI	Calculation type	Molecular Weight



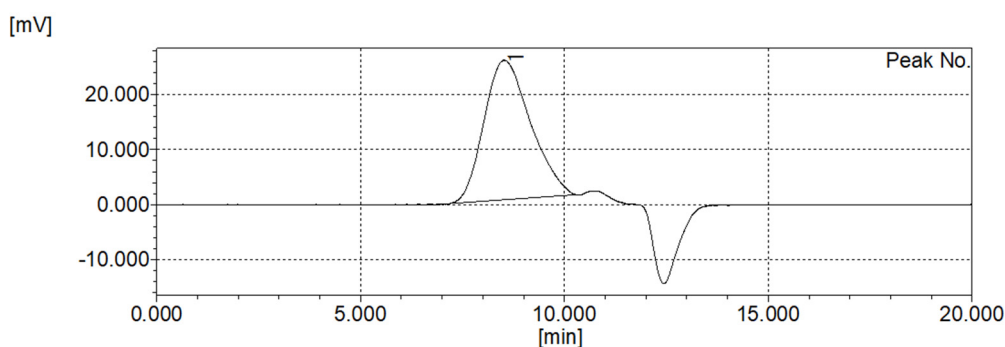
## Result of molecular weight calculation (RI)

Peak 1 Base Peak

	[min]	[mV]	[mol]	Mn	7,973
Peak start	7.232	0.229	107,832	Mw	14,514
Peak top	8.577	37.513	13,240	Mz	22,955
Peak end	10.383	2.020	791	Mz+1	32,268
				Mv	14,514
Height [mV]			36.520	Mp	13,240
Area [mV*sec]			2721.306	Mz/Mw	1.582
Area% [%]			100.000	Mw/Mn	1.820
[eta]			14514.40895	Mz+1/Mw	2.223

**Figure S26.** SEC chart of the polymer obtained in Table 1, entry 4. ( $M_n = 8.0 \text{ kg} \cdot \text{mol}^{-1}$ ,  $M_w/M_n = 1.82$ )

Header			
Title		Data acquisition date and time	2023/03/14 22:23:23
Sample name	GRH-YP202312717-XY-71-2	Calculation date and time	2023/03/23 10:24:17
Database name	2023-03-14.chd	Acquisition time [min]	0.000 - 20.000
Data name	RSLT4539	Sampling interval [msec]	100
Method name	PS-20230320	Cup number	13
Channel	RI	Calculation type	Molecular Weight



#### Result of molecular weight calculation (RI)

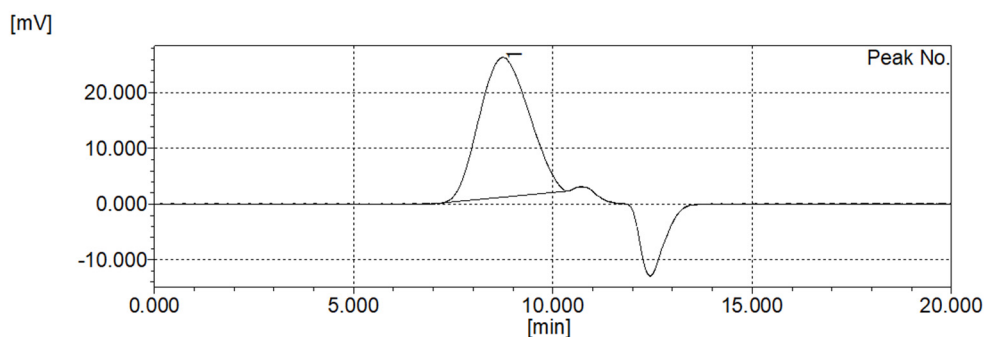
Peak 1 Base Peak

	[min]	[mV]	[mol]	Mn	8,251
Peak start	7.117	0.178	129,011	Mw	15,914
Peak top	8.523	26.312	14,388	Mz	26,097
Peak end	10.302	1.824	898	Mz+1	37,290
				Mv	15,914
Height [mV]			25.407	Mp	14,388
Area [mV*sec]			2008.475	Mz/Mw	1.640
Area% [%]			100.000	Mw/Mn	1.929
[eta]			15913.59598	Mz+1/Mw	2.343

**Figure S27.** SEC chart of the polymer obtained in Table 1, entry 5. ( $M_n = 8.3 \text{ kg} \cdot \text{mol}^{-1}$ ,  $M_w/M_n = 1.93$ )

## Header

Title		Data acquisition date and time	2023/03/14 22:43:24
Sample name	GRH-YP202312717-XY-72-1	Calculation date and time	2023/03/23 10:24:43
Database name	2023-03-14.chd	Acquisition time [min]	0.000 - 20.000
Data name	RSLT4540	Sampling interval [msec]	100
Method name	PS-20230320	Cup number	14
Channel	RI	Calculation type	Molecular Weight



## Result of molecular weight calculation (RI)

Peak 1 Base Peak					
	[min]	[mV]	[mol]	Mn	6,496
Peak start	7.205	0.242	112,410	Mw	13,040
Peak top	8.738	26.441	10,289	Mz	23,004
Peak end	10.358	2.362	822	Mz+1	34,186
				Mv	13,040
Height [mV]			25.168	Mp	10,290
Area [mV*sec]			2179.761	Mz/Mw	1.764
Area% [%]			100.000	Mw/Mn	2.007
[eta]			13040.17051	Mz+1/Mw	2.622

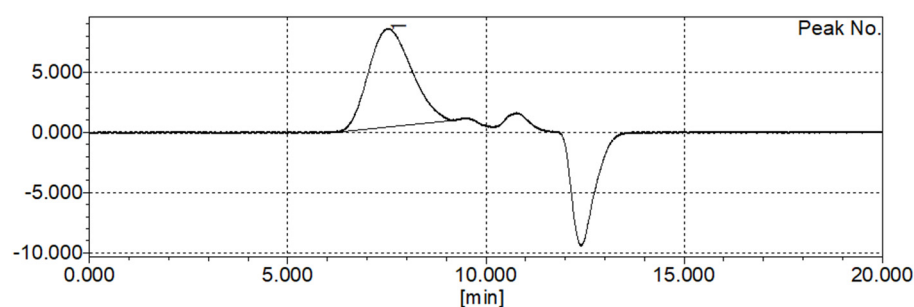
**Figure S28.** SEC chart of the polymer obtained in Table 1, entry 6. ( $M_n = 6.5 \text{ kg} \cdot \text{mol}^{-1}$ ,  $M_w/M_n = 2.00$ )

## Header

Title  
Sample name ZXH-YP202315344-xy-79-1  
Database name 2023-03-22.chd  
Data name RSLT4603  
Method name PS-20230320  
Channel RI

Data acquisition date and time 2023/03/22 23:25:00  
Calculation date and time 2023/03/23 10:04:27  
Acquisition time [min] 0.000 - 20.000  
Sampling interval [msec] 100  
Cup number 15  
Calculation type Molecular Weight

[mV]



## Result of molecular weight calculation (RI)

Peak 1 Base Peak

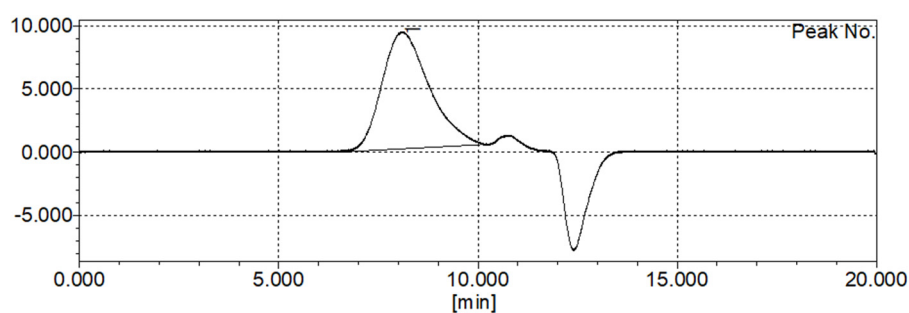
	[min]	[mV]	[mol]		
Peak start	6.172	-0.006	563,115	Mn	42,831
Peak top	7.522	8.668	68,605	Mw	76,566
Peak end	9.165	0.985	5,290	Mz	121,269
				Mz+1	171,765
				Mv	76,566
Height [mV]			8.227	Mp	68,605
Area [mV*sec]			619.195	Mz/Mw	1.584
Area% [%]			100.000	Mw/Mn	1.788
[eta]			76566.14692	Mz+1/Mw	2.243

**Figure S29.** SEC chart of the polymer obtained in Table 1, entry 7. ( $M_n = 42.8 \text{ kg} \cdot \text{mol}^{-1}$ ,  $M_w/M_n = 1.79$ )

## Header

Title		Data acquisition date and time	2023/03/23 00:45:06
Sample name	ZXH-YP202315344-xy-74-2	Calculation date and time	2023/03/23 10:09:53
Database name	2023-03-22.chd	Acquisition time [min]	0.000 - 20.000
Data name	RSLT4607	Sampling interval [msec]	100
Method name	PS-20230320	Cup number	19
Channel	RI	Calculation type	Molecular Weight

[mV]



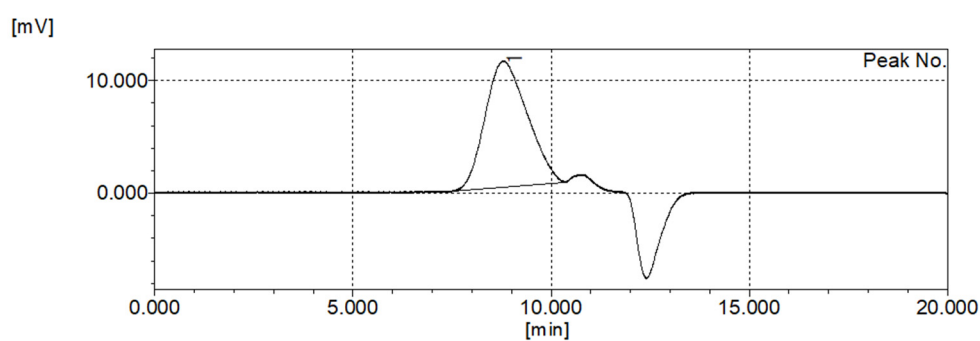
## Result of molecular weight calculation (RI)

Peak 1 Base Peak

	[min]	[mV]	[mol]	Mn	
Peak start	6.597	0.024	290,255	Mw	13,907
Peak top	8.097	9.561	27,987	Mz	30,923
Peak end	10.225	0.623	1,013	Mz+1	54,687
				Mv	85,164
Height [mV]			9.289	Mp	30,923
Area [mV*sec]			764.519	Mz/Mw	27,987
Area% [%]			100.000	Mw/Mn	1.769
[eta]			30922.87134	Mz+1/Mw	2.224
					2.754

**Figure S30.** SEC chart of the polymer obtained in Table 1, entry 8. ( $M_n = 13.9 \text{ kg} \cdot \text{mol}^{-1}$ ,  $M_w/M_n = 2.22$ ).

Header			
Title		Data acquisition date and time	2023/03/23 01:25:08
Sample name	ZXH-YP202315344-xy-75-1	Calculation date and time	2023/03/23 10:12:21
Database name	2023-03-22.chd	Acquisition time [min]	0.000 - 20.000
Data name	RSLT4609	Sampling interval [msec]	100
Method name	PS-20230320	Cup number	21
Channel	RI	Calculation type	Molecular Weight



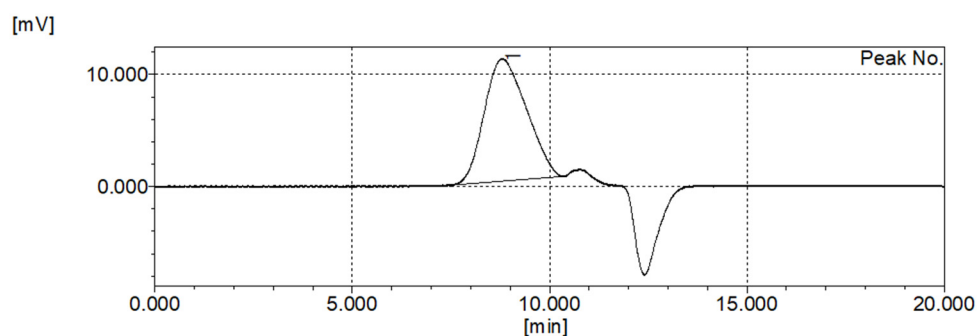
#### Result of molecular weight calculation (RI)

Peak 1 Base Peak

	[min]	[mV]	[mol]		
Peak start	7.353	0.140	89,197	Mn	5,883
Peak top	8.797	11.790	9,395	Mw	10,239
Peak end	10.320	0.958	873	Mz	16,155
				Mz+1	23,323
				Mv	10,239
Height [mV]			11.252	Mp	9,395
Area [mV*sec]			828.429	Mz/Mw	1.578
Area% [%]			100.000	Mw/Mn	1.740
[eta]			10239.01058	Mz+1/Mw	2.278

**Figure S31.** SEC chart of the polymer obtained in Table 1, entry 9. ( $M_n = 5.9 \text{ kg} \cdot \text{mol}^{-1}$ ,  $M_w/M_n = 1.74$ )

Header			
Title		Data acquisition date and time	2023/03/23 00:05:03
Sample name	ZXH-YP202315344-xy-75-2	Calculation date and time	2023/03/23 10:07:41
Database name	2023-03-22.chd	Acquisition time [min]	0.000 - 20.000
Data name	RSLT4605	Sampling interval [msec]	100
Method name	PS-20230320	Cup number	17
Channel	RI	Calculation type	Molecular Weight



#### Result of molecular weight calculation (RI)

Peak 1 Base Peak					
	[min]	[mV]	[mol]	Mn	5,820
Peak start	7.390	0.097	84,240	Mw	9,997
Peak top	8.802	11.468	9,322	Mz	15,650
Peak end	10.358	0.913	822	Mz+1	22,408
				Mv	9,997
Height [mV]			10.983	Mp	9,322
Area [mV*sec]			810.008	Mz/Mw	1.566
Area% [%]			100.000	Mw/Mn	1.718
[eta]			9996.70852	Mz+1/Mw	2.242

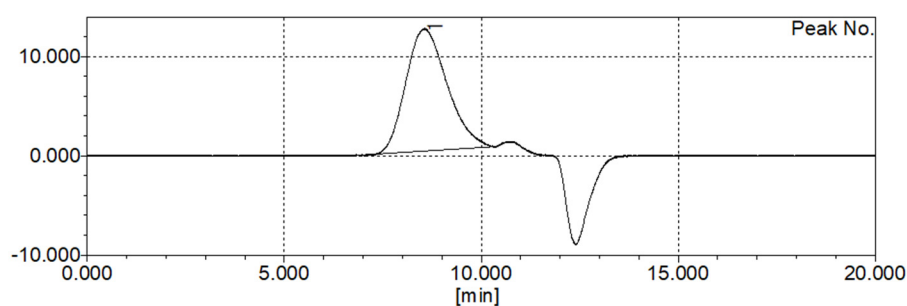
**Figure S32.** SEC chart of the polymer obtained in Table 1, entry 10. ( $M_n = 5.8 \text{ kg} \cdot \text{mol}^{-1}$ ,  $M_w/M_n = 1.72$ )

## Header

Title  
Sample name ZXH-YP202315344-xy-80-2  
Database name 2023-03-22.chd  
Data name RSLT4604  
Method name PS-20230320  
Channel RI

Data acquisition date and time 2023/03/22 23:45:02  
Calculation date and time 2023/03/23 10:06:48  
Acquisition time [min] 0.000 - 20.000  
Sampling interval [msec] 100  
Cup number 16  
Calculation type Molecular Weight

[mV]



## Result of molecular weight calculation (RI)

Peak 1 Base Peak

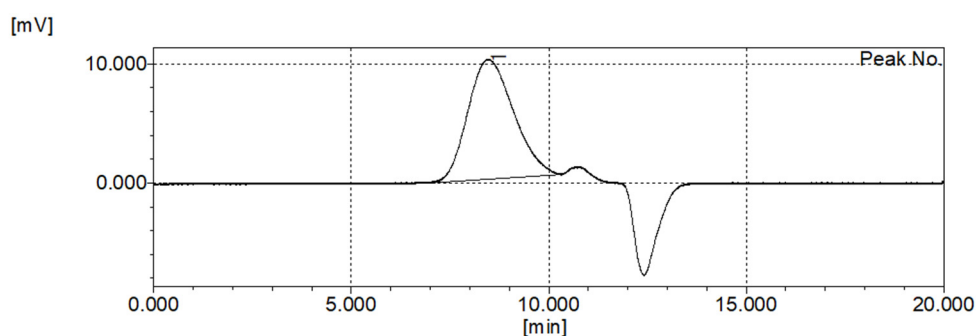
	[min]	[mV]	[mol]	Mn	8,536
Peak start	7.100	0.109	132,408	Mw	15,213
Peak top	8.545	12.825	13,910	Mz	23,837
Peak end	10.252	0.891	971	Mz+1	34,288
				Mv	15,213
Height [mV]			12.357	Mp	13,910
Area [mV*sec]			896.117	Mz/Mw	1.567
Area% [%]			100.000	Mw/Mn	1.782
[eta]			15212.56104	Mz+1/Mw	2.254

**Figure S33.** SEC chart of the polymer obtained in Table 1, entry 11. ( $M_n = 8.5 \text{ kg} \cdot \text{mol}^{-1}$ ,  $M_w/M_n = 1.78$ )



## Header

Title		Data acquisition date and time	2023/03/23 01:05:06
Sample name	ZXH-YP202315344-xy-76-1	Calculation date and time	2023/03/23 10:11:17
Database name	2023-03-22.chd	Acquisition time [min]	0.000 - 20.000
Data name	RSLT4608	Sampling interval [msec]	100
Method name	PS-20230320	Cup number	20
Channel	RI	Calculation type	Molecular Weight



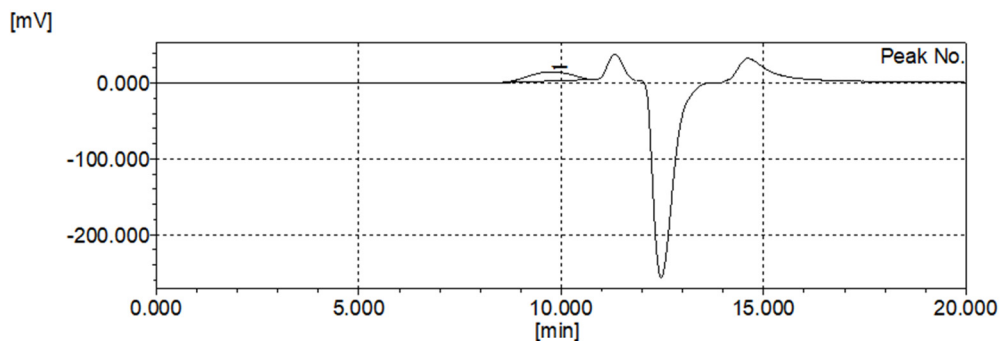
## Result of molecular weight calculation (RI)

Peak 1 Base Peak

	[min]	[mV]	[mol]	Mn	9,135
Peak start	6.872	-0.015	189,036	Mw	18,145
Peak top	8.457	10.439	15,964	Mz	31,371
Peak end	10.375	0.734	801	Mz+1	49,274
				Mv	18,145
Height [mV]			10.115	Mp	15,965
Area [mV*sec]			812.125	Mz/Mw	1.729
Area% [%]			100.000	Mw/Mn	1.986
[eta]			18144.98930	Mz+1/Mw	2.716

**Figure S34.** SEC chart of the polymer obtained in Table 1, entry 12. ( $M_n = 9.1 \text{ kg} \cdot \text{mol}^{-1}$ ,  $M_w/M_n = 1.99$ )

Header			
Title		Data acquisition date and time	2023/04/19 16:53:10
Sample name	XY-YP202322263-85-1	Calculation date and time	2023/04/19 19:18:02
Database name	2023-04-19.chd	Acquisition time [min]	0.000 - 20.000
Data name	RSLT4790	Sampling interval [msec]	100
Method name	PS-20230320	Cup number	6
Channel	RI	Calculation type	Molecular Weight



Result of molecular weight calculation (RI)

Peak 1 Base Peak					
	[min]	[mV]	[mol]	Mn	1,830
Peak start	8.382	0.279	17.945	Mw	2,904
Peak top	9.700	14.990	2.296	Mz	4,475
Peak end	10.825	4.875	397	Mz+1	6,271
				Mv	2,904
Height [mV]			12.231	Mp	2,297
Area [mV*sec]			889.844	Mz/Mw	1.541
Area% [%]			100.000	Mw/Mn	1.587
[eta]			2903.60267	Mz+1/Mw	2.160

**Figure S35.** SEC chart of the polymer obtained in Table 1, entry 10 after treatment of tri-*n*-butylphosphine. ( $M_n = 1.8 \text{ kg} \cdot \text{mol}^{-1}$ ,  $M_w/M_n = 1.59$ )