Supporting Information

Diversity-Oriented Synthesis of Chemically Recyclable Poly(sulfonamide ester)s through Organocatalytic Aziridine-Based Multicomponent Polymerization

Songjie Fan[a], Peng Zhu[a], Jintong Ye[a], Huishan Huang[a], Zhen Zhang[*a,b], and Jinxiang Dong[*a,b]

[a]School of Chemical Engineering and Light Industry, Guangdong University of Technology, Guangzhou 510006, China

[b]Jieyang Branch of Chemistry and Chemical Engineering Guangdong Laboratory (Rongjiang Laboratory), Jieyang 515200, China

Content

1. Experimental Section

1.1 Materials

1,4-Benzenedimethanol (98%), 1,5-pentanediol (98%), 2,2-dimethyl-1,3-propanediol (99%), 2,5-furandimethanol (98%), poly(ethylene glycol) (average M_n 200, 400, & 600), 1,12-dodecanediol (98%), 2,3-butanediol (98%), 2,5-dimethyl-2,5-hexanediol (99%), succinic anhydride (98%), phthalic anhydride (99%), *cis*-5-norbornene-endo-2,3-dicarboxylic anhydride (99%), 4,4'-oxydiphthalic anhydride (97%), 4,4'-(hexafluoroisopropylidene)diphthalic anhydride (97%), 4-methylbenzyl alcohol (98%), 6-heptyn-1-ol (98%), 1-octadecanol (98%), 1H,1H,11H-eicosafluoro-1-undecanol (98%), poly(ethylene glycol) methyl ether (average M_n ~2,000), sodium hydroxide (NaOH), hydrochloric acid, methanesulfonyl chloride (>99%), pyridine (99%), potassium carbonate were purchased commercially and used without further purification. Tetrahydrofuran (THF) was distilled from sodium benzophenone before use. *N,N*-dimethylformamide (DMF), and acetonitrile were dried over CaH_2 and distilled before use. Bis(aziridine)s **1a**, and **1b** were prepared according to reported procedures.[1,2]

1.2 Characterizations

Nuclear magnetic resonance (^{1}H NMR and ^{13}C NMR) spectra were recorded with a Bruker AVANCE III 400 spectrometer. Size exclusion chromatography (SEC) measurements were carried out in DMF with 0.01 M LiBr at 60 °C with the Agilent 1260 Infinity II instrument, equipped with two PLgel 10 μm MIXED-B columns and a differential refractive index (DRI) detector. The system was calibrated with poly(methyl methacrylate) (PMMA) standards at a flow rate of 1.0 mL/min. FT-IR spectra were obtained on a Thermo-Fisher Nicolet 6700 spectrometer. Thermal stabilities were evaluated by performing the thermogravimetric analysis (TGA) on an STA 449 F5 Jupiter instrument under dry nitrogen at a heating rate of 10 °C/min. Differential scanning calorimetry (DSC) measurements were performed using a Mettler Toledo DSC3 calorimeter. Two scanning cycles of heating-cooling were performed in the temperature range from 25 to 150 °C with heating rates of 10 °C/min under nitrogen. T_g was determined from the second heating run.

2. Supporting Schemes, Figures, and Tables

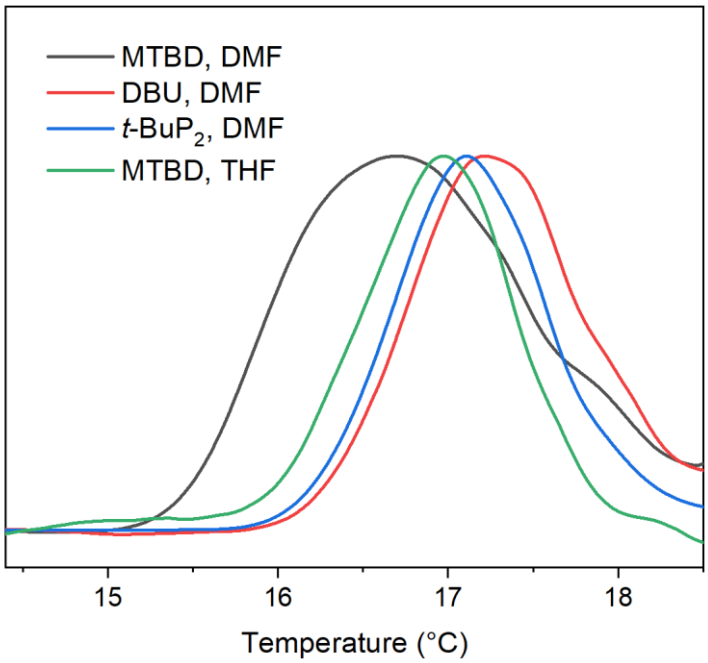


Fig. S1 SEC traces of samples synthesized in **Table 1.**

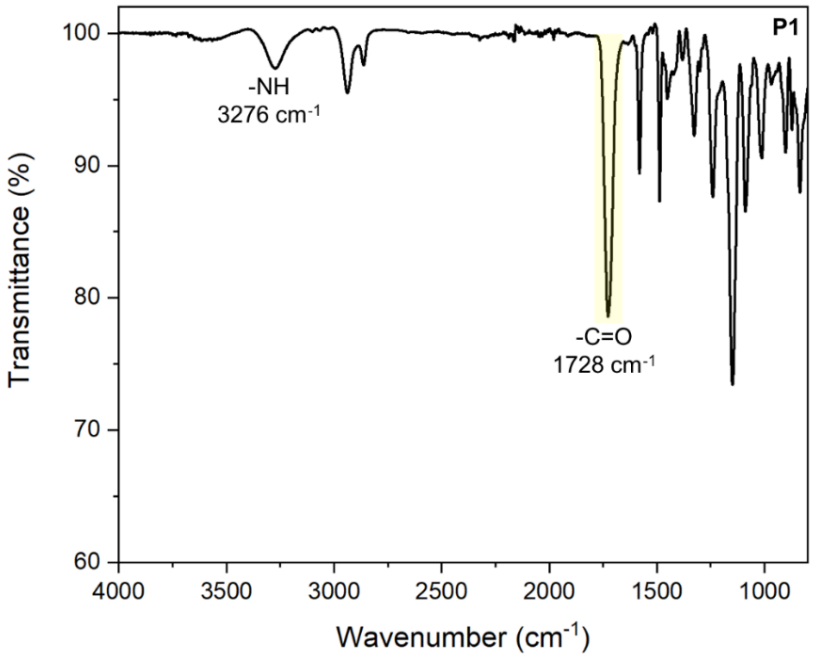
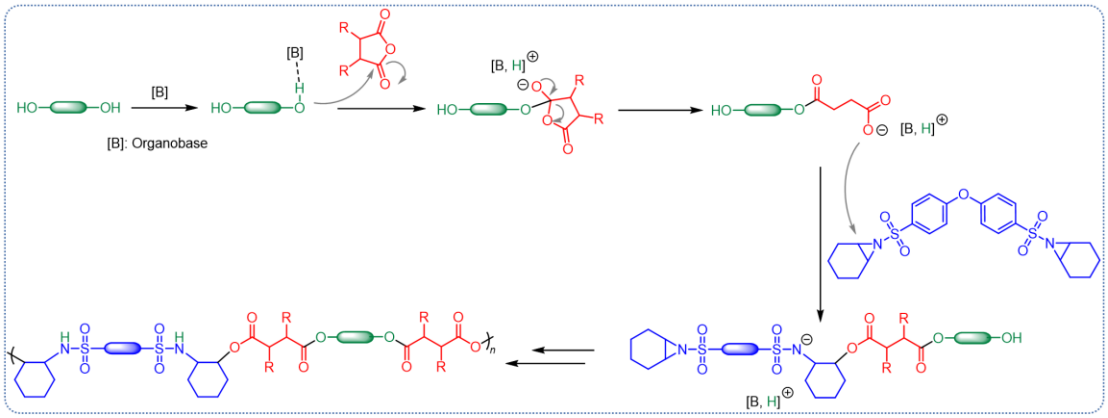
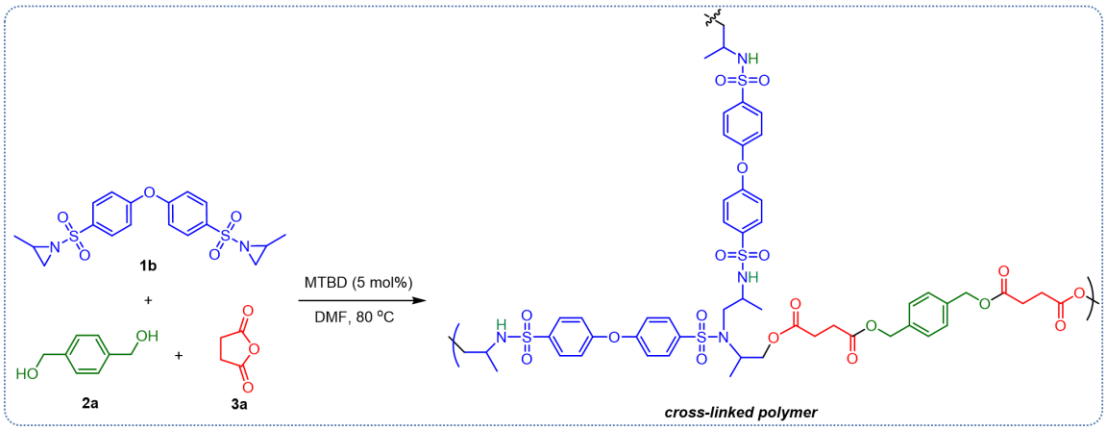


Fig. S2 FT-IR spectrum of poly(sulfonamide ester) **P1**.



Scheme S1 A proposed mechanism for organocatalytic multicomponent polymerization of bis(aziridine), diol, and anhydride.



Scheme S2 Multicomponent polymerization of bis(aziridine) **1b**, 1,4-benzenedimethanol **2a**, and succinic anhydride **3a**.

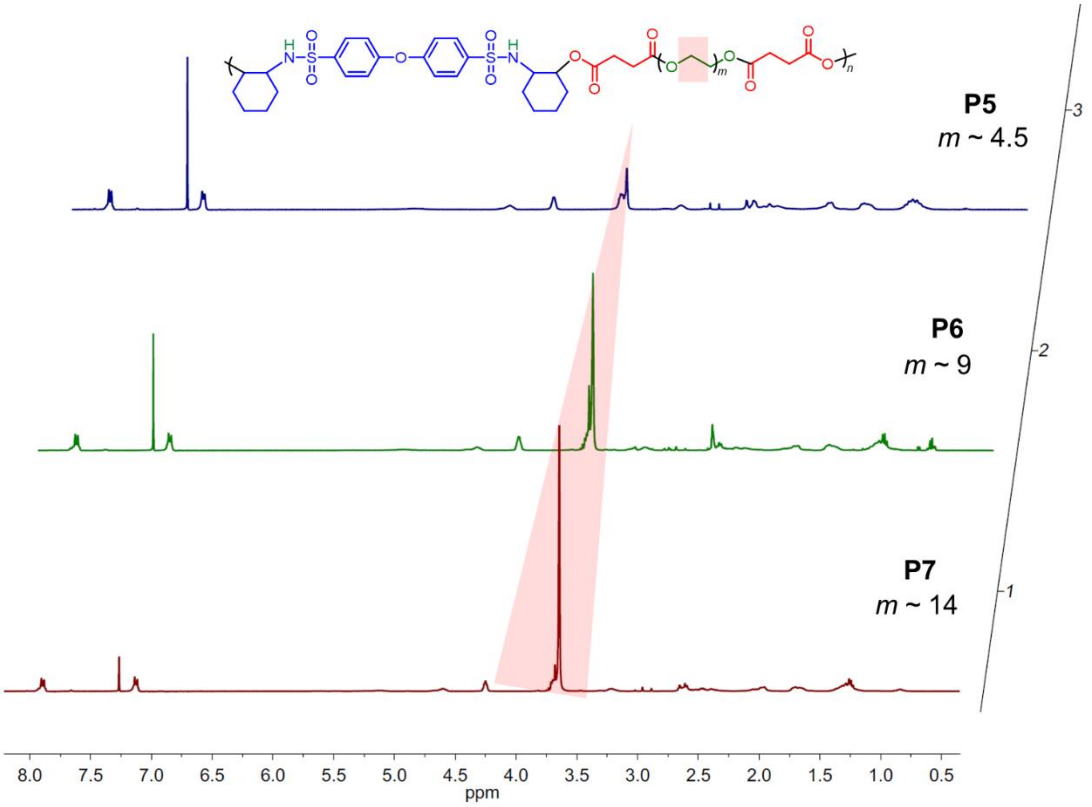


Fig. S3 ^{1}H ($CDCl_3$, 400 MHz, 25 °C) NMR spectra of **P5-P7**.

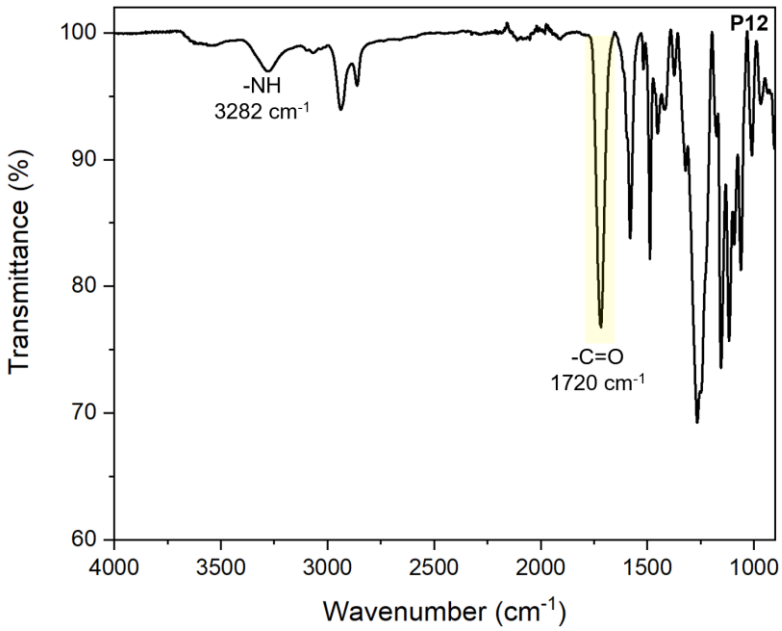
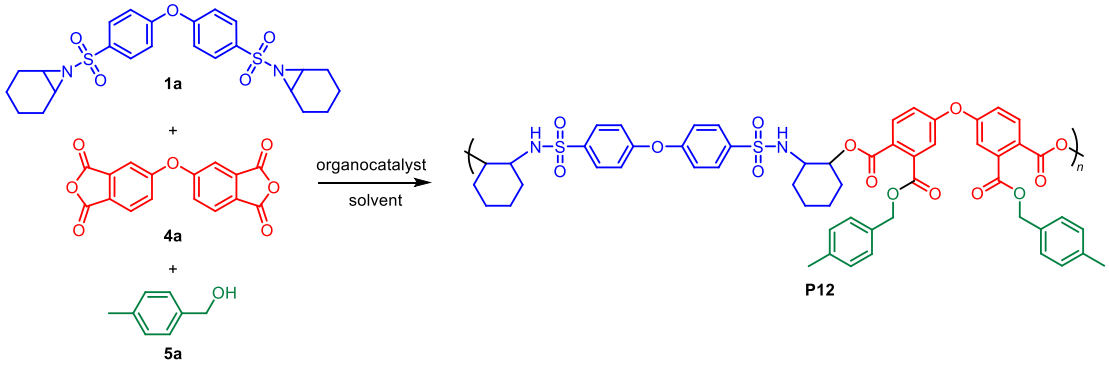


Fig. S4 FT-IR spectrum of poly(sulfonamide ester) **P12**.

Table S1. Multicomponent polymerization of bis(aziridine) **1a**, 4,4'-oxydiphthalic anhydride **4a**, and 4-methylbenzyl alcohol **5a**.



entry[a]	catalyst	solvent	time (h)	$M_{n,SEC}$[b] (Da)	$M_{w,SEC}$[b] (g/mol)	PDI[b]
1	MTBD	DMF	16	5880	13760	2.34
2	DBU	DMF	16	8930	16790	1.88
3	PMDETA	DMF	16	7510	14490	1.93
4	*t*-BuP$_2$	DMF	16	6740	12130	1.80

[a]Reaction conditions: **1a** (0.2 mmol, 1.0 equiv., 0.5 M), **4a** (1.0 equiv.), **5a** (2.2 equiv.).

[b]Determined by SEC in DMF at 60 °C (PMMA standards calibration).

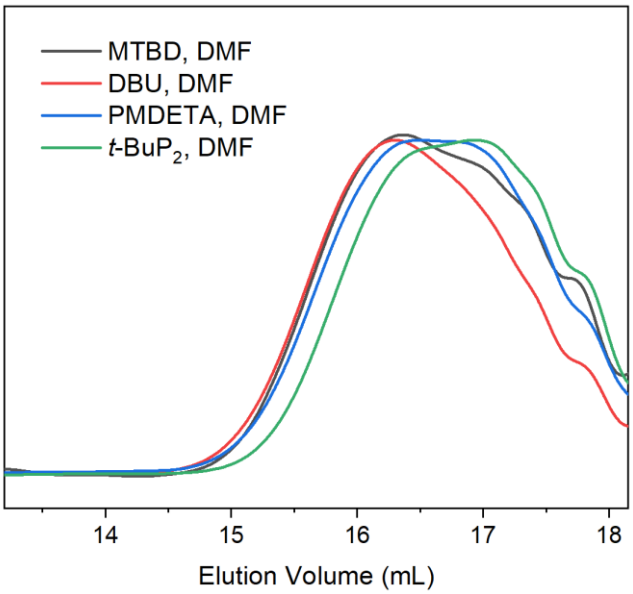


Fig. S5 SEC traces of samples in Table S1.

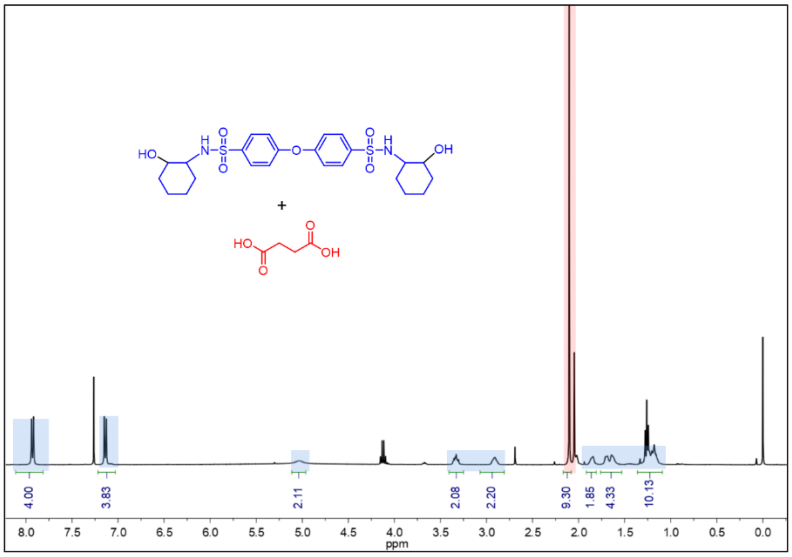
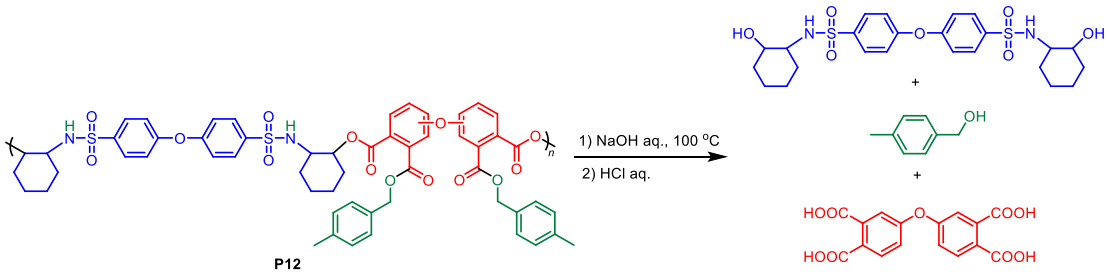


Fig. S6 ^{1}H NMR ($CDCl_3$, 400 MHz, 25 °C) spectrum of hydrolyzed polymer **P2**.



Scheme S3 Depolymerization of poly(sulfonamide ester) **P12**.

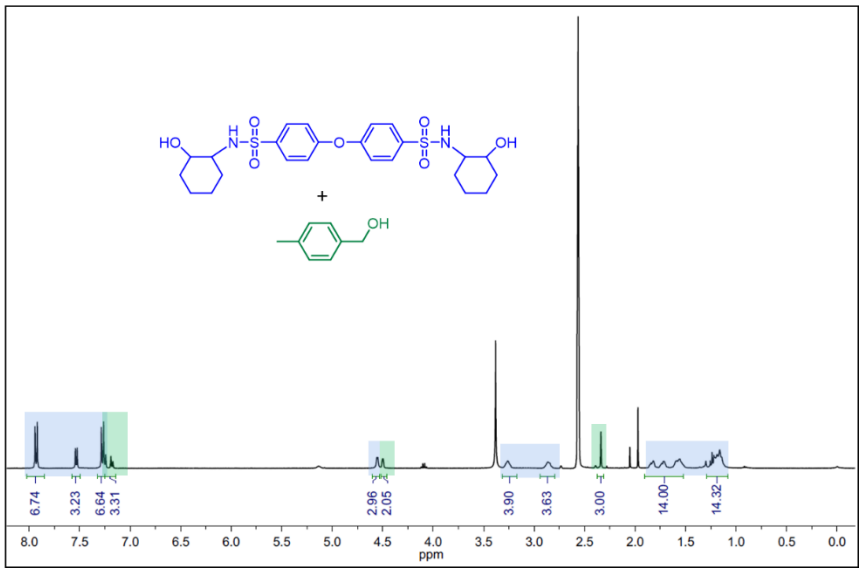
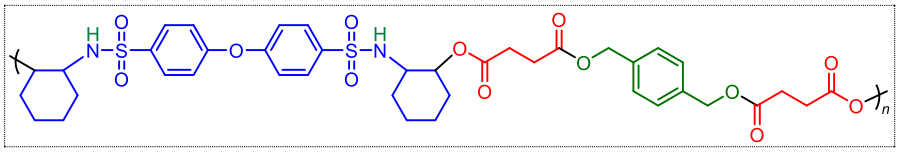


Fig. S7 ^{1}H NMR ($CDCl_3$, 400 MHz, 25 °C) spectrum of hydrolyzed polymer **P12**.

3. Polymer Characterization Data

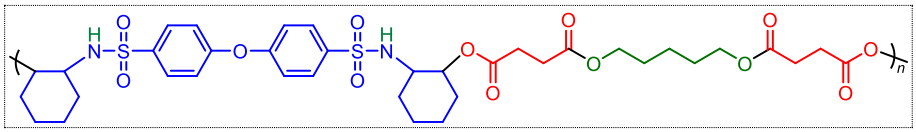


P1

FT-IR (neat): 3276, 2942, 2863, 1728, 1582, 1487, 1329, 1241, 1149, 1089 cm^{-1};

^{1}H NMR (400 MHz, $CDCl_3$, TMS): δ 7.80 (d, *J* = 8.0 Hz, 4H) , 7.24 (s, 4H), 7.01 (d, *J* = 8.0 Hz, 4H), 5.36 (br, 2H), 5.02 (s, 4H), 4.60-4.42 (m, 2H), 3.22-3.02 (m, 2H), 2.68-2.20 (m, 8H), 2.01-1.77 (m, 4H), 1.68-1.48 (m, 4H), 1.34-0.97 (m, 8H);

^{13}C NMR (100 MHz, $CDCl_3$): δ 172.3, 172.1, 159.1, 136.9, 135.8, 128.3, 128.2, 119.1, 74.4, 66.1, 56.4, 32.6, 30.7, 29.2, 29.0, 24.0, 23.4.

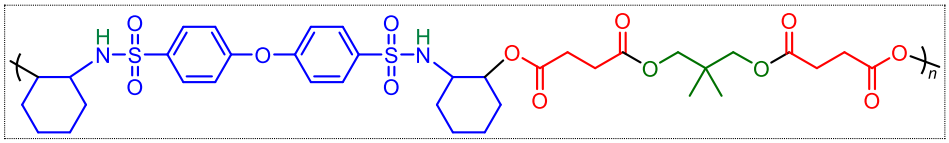


P2

FT-IR (neat): 3282, 2939, 2858, 1732, 1581, 1488, 1330, 1240, 1152, 1092 cm^{-1};

^{1}H NMR (400 MHz, $CDCl_3$, TMS): δ 7.90 (d, *J* = 8.0 Hz, 4H), 7.12 (d, *J* = 8.0 Hz, 4H), 5.62-5.31 (m, 2H), 4.71-4.55 (m, 2H), 4.19-3.92 (m, 4H), 3.26-3.10 (m, 2H), 2.73-2.24 (m, 8H), 2.06-1.77 (m, 6H), 1.77-1.53 (m, 8H), 1.51-1.06 (m, 8H);

^{13}C NMR (100 MHz, $CDCl_3$): δ 172.5, 172.4, 159.2, 137.0, 129.5, 119.2, 74.4, 64.6, 56.7, 32.8, 30.9, 29.2, 29.1, 28.1, 24.1, 23.6, 22.3.

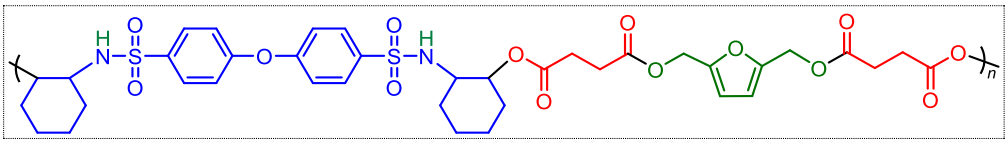


P3

FT-IR (neat): 3276, 2937, 2861, 1724, 1580, 1484, 1320, 1245, 1148, 1089 cm^{-1};

^{1}H NMR (400 MHz, $CDCl_3$, TMS): δ 7.90 (d, *J* = 8.0 Hz, 4H), 7.12 (d, *J* = 8.0 Hz, 4H), 5.67-5.43 (m, 2H), 4.72-4.53 (m, 2H), 3.97-3.84 (m, 4H), 3.26-3.12 (m, 2H), 2.70-2.32 (m, 8H), 2.04-1.59 (m, 14H), 1.40-1.13 (m, 8H);

^{13}C NMR (100 MHz, CDCl3): δ 172.4, 172.3, 159.2, 129.4, 119.2, 74.5, 69.4, 56.6, 34.7, 32.6, 31.0, 29.2, 29.1, 24.2, 23.6, 21.8.

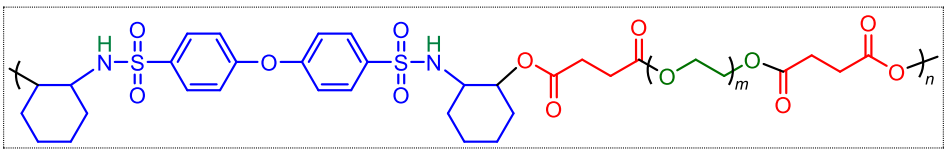


P4

FT-IR (neat): 3278, 2935, 2861, 1731, 1582, 1487, 1331, 1241, 1149, 1091 cm^{-1};

^{1}H NMR (400 MHz, $CDCl_3$, TMS): δ 7.82 (d, *J* = 8.0 Hz, 4H), 7.03 (d, *J* = 8.0 Hz, 4H), 6.28 (s, 2H), 5.67-5.27 (m, 2H), 5.00 (s, 4H), 4.65-4.41 (m, 2H), 3.25-2.96 (m, 2H), 2.63-2.17 (m, 10H), 2.10-1.78 (m, 4H), 1.73-1.46 (m, 4H), 1.37-0.95 (m, 8H);

^{13}C NMR (100 MHz, $CDCl_3$): δ 172.3, 171.9, 159.1, 149.9, 136.9, 129.4, 119.1, 111.7, 74.4, 58.2, 56.4, 32.6, 30.7, 29.1, 28.9, 24.0, 23.4.



P5

^{1}H NMR (400 MHz, $CDCl_3$, TMS): δ 7.80 (d, J = 8.0 Hz, 4H), 7.07 (d, J = 8.0 Hz, 4H), 5.66-5.26 (m, 4H), 4.75-4.50 (m, 2H), 4.34-4.16 (m, 4H), 3.82-3.52 (m, 8H), 3.36-3.09 (m, 2H), 2.72-2.24 (m, 8H), 2.17-1.87 (m, 4H), 1.79-1.52 (m, 4H), 1.45-1.05 (m, 8H).

P6

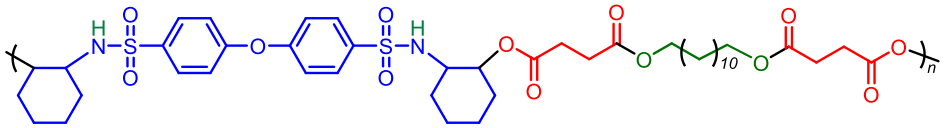
FT-IR (neat): 3272, 2929, 2868, 1727, 1582, 1488, 1325, 1243, 1154, 1089 cm^{-1};

^{1}H NMR (400 MHz, $CDCl_3$, TMS): δ 7.80(d, *J* = 8.0 Hz, 4H), 7.05(d, *J* = 8.0 Hz, 4H), 5.41-5.03(m, 4H), 4.76-4.51(m, 2H), 4.34-4.16(m, 4H), 3.78-3.47(m, 28H), 3.37-3.15(m, 2H), 2.76-2.26(m, 8H), 2.14-1.89(m, 4H), 1.83-1.54(m, 4H), 1.44-1.01(m, 8H);

^{13}C NMR (100 MHz, $CDCl_3$): δ 172.54, 172.36, 159.60, 137.06, 129.92, 128.83, 119.25, 119.19, 119.10, 77.35, 77.03, 76.71, 74.48, 70.56-68.97, 63.99, 63.87, 56.74, 34.73-32.76, 30.95, 29.06, 24.12-22.62.

P7

^{1}H NMR (400 MHz, $CDCl_3$, TMS): δ 7.81(d, *J* = 8.0 Hz, 4H), 7.05(d, *J* = 8.0 Hz, 4H), 5.30-4.91(m, 4H), 4.79-4.49(m, 2H), 4.36-4.12(m, 4H), 3.89-3.40(m, 44H), 3.34-3.11(m,2H), 2.78-2.21(m,8H), 2.17-1.85(m, 4H), 1.77-1.52(m, 4H), 1.45-1.08(m, 8H).

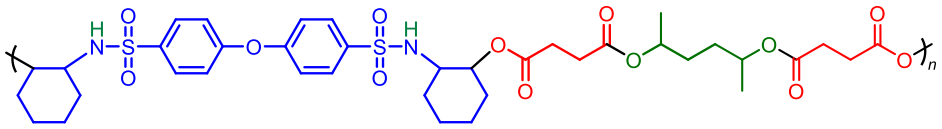


P8

FT-IR (neat): 3272, 2927, 2856, 1728, 1581, 1488, 1328, 1241, 1152, 1090 cm^{-1};

^{1}H NMR (400 MHz, $CDCl_3$, TMS): δ 8.00-7.80 (m, 4H), 7.22-7.02 (m, 4H), 5.47-5.13 (m, 2H), 4.72-4.52 (m, 2H), 4.15-3.98 (m, 4H), 3.31-3.10 (m, 2H), 2.70-2.30 (m, 8H), 2.08-1.89 (m, 4H), 1.77-1.55 (m, 8H), 1.41-1.13 (m, 24H);

^{13}C NMR (100 MHz, $CDCl_3$): δ 173., 172.5, 159.2, 137.0, 129.4, 119.1, 77.3, 77.0, 76.7, 74.4, 65.1, 56.7, 33.0, 30.9, 29.5, 29.3, 29.2, 29.1, 28.5, 25.8, 24.9, 24.1, 23.6.

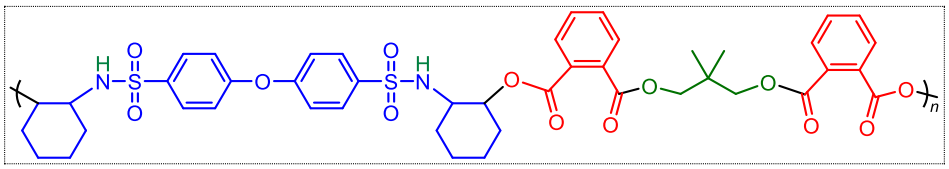


P9

FT-IR (neat): 3267, 2936, 2863, 1724, 1581, 1488, 1327, 1241, 1152, 1090 cm^{-1};

^{1}H NMR (400 MHz, $CDCl_3$, TMS): δ 7.99-7.76 (m, 4H) , 7.21-7.02 (mm, 4H), 5.78-5.26 (m, 4H), 5.03-4.77 (m, 2H), 4.74-4.77 (m, 2H), 3.30-3.08 (m, 2H), 2.70-2.28 (m, 8H), 2.06-1.90 (m, 4H), 1.79-1.41 (m, 8H), 1.38-1.01 (m, 14H);

^{13}C NMR (100 MHz, $CDCl_3$): δ 172.7, 172.0, 159.2, 136.9, 129.5, 119.2, 74.8, 71.4, 63.0, 56.7, 42.3, 31.7, 29.3, 24.4, 23.8, 20.0.

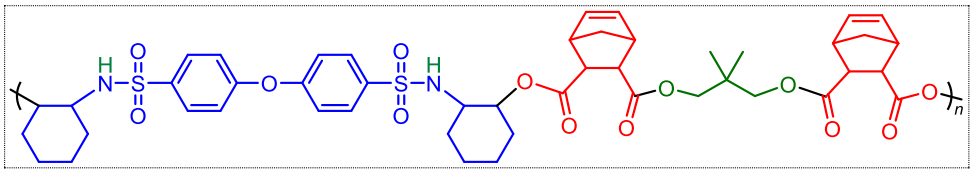


P10

FT-IR (neat): 3273, 2939, 2857, 1718, 1581, 1485, 1326, 1247, 1154, 1067 cm^{-1};

^{1}H NMR (400 MHz, $CDCl_3$, TMS): δ 7.82-7.56 (m, 4H), 7.52-7.31 (m, 4H), 7.23-7.13 (m, 4H), 6.79-6.47 (m, 4H), 5.70-5.49 (m, 2H), 4.89-4.52 (m, 2H), 4.28-3.96 (m, 4H), 3.29-3.12 (m, 2H), 2.25-1.87 (m, 4H), 1.83-1.47(m, 8H), 1.41-1.07(m, 6H), 1.06-0.88 (m, 4H);

^{13}C NMR (100 MHz, $CDCl_3$): δ 167.9, 167.0, 158.7, 136.8, 131.5, 129.3, 128.8, 118.72, 118.69, 75.5, 75.4, 70.6, 56.6, 34.7, 33.0, 32.6, 30.9, 24.1, 23.6, 21.9.

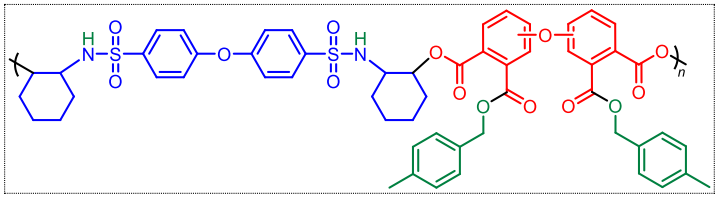


P11

FT-IR (neat): 3278, 2943, 2865, 1732, 1581, 1483, 1331, 1247, 1154, 1090 cm^{-1};

^{1}H NMR (400 MHz, $CDCl_3$, TMS): δ 7.91-7.73 (m, 4H), 7.13-6.93 (m, 4H), 6.35-5.96 (m, 4H), 5.84-5.56 (m, 2H), 4.61-4.31 (2H, m), 3.94-3.61 (m, 4H), 3.35-2.77 (m, 10H), 2.04-1.74 (m, 4H), 1.69-1.33 (m, 10H), 1.29-0.99 (m, 8H), 0.97-0.79 (m, 4H);

^{13}C NMR (100 MHz, $CDCl_3$): δ 173.6-172.9, 172.0-171.5, 159.1, 137.6, 136.2-133.6, 129.5-129.3, 119.0, 74.8-73.7, 70.2-68.9, 57.0, 56.5-56.3, 48.9-47.7, 47.3, 46.8-46.0, 34.5-33.9, 32.8-32.1, 31.1-30.7, 24.5-23.9, 23.6, 22.0-21.5.

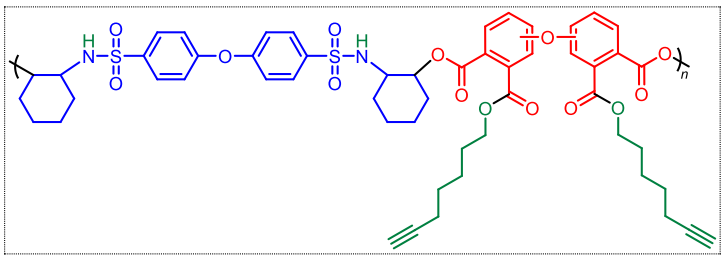


P12

FT-IR (neat): 3282, 2936, 2862, 1720, 1580, 1488, 1323, 1266, 1154, 1114 cm^{-1};

^{1}H NMR (400 MHz, $CDCl_3$, TMS): δ 7.95-7.44 (m, 6H), 7.42-6.62 (m, 16H), 5.64-4.98 (m, 6H), 4.94-4.46 (m, 2H), 3.43-3.08 (m, 2H), 2.31 (br, 6H), 2.19-1.91 (m, 4H), 1.83-1.49 (m, 4H), 1.43-1.03 (m, 8H);

^{13}C NMR (100 MHz, $CDCl_3$): δ 167.2-165.7, 159.1-157.9, 138.4-138.2, 136.9-135.9, 134.7-134.0, 132.2-131.3, 129.4-128.4, 120.9, 119.3-118.3, 75.9-75.4, 67.9-67.4, 56.5, 33.7-32.3, 30.9-30.2, 24.4-23.5, 21.2.



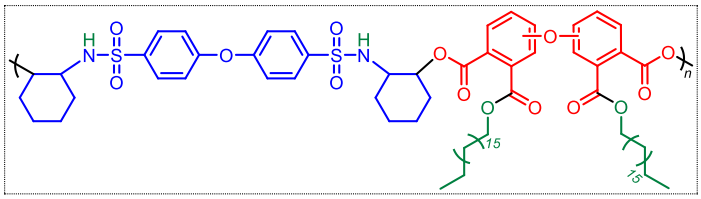
P13

FT-IR (neat): 3286, 2936, 2863, 1717, 1584, 1488, 1265, 1155, 1118 cm^{-1};

^{1}H NMR (400 MHz, $CDCl_3$, TMS): δ 7.97-7.49 (m, 6H), 7.38-6.71 (m, 8H), 5.85-5.24 (m, 2H), 4.89-4.67 (m, 2H), 4.47-4.10 (m, 4H), 3.43-3.16 (m, 2H), 3.15-2.66 (m, 2H),

2.34-1.85 (m, 10H), 1.83-0.96 (m, 22H);

^{13}C NMR (100 MHz, $CDCl_3$): δ 167.8-166.3, 159.1, 137.0, 131.8, 129.2, 119.0, 84.2, 75.6, 68.6, 66.1-65.8, 57.1-56.4, 33.3-32.6, 31.0-30.6, 28.0, 27.9, 25.01, 24.95, 24.2-23.6, 18.2.

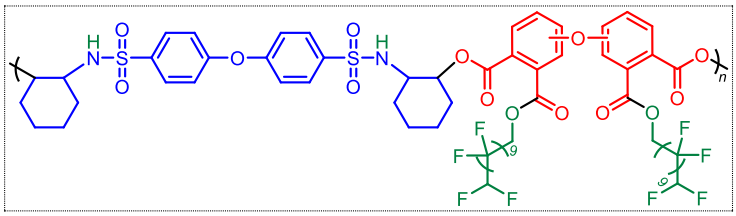


P14

FT-IR (neat): 3279, 2916, 2851, 1715, 1579, 1491, 1463, 1266, 1158, 1114 cm^{-1};

^{1}H NMR (400 MHz, $CDCl_3$, TMS): δ 8.04-7.49 (m, 6H), 7.37- 6.71 (m, 8H), 5.99-5.31 (m, 2H), 4.92-4.64 (m, 2H), 4.45-4.10 (m, 4H), 3.50-3.14 (m, 2H), 2.26-1.88 (m, 4H), 1.84-1.55 (m, 8H), 1.53-0.99 (m, 68H), 0.87 (t, J = 8.0 Hz, 6H);

^{13}C NMR (100 MHz, $CDCl_3$): δ 167.02, 166.28, 158.96, 137.17-131.71, 129.23, 118.98, 77.35, 77.03, 76.71, 75.50, 66.86, 66.44, 63.11, 57.15, 56.89, 48.02, 47.08, 38.87, 37.75, 32.80-28.45, 25.98-22.69, 20.93.

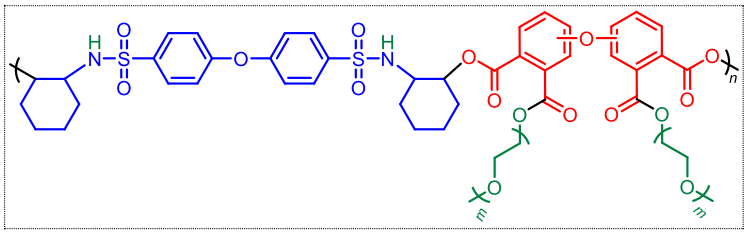


P15

FT-IR (neat): 3284, 2942, 2866, 1729, 1582, 1487, 1263, 1215, 1148, 1116 cm^{-1};

^{1}H NMR (400 MHz, $CDCl_3$, TMS): δ 8.04-7.52 (m, 6H), 7.48-6.67 (m, 8H), 6.05 (t, J = 52 Hz, 2H), 5.75-5.18 (m, 2H), 5.05-4.53 (m, 6H), 3.45-3.13 (m, 2H), 2.32-1.49 (m, 8H), 1.49-0.90 (m, 8H);

^{13}C NMR (100 MHz, $CDCl_3$): δ 167.1-164.1, 159.0, 137.2-136.3, 132.1, 129.2, 119.0, 113.5-104.5, 76.2, 60.4, 56.6, 32.9-31.9, 30.8-30.3, 29.7, 24.1-23.3.

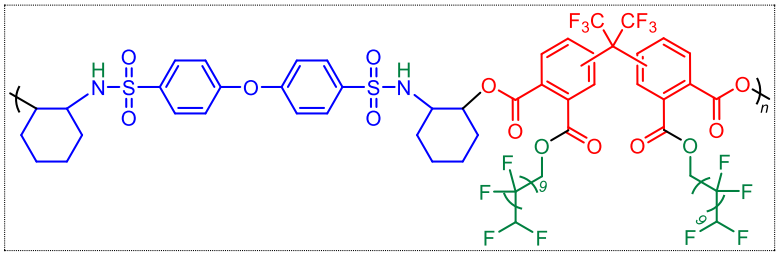


P16

FT-IR (neat): 2916, 2883, 1717, 1582, 1463, 1342, 1277, 1234, 1148, 1098 cm^{-1};

^{1}H NMR (400 MHz, $CDCl_3$, TMS): δ 8.40-7.51 (m, 6H), 7.36-6.66 (m, 8H), 6.09-5.52 (m, 2H), 4.86-4.32 (m, 6H), 4.07-3.50 (m, 268H), 3.44-3.25 (m, 2H), 3.38 (s, 6H), 2.24-1.93 (m, 4H), 1.80-1.57 (m, 4H), 1.51-1.12 (m, 8H);

^{13}C NMR (100 MHz, $CDCl_3$): δ 169.0, 165.6, 158.3, 136.7, 134.6, 131.1, 129.5, 129.0, 118.8, 72.2, 71.5, 70.2, 70.1, 68.3, 64.7, 58.7, 56.2, 33.5-29.2, 29.5-22.2.



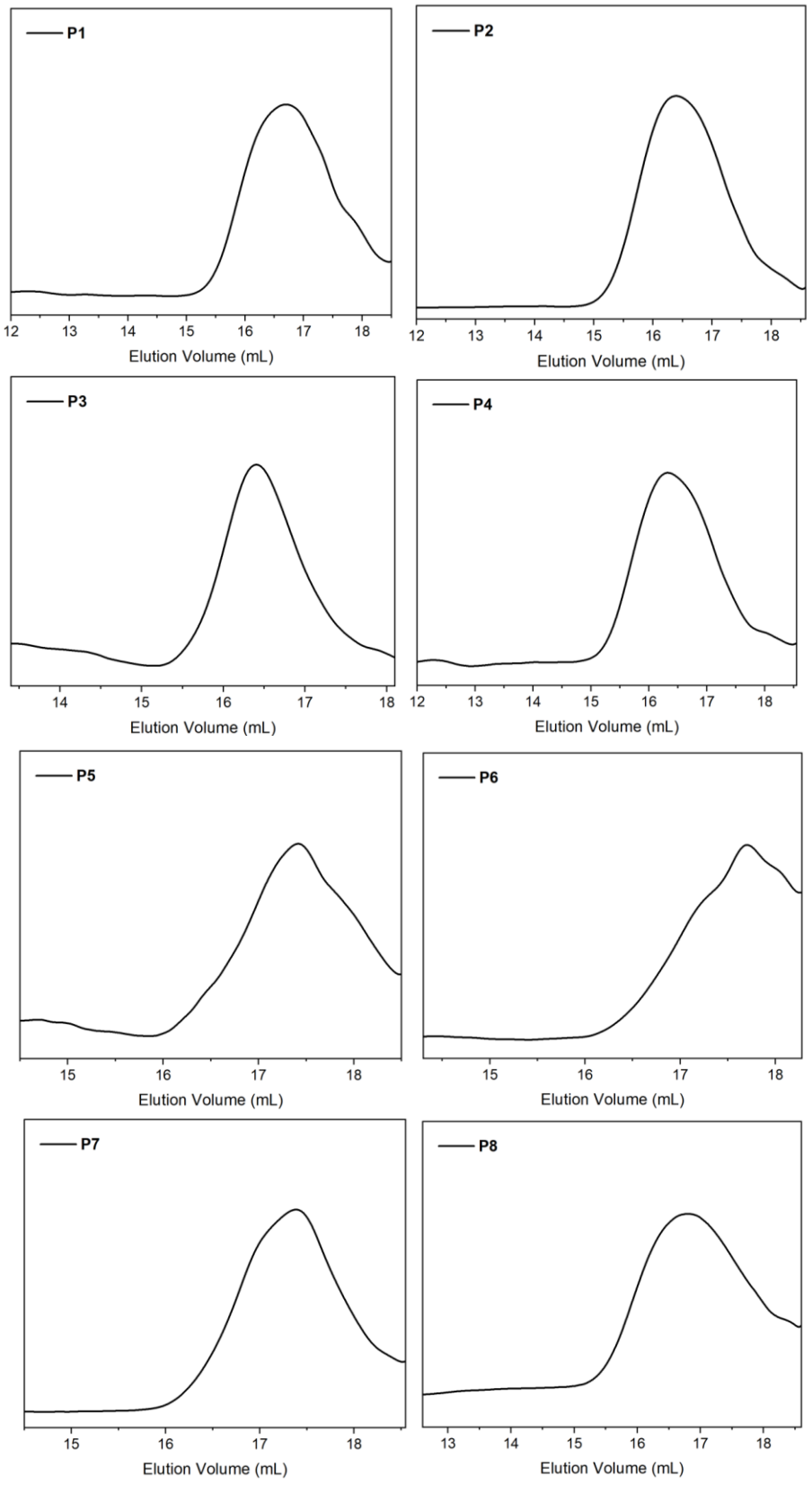
P17

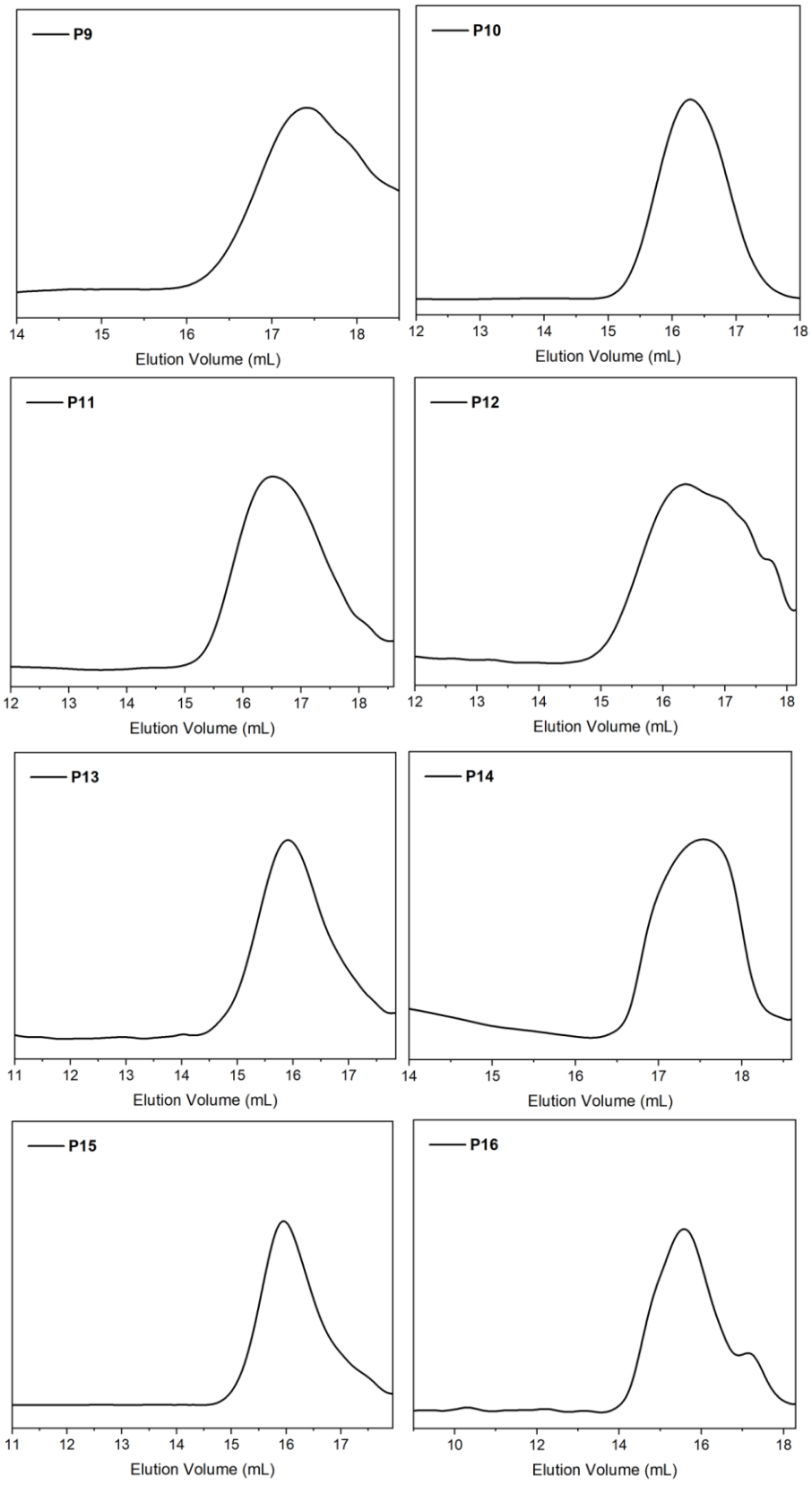
FT-IR (neat): 3284, 2946, 2866, 1728, 1584, 1486, 1257, 1212, 1139, 1073 cm^{-1};

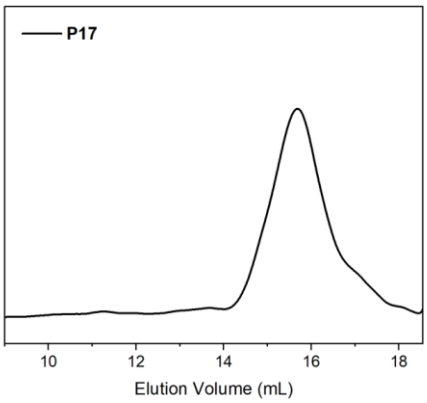
^{1}H NMR (400 MHz, $CDCl_3$, TMS): δ 8.29-7.39 (m, 10H), 7.21-6.69 (m, 4H), 6.05 (t, J = 52 Hz, 2H), 5.73-5.21 (m, 2H), 5.04-4.51 (m, 6H), 3.48-2.96 (m, 2H), 2.39-1.47 (m, 8H), 1.47-0.90 (m, 8H);

^{13}C NMR (100 MHz, $CDCl_3$): δ 166.0, 164.5, 159.0, 136.9, 129.3, 119.0, 113.5, 110.6, 107.5, 105.0, 60.8, 56.5, 33.0-29.7, 24.6-23.4.

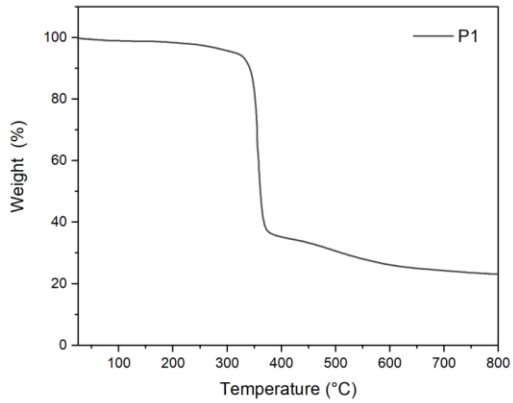
4. SEC (DMF, 60 °C) Traces of Poly(sulfonamide ester)s P1-P17

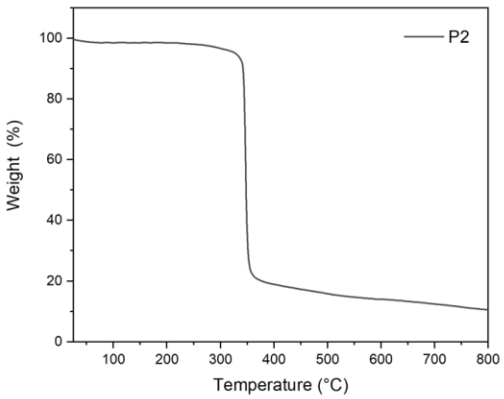


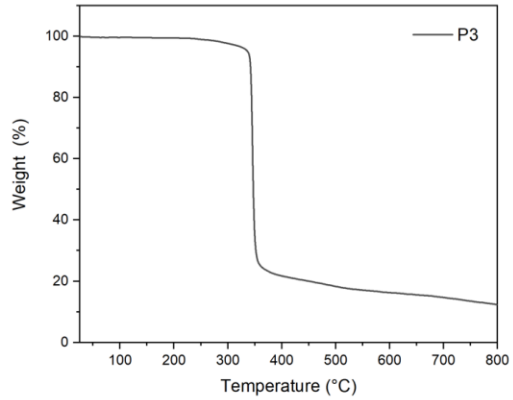

P9
14 15 16 17 18
Elution Volume (mL)
P10
12 13 14 15 16 17 18
Elution Volume (mL)
P11
12 13 14 15 16 17 18
Elution Volume (mL)
P12
12 13 14 15 16 17 18
Elution Volume (mL)
P13
11 12 13 14 15 16 17
Elution Volume (mL)
P14
14 15 16 17 18
Elution Volume (mL)
P15
11 12 13 14 15 16 17
Elution Volume (mL)
P16
10 12 14 16 18
Elution Volume (mL)

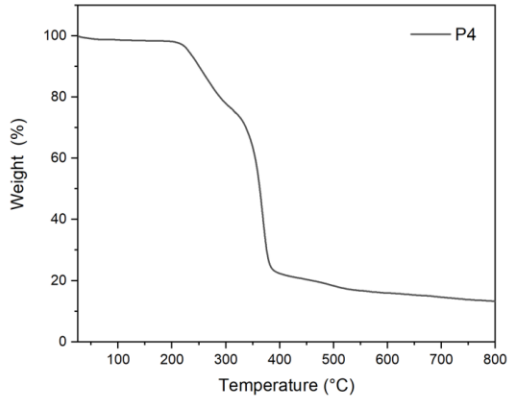

P17
10
12
14
16
18
Elution Volume (mL)

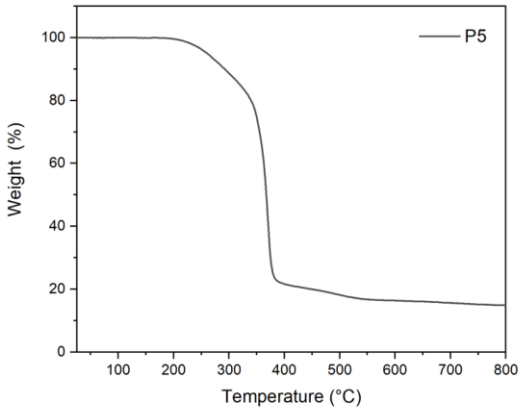
5. TG Curves of Poly(sulfonamide ester)s P1-P17

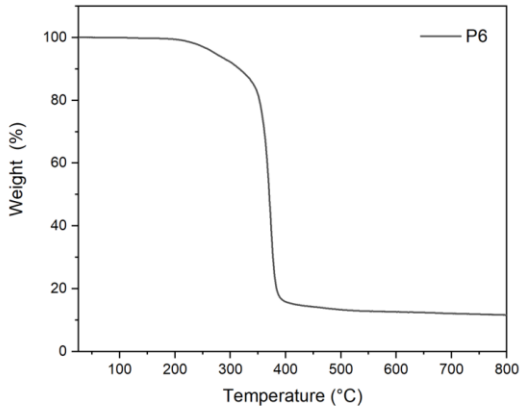


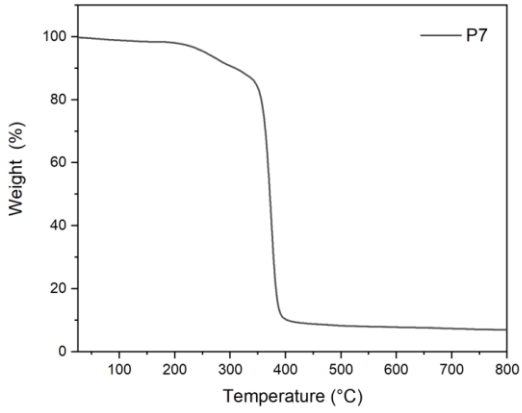


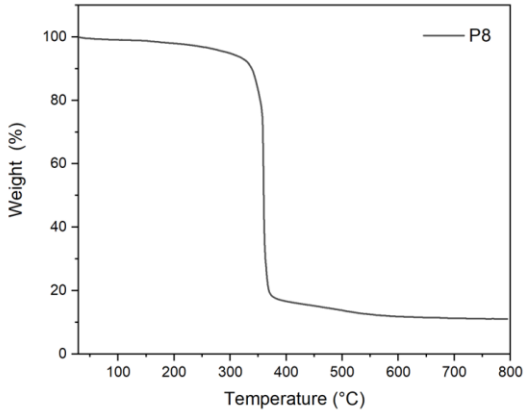


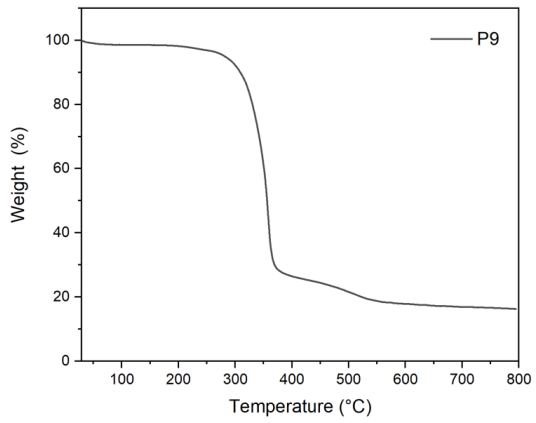


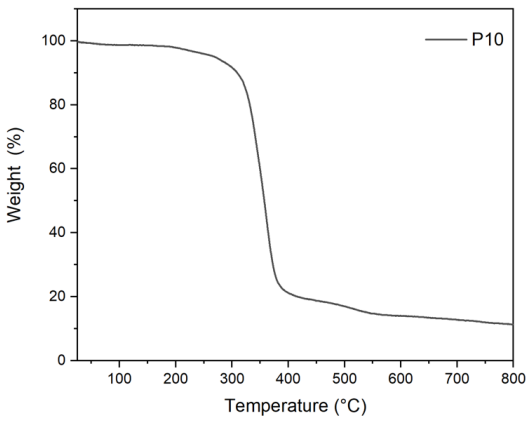


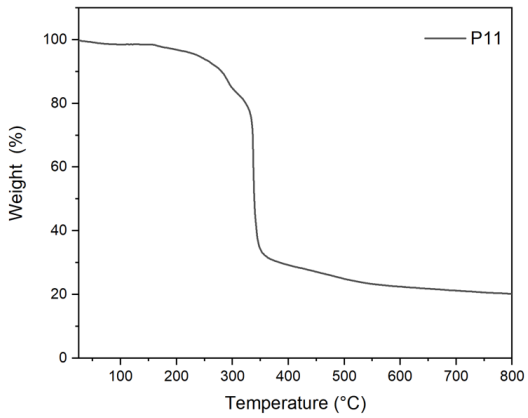


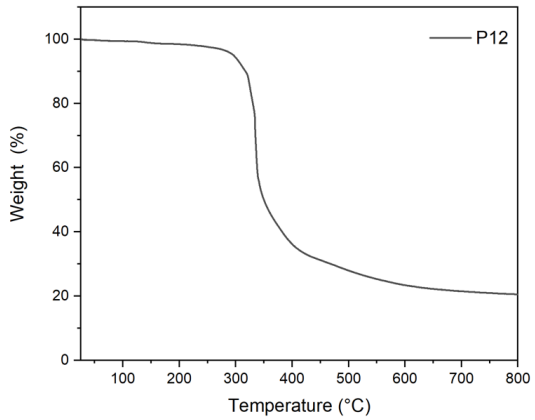


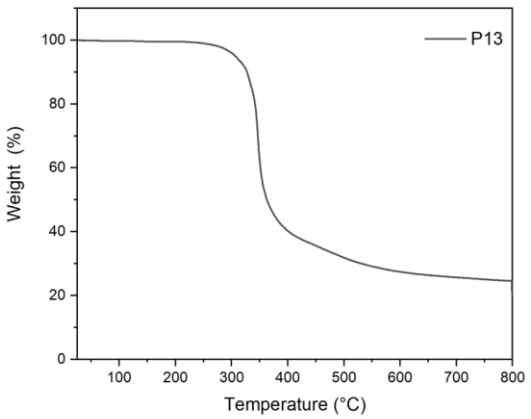


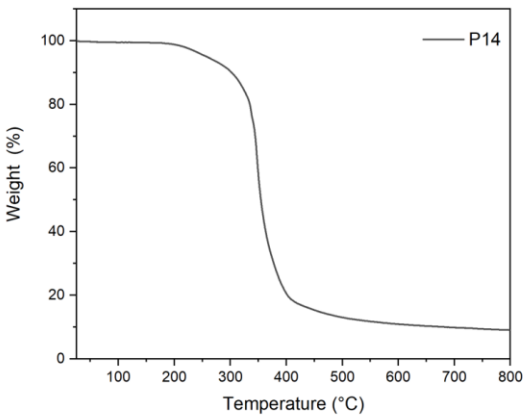

P9
Weight (%)
Temperature (°C)

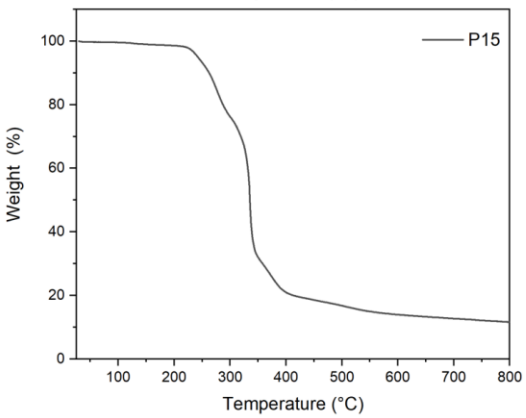

P10
Weight (%)
Temperature (°C)

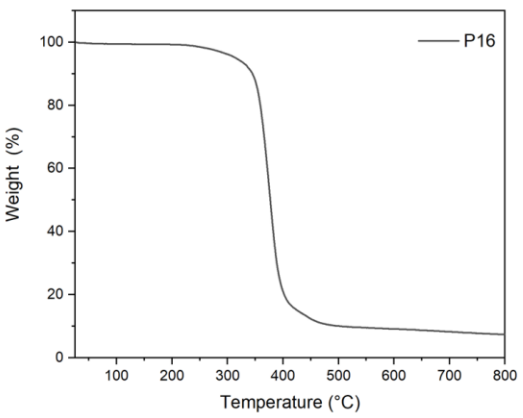

P11
Weight (%)
Temperature (°C)

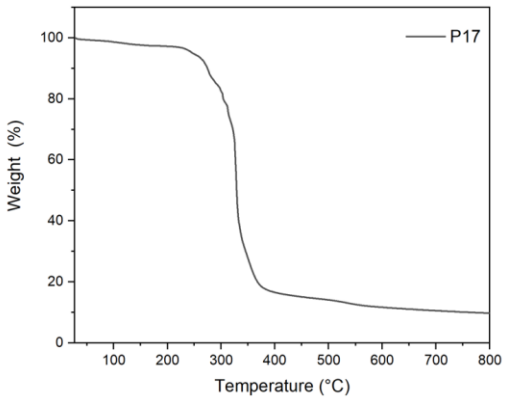

P12
Weight (%)
Temperature (°C)


P13
Weight (%)
Temperature (°C)

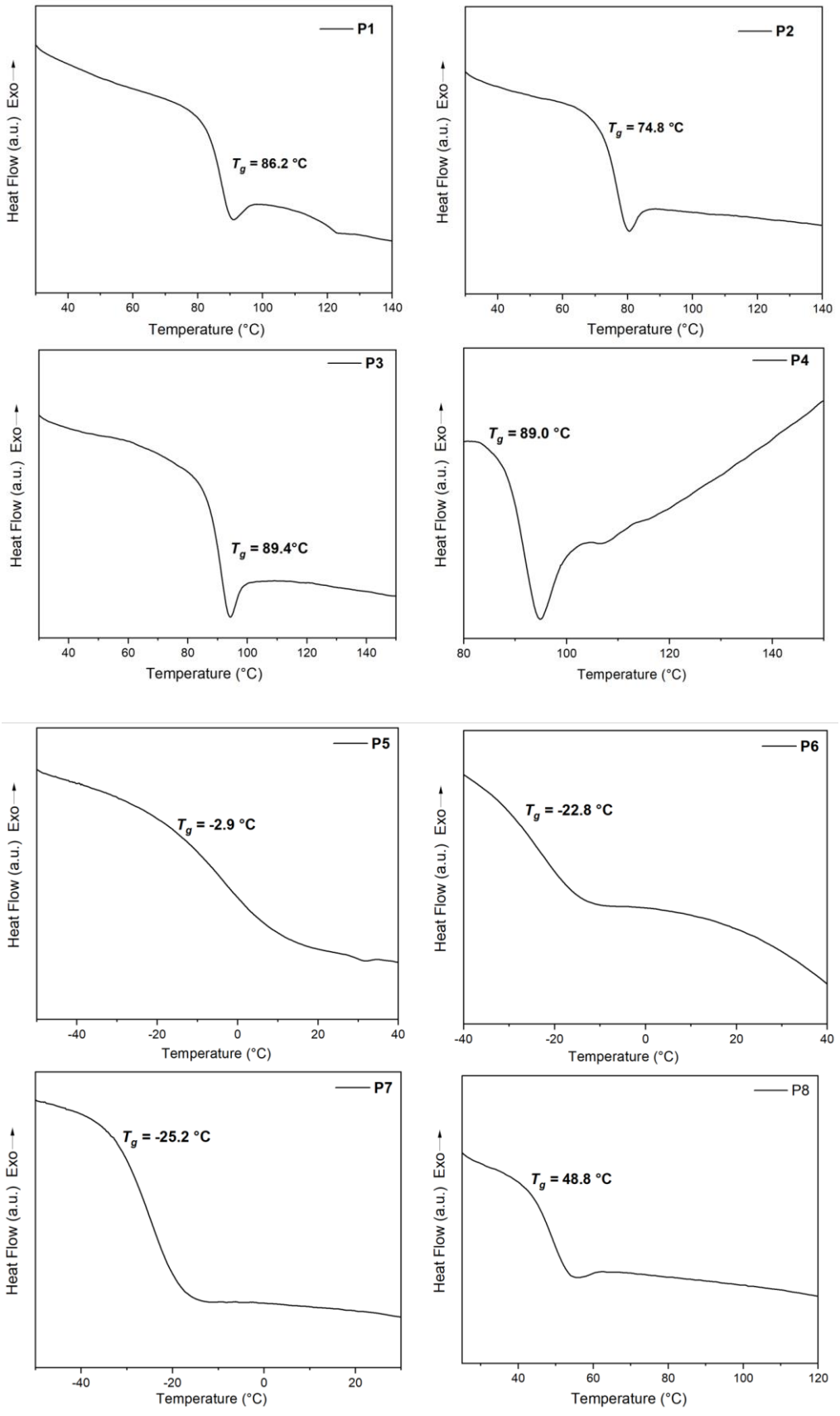

P14
Weight (%)
Temperature (°C)

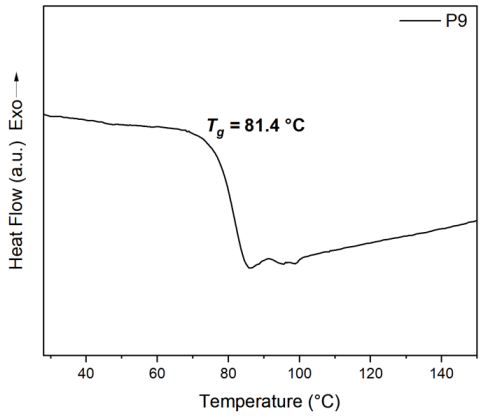

P15
Weight (%)
Temperature (°C)

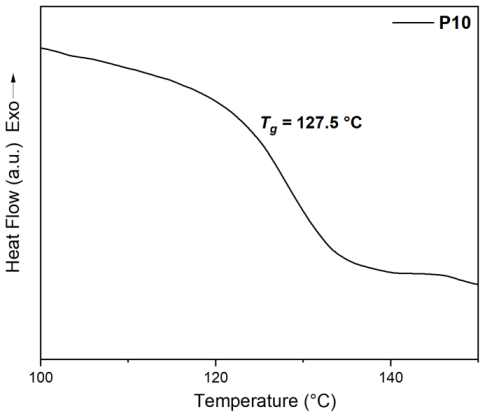

P16
Weight (%)
Temperature (°C)

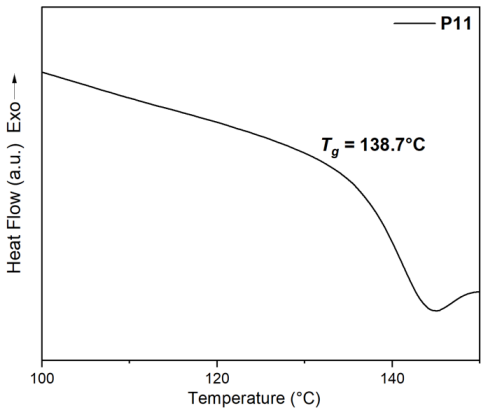

P17
Weight (%)
Temperature (°C)
100
80
60
40
20
0
100
200
300
400
500
600
700
800

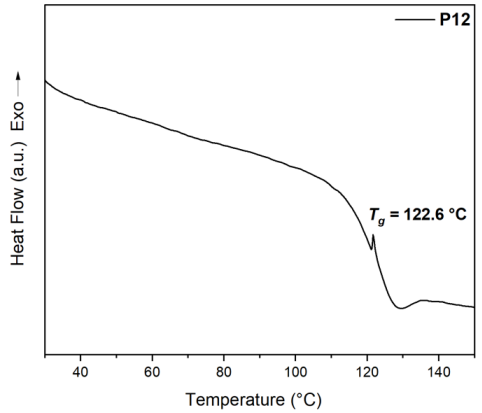
6. DSC Curves of Poly(sulfonamide ester)s P1-P17

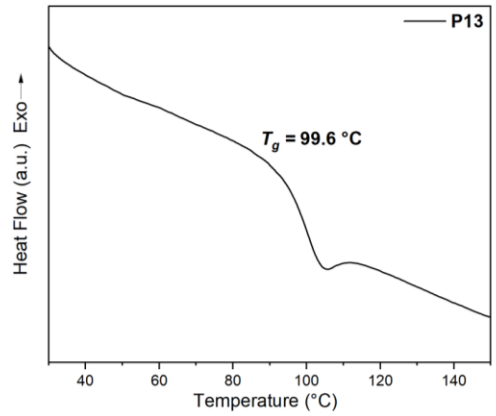


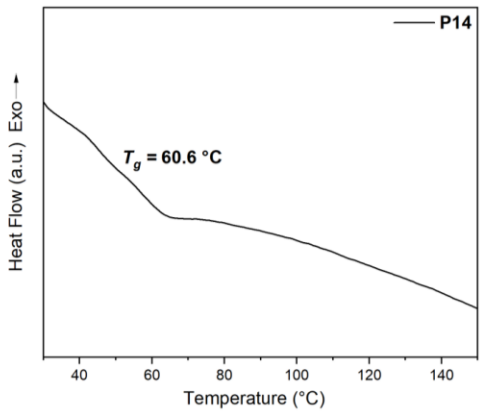

P9
T_g = 81.4 °C
Heat Flow (a.u.) Exo
40
60
80
100
120
140
Temperature (°C)

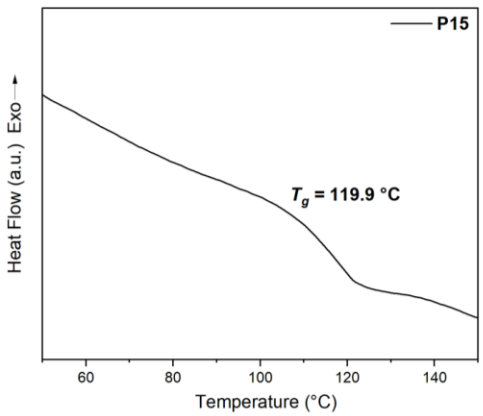

P10
T_g = 127.5 °C
Heat Flow (a.u.) Exo
100
120
140
Temperature (°C)

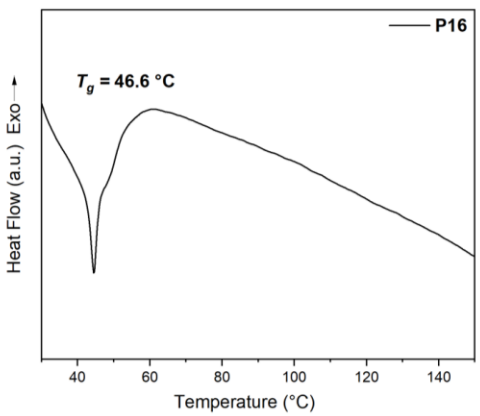

P11
T_g = 138.7°C
Heat Flow (a.u.) Exo
100
120
140
Temperature (°C)

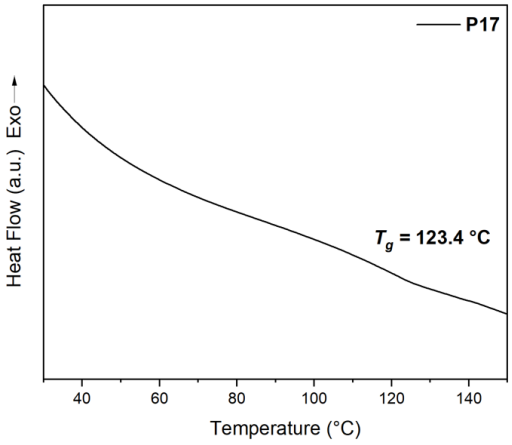

P12
T_g = 122.6 °C
Heat Flow (a.u.) Exo
40
60
80
100
120
140
Temperature (°C)


P13
T_g = 99.6 °C
Heat Flow (a.u.) Exo
40
60
80
100
120
140
Temperature (°C)


P14
T_g = 60.6 °C
Heat Flow (a.u.) Exo
40
60
80
100
120
140
Temperature (°C)

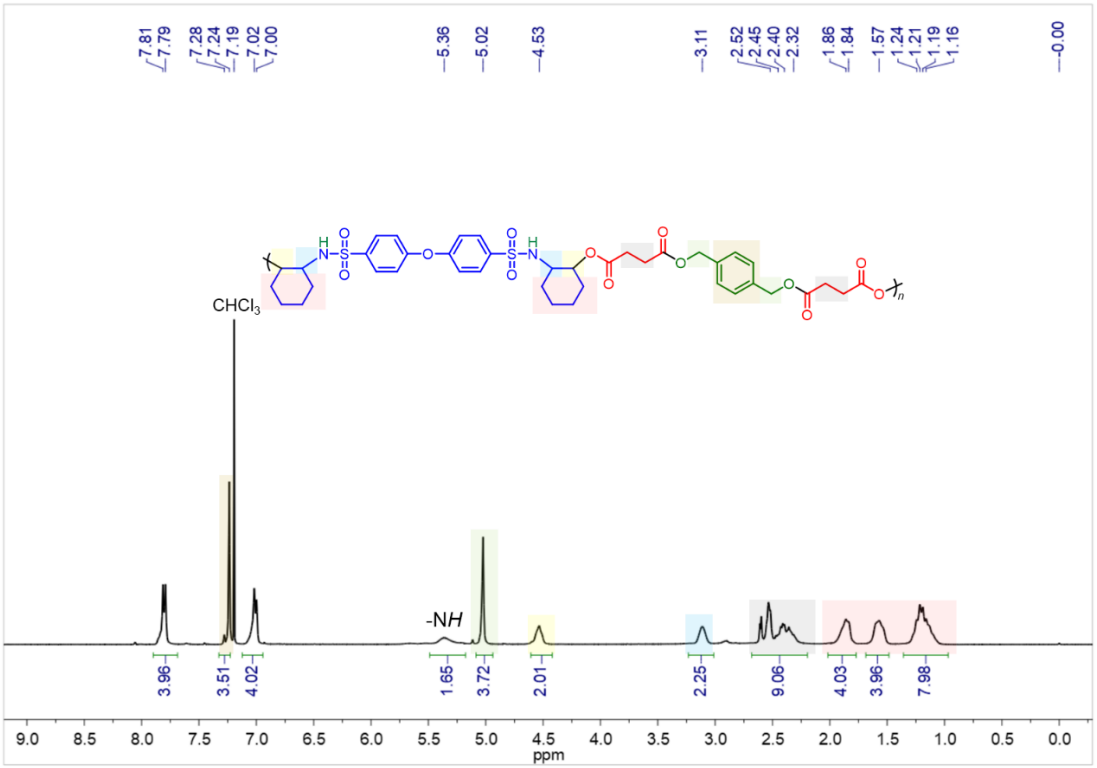

P15
T_g = 119.9 °C
Heat Flow (a.u.) Exo
60
80
100
120
140
Temperature (°C)

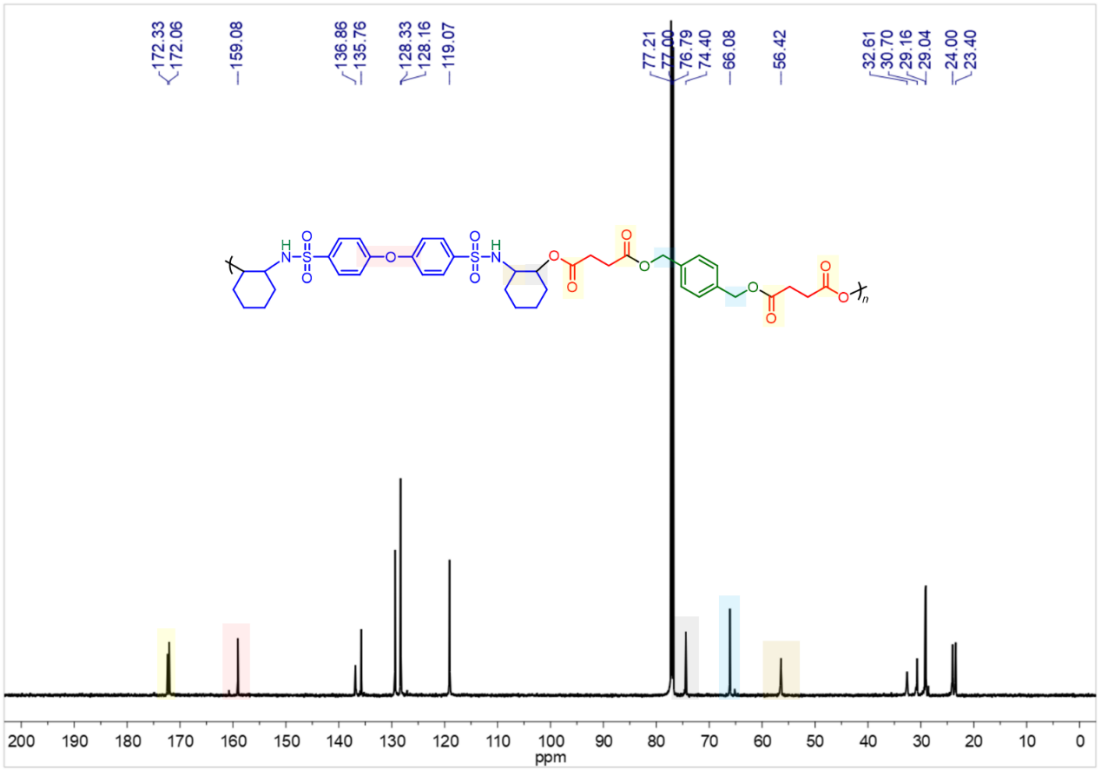

P16
T_g = 46.6 °C
Heat Flow (a.u.) Exo
40
60
80
100
120
140
Temperature (°C)


P17
T_g = 123.4 °C
Heat Flow (a.u.) Exo
40
60
80
100
120
140
Temperature (°C)

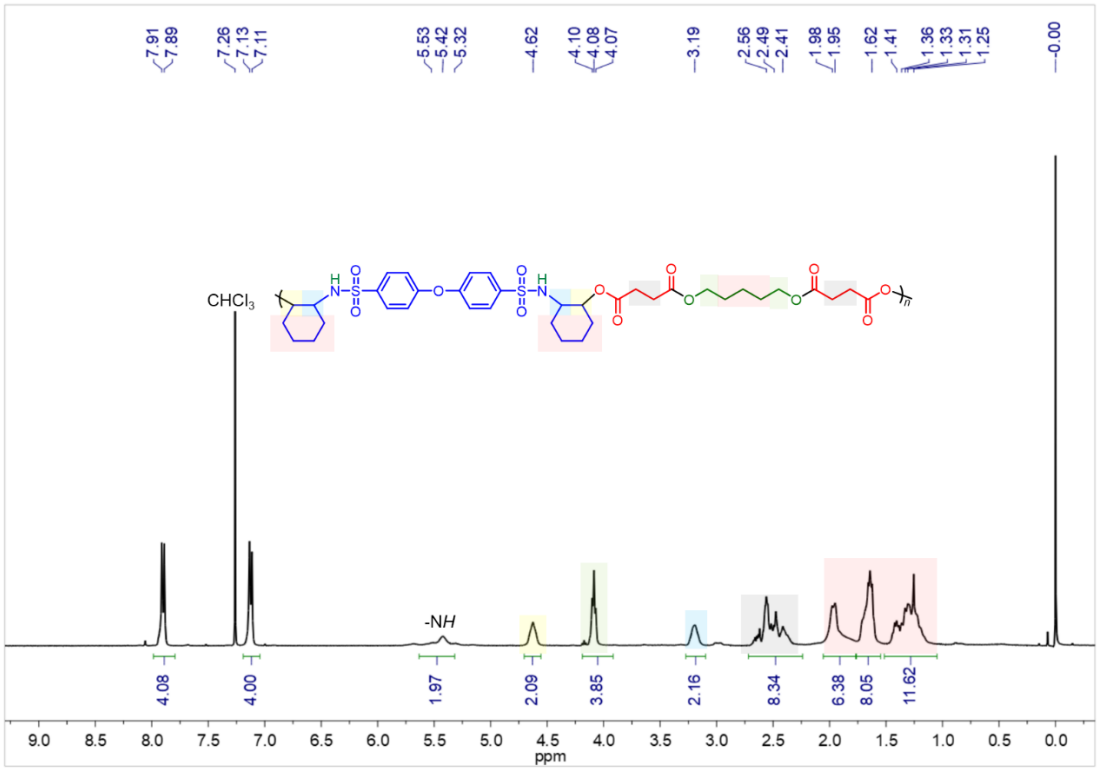
7. NMR Spectra of Poly(sulfonamide ester)s P1-P17, and Bis(hydroxy sulfonamide) 6

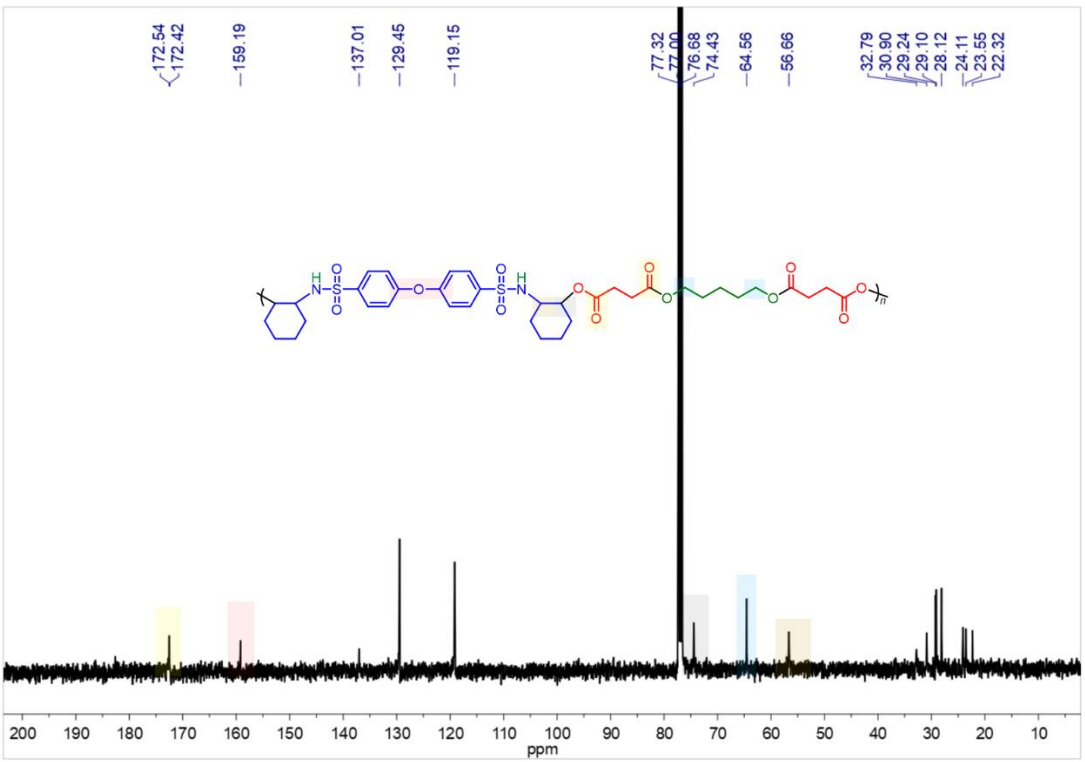
P1



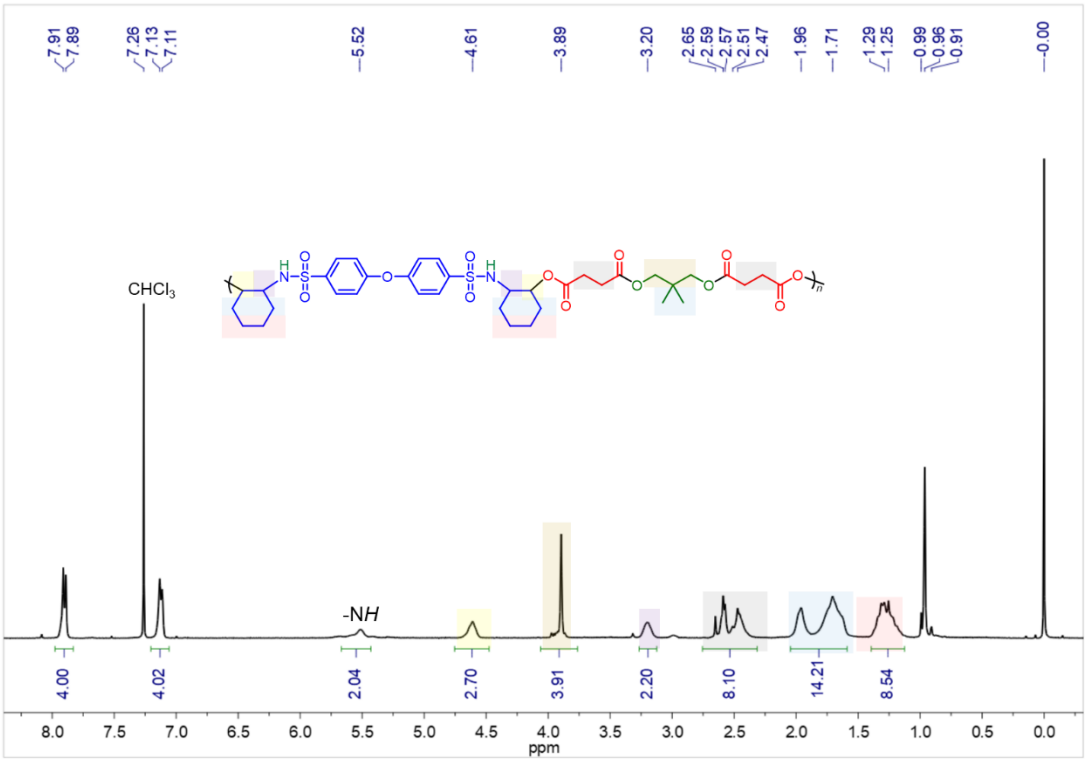


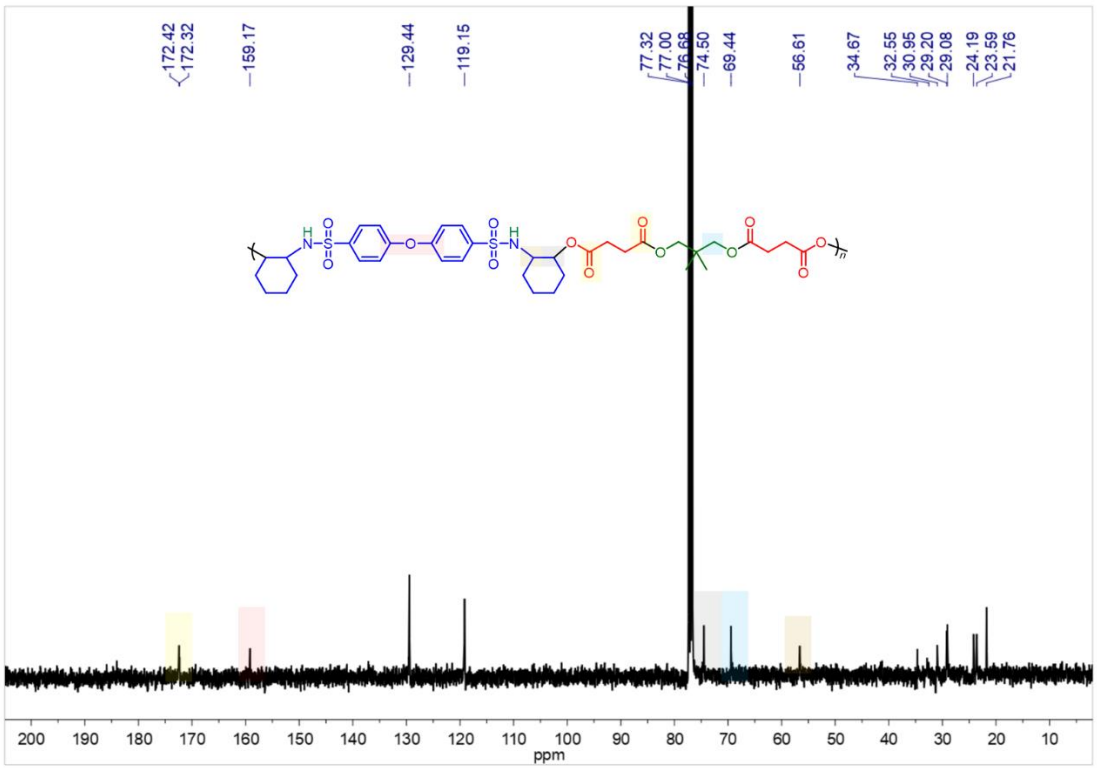
P2


7.91
7.89
7.26
7.13
7.11
5.53
5.42
5.32
4.62
4.10
4.08
4.07
3.19
2.56
2.49
2.41
1.98
1.95
1.62
1.41
1.36
1.33
1.31
1.25
0.00
CHCl3
-NH
4.08
4.00
1.97
2.09
3.85
2.16
8.34
6.38
8.05
11.62
ppm

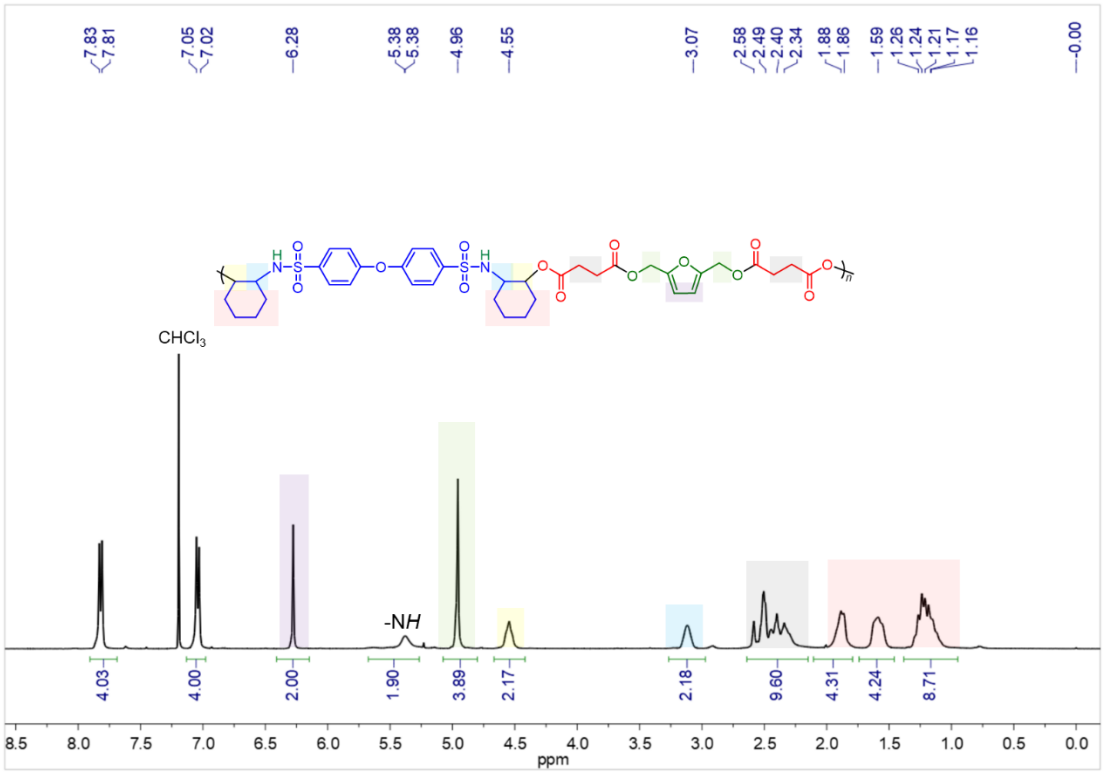

172.54
172.42
159.19
137.01
129.45
119.15
77.32
77.00
76.68
74.43
64.56
56.66
32.79
30.90
29.24
29.10
28.12
24.11
23.55
22.32
ppm

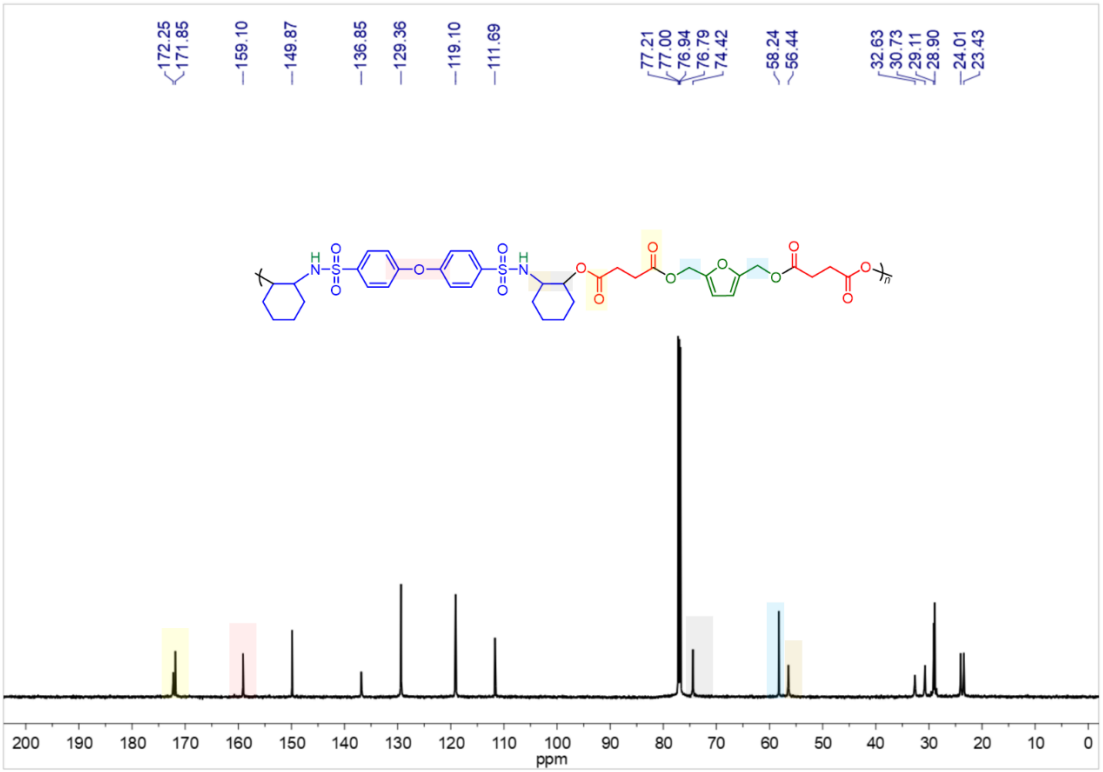
P3


7.91
7.89
7.26
7.13
7.11
5.52
4.61
3.89
3.20
2.65
2.59
2.57
2.51
2.47
1.96
1.71
1.29
1.25
0.99
0.96
0.91
0.00
CHCl3
-NH
4.00
4.02
2.04
2.70
3.91
2.20
8.10
14.21
8.54
ppm

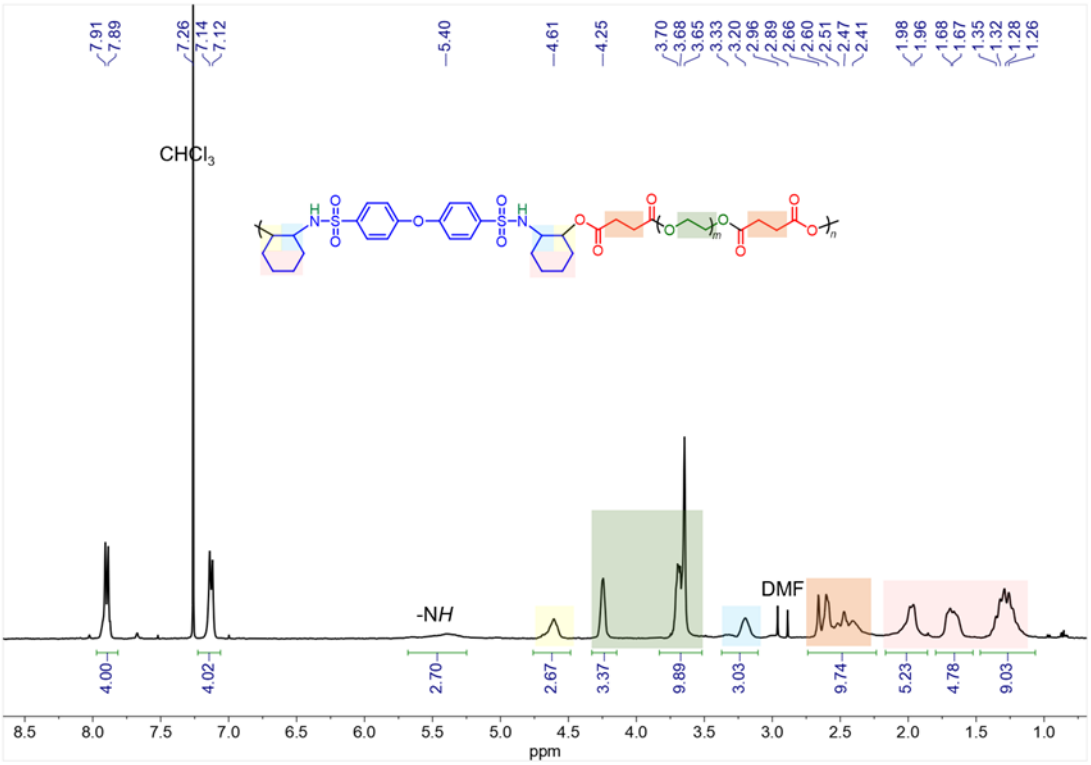

172.42
172.32
159.17
129.44
119.15
77.32
77.00
76.68
74.50
69.44
56.61
34.67
32.55
30.95
29.20
29.08
24.19
23.59
21.76
ppm

P4

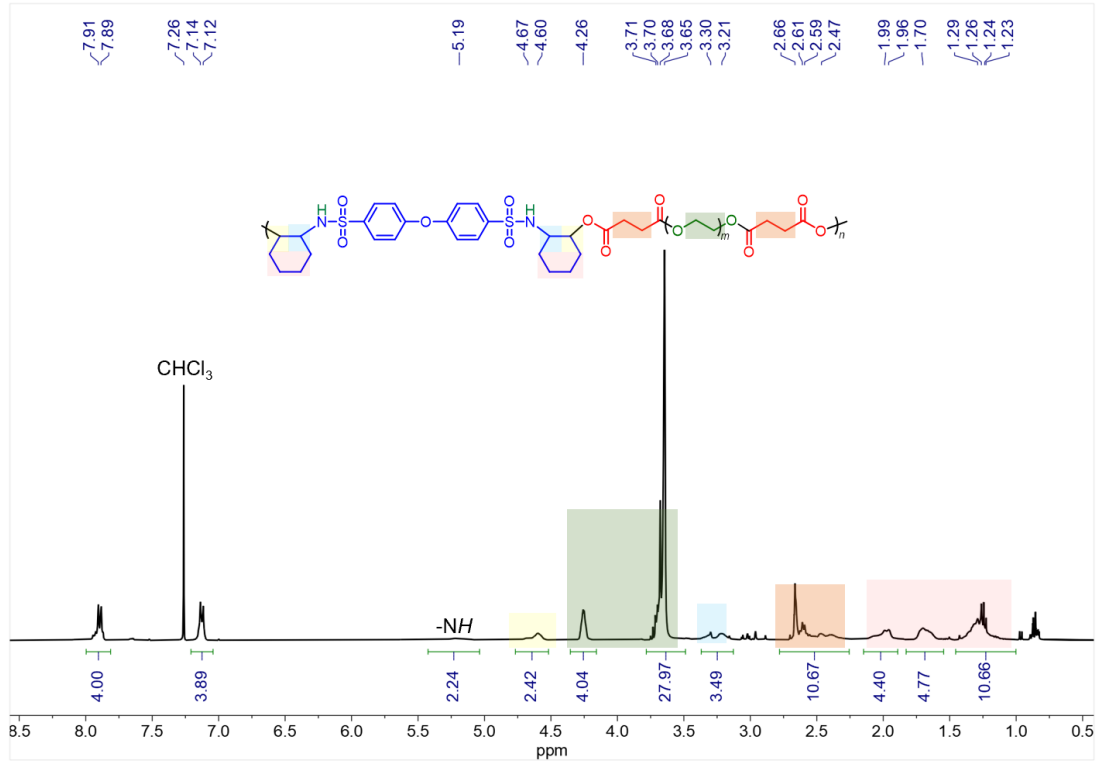

7.83
7.81
7.05
7.02
6.28
5.38
5.38
4.96
4.55
3.07
2.58
2.49
2.40
2.34
1.88
1.86
1.59
1.26
1.24
1.21
1.17
1.16
0.00
CHCl3
-NH
4.03
4.00
2.00
1.90
3.89
2.17
2.18
9.60
4.31
4.24
8.71
ppm

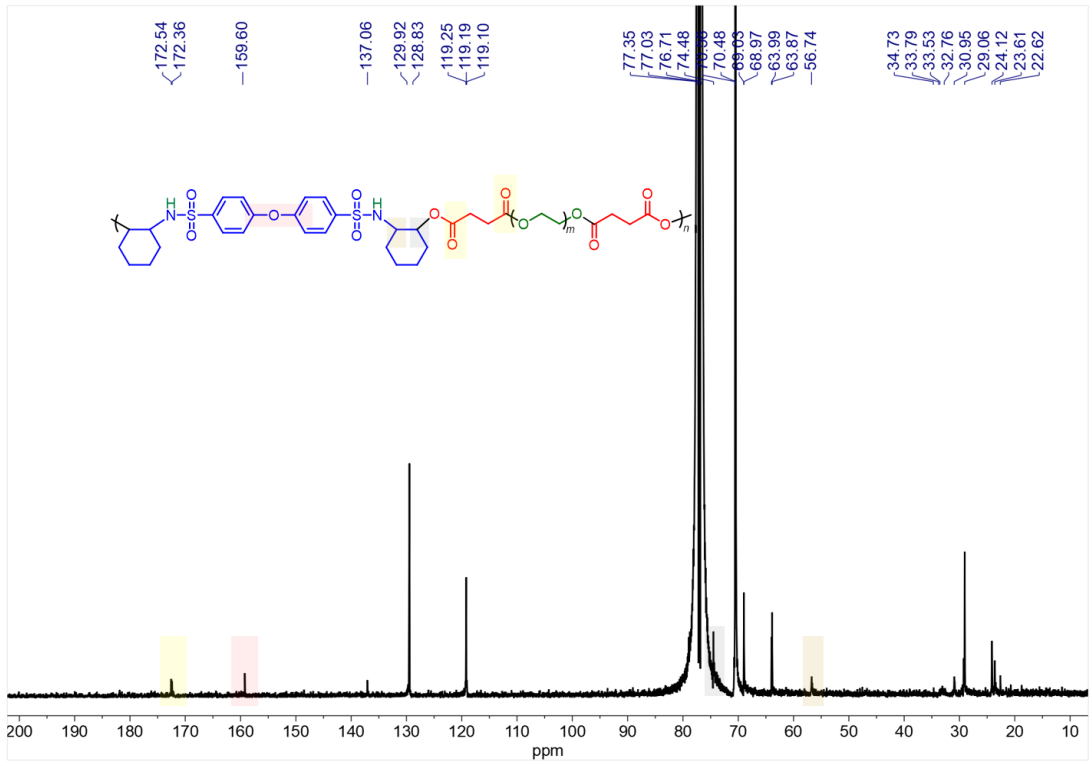

172.25
171.85
159.10
149.87
136.85
129.36
119.10
111.69
77.21
77.00
76.94
76.79
74.42
58.24
56.44
32.63
30.73
29.11
28.90
24.01
23.43
ppm

P5

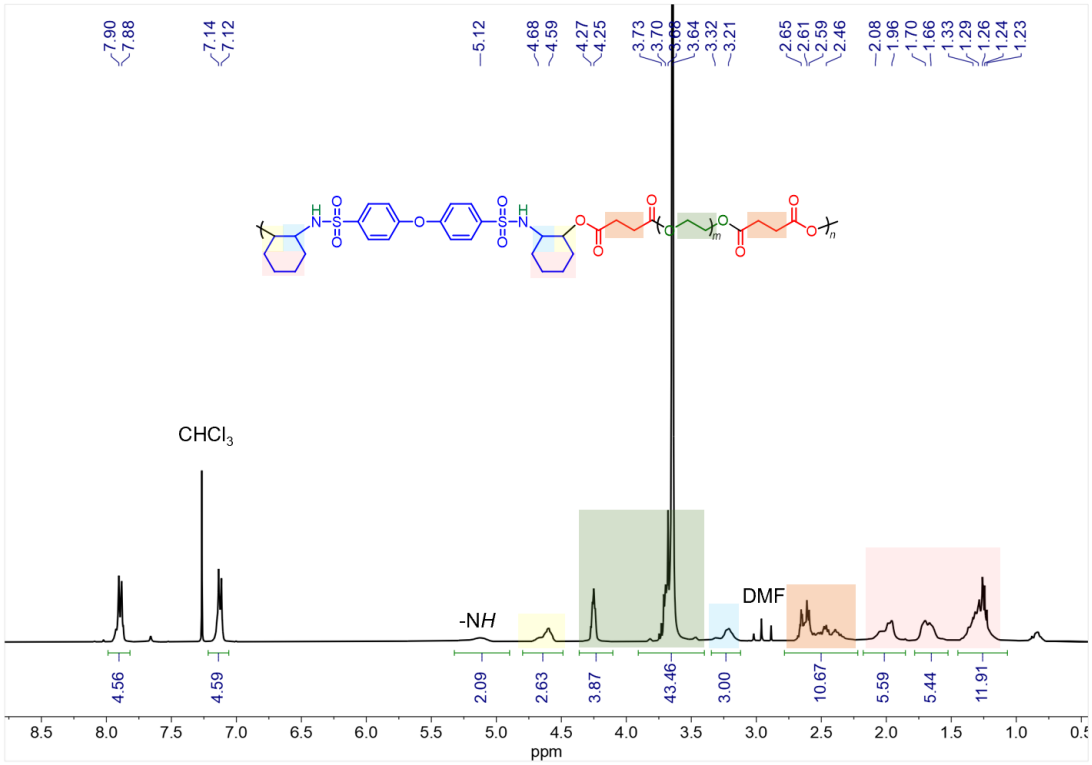

7.91
7.89
7.26
7.14
7.12
5.40
4.61
4.25
3.70
3.68
3.65
3.33
3.20
2.96
2.89
2.66
2.60
2.51
2.47
2.41
1.98
1.96
1.68
1.67
1.35
1.32
1.28
1.26
CHCl3
-NH
DMF
4.00
4.02
2.70
2.67
3.37
9.89
3.03
9.74
5.23
4.78
9.03
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
ppm

P6

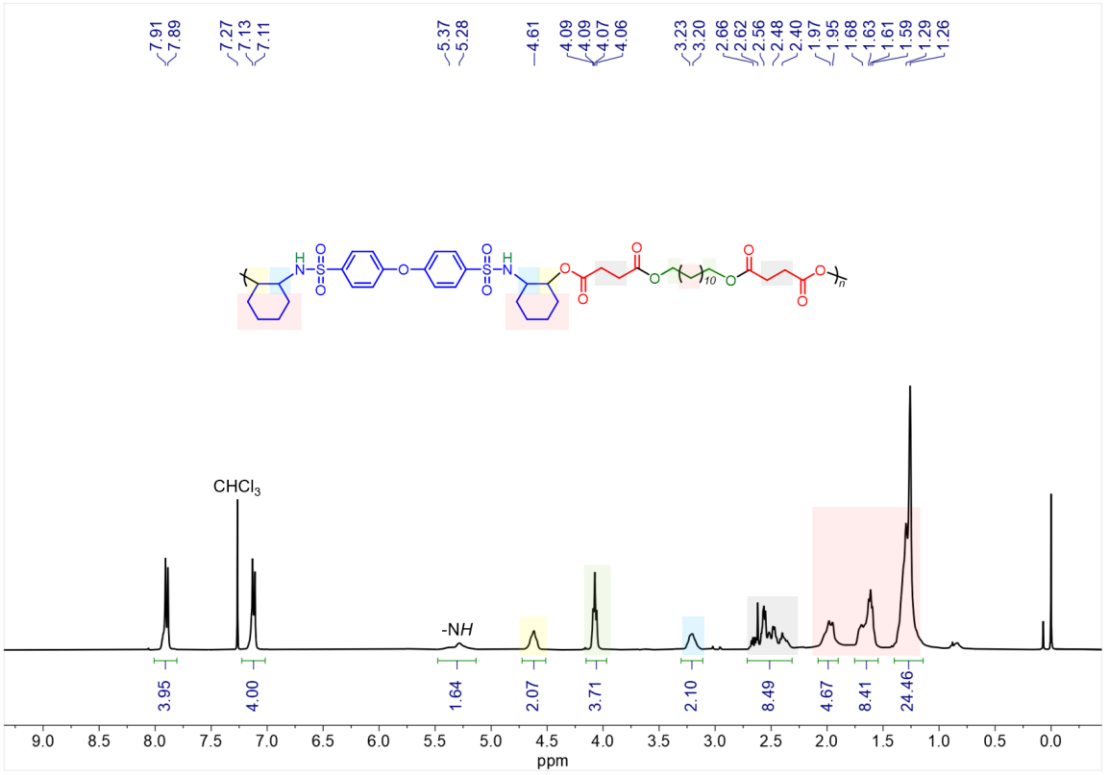

7.91
7.89
7.26
7.14
7.12
5.19
4.67
4.60
4.26
3.71
3.70
3.68
3.65
3.30
3.21
2.66
2.61
2.59
2.47
1.99
1.96
1.70
1.29
1.26
1.24
1.23
CHCl3
-NH
4.00
3.89
2.24
2.42
4.04
27.97
3.49
10.67
4.40
4.77
10.66
ppm

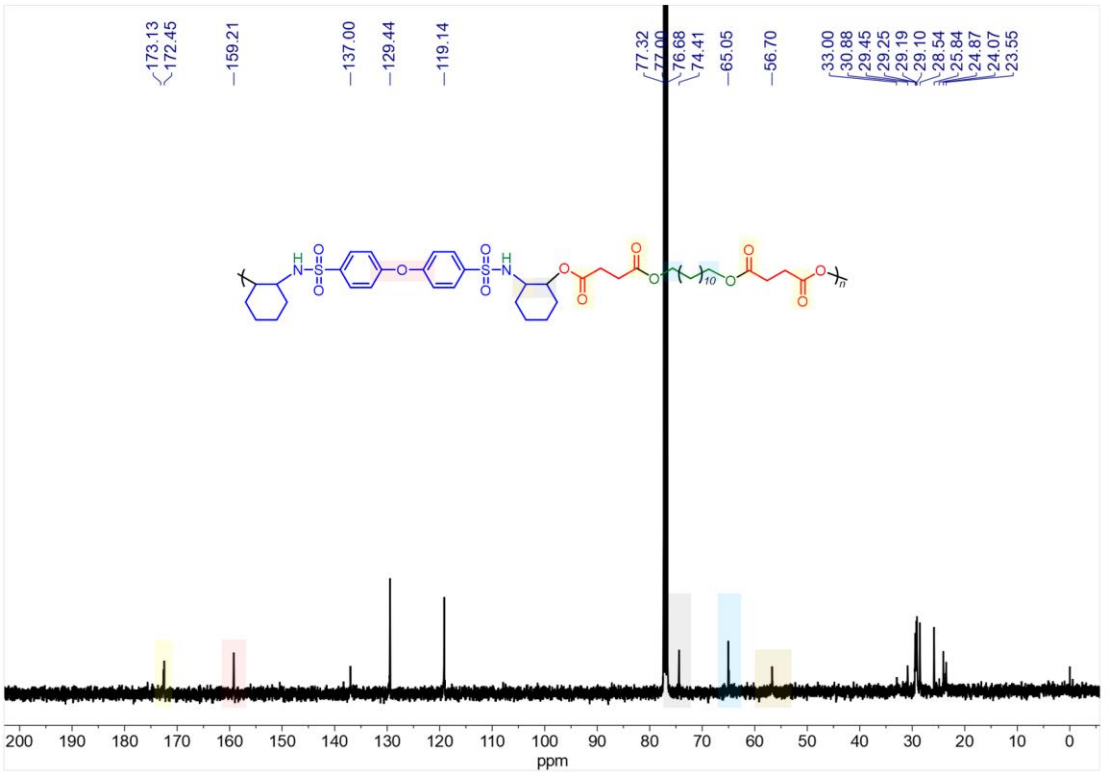

172.54
172.36
159.60
137.06
129.92
128.83
119.25
119.19
119.10
77.35
77.03
76.71
74.48
70.48
68.97
63.99
63.87
56.74
34.73
33.79
33.53
32.76
30.95
29.06
24.12
23.61
22.62
ppm

P7

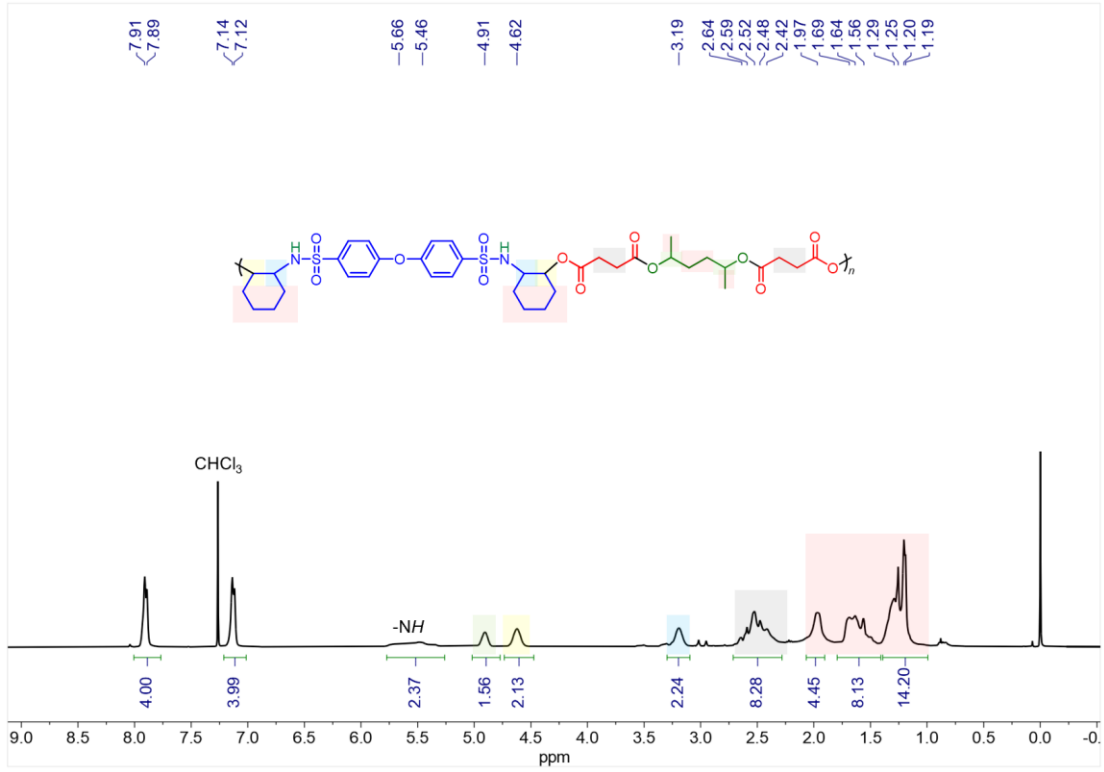

7.90
7.88
7.14
7.12
5.12
4.68
4.59
4.27
4.25
3.73
3.70
3.66
3.64
3.32
3.21
2.65
2.61
2.59
2.46
2.08
1.96
1.70
1.66
1.33
1.29
1.26
1.24
1.23
CHCl3
-NH
DMF
4.56
4.59
2.09
2.63
3.87
43.46
3.00
10.67
5.59
5.44
11.91
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
ppm

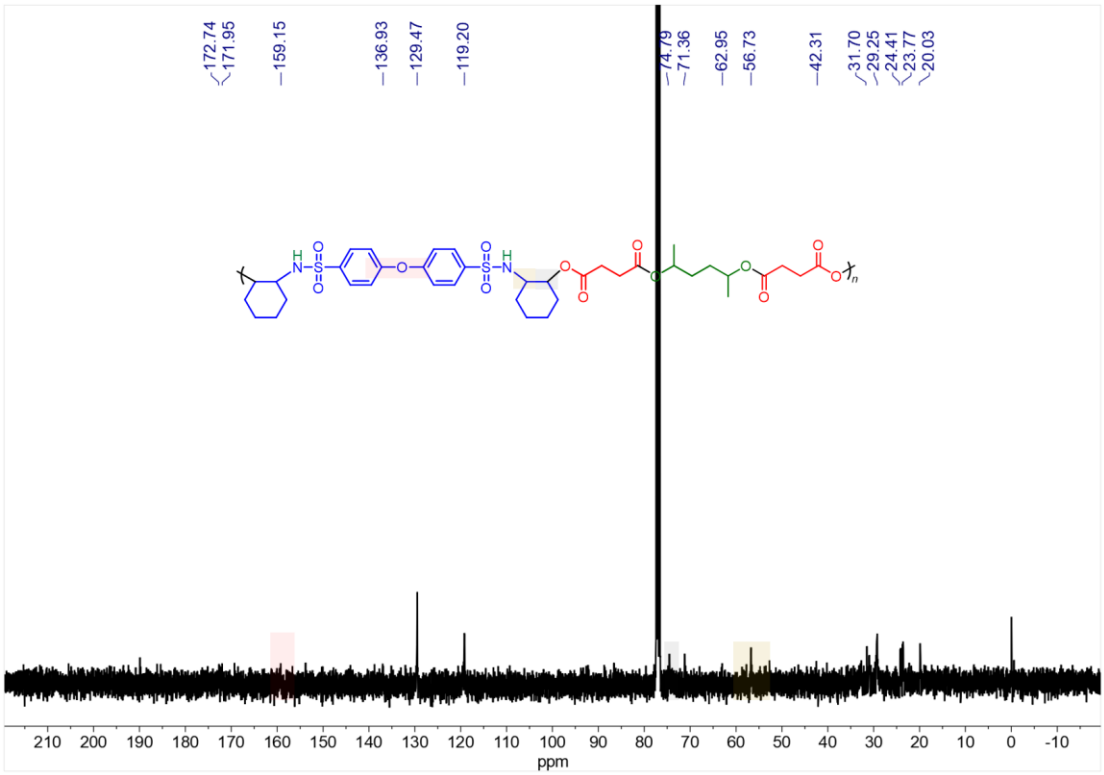
P8


7.91
7.89
7.27
7.13
7.11
5.37
5.28
4.61
4.09
4.09
4.07
4.06
3.23
3.20
2.66
2.62
2.56
2.48
2.40
1.97
1.95
1.68
1.63
1.61
1.59
1.29
1.26
CHCl3
-NH
3.95
4.00
1.64
2.07
3.71
2.10
8.49
4.67
8.41
24.46
ppm

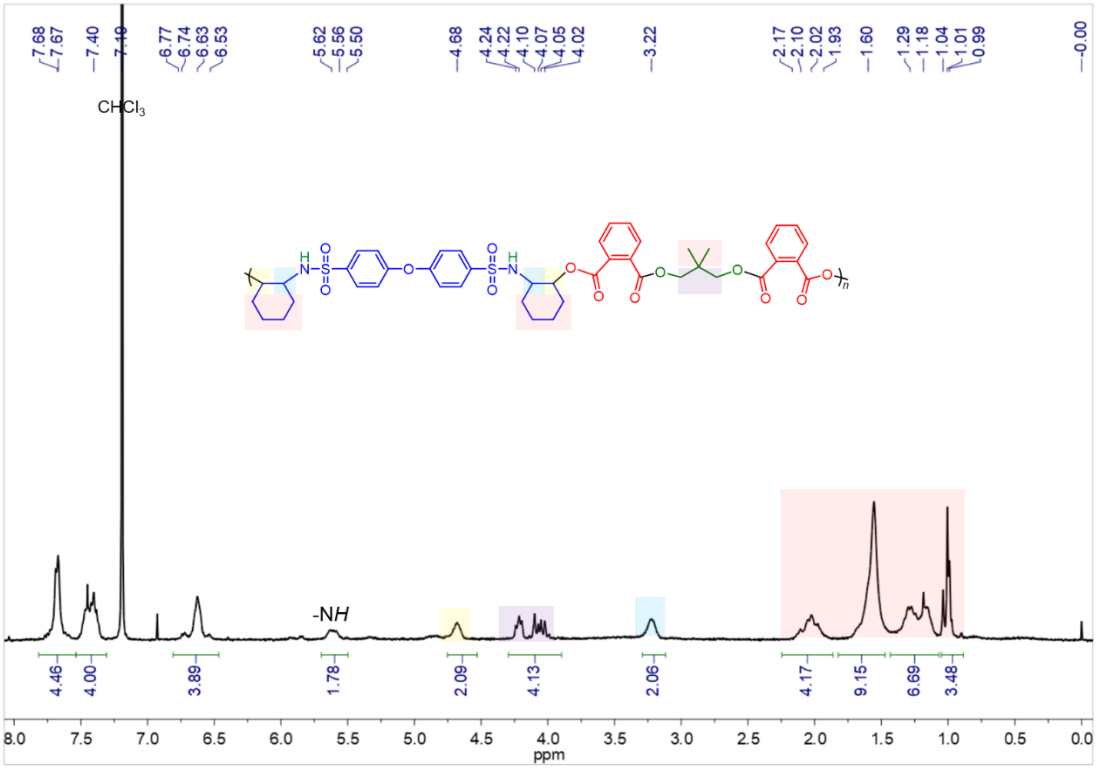

173.13
172.45
159.21
137.00
129.44
119.14
77.32
77.00
76.68
74.41
65.05
56.70
33.00
30.88
29.45
29.25
29.19
29.10
28.54
25.84
24.87
24.07
23.55
ppm

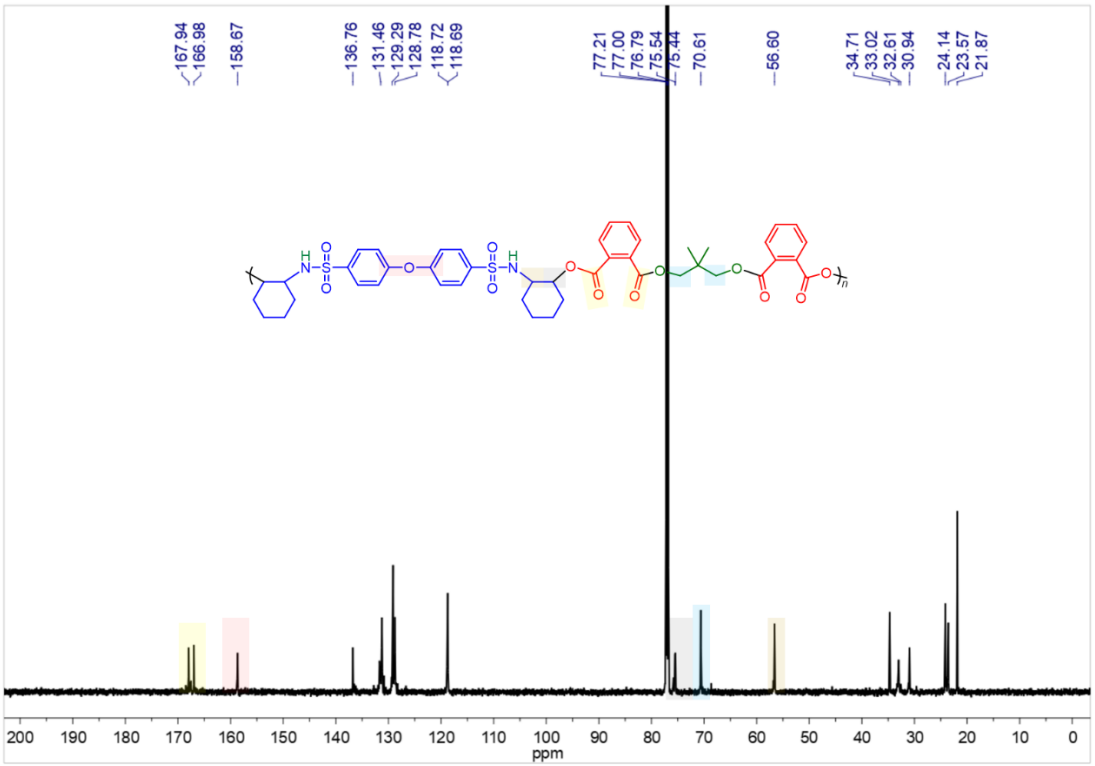
P9


7.91
7.89
7.14
7.12
5.66
5.46
4.91
4.62
3.19
2.64
2.59
2.52
2.48
2.42
1.97
1.69
1.64
1.56
1.29
1.25
1.20
1.19
CHCl3
-NH
4.00
3.99
2.37
1.56
2.13
2.24
8.28
4.45
8.13
14.20
ppm

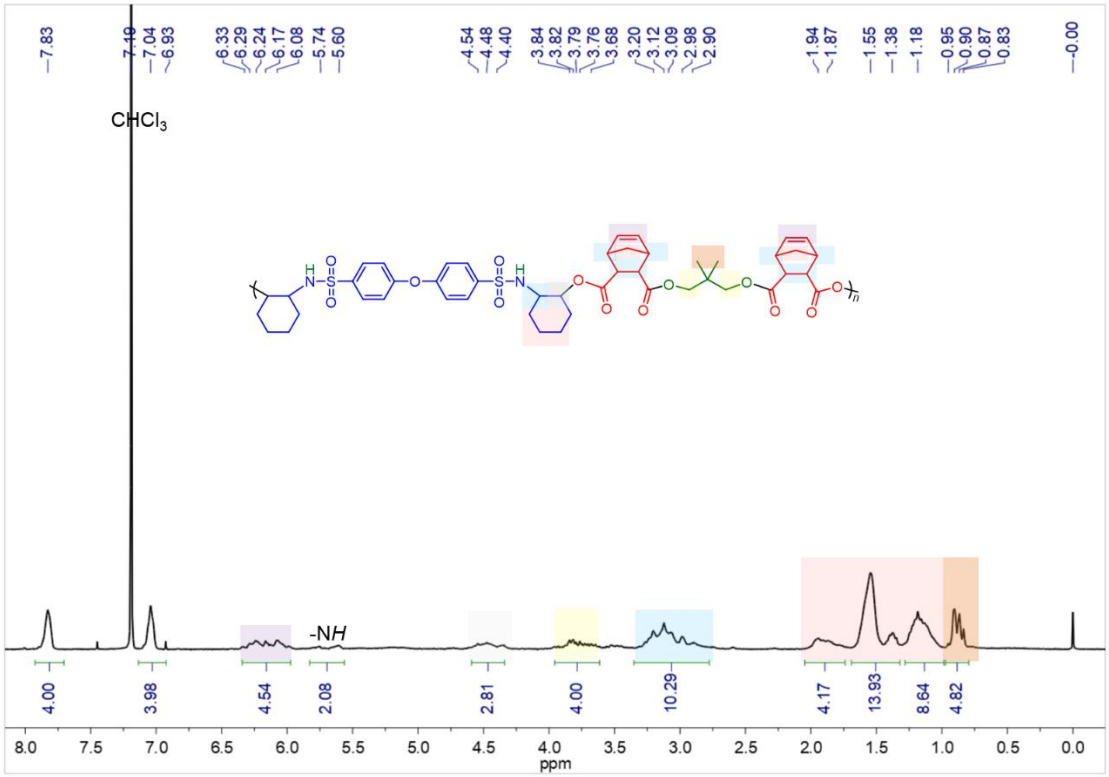

172.74
171.95
159.15
136.93
129.47
119.20
74.79
71.36
62.95
56.73
42.31
31.70
29.25
24.41
23.77
20.03
ppm

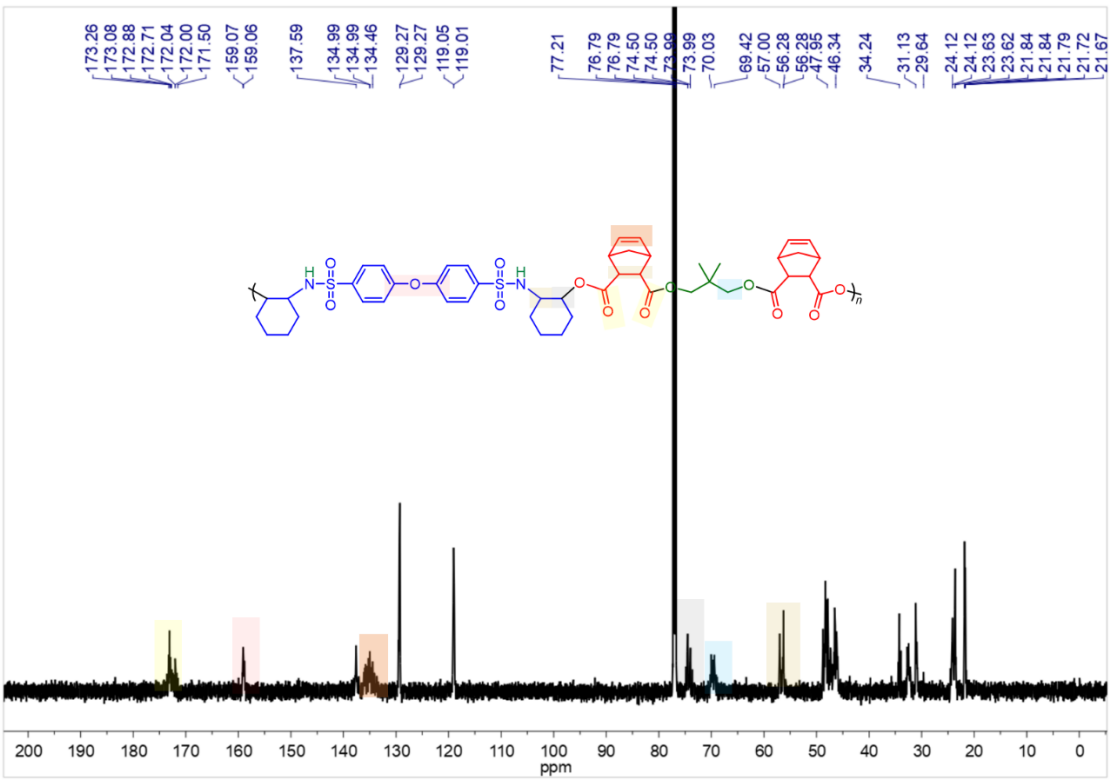
P10


7.68
7.67
7.40
7.49
6.77
6.74
6.63
6.53
5.62
5.56
5.50
4.68
4.24
4.22
4.10
4.07
4.05
4.02
3.22
2.17
2.10
2.02
1.93
1.60
1.29
1.18
1.04
1.01
0.99
0.00
CHCl3
-NH
4.46
4.00
3.89
1.78
2.09
4.13
2.06
4.17
9.15
6.69
3.48
ppm

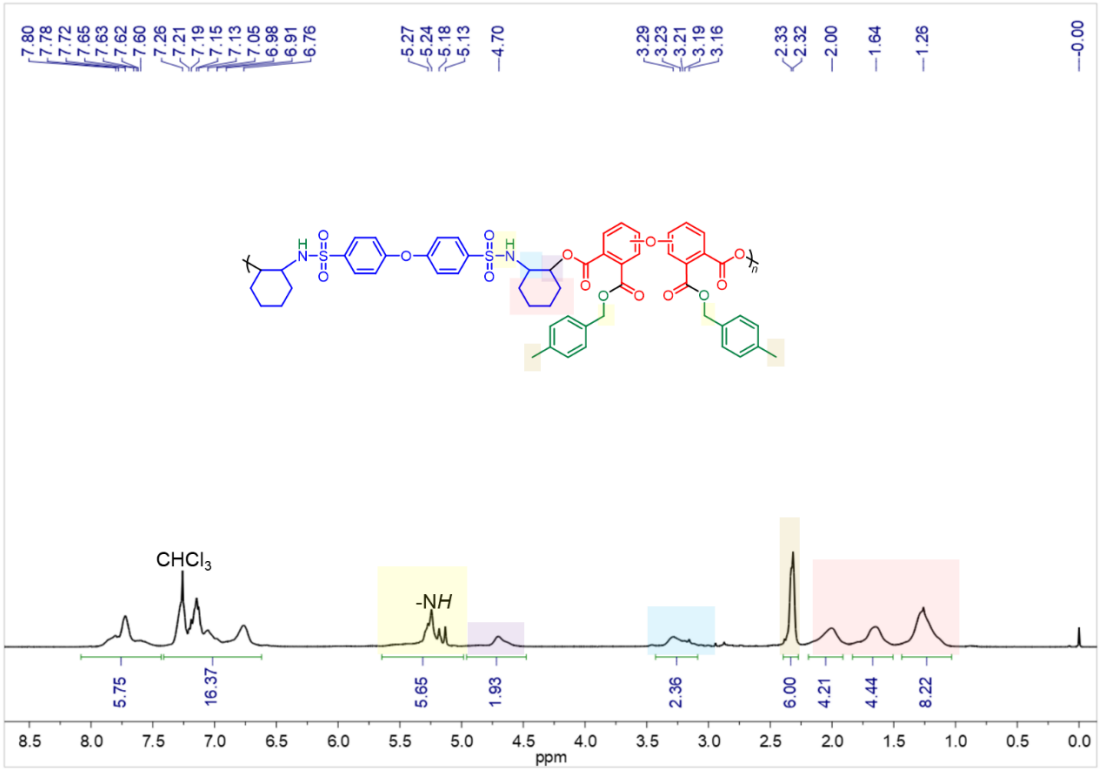

167.94
166.98
158.67
136.76
131.46
129.29
128.78
118.72
118.69
77.21
77.00
76.79
75.54
75.44
70.61
66.60
34.71
33.02
32.61
30.94
24.14
23.57
21.87
ppm

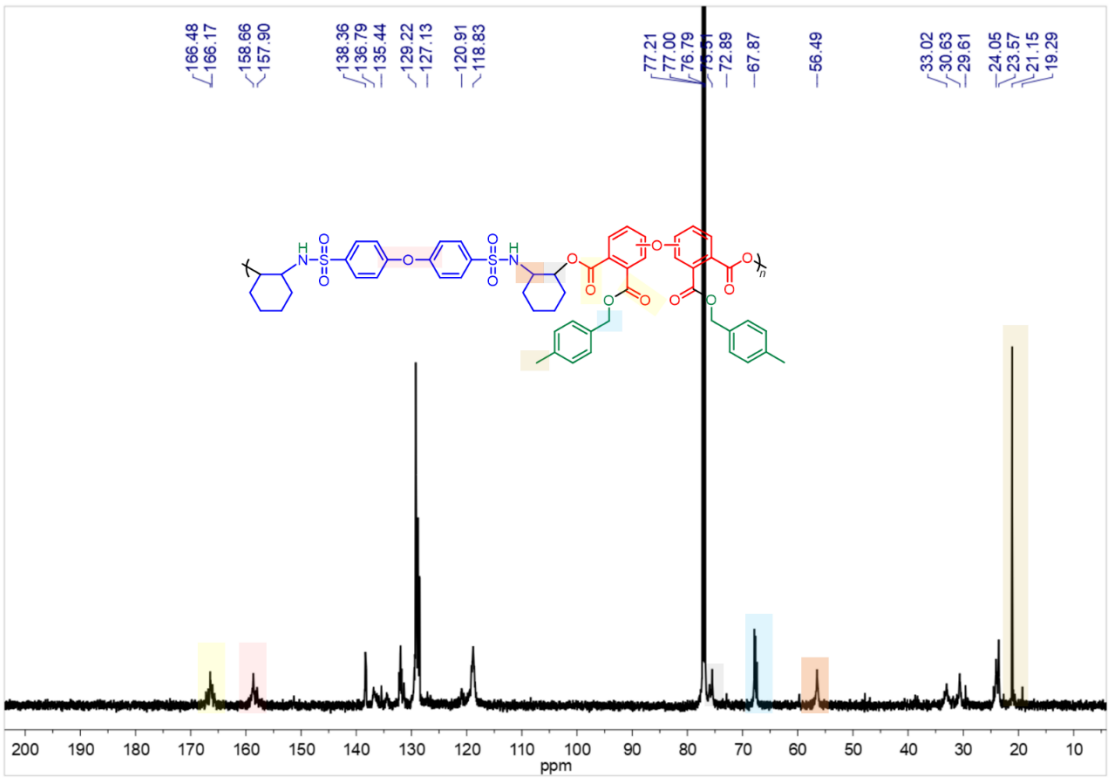
P11


7.83
7.19
7.04
6.93
6.33
6.29
6.24
6.17
6.08
5.74
5.60
4.54
4.48
4.40
3.84
3.82
3.79
3.76
3.68
3.20
3.12
3.09
2.98
2.90
1.94
1.87
1.55
1.38
1.18
0.95
0.90
0.87
0.83
0.00
CHCl3
-NH
4.00
3.98
4.54
2.08
2.81
4.00
10.29
4.17
13.93
8.64
4.82
ppm

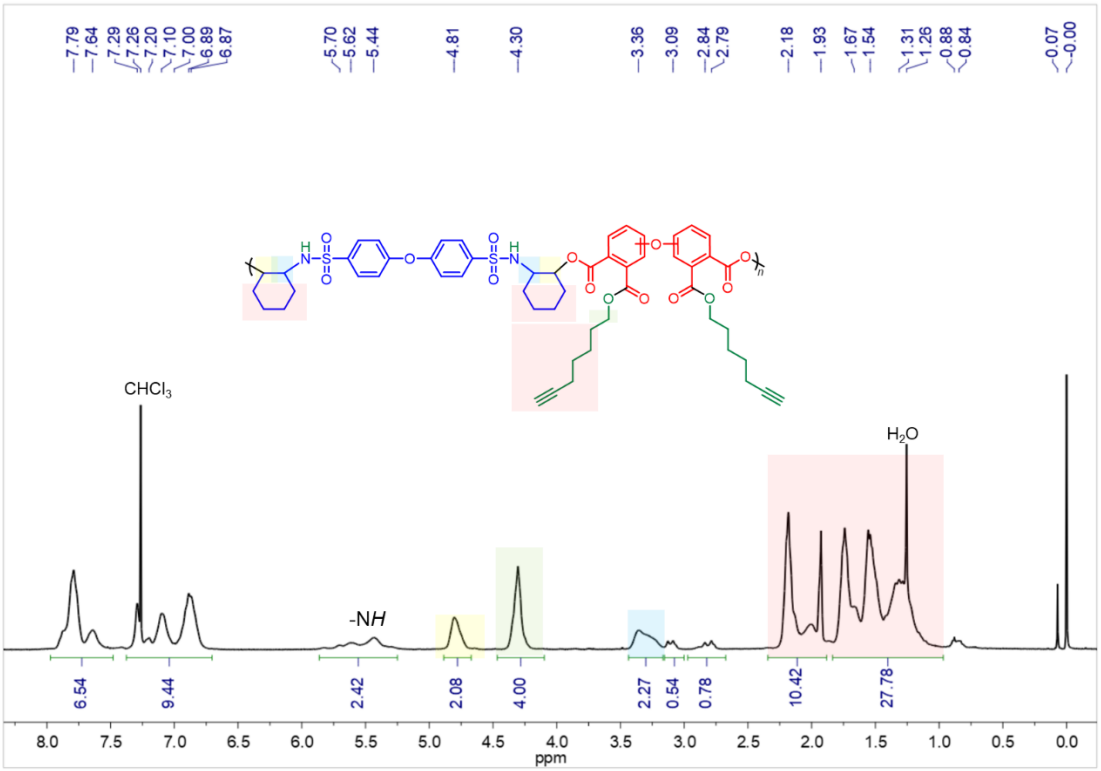

173.26
173.08
172.88
172.71
172.04
172.00
171.50
159.07
159.06
137.59
134.99
134.99
134.46
129.27
129.27
119.05
119.01
77.21
76.79
76.79
74.50
74.50
73.99
70.03
69.42
57.00
56.28
56.28
47.65
46.34
34.24
31.13
29.64
24.12
24.12
23.63
23.62
21.84
21.84
21.79
21.72
21.67
ppm

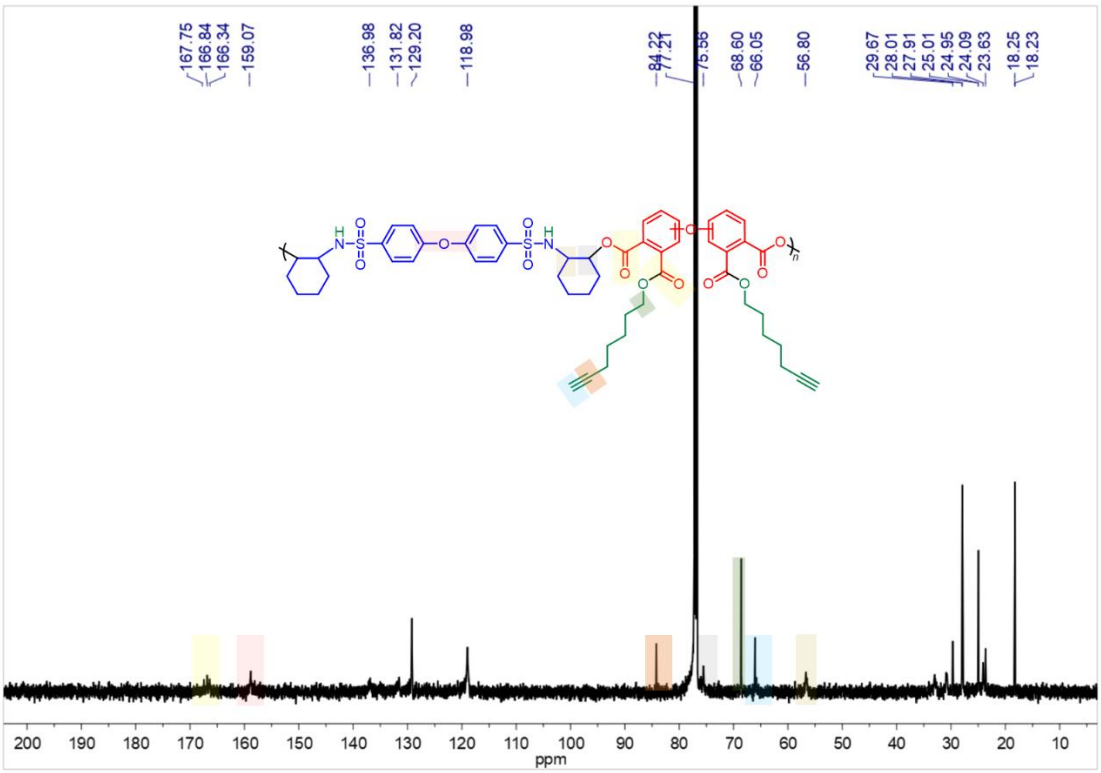
P12


7.80
7.78
7.72
7.65
7.63
7.62
7.60
7.26
7.21
7.19
7.15
7.13
7.05
6.98
6.91
6.76
5.27
5.24
5.18
5.13
4.70
3.29
3.23
3.21
3.19
3.16
2.33
2.32
2.00
1.64
1.26
0.00
CHCl3
-NH
5.75
16.37
5.65
1.93
2.36
6.00
4.21
4.44
8.22
ppm

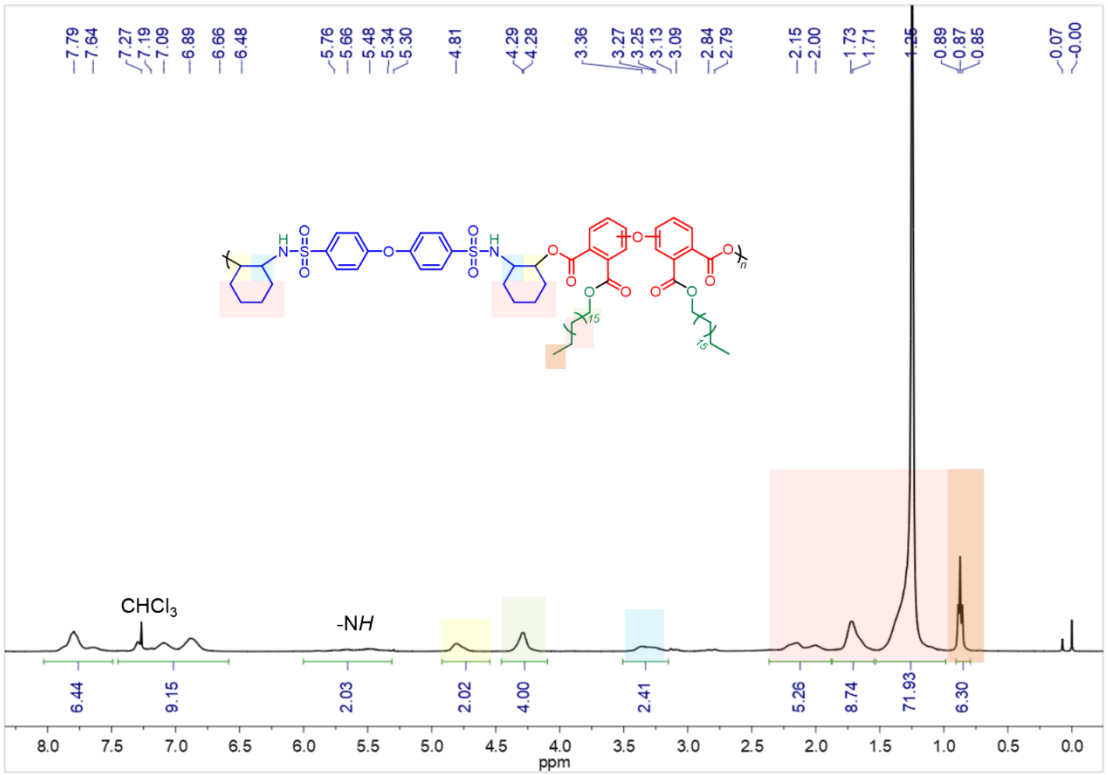

166.48
166.17
158.66
157.90
138.36
136.79
135.44
129.22
127.13
120.91
118.83
77.21
77.00
76.79
72.89
67.87
56.49
33.02
30.63
29.61
24.05
23.57
21.15
19.29
ppm

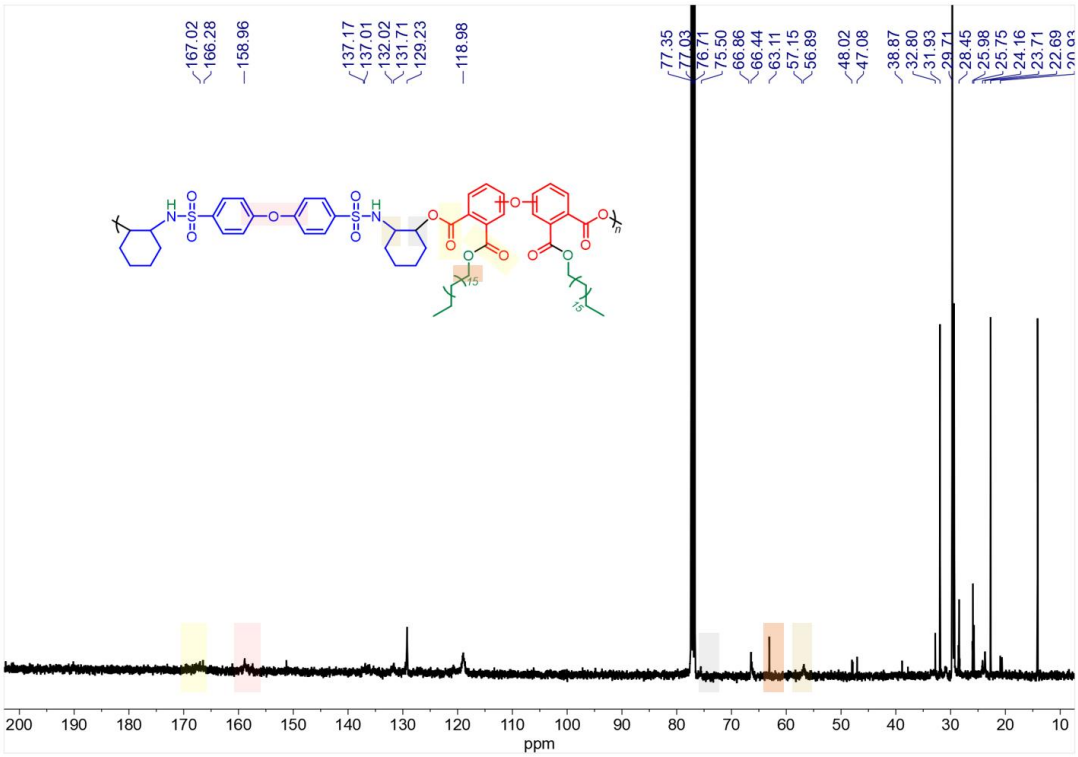
P13


7.79
7.64
7.29
7.26
7.20
7.10
7.00
6.89
6.87
5.70
5.62
5.44
4.81
4.30
3.36
3.09
2.84
2.79
2.18
1.93
1.67
1.54
1.31
1.26
0.88
0.84
0.07
0.00
CHCl3
H2O
-NH
6.54
9.44
2.42
2.08
4.00
2.27
0.54
0.78
10.42
27.78
ppm

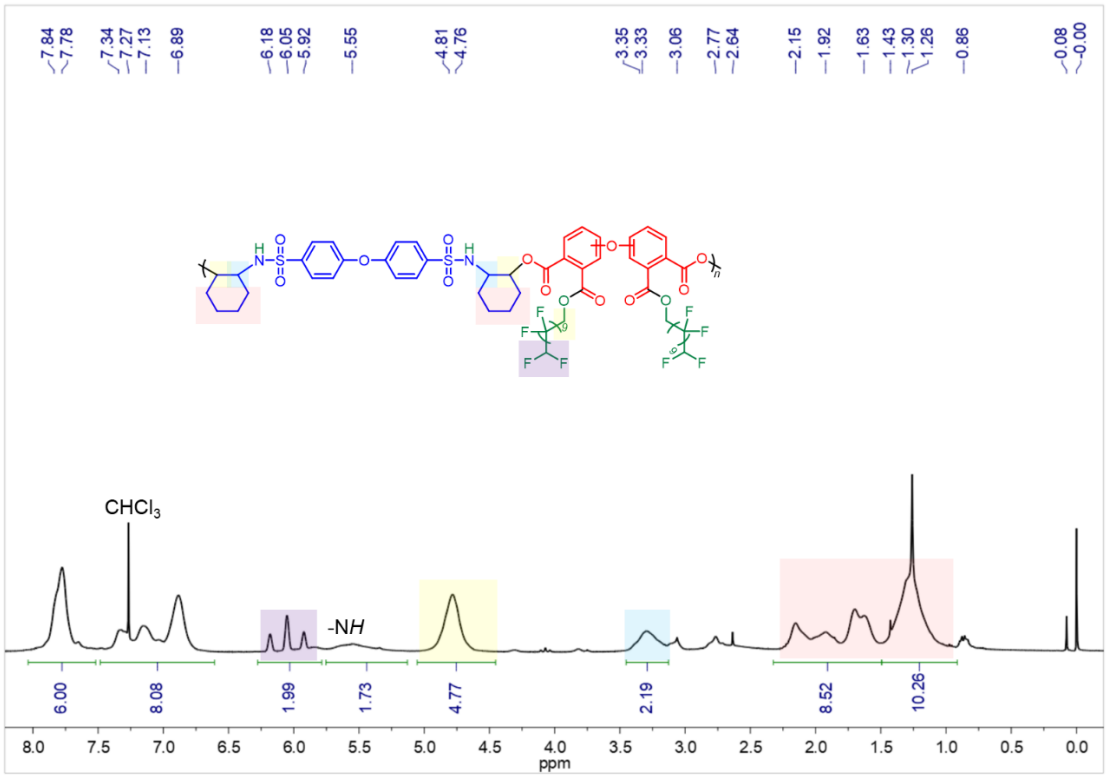

167.75
166.84
166.34
159.07
136.98
131.82
129.20
118.98
84.22
77.21
76.56
68.60
66.05
56.80
29.67
28.01
27.91
25.01
24.95
24.09
23.63
18.25
18.23
ppm

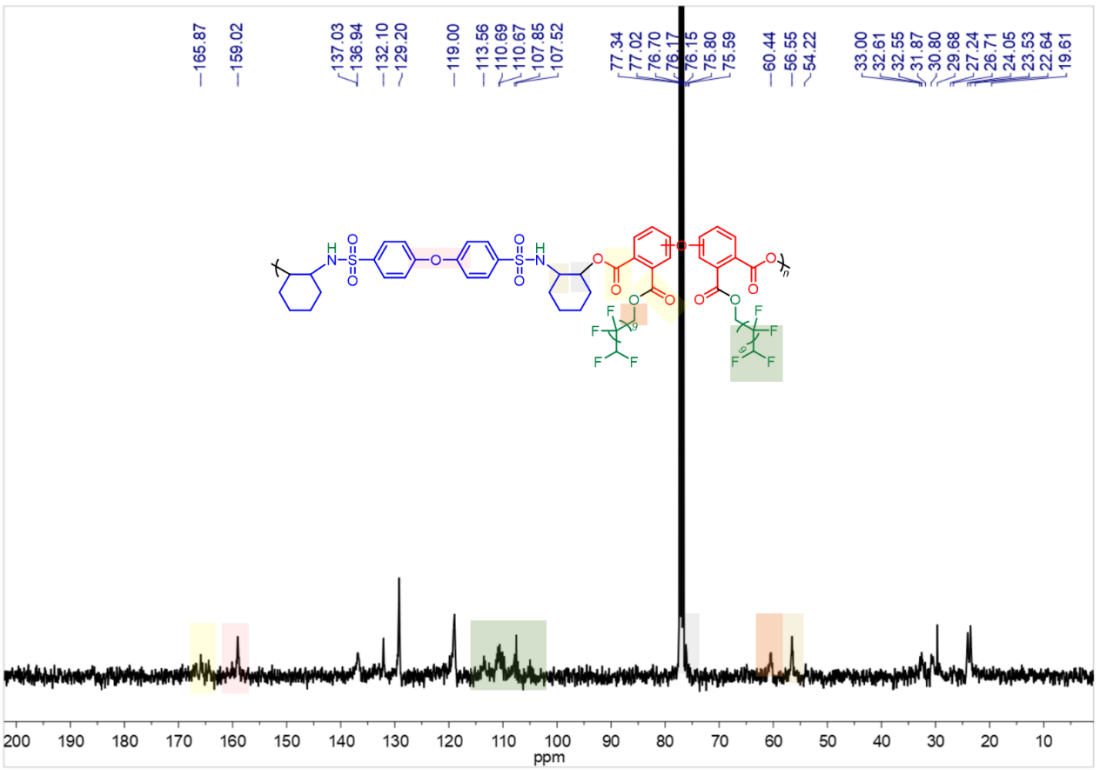
P14


7.79
7.64
7.27
7.19
7.09
6.89
6.66
6.48
5.76
5.66
5.48
5.34
5.30
4.81
4.29
4.28
3.36
3.27
3.25
3.13
3.09
2.84
2.79
2.15
2.00
1.73
1.71
1.25
0.89
0.87
0.85
0.07
-0.00
CHCl3
-NH
6.44
9.15
2.03
2.02
4.00
2.41
5.26
8.74
71.93
6.30
ppm

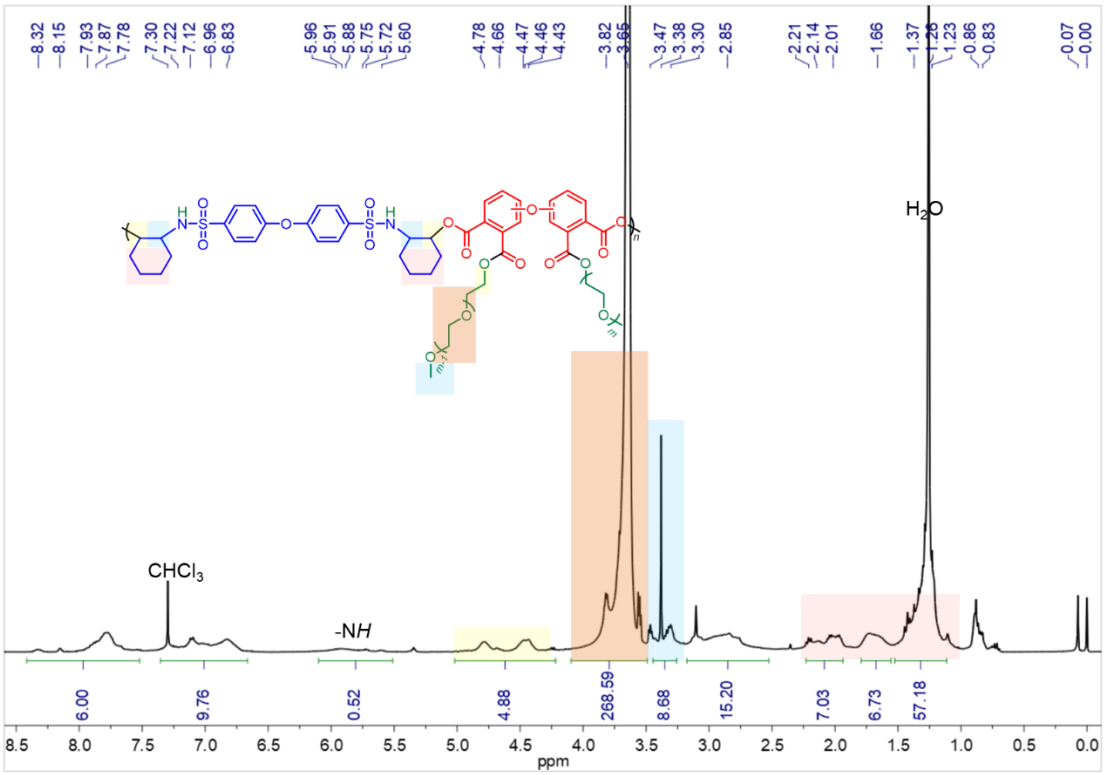

167.02
166.28
158.96
137.17
137.01
132.02
131.71
129.23
118.98
77.35
77.03
76.71
75.50
66.86
66.44
63.11
57.15
56.89
48.02
47.08
38.87
32.80
31.93
29.71
28.45
25.98
25.75
24.16
23.71
22.69
ppm

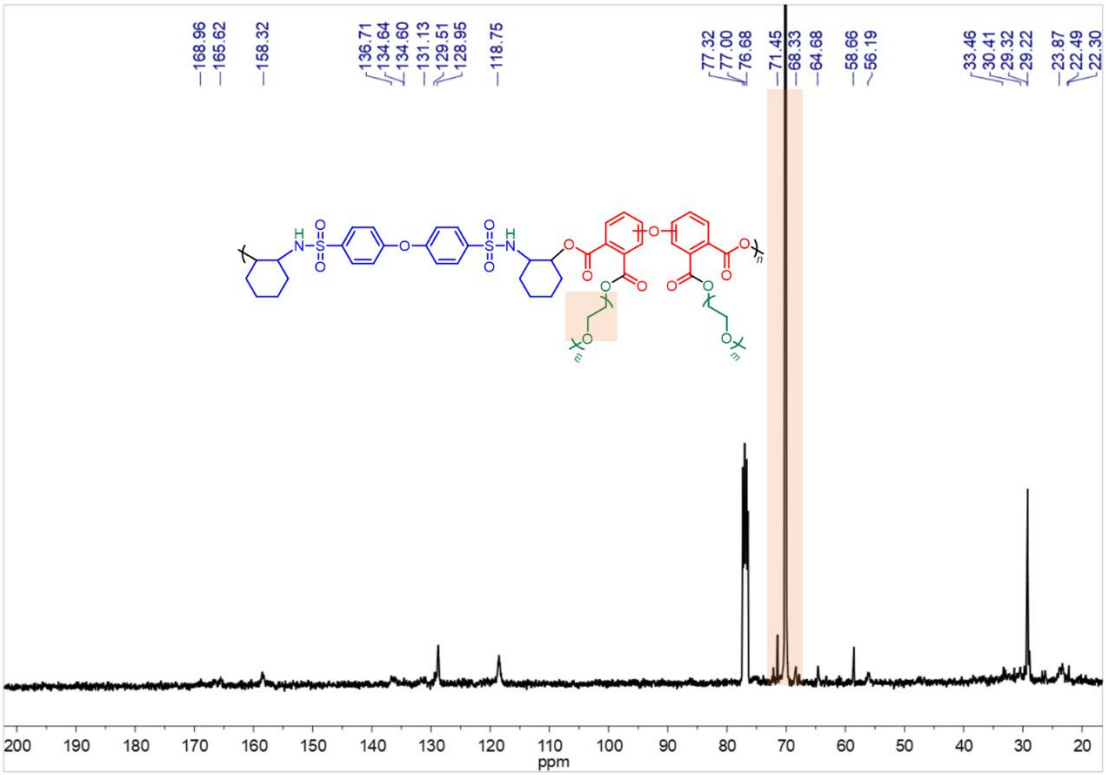
P15


7.84
7.78
7.34
7.27
7.13
6.89
6.18
6.05
5.92
5.55
4.81
4.76
3.35
3.33
3.06
2.77
2.64
2.15
1.92
1.63
1.43
1.30
1.26
0.86
0.08
0.00
CHCl3
-NH
6.00
8.08
1.99
1.73
4.77
2.19
8.52
10.26
ppm

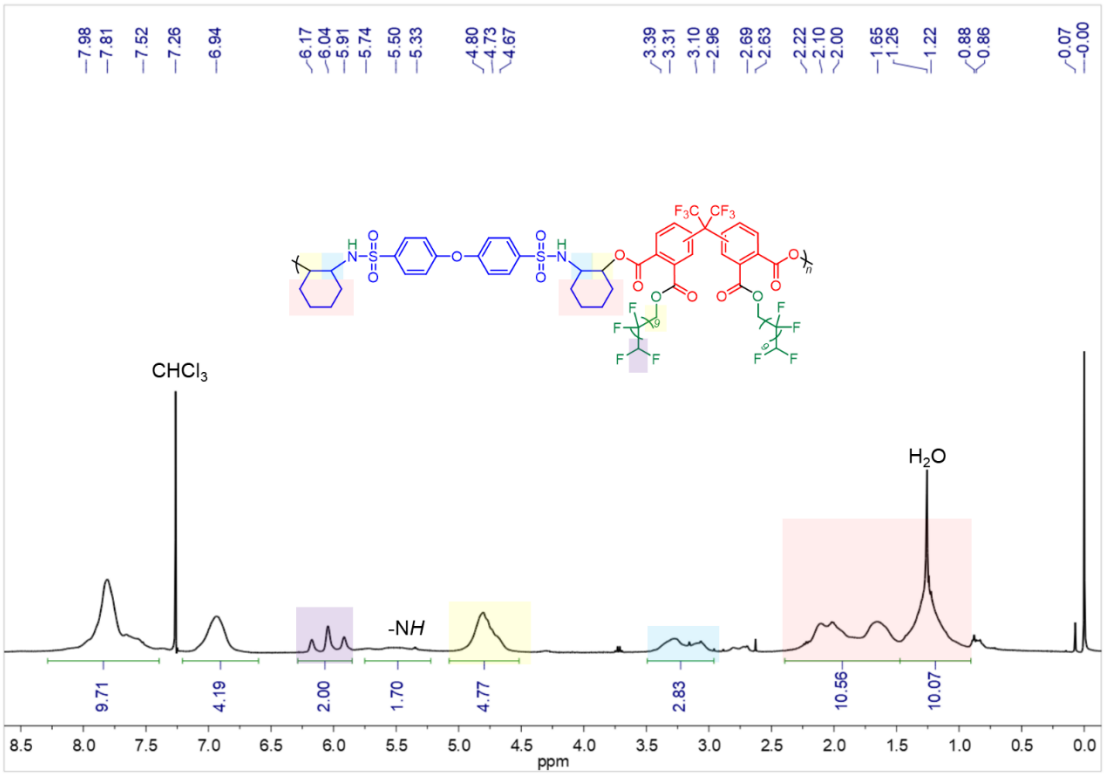

165.87
159.02
137.03
136.94
132.10
129.20
119.00
113.56
110.69
110.67
107.85
107.52
77.34
77.02
76.70
76.17
76.15
75.80
75.59
60.44
56.55
54.22
33.00
32.61
32.55
31.87
30.80
29.68
27.24
26.71
24.05
23.53
22.64
19.61
ppm

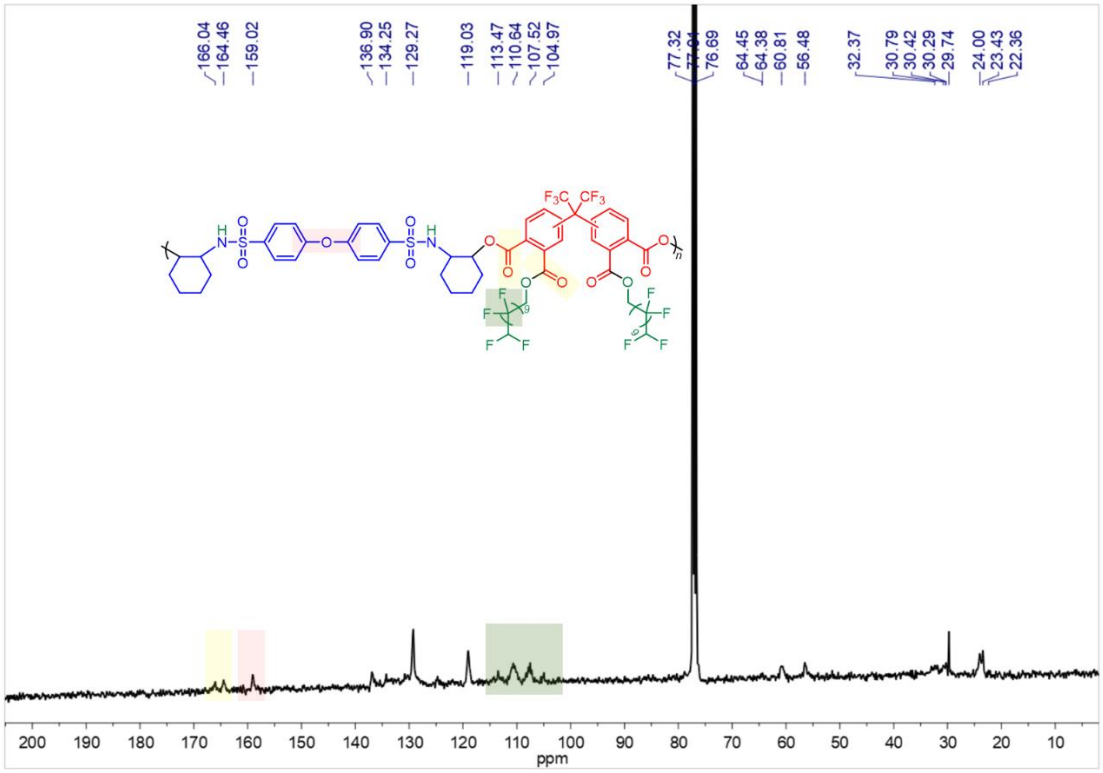
P16


8.32
8.15
7.93
7.87
7.78
7.30
7.22
7.12
6.96
6.83
5.96
5.91
5.88
5.75
5.72
5.60
4.78
4.66
4.47
4.46
4.43
3.82
3.65
3.47
3.38
3.30
2.85
2.21
2.14
2.01
1.66
1.37
1.28
1.23
0.86
0.83
0.07
0.00
H2O
CHCl3
-NH
6.00
9.76
0.52
4.88
268.59
8.68
15.20
7.03
6.73
57.18
ppm

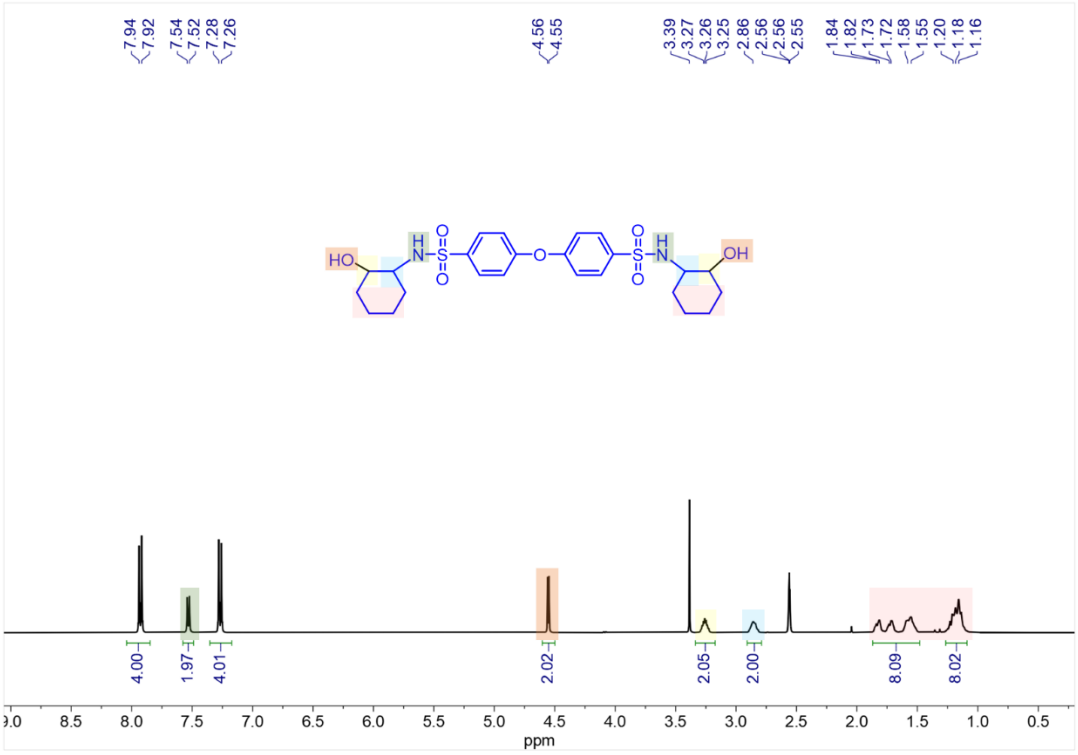

168.96
165.62
158.32
136.71
134.64
134.60
131.13
129.51
128.95
118.75
77.32
77.00
76.68
71.45
68.33
64.68
58.66
56.19
33.46
30.41
29.32
29.22
23.87
22.49
22.30
ppm

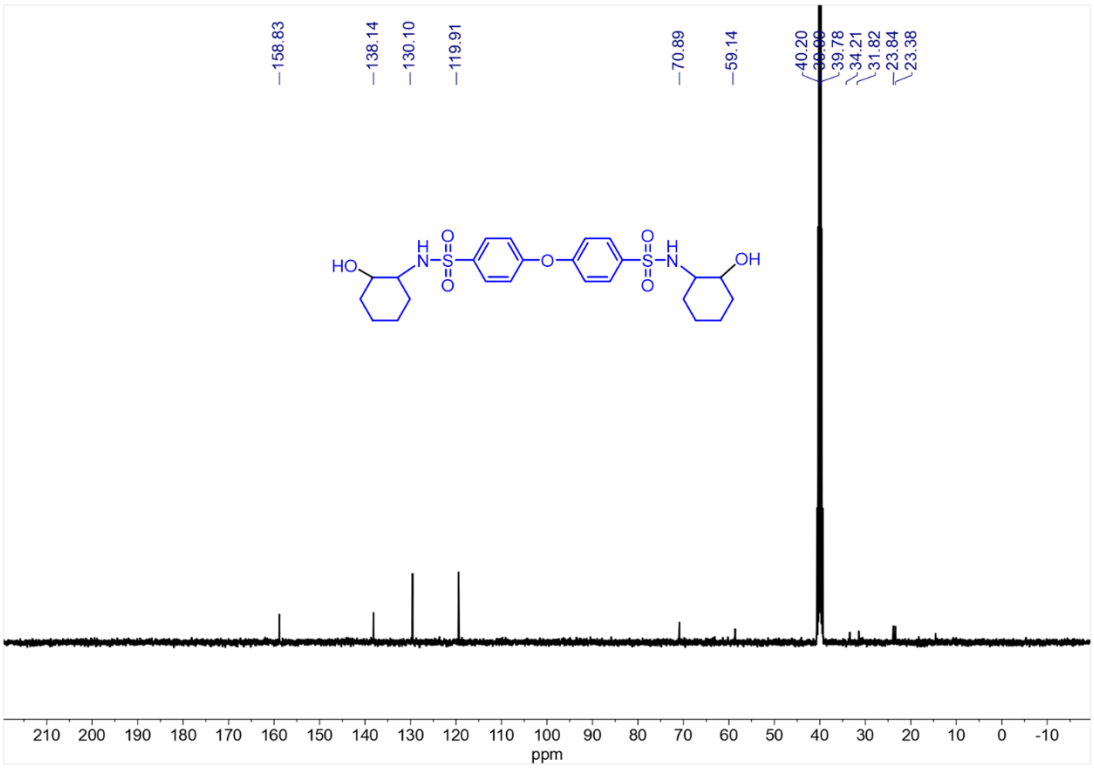
P17


7.98
7.81
7.52
7.26
6.94
6.17
6.04
5.91
5.74
5.50
5.33
4.80
4.73
4.67
3.39
3.31
3.10
2.96
2.69
2.63
2.22
2.10
2.00
1.65
1.26
1.22
0.88
0.86
0.07
0.00
CHCl3
H2O
-NH
9.71
4.19
2.00
1.70
4.77
2.83
10.56
10.07
ppm


166.04
164.46
159.02
136.90
134.25
129.27
119.03
113.47
110.64
107.52
104.97
77.32
76.69
64.45
64.38
60.81
56.48
32.37
30.79
30.42
30.29
29.74
24.00
23.43
22.36
ppm

6

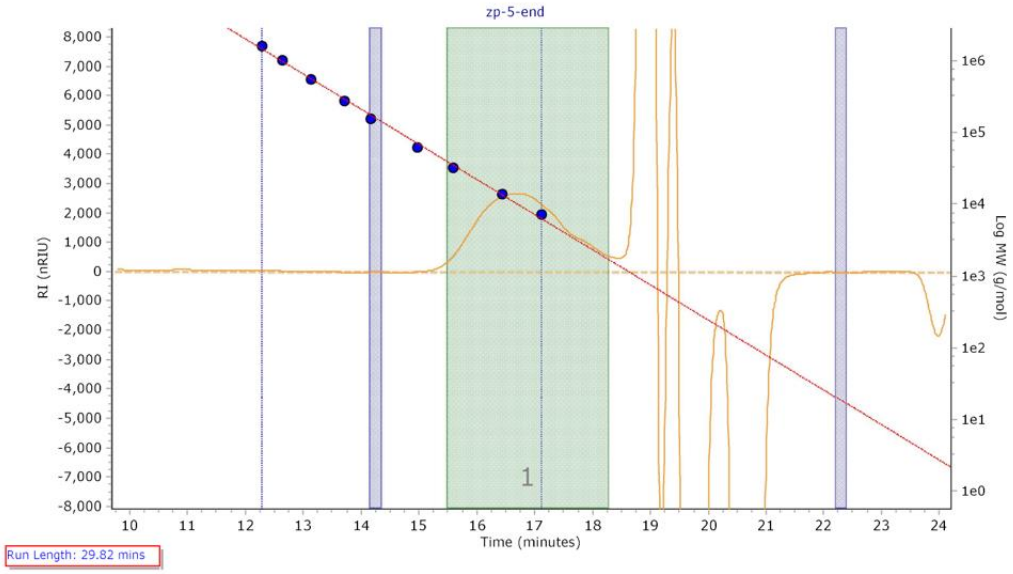

7.94
7.92
7.54
7.52
7.28
7.26
4.56
4.55
3.39
3.27
3.26
3.25
2.86
2.56
2.56
2.55
1.84
1.82
1.73
1.72
1.58
1.55
1.20
1.18
1.16
HO
OH
4.00
1.97
4.01
2.02
2.05
2.00
8.09
8.02
ppm


158.83
138.14
130.10
119.91
70.89
59.14
40.20
39.78
34.21
31.82
23.84
23.38
HO
OH
ppm

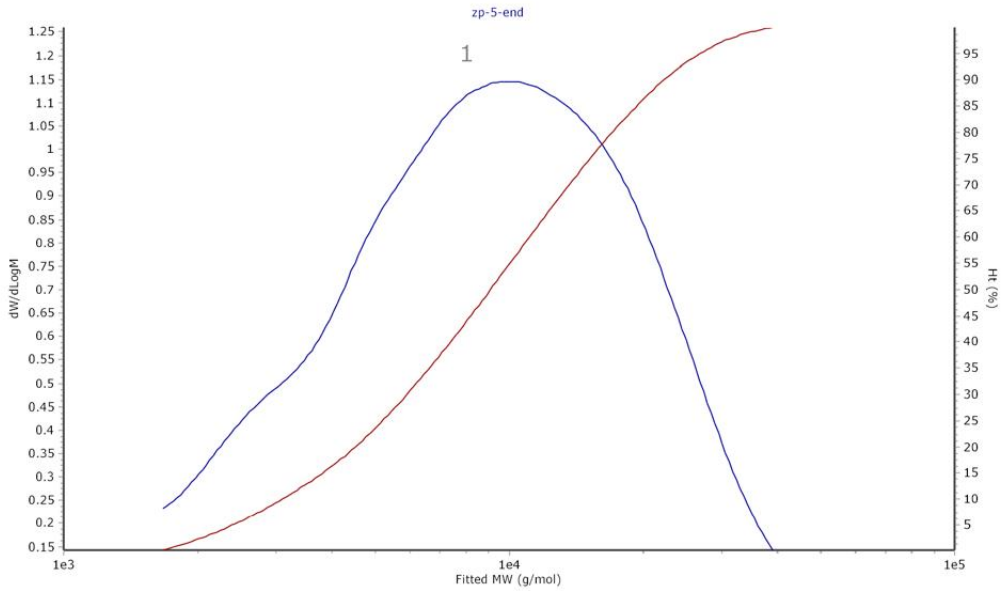
8. Full SEC Traces of Poly(sulfonamide ester)s P1-P117

P1

Chromatogram Plot

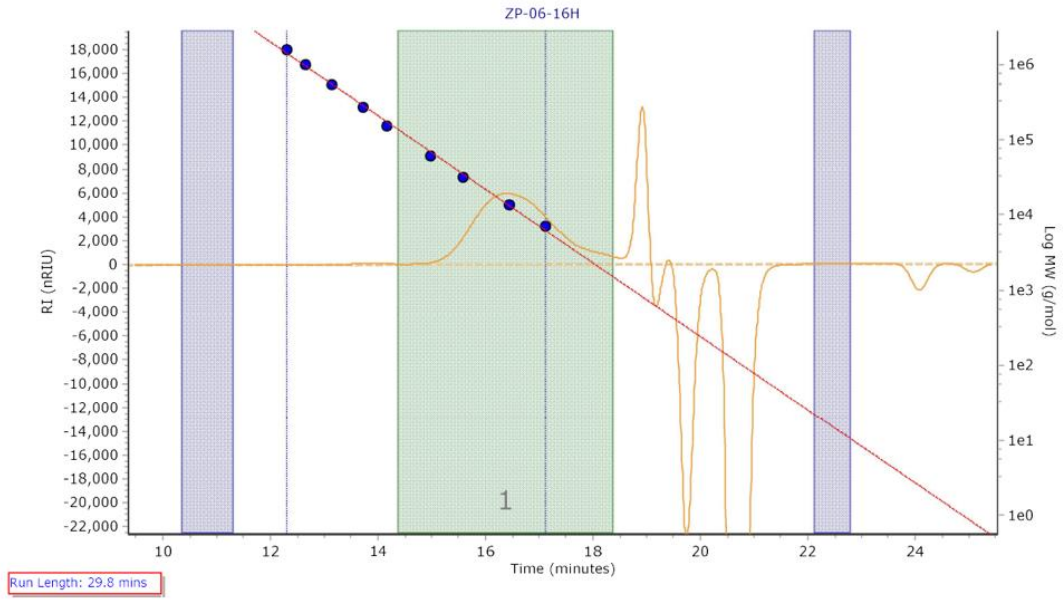


Distribution Plot

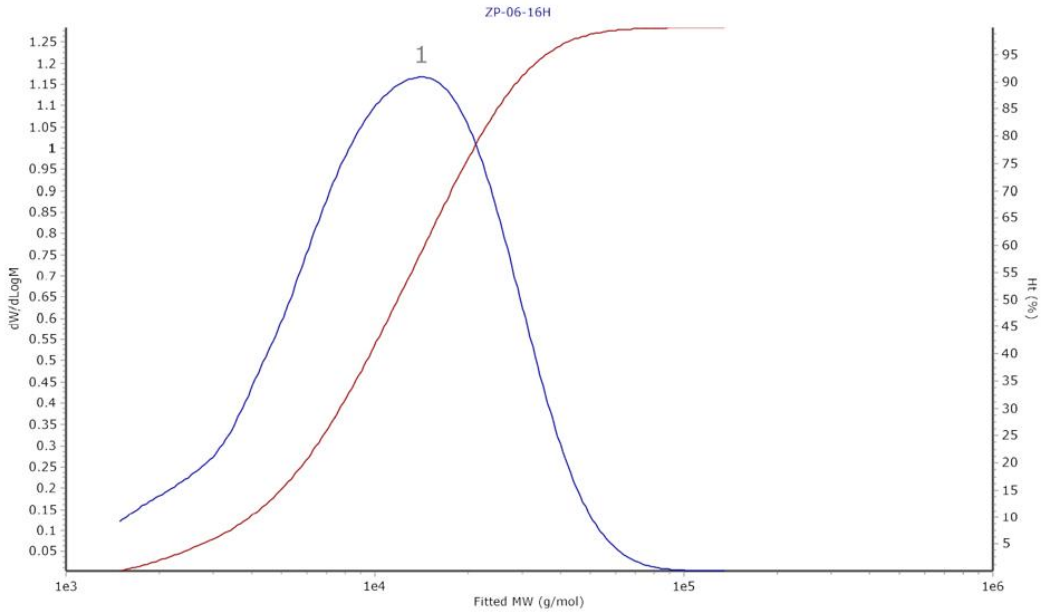


P2

Chromatogram Plot

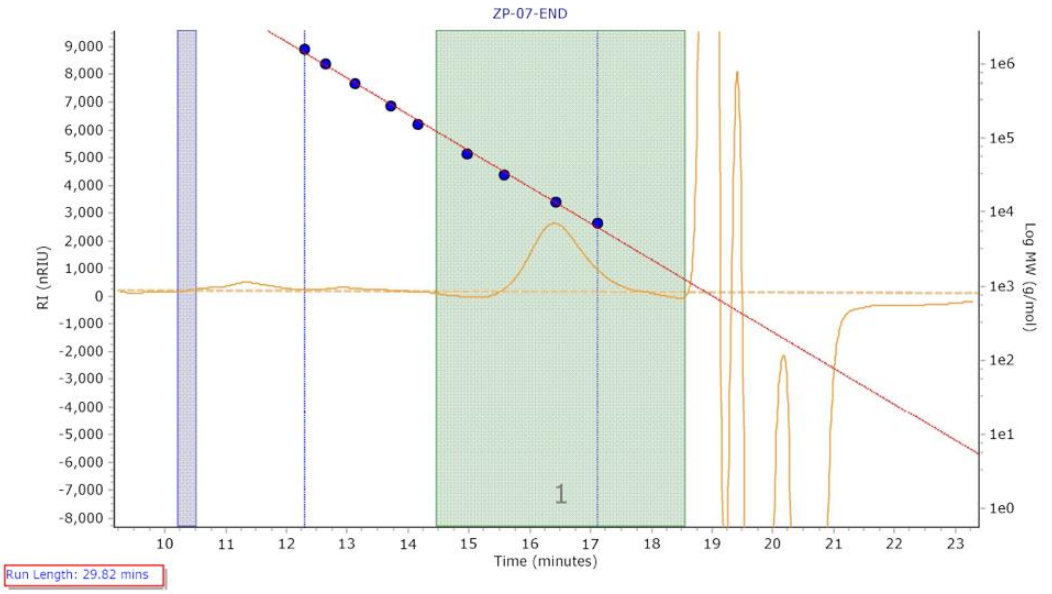


Distribution Plot

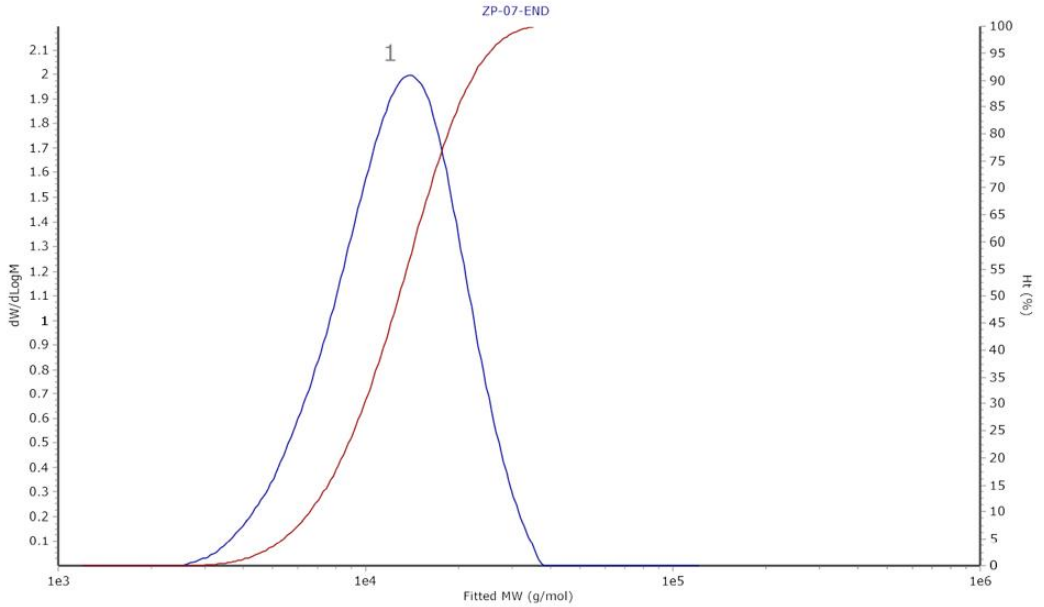


P3

Chromatogram Plot

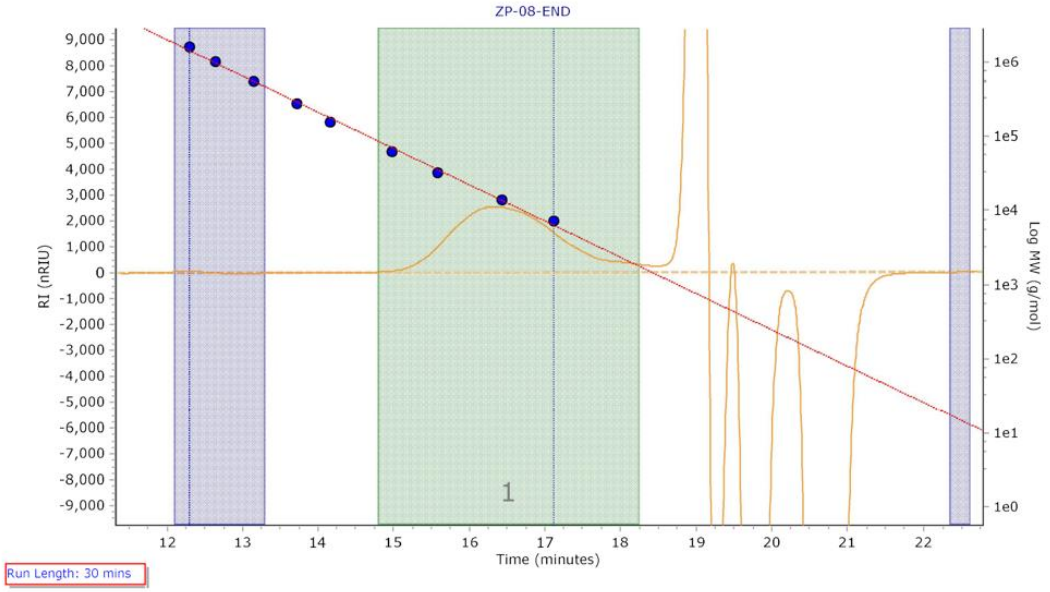


Distribution Plot

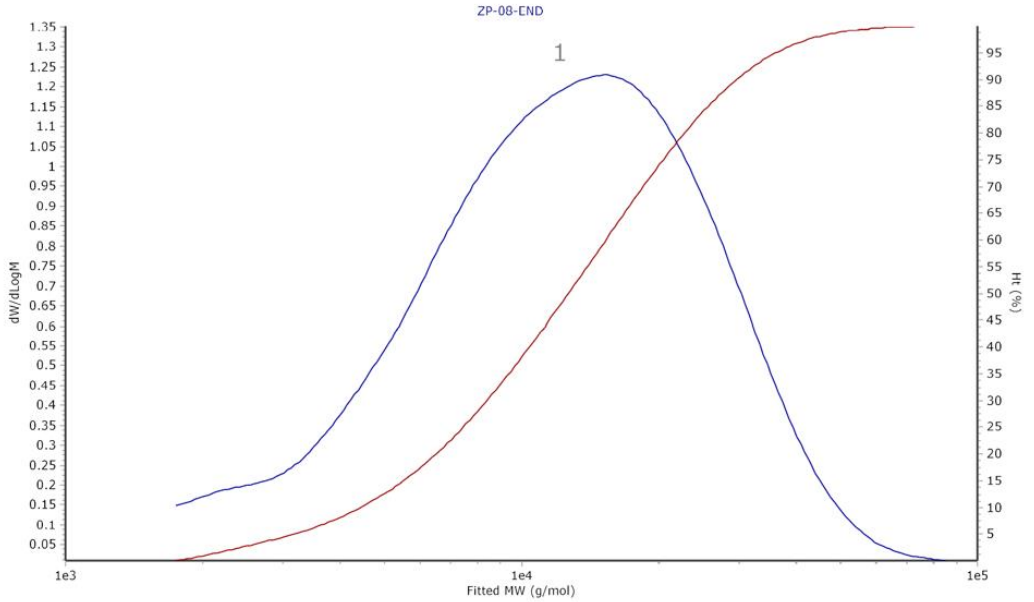


P4

Chromatogram Plot

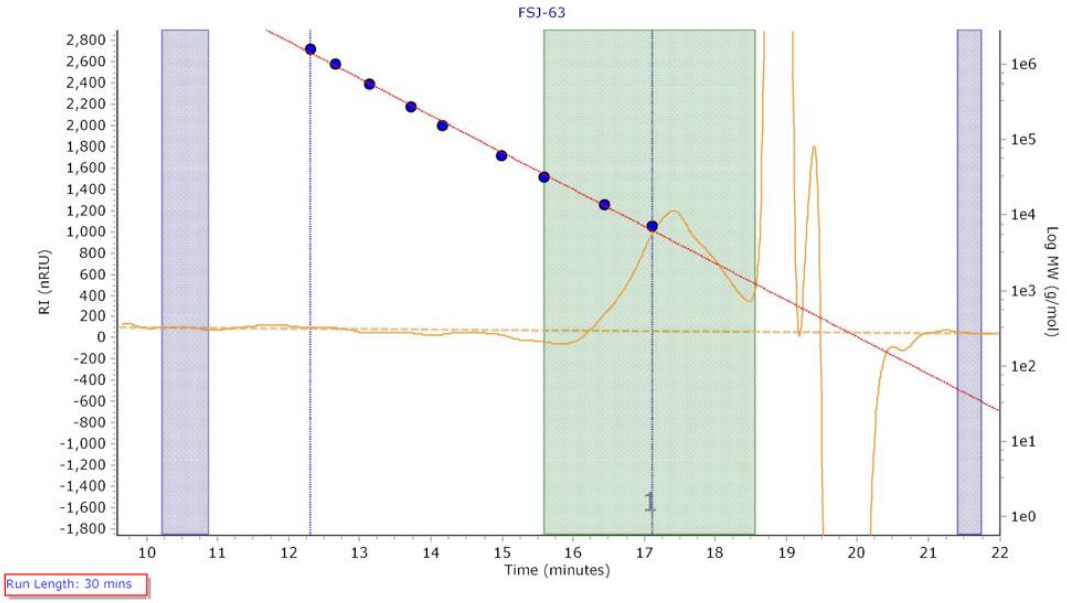


Distribution Plot

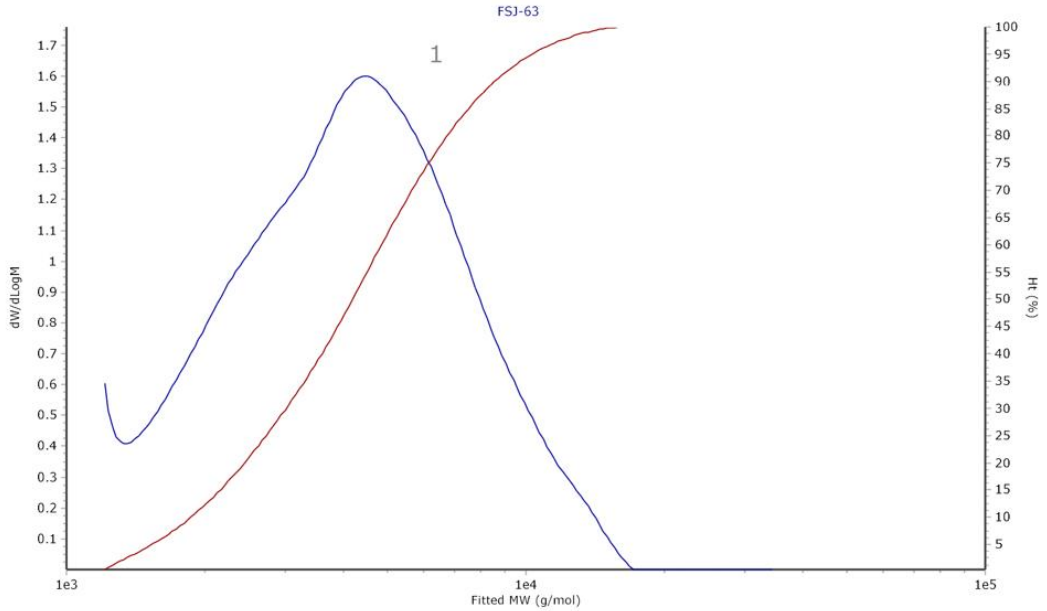


P5

Chromatogram Plot

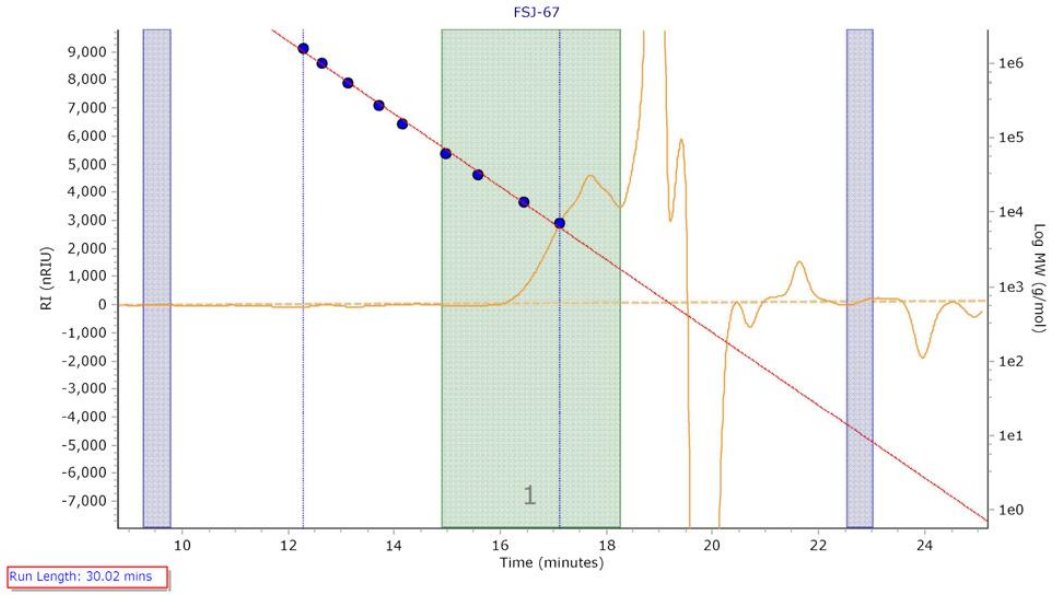


Distribution Plot

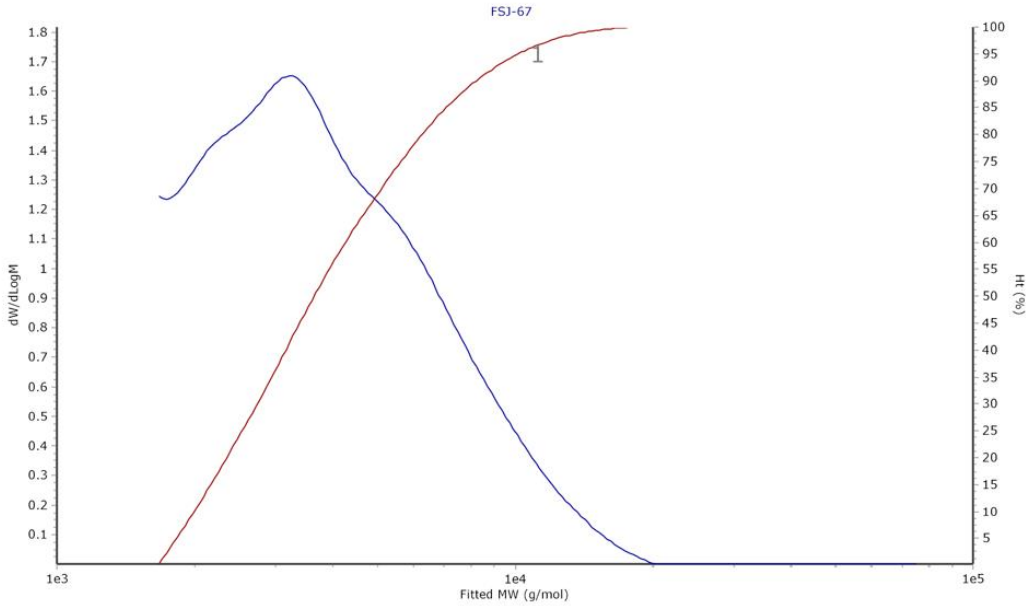


P6

Chromatogram Plot

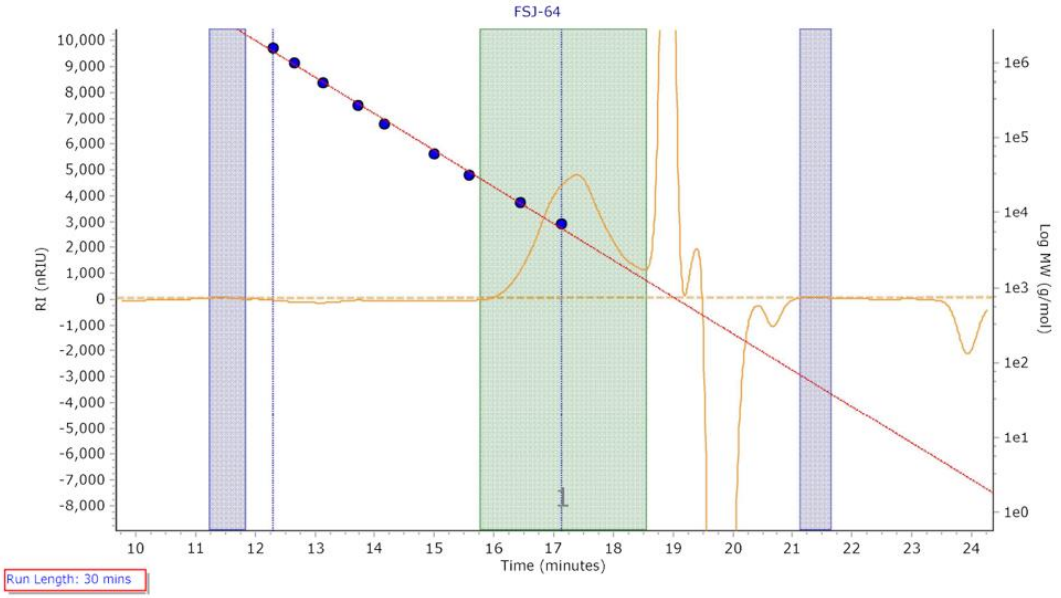


Distribution Plot

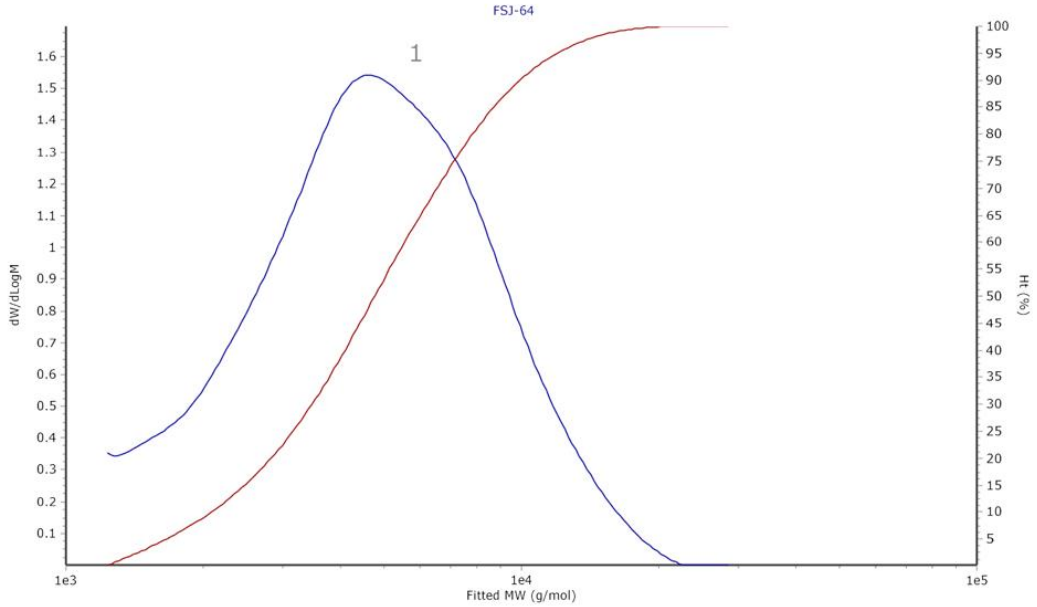


P7

Chromatogram Plot

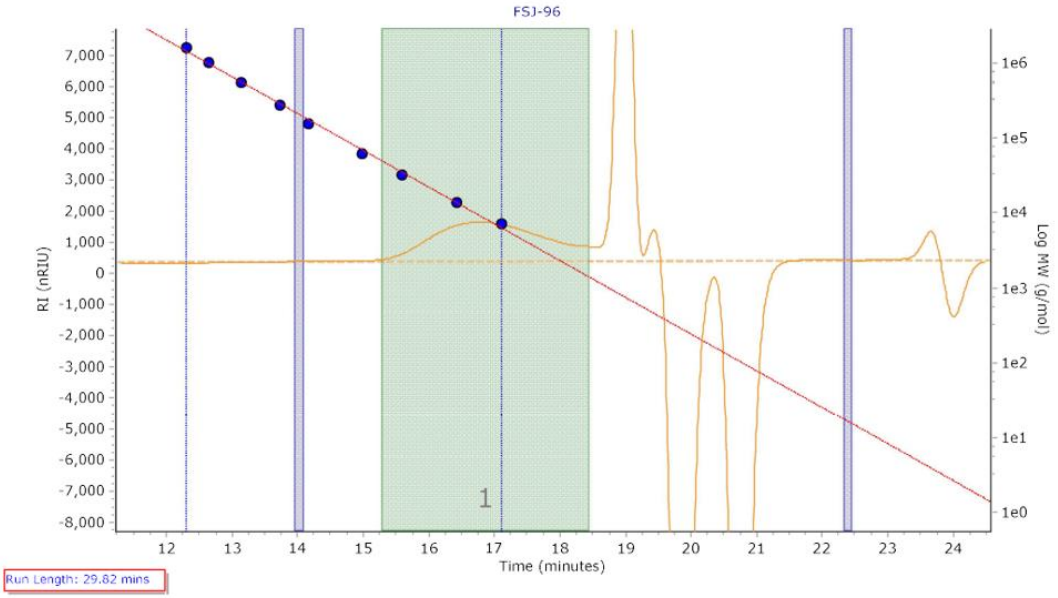


Distribution Plot

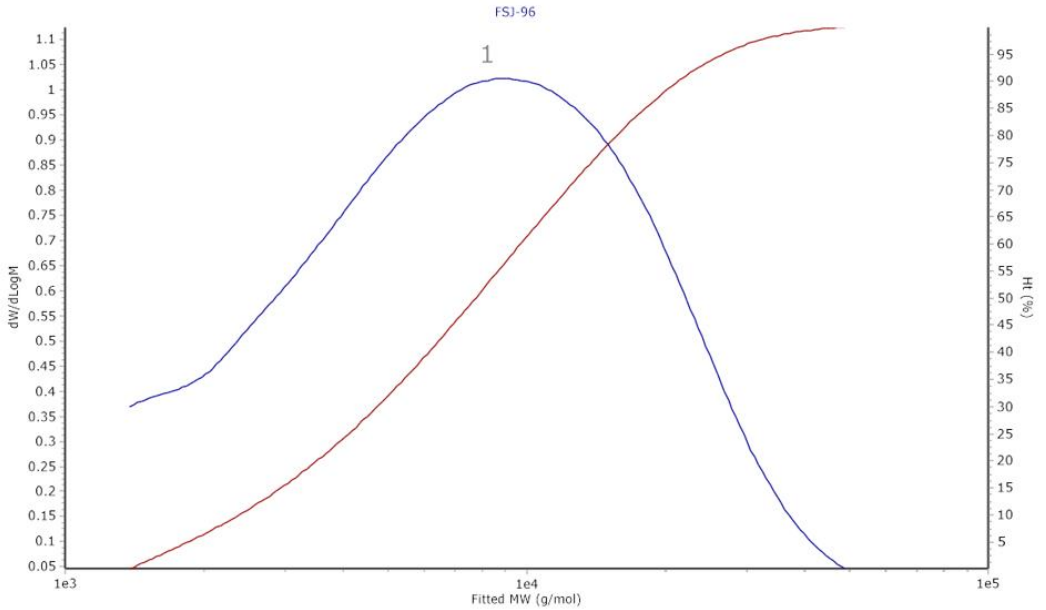


P8

Chromatogram Plot

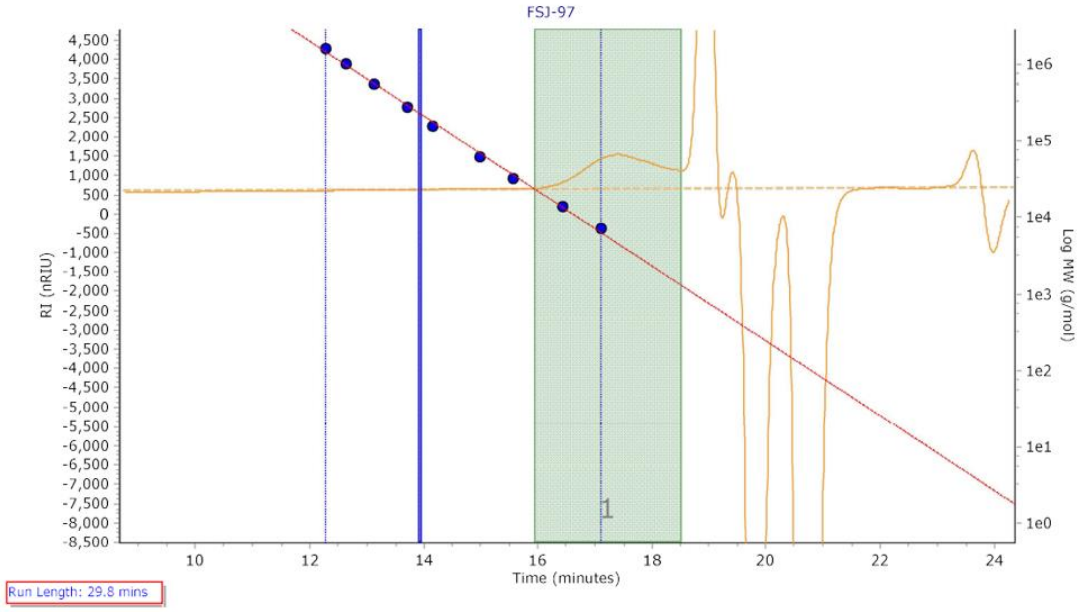


Distribution Plot

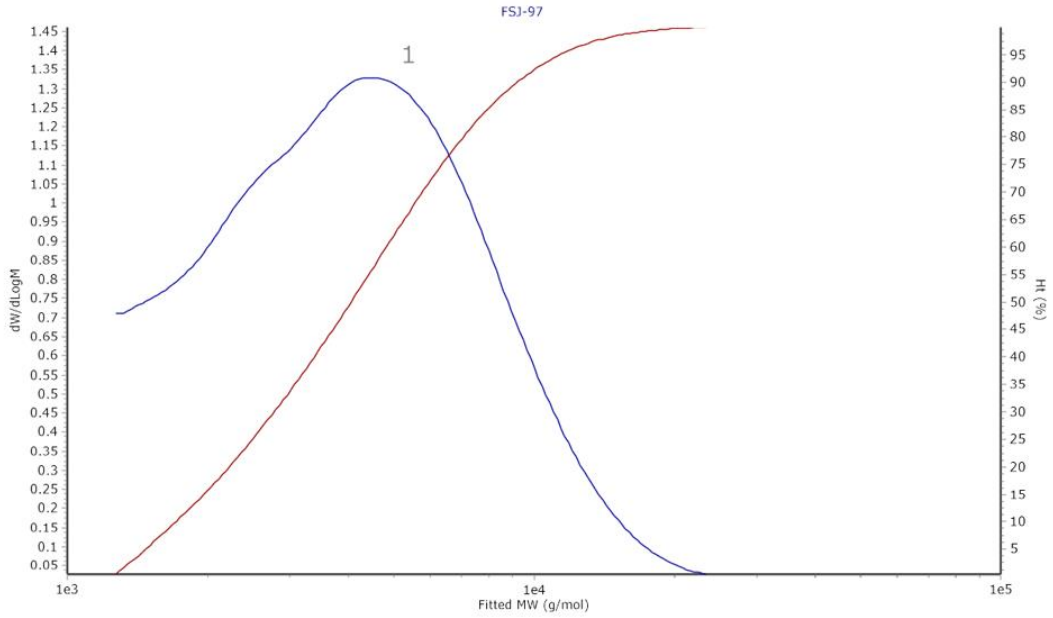


P9

Chromatogram Plot

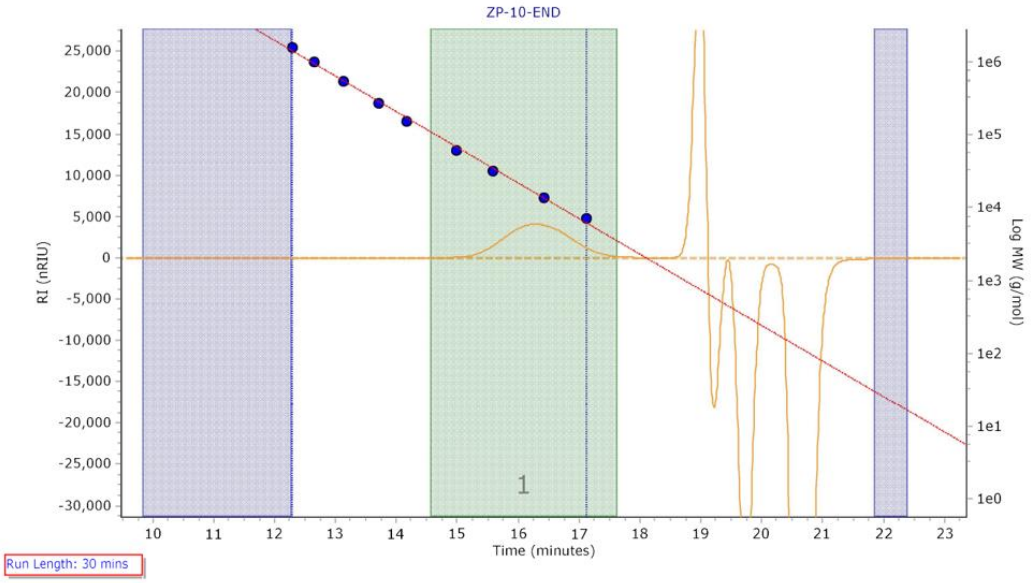


Distribution Plot

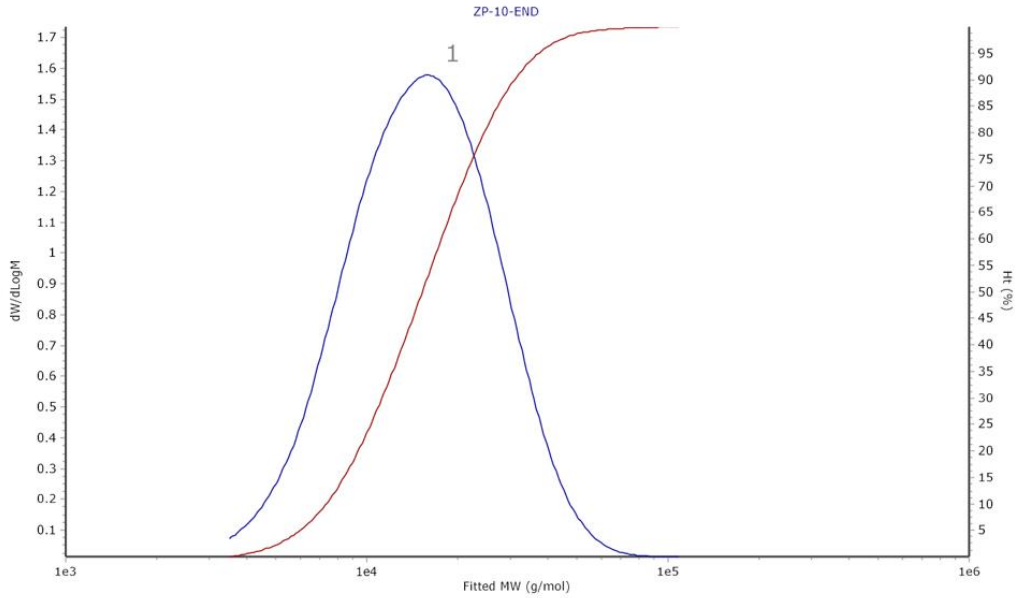


P10

Chromatogram Plot

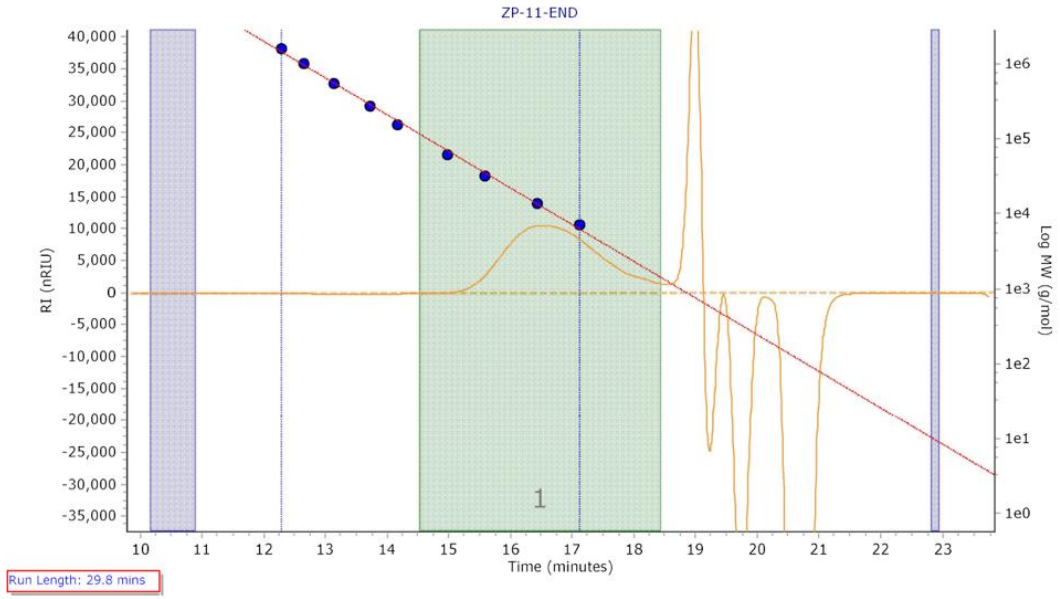


Distribution Plot

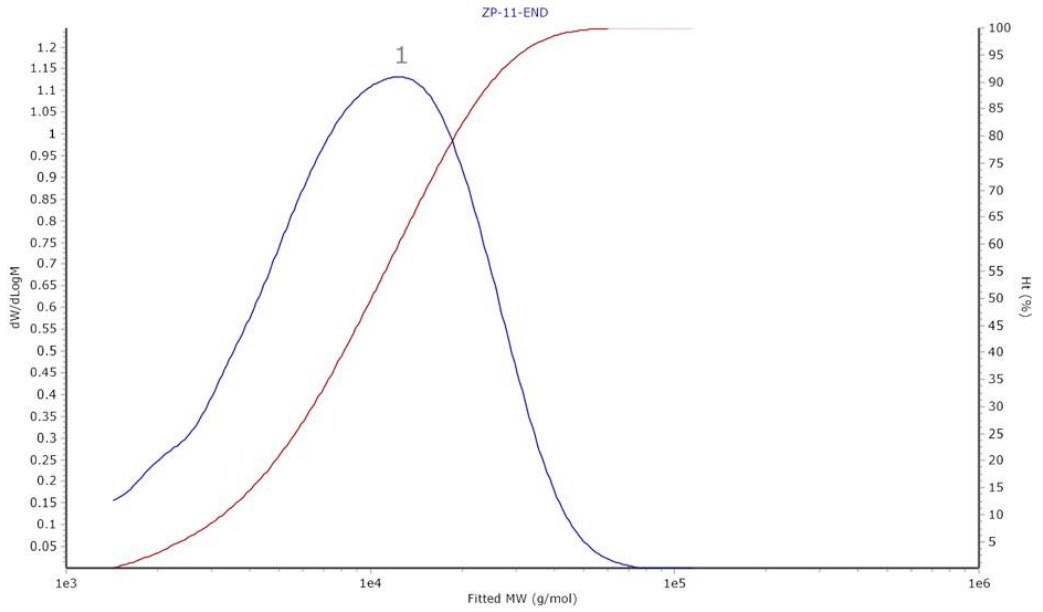


P11

Chromatogram Plot

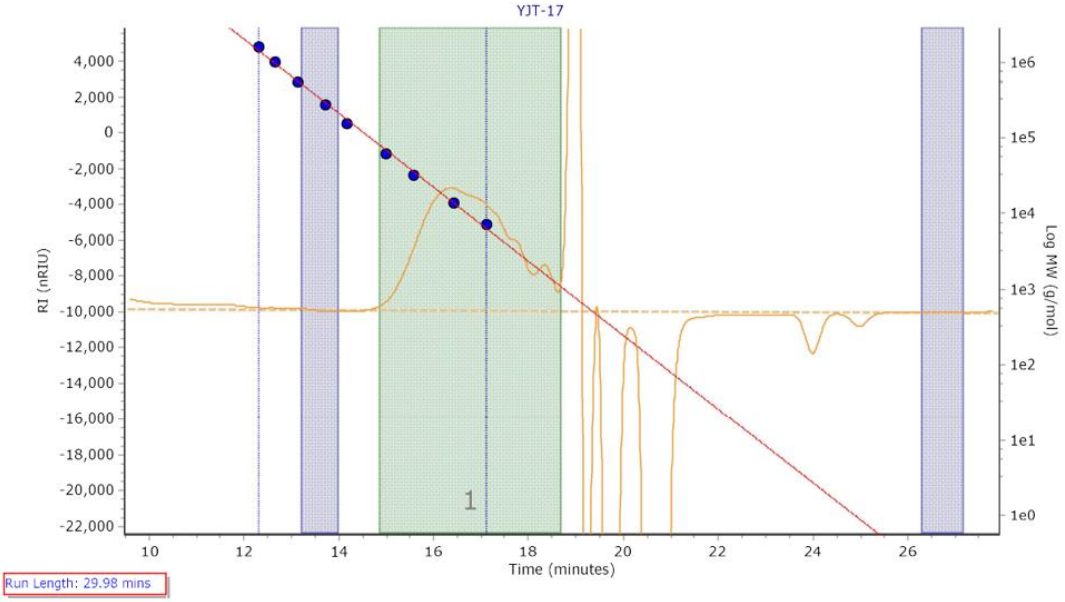


Distribution Plot

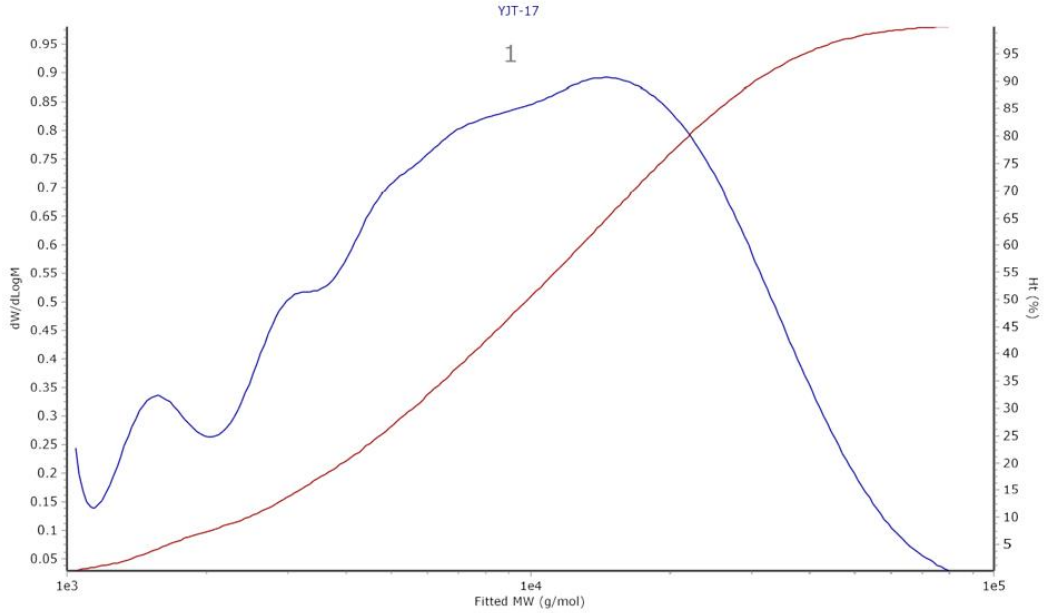


P12

Chromatogram Plot

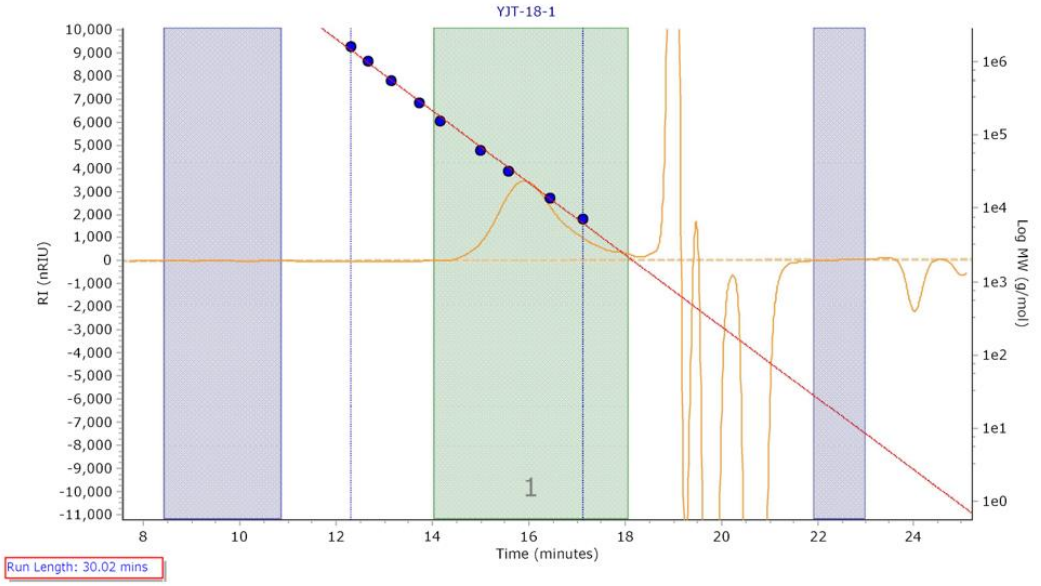


Distribution Plot

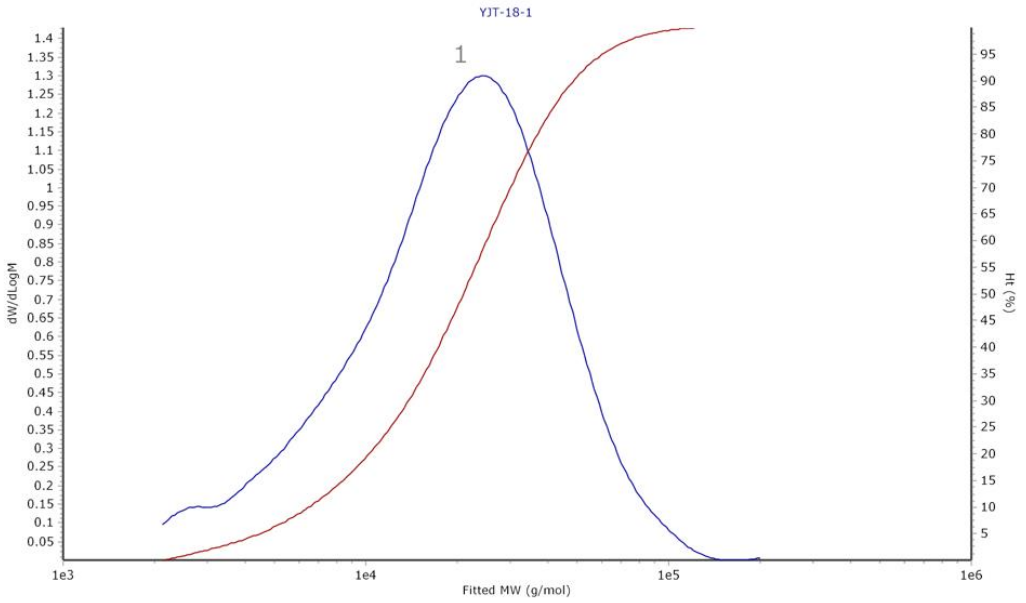


P13

Chromatogram Plot

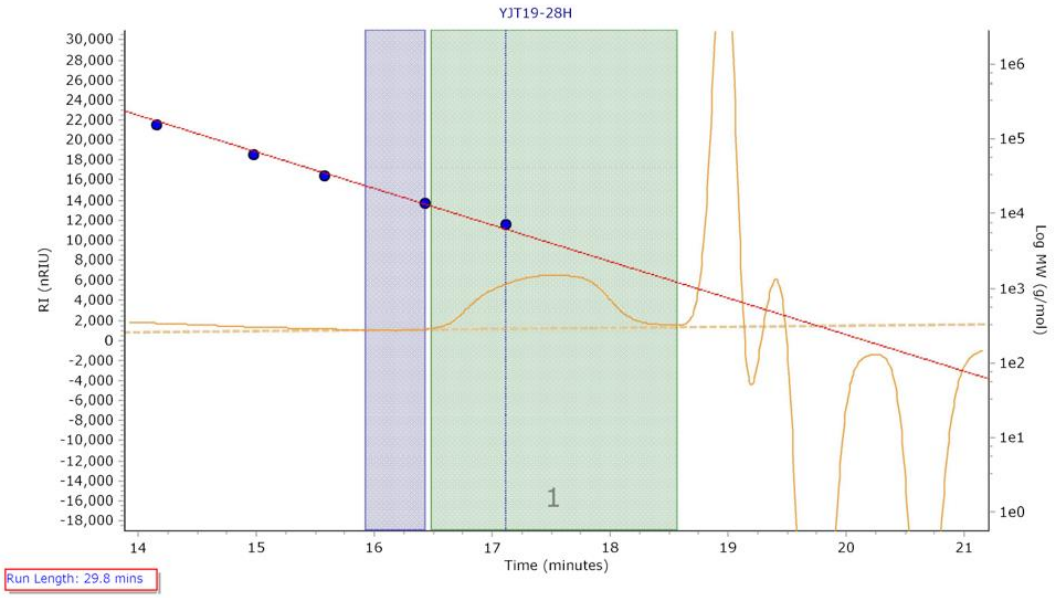


Distribution Plot

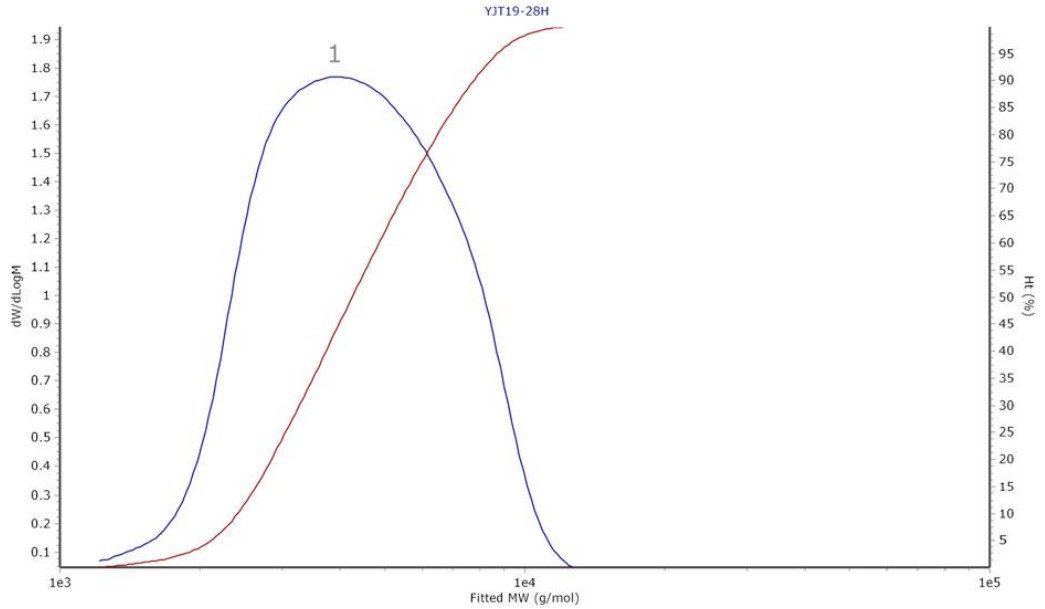


P14

Chromatogram Plot

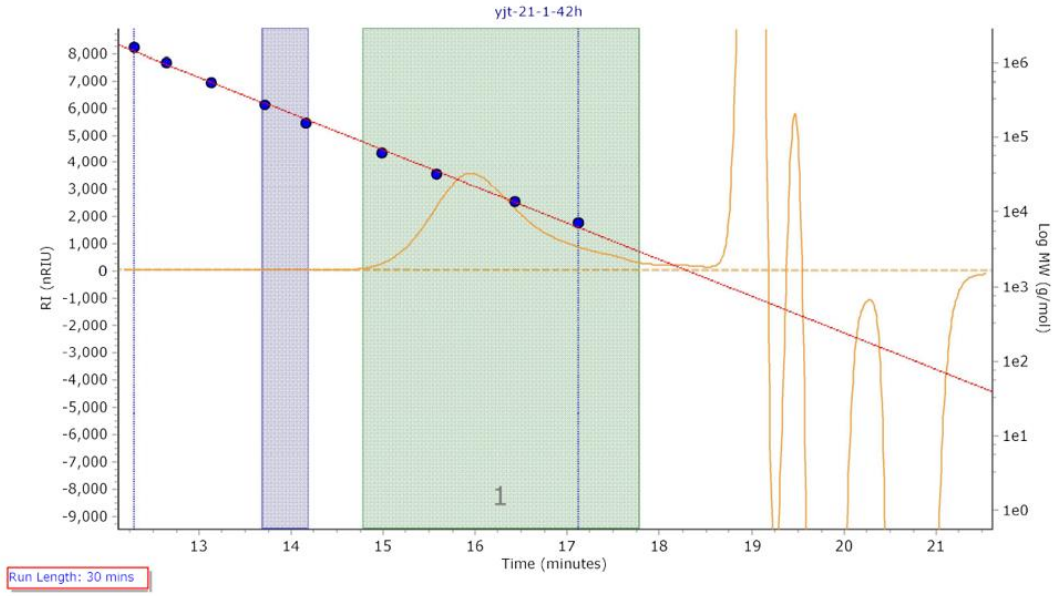


Distribution Plot

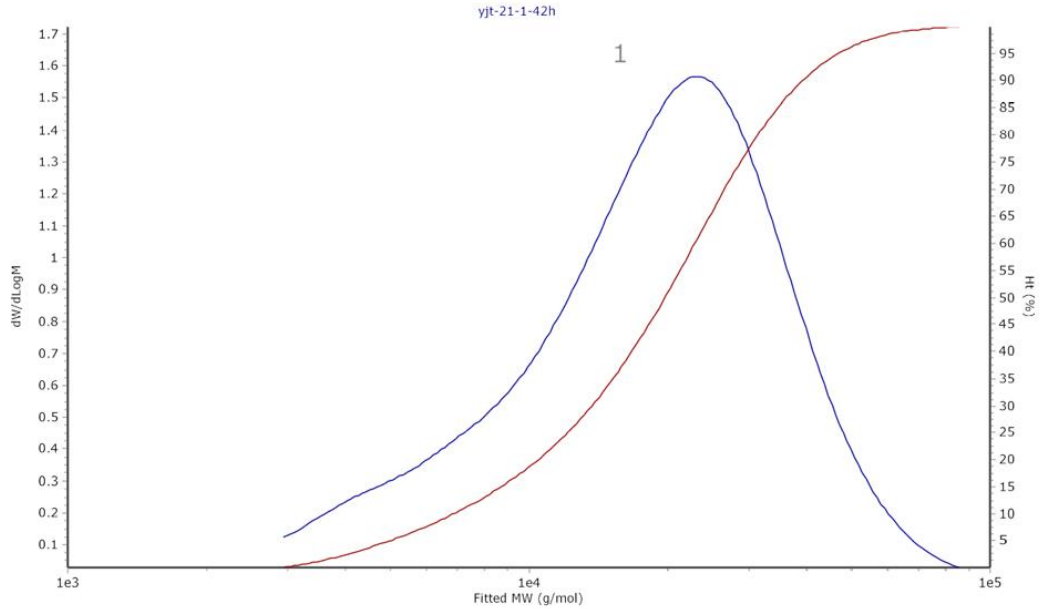


P15

Chromatogram Plot

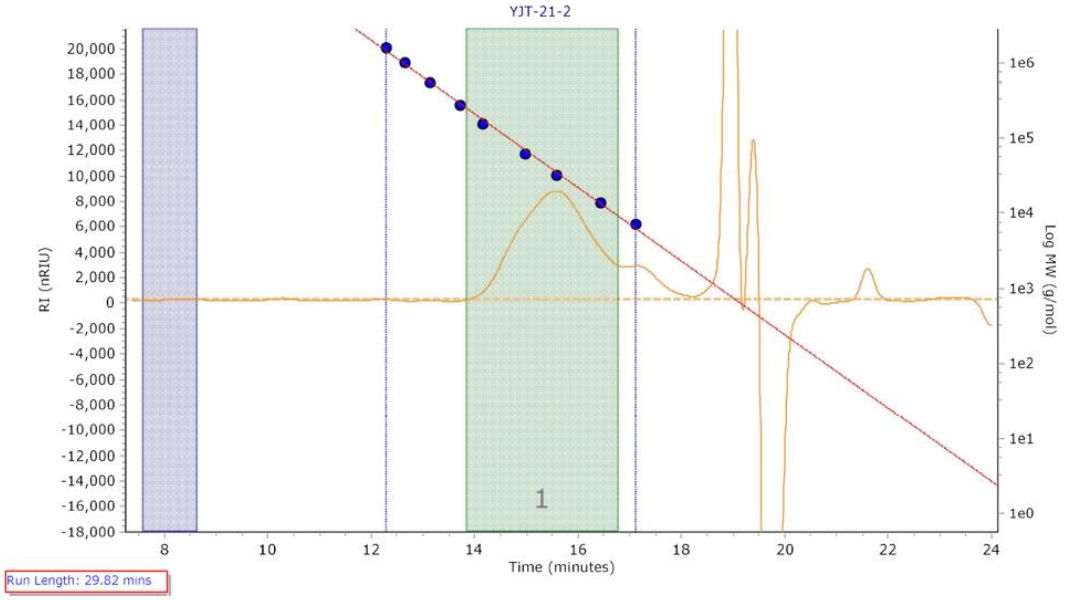


Distribution Plot

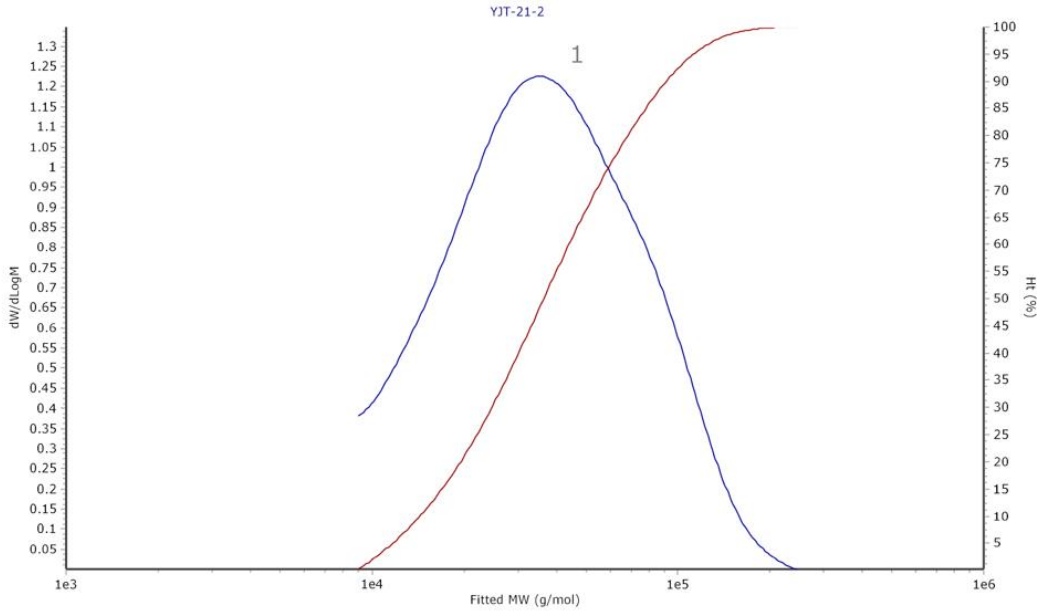


P16

Chromatogram Plot

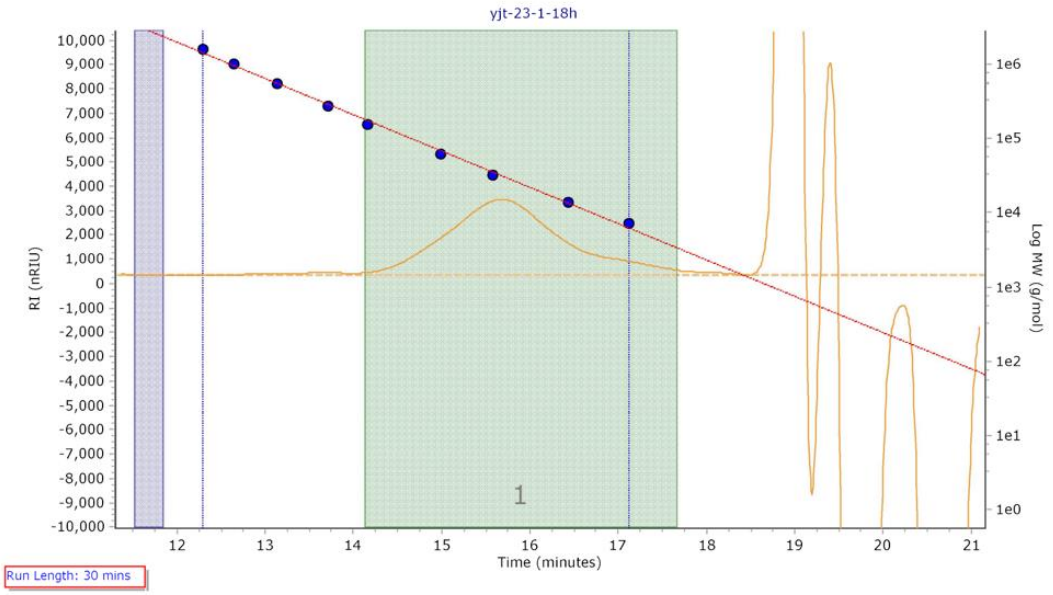


Distribution Plot

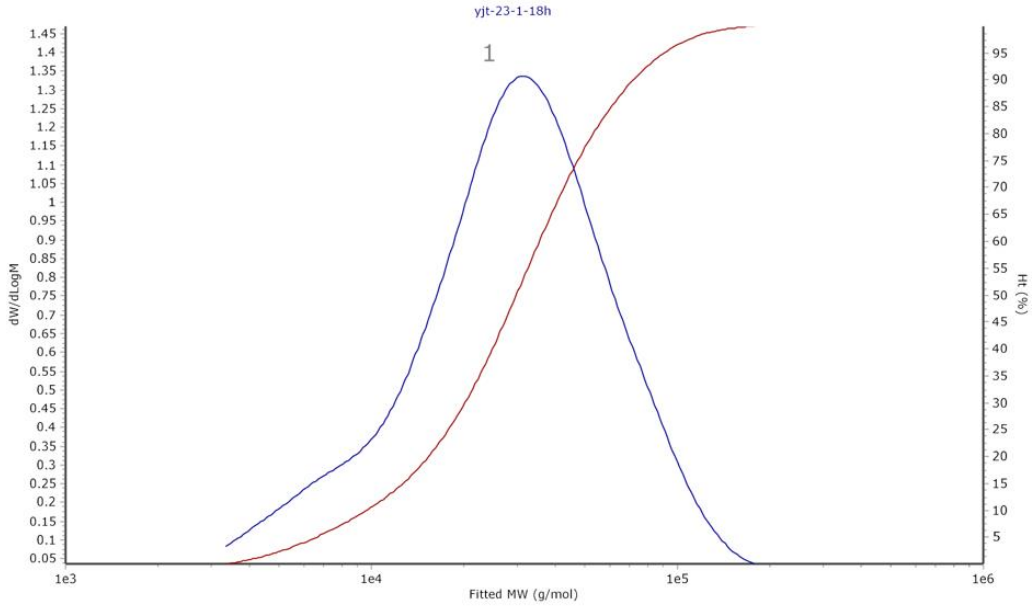


P17

Chromatogram Plot



Distribution Plot



9. References

(1) Zhu, L.; Huang, H.; Wang, Y.; Zhang, Z.; Hadjichristidis, N. Organocatalytic synthesis of polysulfonamides with well-defined linear and brush architectures from a designed/synthesized bis(*N*-sulfonyl aziridine). *Macromolecules* **2021**, *54*, 8164-8172.

(2) Chen, S.; Zhu, L.; Zhang, Z. Catalyst-free aziridine-based step-growth polymerization: a facile approach to optically active poly(sulfonamide amine)s and poly(sulfonamide dithiocarbamate)s. *Polym. Chem.* **2022**, *13*, 4324-4332.