

## Supporting Information:

# Direct Synthesis of Poly( $\alpha$ -olefin) Thermoplastic Elastomers Via Controlled Chain Straightening Using Bulky $\alpha$ -Diimine Palladium Complexes

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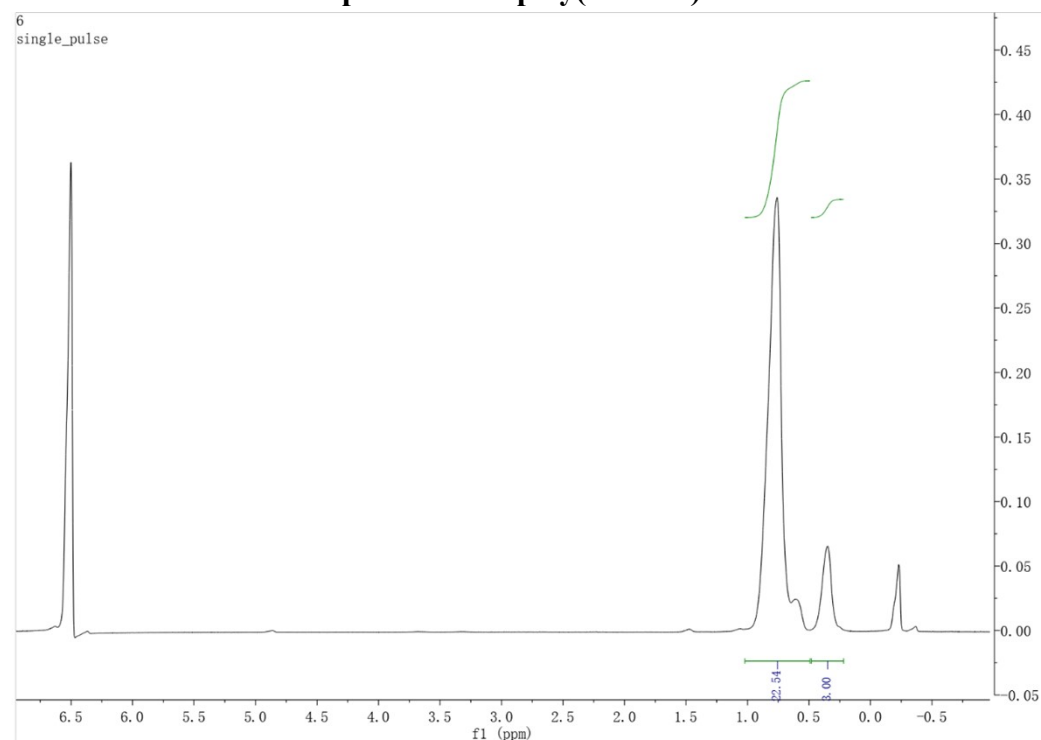
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<sup>c</sup>Institutes of Physical Science and Information Technology, Information Materials and Intelligent Sensing Laboratory of Anhui Province, Anhui University, Hefei, Anhui, 230601, China.

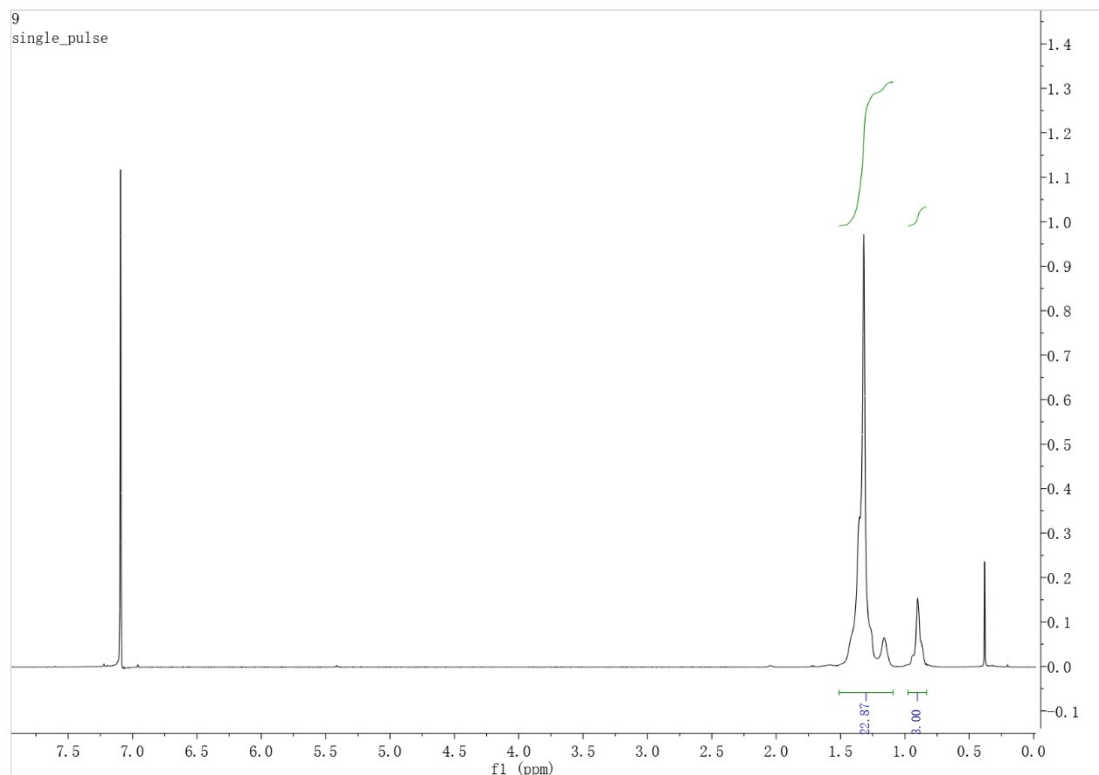
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## 1. Spectra Data

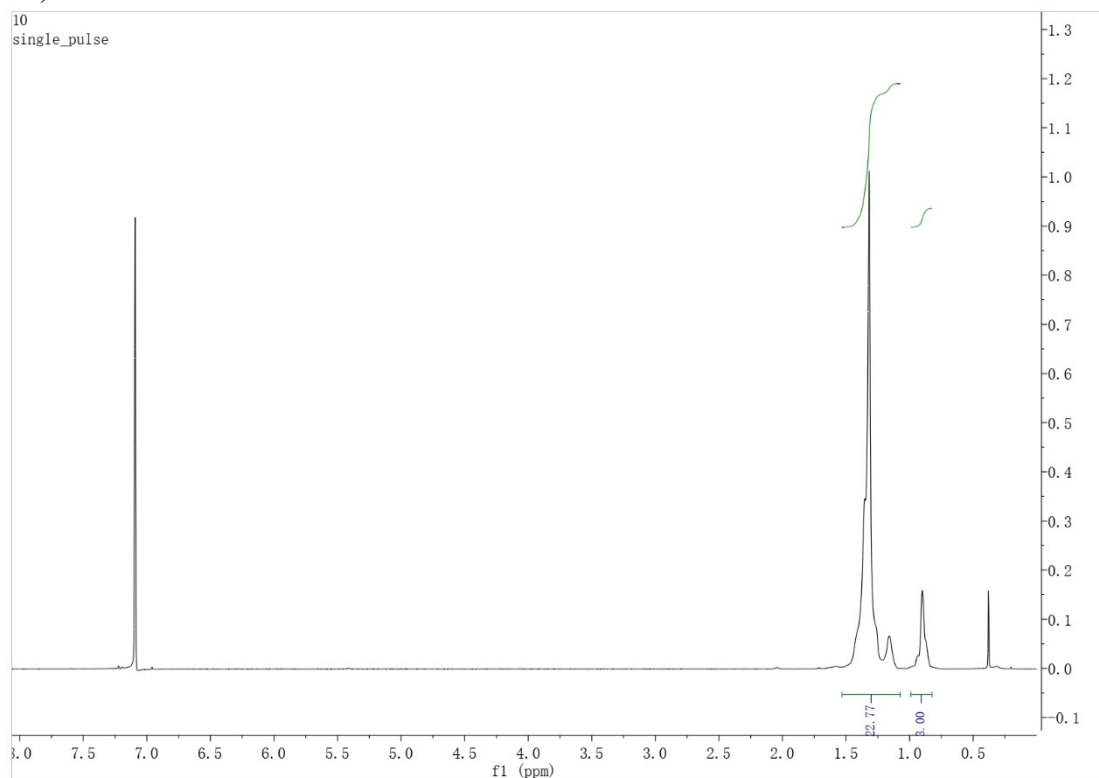
### 1.1 <sup>1</sup>H NMR of Some Representative poly( $\alpha$ -olefin)s.



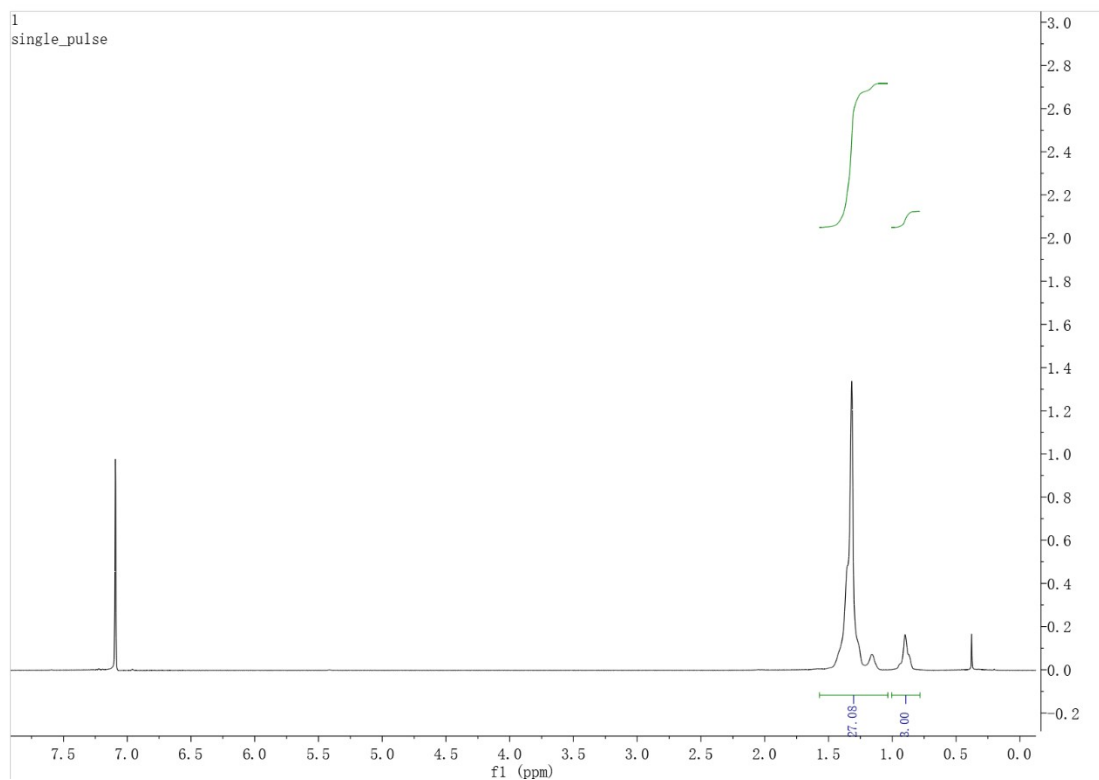
**Figure S1.** <sup>1</sup>H NMR spectrum of the poly( $\alpha$ -olefin) from table 1, entry 3 (C<sub>6</sub>D<sub>6</sub>, 20 °C).



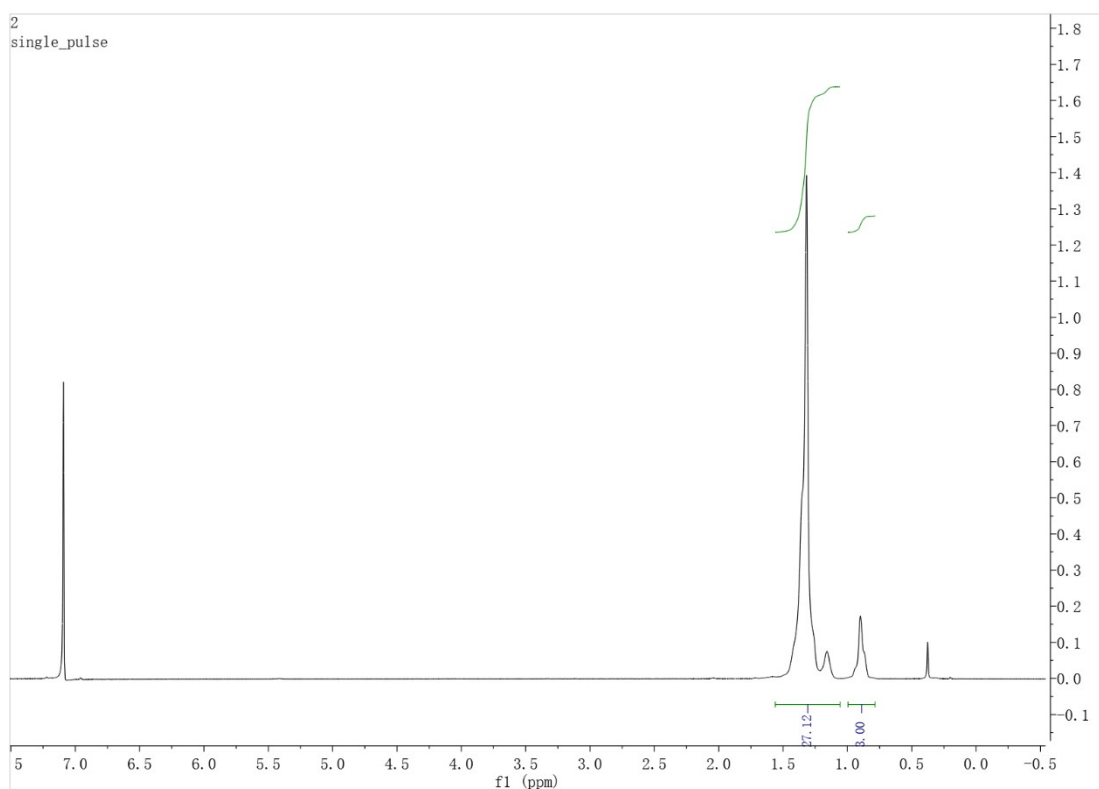
**Figure S2.**  $^1\text{H}$  NMR spectrum of the poly( $\alpha$ -olefin) from table 1, entry 5 ( $\text{C}_6\text{D}_6$ , 20  $^\circ\text{C}$ ).



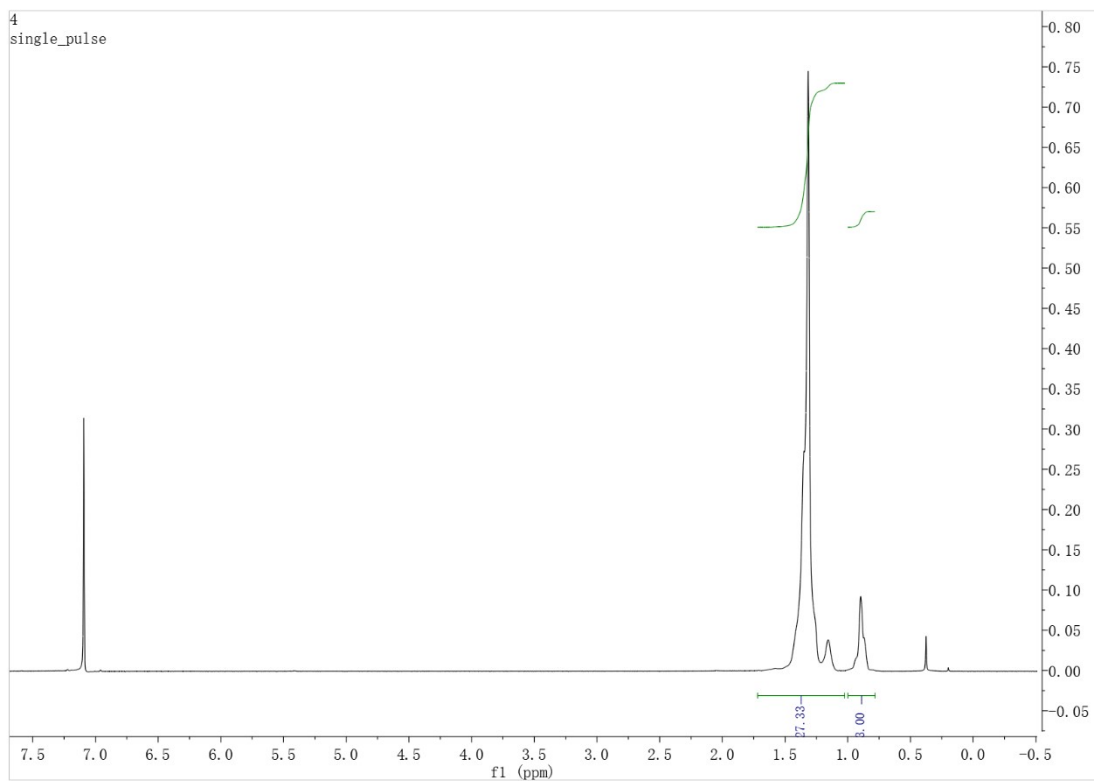
**Figure S3.**  $^1\text{H}$  NMR spectrum of the poly( $\alpha$ -olefin) from table 1, entry 6 ( $\text{C}_6\text{D}_6$ , 20  $^\circ\text{C}$ ).



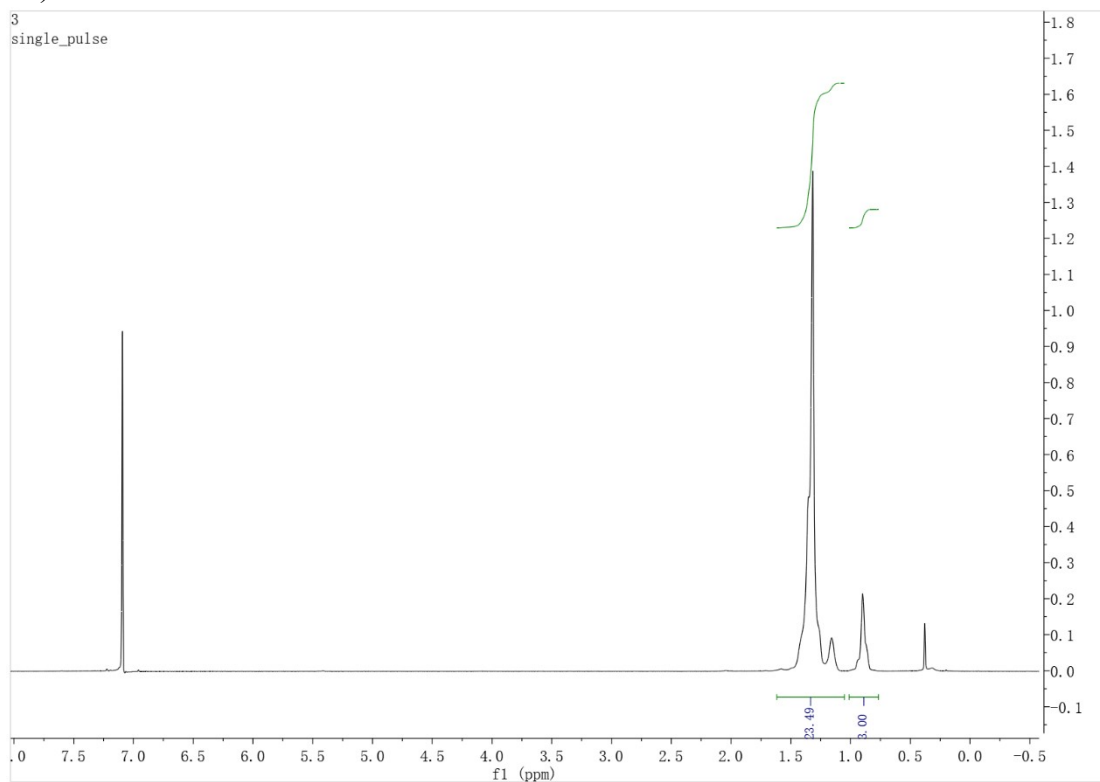
**Figure S4.** <sup>1</sup>H NMR spectrum of the poly( $\alpha$ -olefin) from table 1, entry 7 ( $C_6D_6$ , 20 °C).



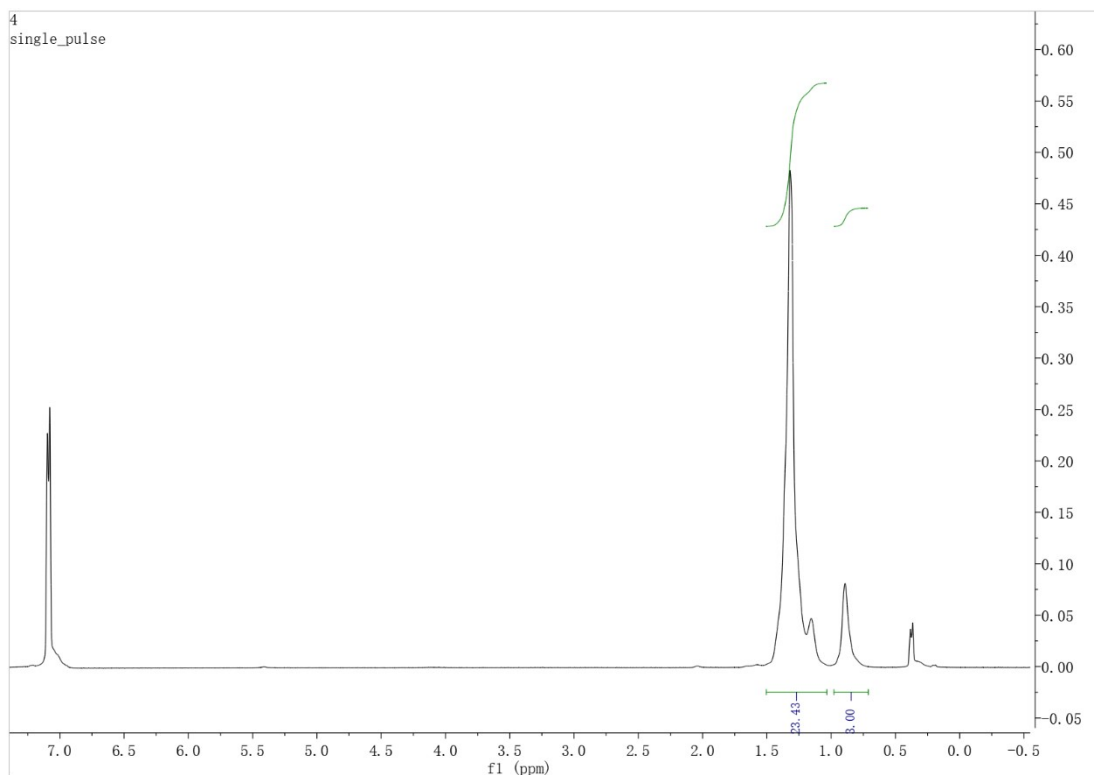
**Figure S5.** <sup>1</sup>H NMR spectrum of the poly( $\alpha$ -olefin) from table 1, entry 8 ( $C_6D_6$ , 20 °C).



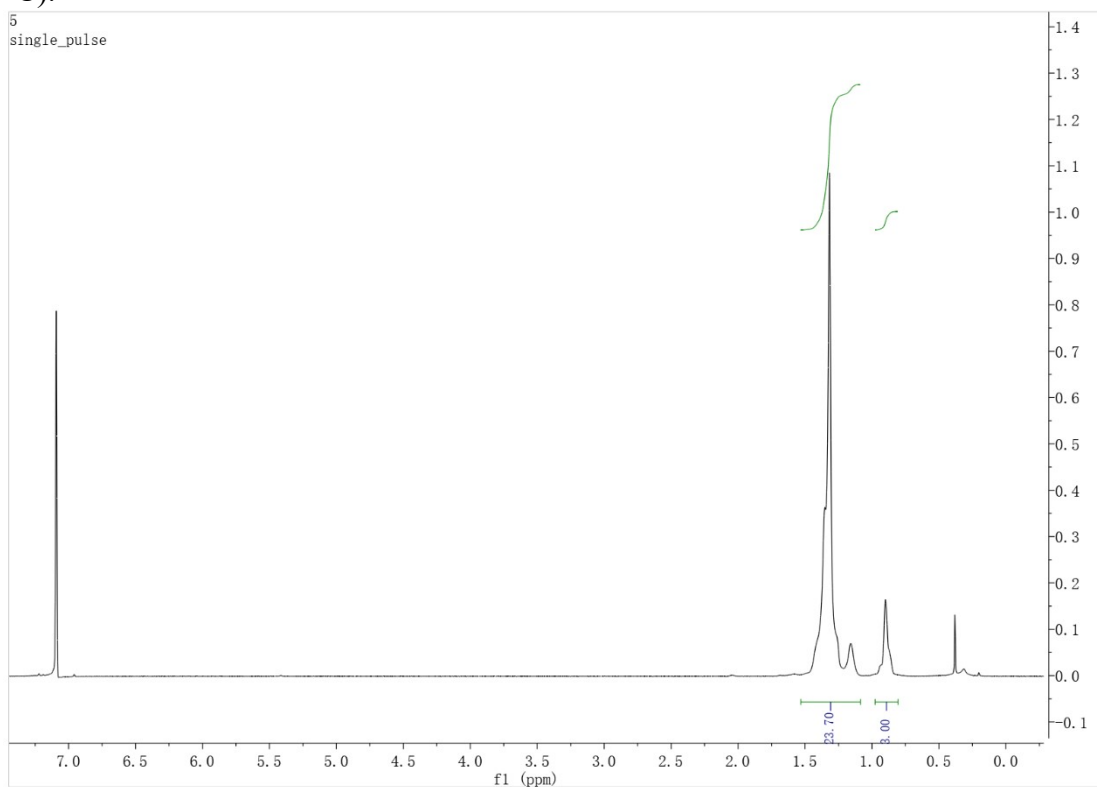
**Figure S6.** <sup>1</sup>H NMR spectrum of the poly( $\alpha$ -olefin) from table 1, entry 9 ( $C_6D_6$ , 20 °C).



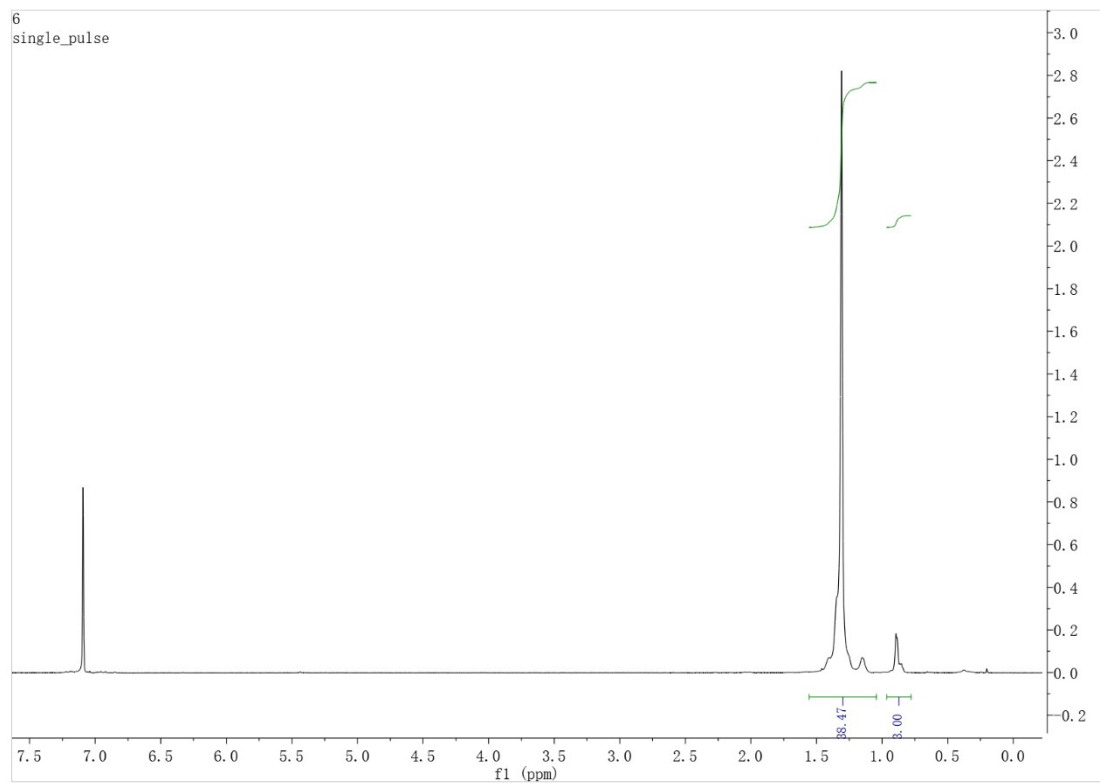
**Figure S7.** <sup>1</sup>H NMR spectrum of the poly( $\alpha$ -olefin) from table 1, entry 10 ( $C_6D_6$ , 20 °C).



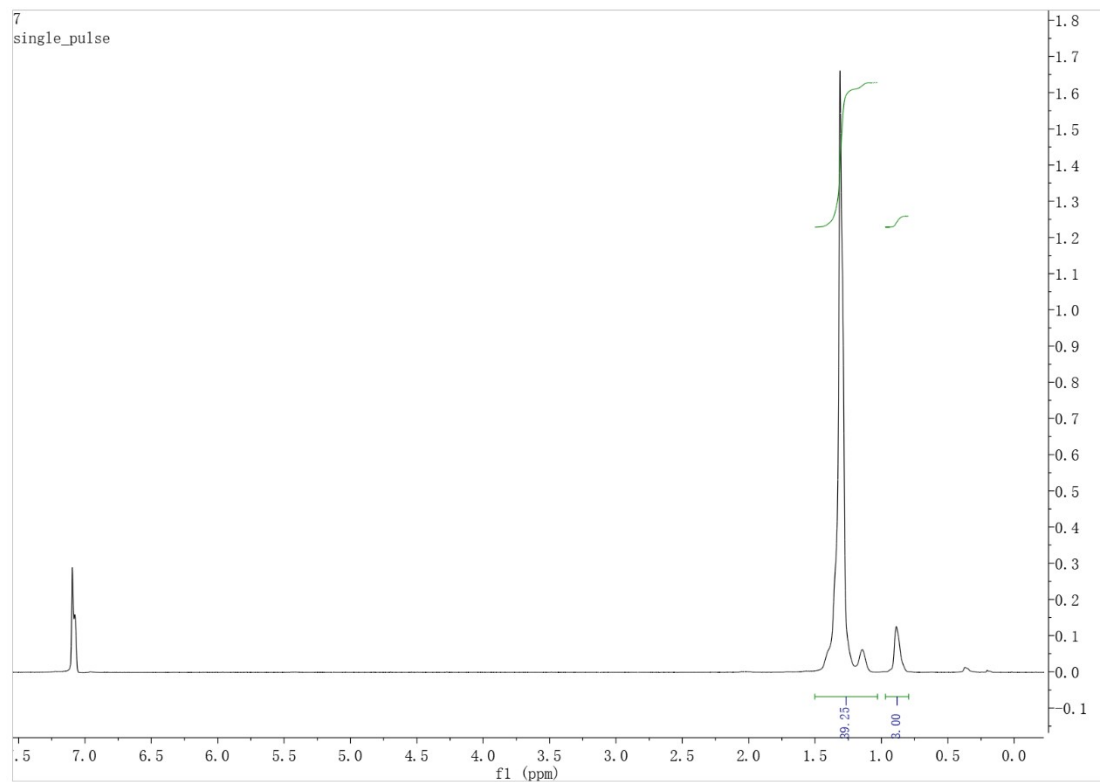
**Figure S8.**  $^1\text{H}$  NMR spectrum of the poly( $\alpha$ -olefin) from table 1, entry 11 ( $\text{C}_6\text{D}_6$ , 20  $^\circ\text{C}$ ).



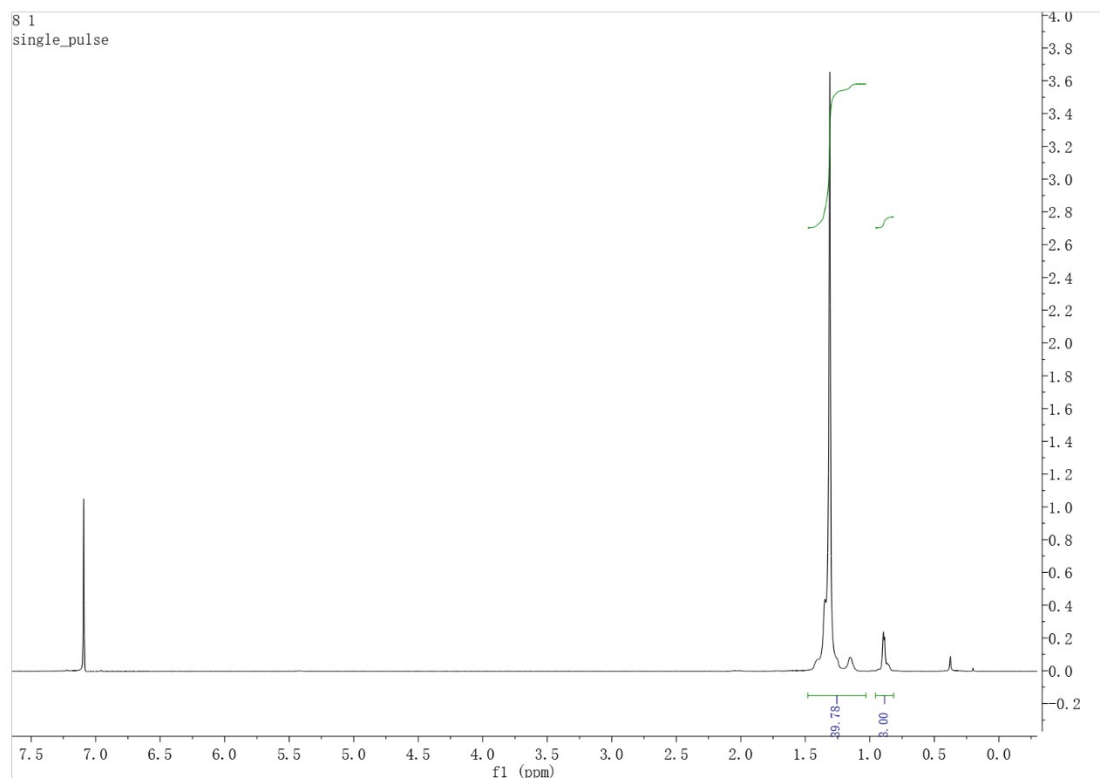
**Figure S9.**  $^1\text{H}$  NMR spectrum of the poly( $\alpha$ -olefin) from table 1, entry 12 ( $\text{C}_6\text{D}_6$ , 20  $^\circ\text{C}$ ).



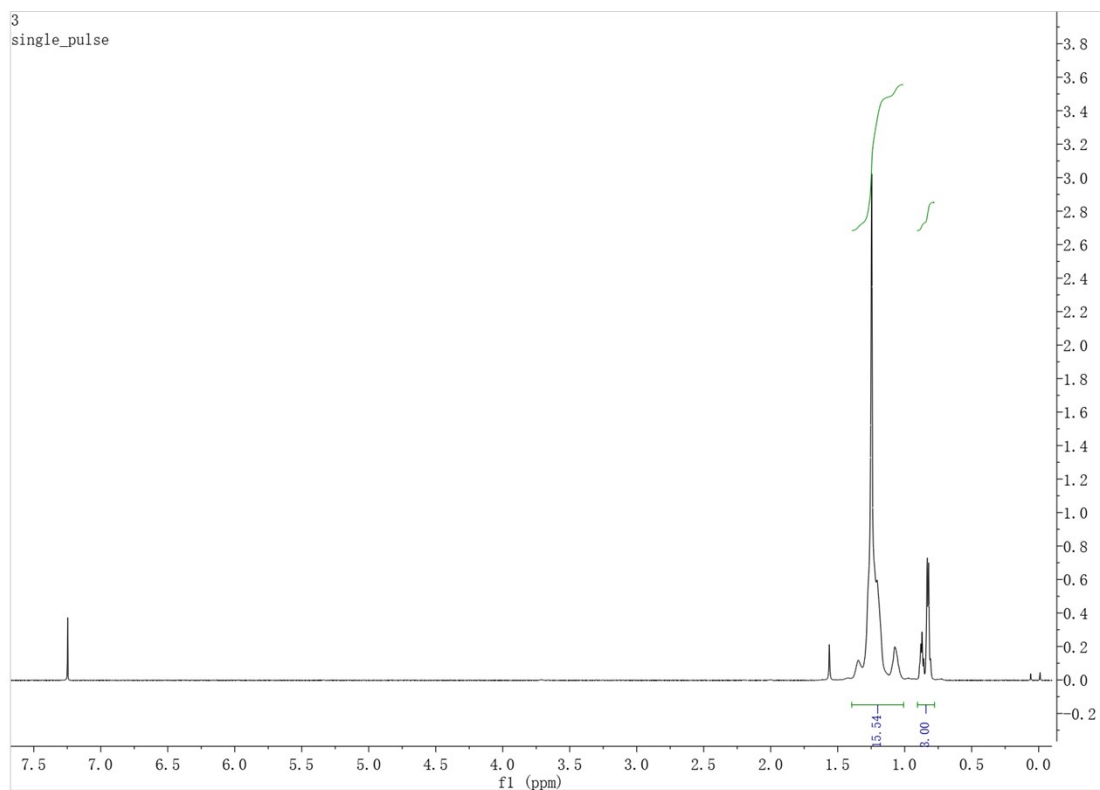
**Figure S10.**  $^1\text{H}$  NMR spectrum of the poly( $\alpha$ -olefin) from table 1, entry 16 ( $\text{C}_6\text{D}_6$ , 20  $^\circ\text{C}$ ).



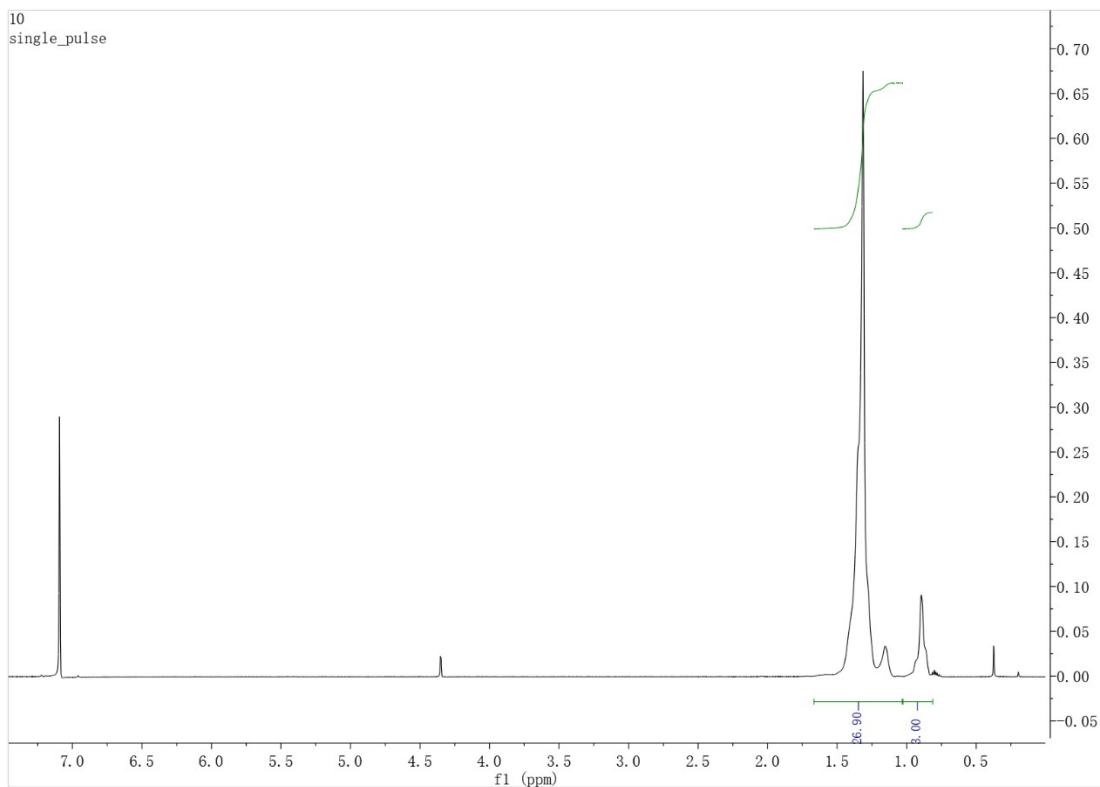
**Figure S11.**  $^1\text{H}$  NMR spectrum of the poly( $\alpha$ -olefin) from table 1, entry 17 ( $\text{C}_6\text{D}_6$ , 20  $^\circ\text{C}$ ).



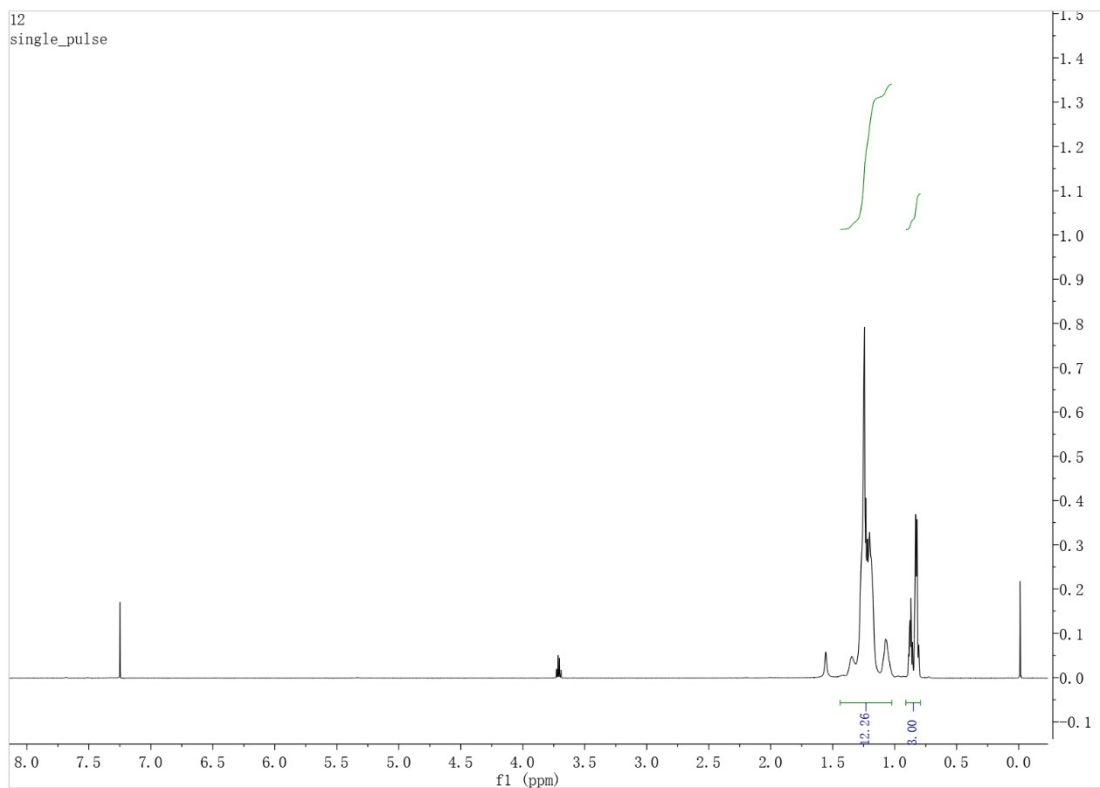
**Figure S12.**  $^1\text{H}$  NMR spectrum of the poly( $\alpha$ -olefin) from table 1, entry 18 ( $\text{C}_6\text{D}_6$ , 20  $^\circ\text{C}$ ).



**Figure S13.**  $^1\text{H}$  NMR spectrum of the poly( $\alpha$ -olefin) from table 2, entry 1 ( $\text{CDCl}_3$ , 20  $^\circ\text{C}$ ).

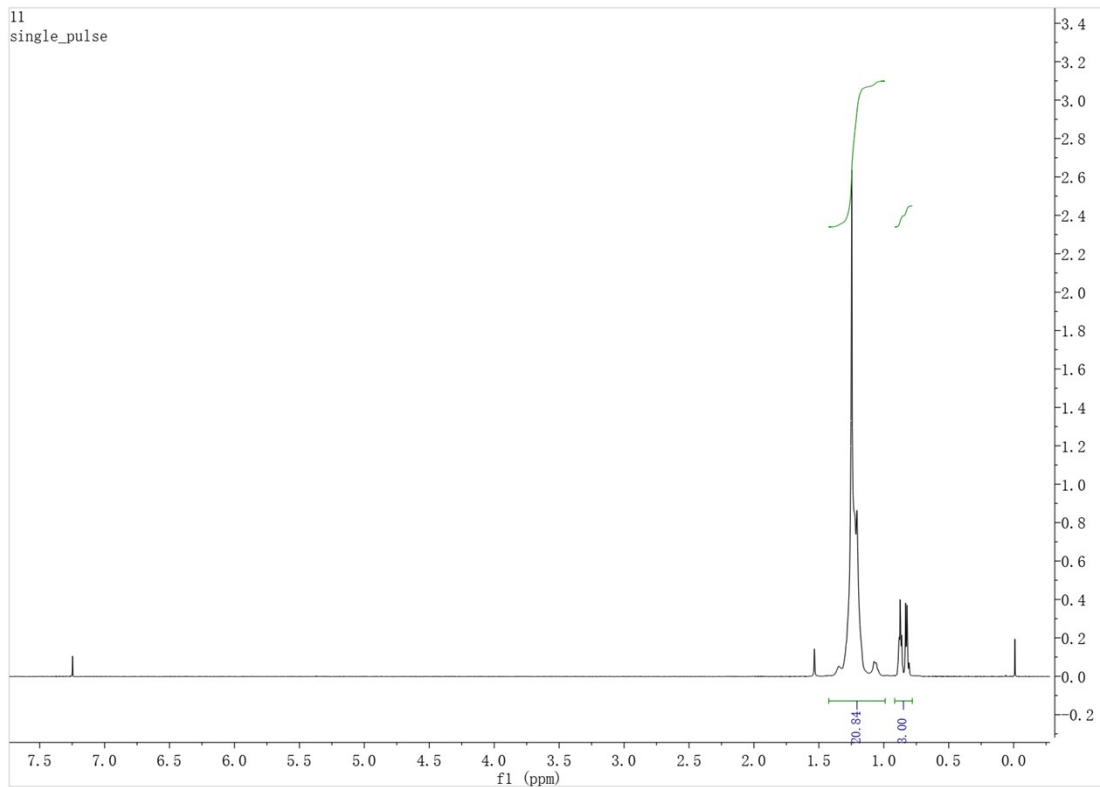


**Figure S14.**  $^1\text{H}$  NMR spectrum of the poly( $\alpha$ -olefin) from table 2, entry 3 ( $\text{C}_6\text{D}_6$ , 70  $^\circ\text{C}$ ).

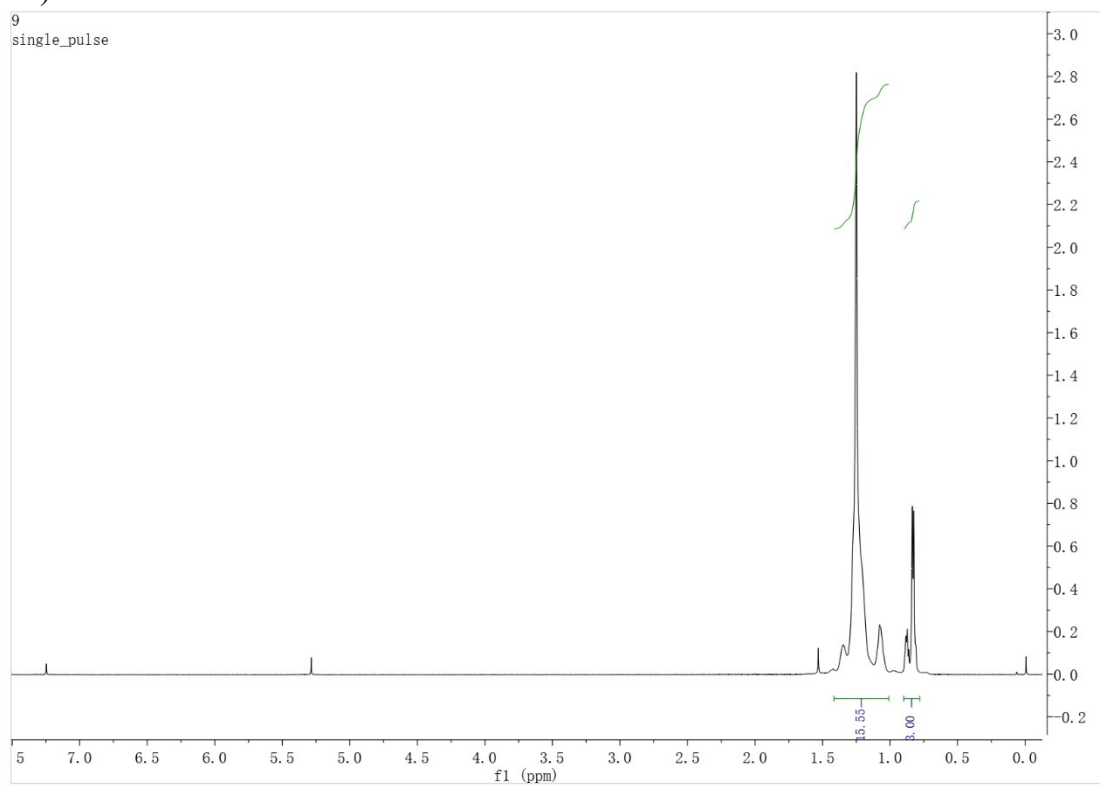


**Figure S15.**  $^1\text{H}$  NMR spectrum of the poly( $\alpha$ -olefin) from table 2, entry 4 ( $\text{CDCl}_3$ , 20  $^\circ\text{C}$ ).

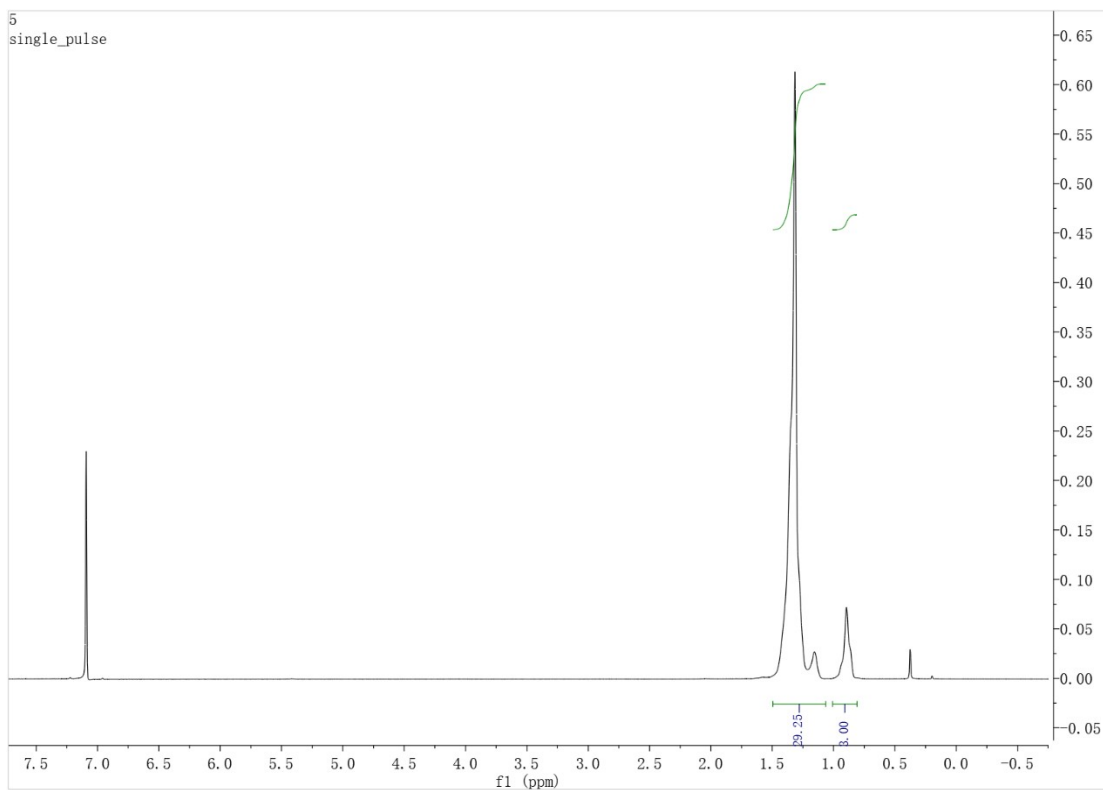




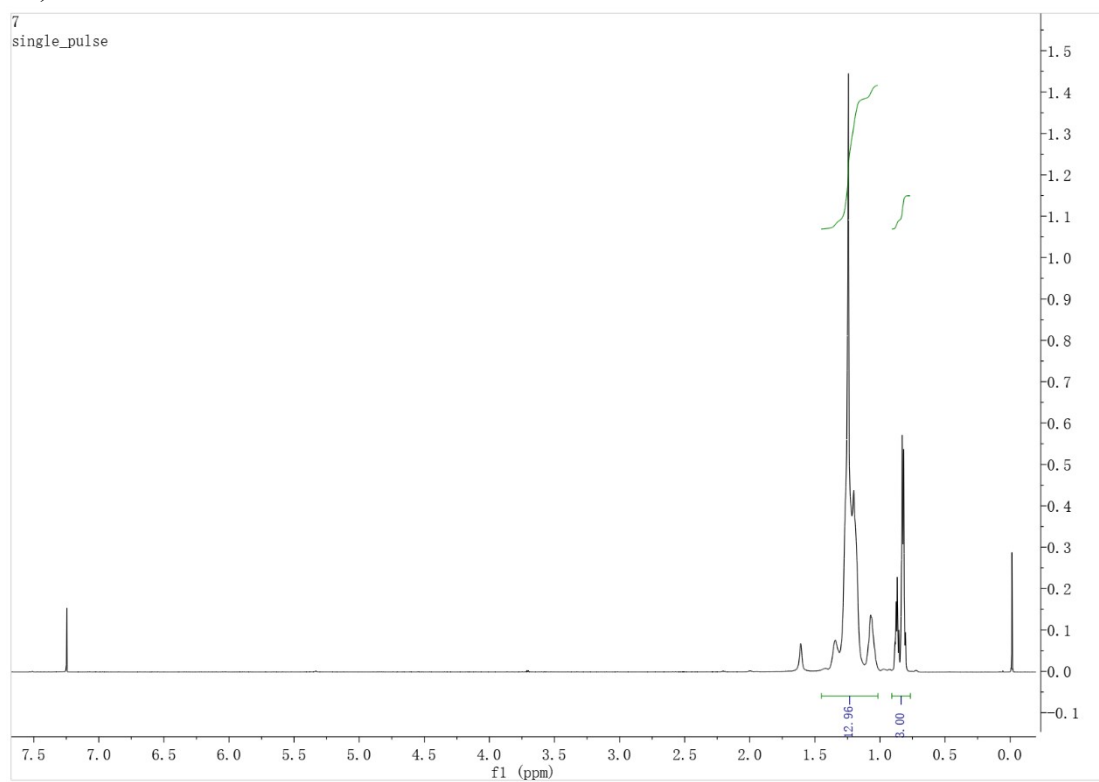
**Figure S16.** <sup>1</sup>H NMR spectrum of the poly( $\alpha$ -olefin) from table 2, entry 6 (CDCl<sub>3</sub>, 20 °C).



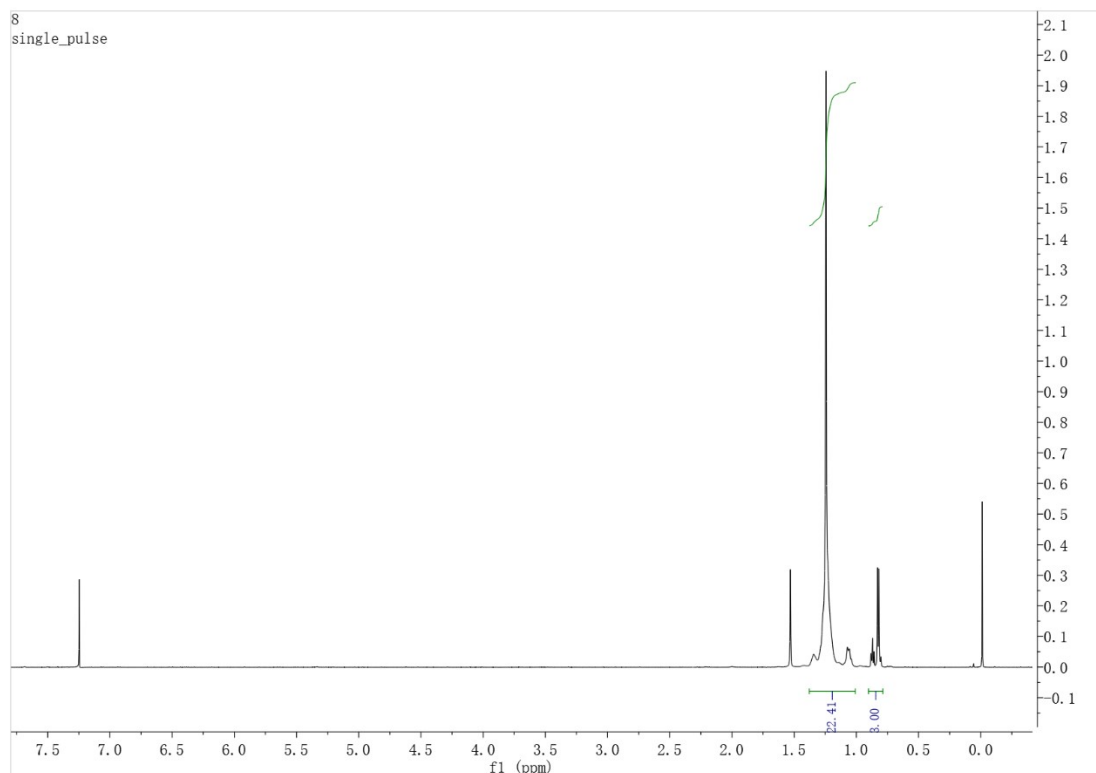
**Figure S17.** <sup>1</sup>H NMR spectrum of the poly( $\alpha$ -olefin) from table 2, entry 7 (CDCl<sub>3</sub>, 20 °C).



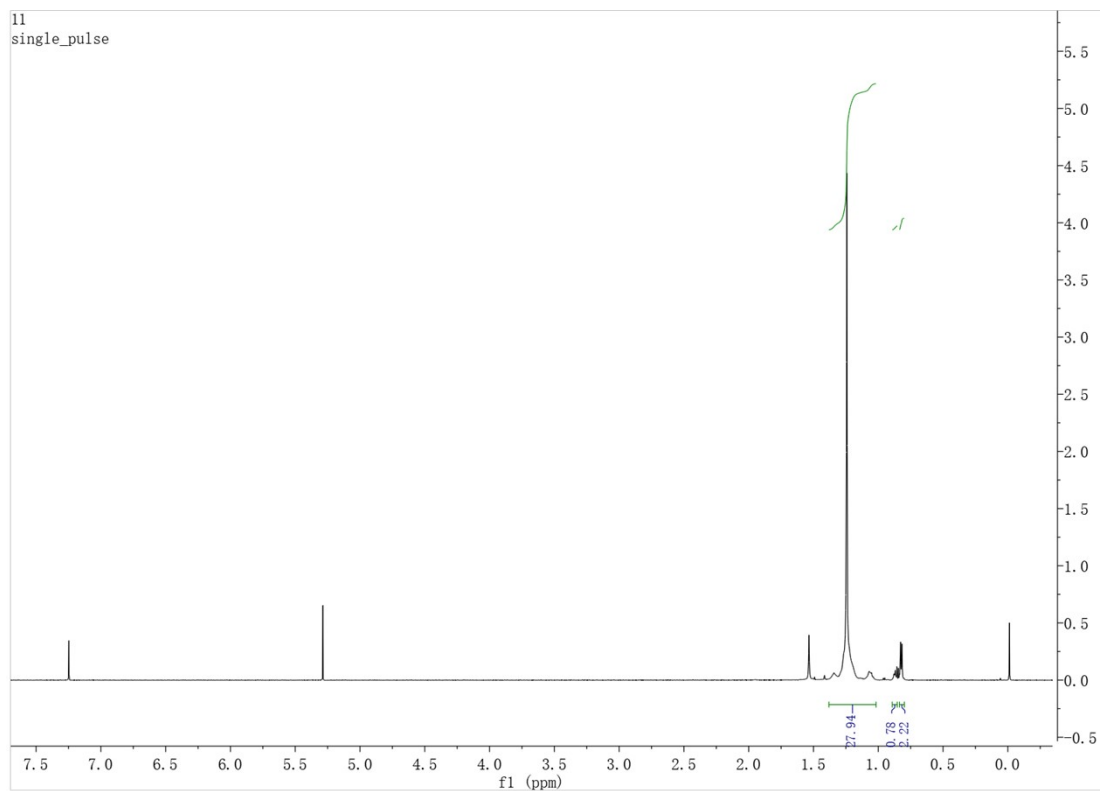
**Figure S18.**  $^1\text{H}$  NMR spectrum of the poly( $\alpha$ -olefin) from table 2, entry 9 ( $\text{C}_6\text{D}_6$ , 70  $^\circ\text{C}$ ).



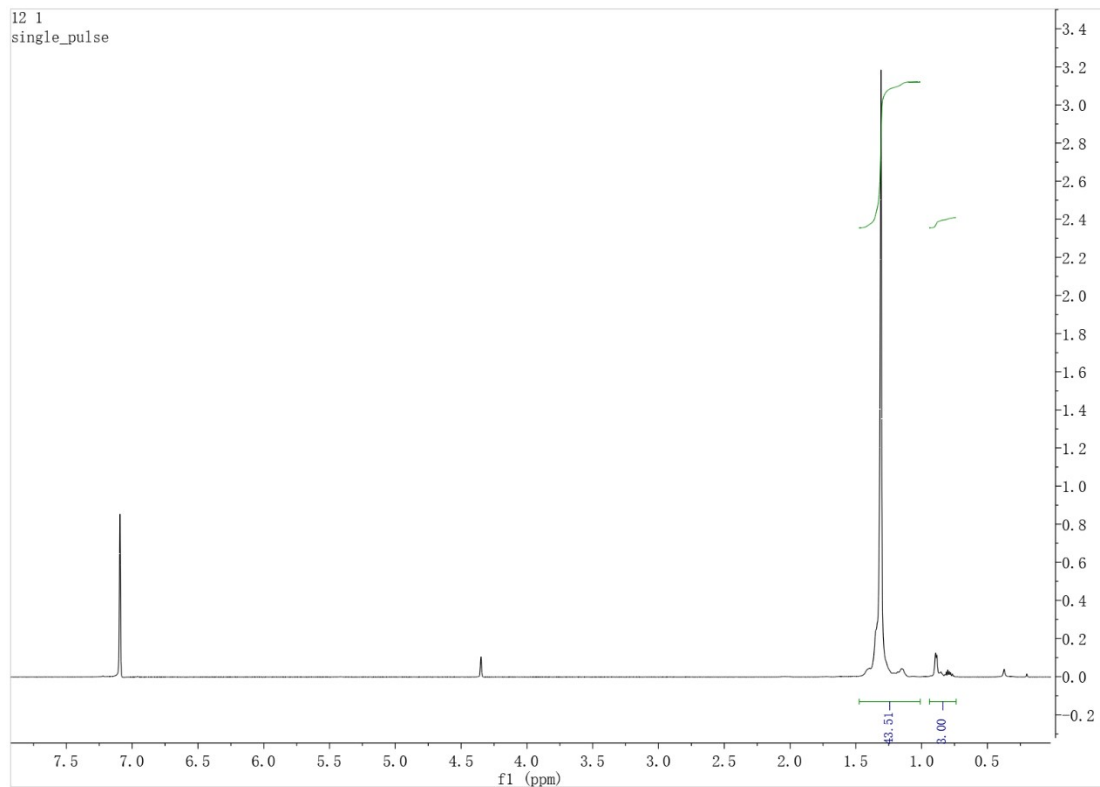
**Figure S19.**  $^1\text{H}$  NMR spectrum of the poly( $\alpha$ -olefin) from table 2, entry 10 ( $\text{CDCl}_3$ , 20  $^\circ\text{C}$ ).



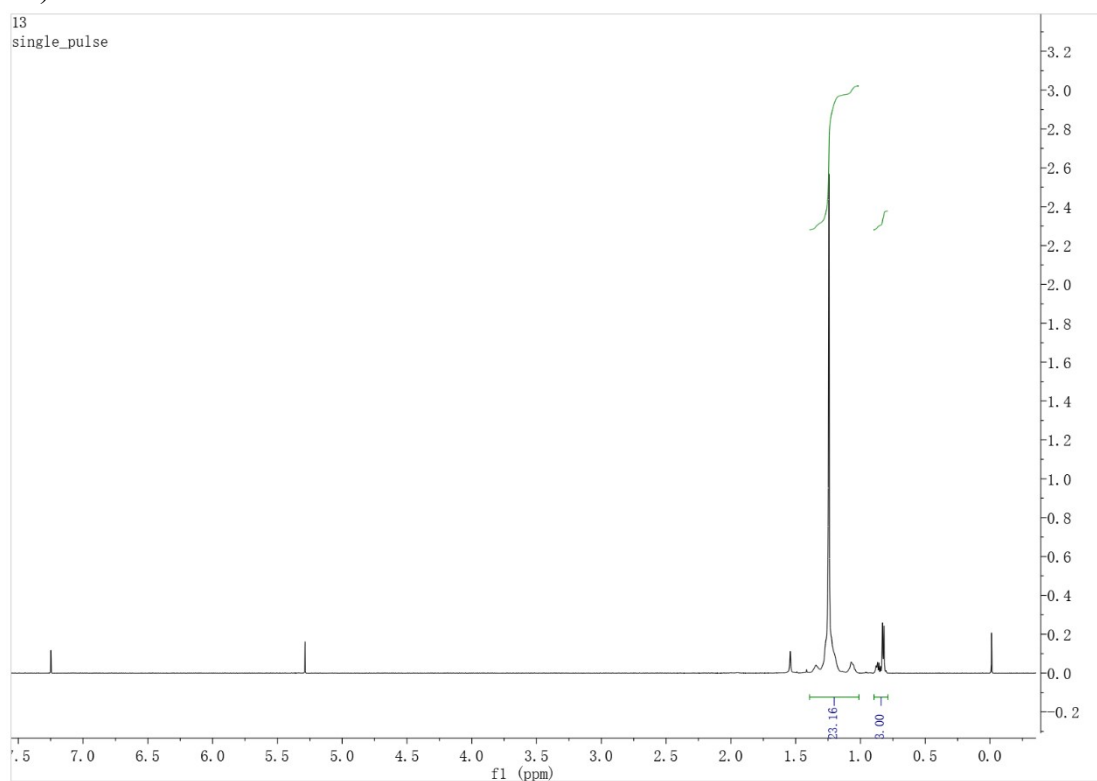
**Figure S20.**  $^1\text{H}$  NMR spectrum of the poly( $\alpha$ -olefin) from table 2, entry 12 ( $\text{CDCl}_3$ ,  $20^\circ\text{C}$ ).



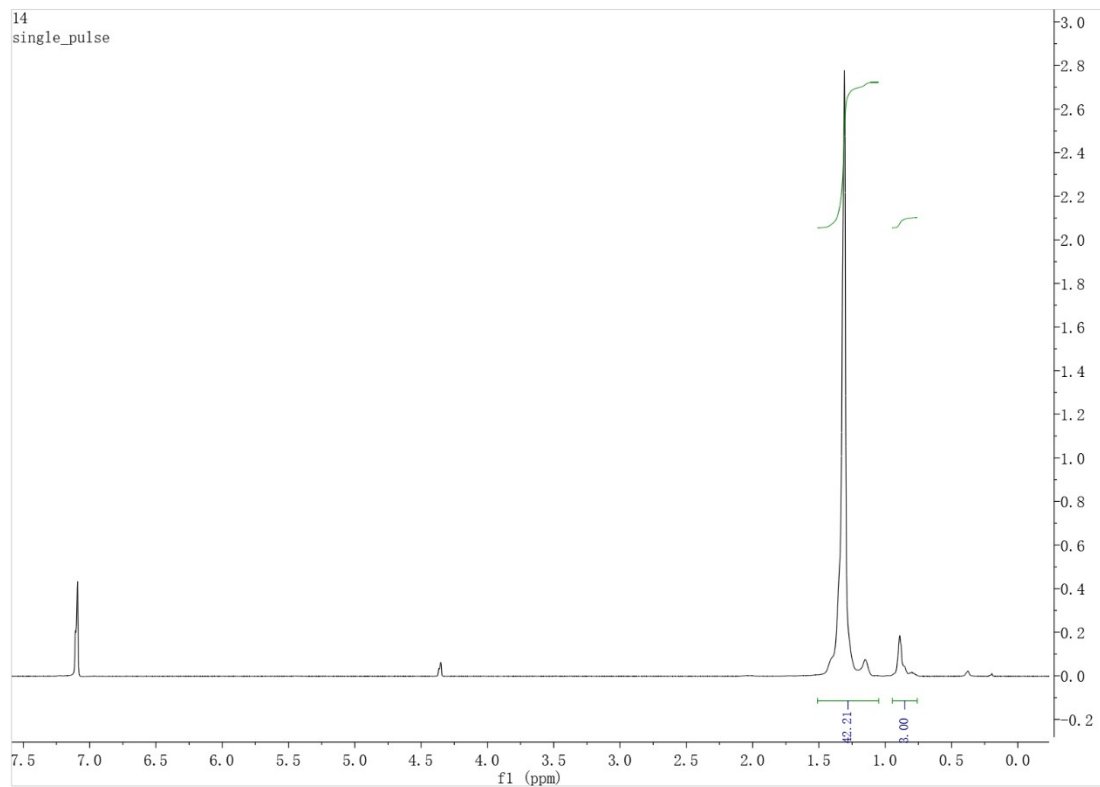
**Figure S21.**  $^1\text{H}$  NMR spectrum of the poly( $\alpha$ -olefin) from table 2, entry 13 ( $\text{CDCl}_3$ ,  $20^\circ\text{C}$ ).



**Figure S22.**  $^1\text{H}$  NMR spectrum of the poly( $\alpha$ -olefin) from table 2, entry 15 ( $\text{C}_6\text{D}_6$ ,  $70^\circ\text{C}$ ).

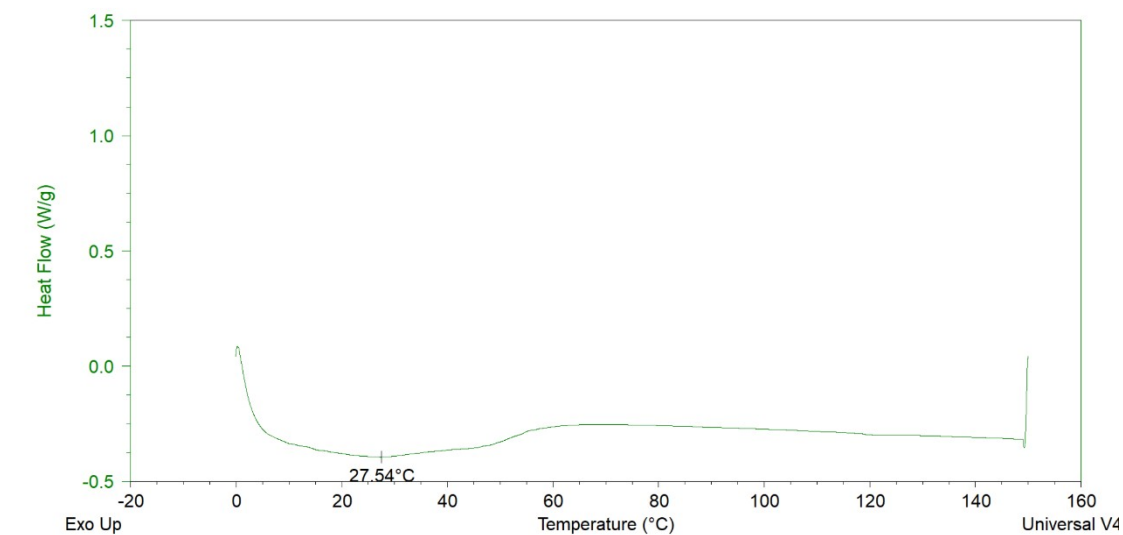


**Figure S23.**  $^1\text{H}$  NMR spectrum of the poly( $\alpha$ -olefin) from table 2, entry 16 ( $\text{CDCl}_3$ ,  $20^\circ\text{C}$ ).

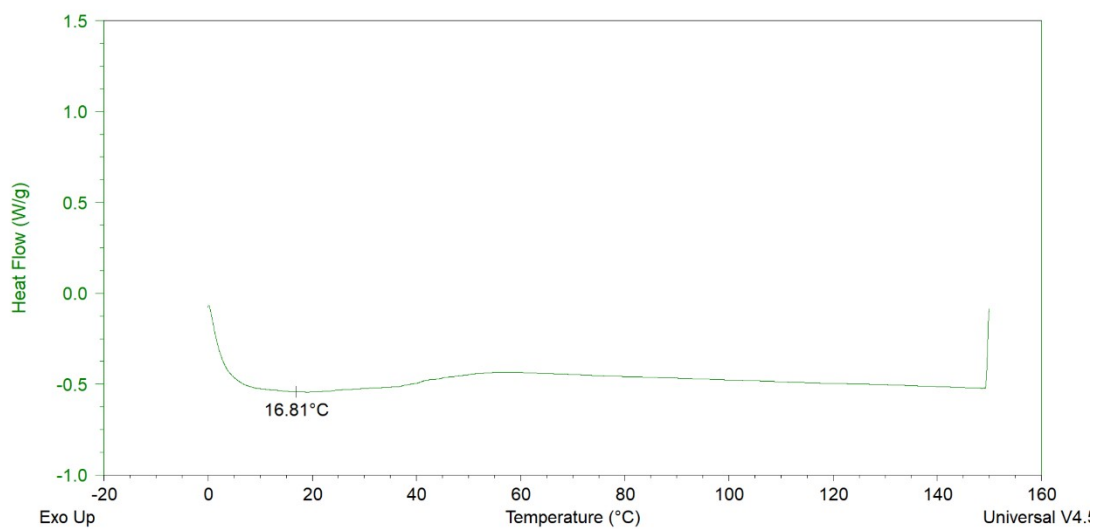


**Figure S24.** <sup>1</sup>H NMR spectrum of the poly( $\alpha$ -olefin) from table 2, entry 18 ( $C_6D_6$ , 70 °C).

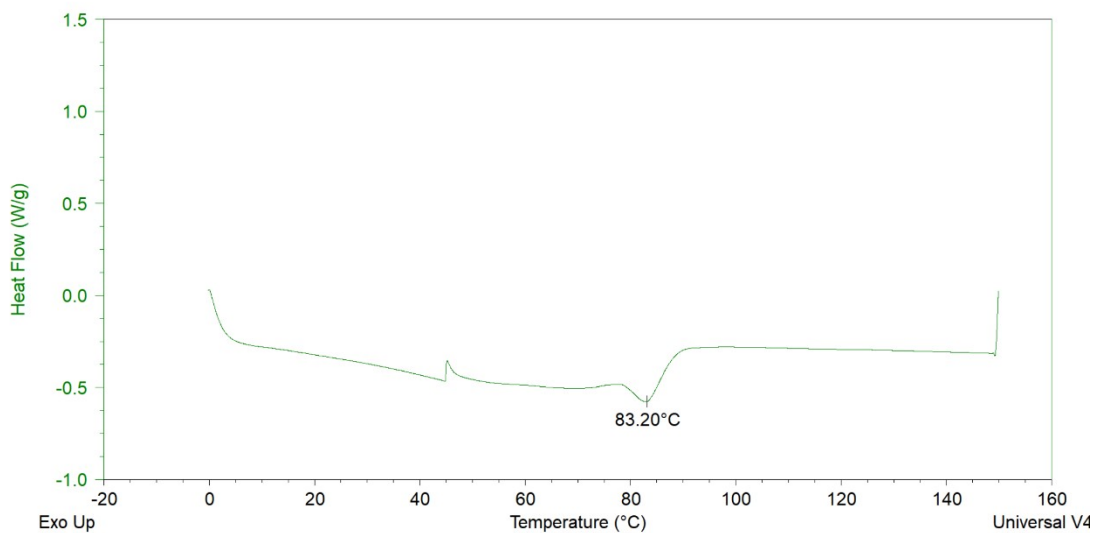
### 1.2 DSC and GPC of Some Representative Poly( $\alpha$ -olefin)s.



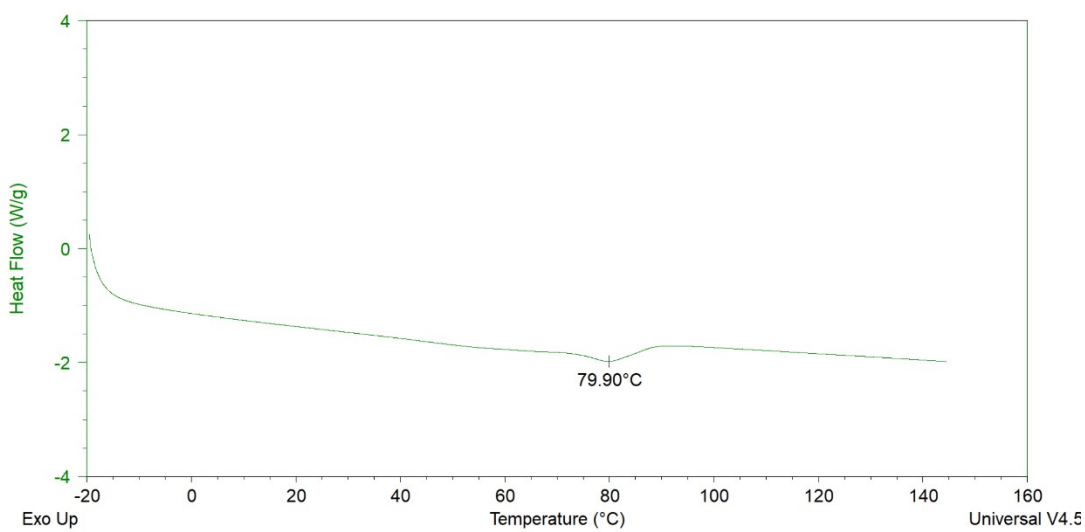
**Figure S25.** DSC of the poly( $\alpha$ -olefin) from table 1, entry 7.



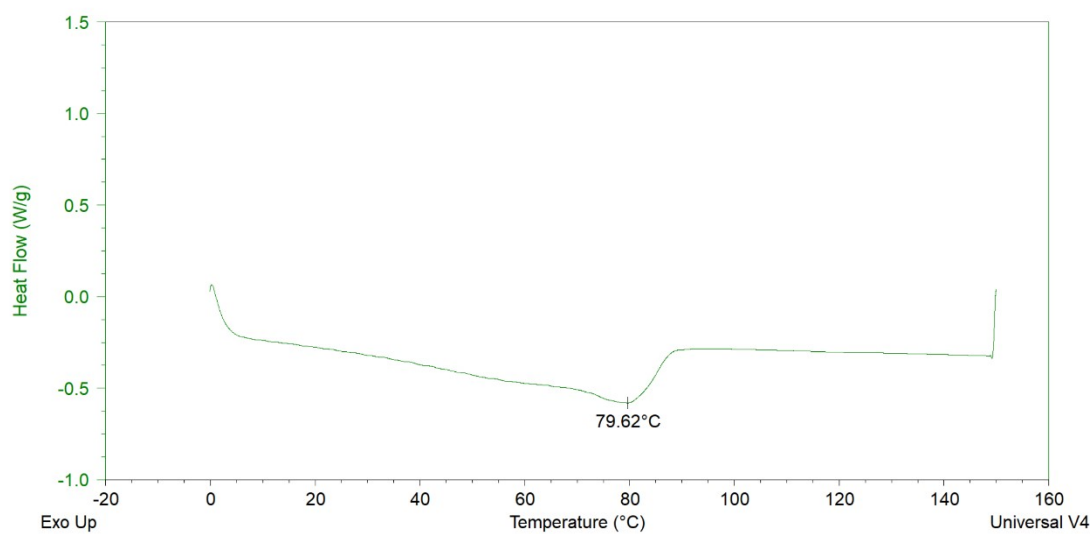
**Figure S26.** DSC of the poly( $\alpha$ -olefin) from table 1, entry 10.



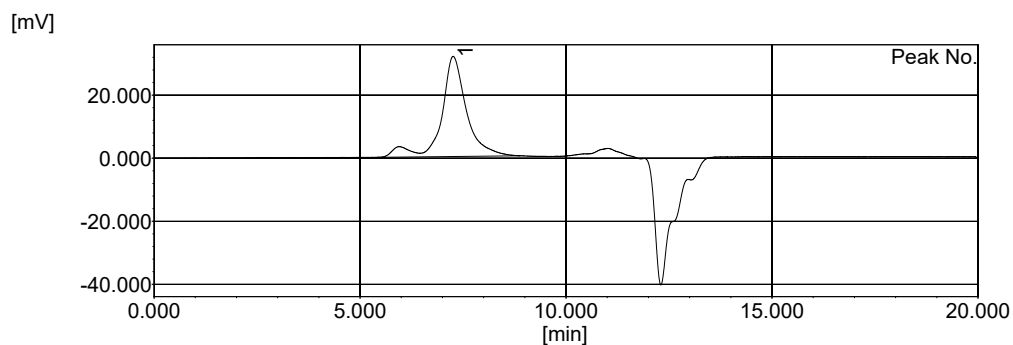
**Figure S27.** DSC of the poly( $\alpha$ -olefin) from table 1, entry 16.



**Figure S28.** DSC of the poly( $\alpha$ -olefin) from table 1, entry 17.



**Figure S29.** DSC of the poly( $\alpha$ -olefin) from table 1, entry 18.

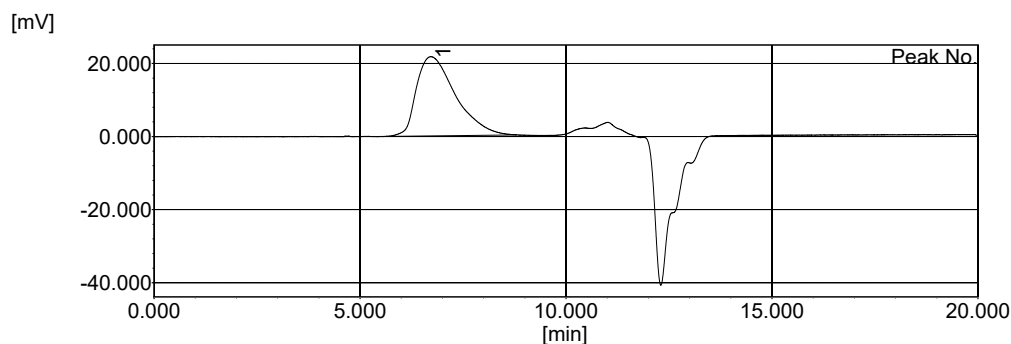


Result of molecular weight calculation (RI)

Peak 1 Base Peak

	[min]	[mV]	[mol]		
Peak start	5.425	0.266	1,632,992	Mn	88,629
Peak top	7.263	32.322	106,918	Mw	153,061
Peak end	8.852	0.757	10,142	Mz	355,040
				Mz+1	662,930
				Mv	153,061
Height [mV]			31.793	Mp	106,918
Area [mV*sec]			1354.864	Mz/Mw	2.320
Area% [%]			100.000	Mw/Mn	1.727
[eta]			153061.15312	Mz+1/Mw	4.331

**Figure S30.** GPC of the poly( $\alpha$ -olefin) from table 1, entry 1.

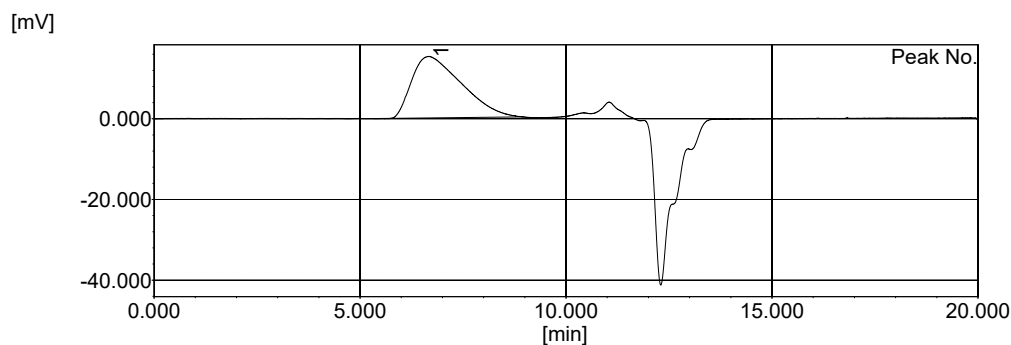


Result of molecular weight calculation (RI)

Peak 1 Base Peak

	[min]	[mV]	[mol]		
Peak start	5.553	0.010	1,350,001	Mn	130,902
Peak top	6.722	21.889	238,725	Mw	214,036
Peak end	8.767	0.442	11,504	Mz	295,407
				Mz+1	375,050
				Mv	214,036
Height [mV]			21.722	Mp	238,725
Area [mV*sec]			1431.074	Mz/Mw	1.380
Area% [%]			100.000	Mw/Mn	1.635
[eta]			214036.15783	Mz+1/Mw	1.752

**Figure S31.** GPC of the poly( $\alpha$ -olefin) from table 1, entry 2.

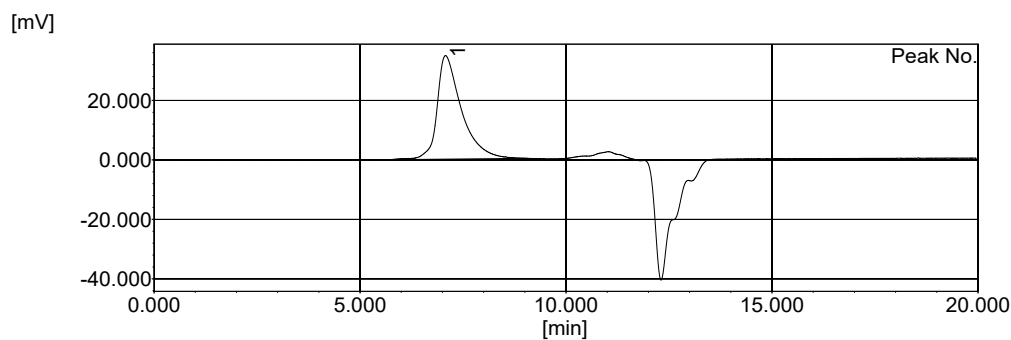


Result of molecular weight calculation (RI)

Peak 1 Base Peak

	[min]	[mV]	[mol]		
Peak start	5.447	0.077	1,581,358	Mn	109,824
Peak top	6.670	15.484	257,734	Mw	221,818
Peak end	8.957	0.484	8,679	Mz	340,237
				Mz+1	442,284
				Mv	221,818
Height [mV]			15.265	Mp	257,735
Area [mV*sec]			1280.008	Mz/Mw	1.534
Area% [%]			100.000	Mw/Mn	2.020
[eta]			221817.64896	Mz+1/Mw	1.994

**Figure S32.** GPC of the poly( $\alpha$ -olefin) from table 1, entry 3.

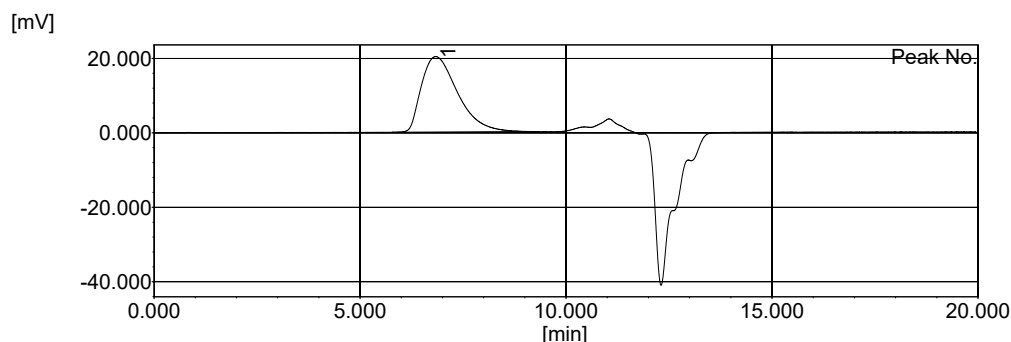




Result of molecular weight calculation (RI)

Peak 1 Base Peak					
	[min]	[mV]	[mol]		
Peak start	5.468	0.018	1,531,357	Mn	93,865
Peak top	7.075	35.070	141,365	Mw	126,857
Peak end	9.043	0.529	7,632	Mz	168,410
				Mz+1	263,659
				Mv	126,857
Height [mV]			34.822	Mp	141,365
Area [mV*sec]			1432.746	Mz/Mw	1.328
Area% [%]			100.000	Mw/Mn	1.351
[eta]			126857.04114	Mz+1/Mw	2.078

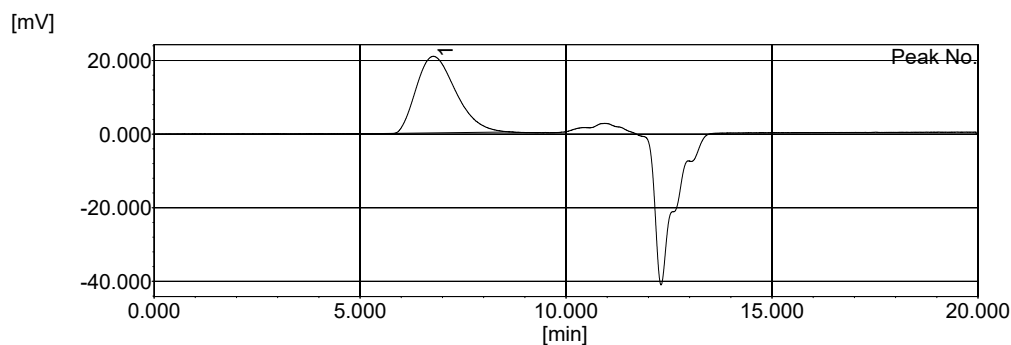
Figure S33. GPC of the poly( $\alpha$ -olefin) from table 1, entry 4.



Result of molecular weight calculation (RI)

Peak 1 Base Peak					
	[min]	[mV]	[mol]		
Peak start	5.787	0.165	955,128	Mn	121,092
Peak top	6.845	20.516	198,823	Mw	185,356
Peak end	9.085	0.373	7,175	Mz	242,011
				Mz+1	290,744
				Mv	185,356
Height [mV]			20.284	Mp	198,824
Area [mV*sec]			1235.482	Mz/Mw	1.306
Area% [%]			100.000	Mw/Mn	1.531
[eta]			185355.63018	Mz+1/Mw	1.569

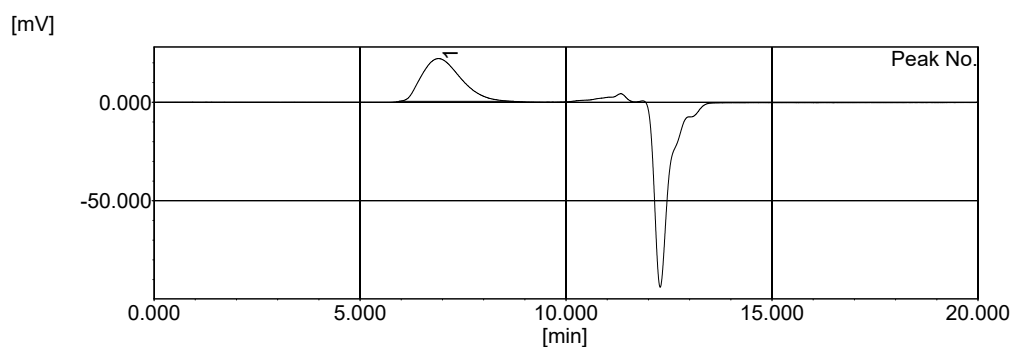
Figure S34. GPC of the poly( $\alpha$ -olefin) from table 1, entry 5.



Result of molecular weight calculation (RI)

Peak 1 Base Peak					
	[min]	[mV]	[mol]		
Peak start	5.405	0.158	1,682,150	Mn	141,581
Peak top	6.775	21.166	220,571	Mw	221,973
Peak end	8.702	0.577	12,668	Mz	307,610
				Mz+1	396,579
				Mv	221,973
Height [mV]			20.834	Mp	220,572
Area [mV*sec]			1387.857	Mz/Mw	1.386
Area% [%]			100.000	Mw/Mn	1.568
[eta]			221972.73816	Mz+1/Mw	1.787

**Figure S35.** GPC of the poly( $\alpha$ -olefin) from table 1, entry 6.

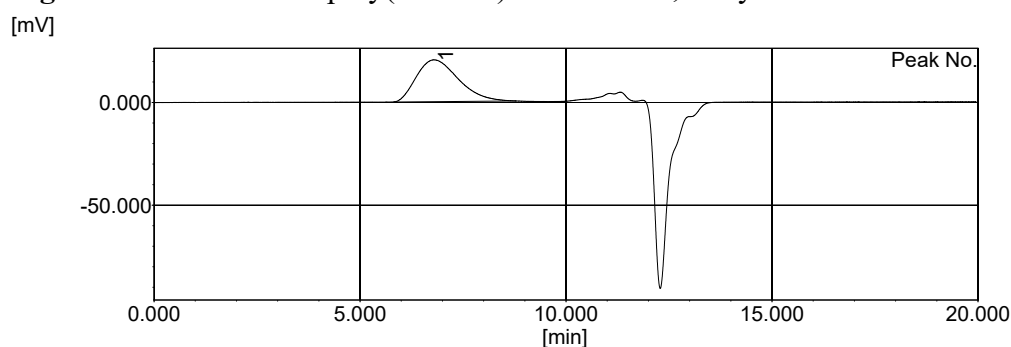


Result of molecular weight calculation (RI)

Peak 1 Base Peak

	[min]	[mV]	[mol]		
Peak start	5.947	0.451	748,484	Mn	118,755
Peak top	6.900	22.201	182,155	Mw	181,743
Peak end	8.698	0.467	12,667	Mz	246,288
				Mz+1	305,255
				Mv	181,743
Height [mV]			21.744	Mp	182,156
Area [mV*sec]			1432.937	Mz/Mw	1.355
Area% [%]			100.000	Mw/Mn	1.530
[eta]			181743.02798	Mz+1/Mw	1.680

**Figure S36.** GPC of the poly( $\alpha$ -olefin) from table 1, entry 8.

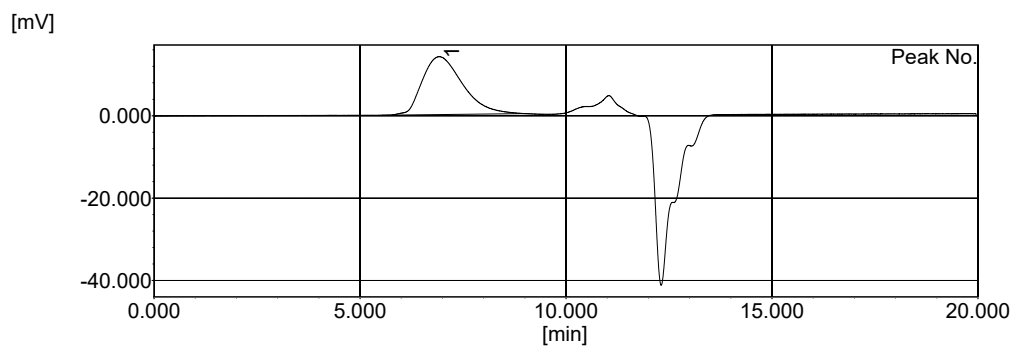


Result of molecular weight calculation (RI)

Peak 1 Base Peak

	[min]	[mV]	[mol]		
Peak start	5.823	0.255	898,633	Mn	128,584
Peak top	6.785	20.781	216,011	Mw	212,882
Peak end	8.772	0.727	11,363	Mz	300,535
				Mz+1	380,285
				Mv	212,882
Height [mV]			20.372	Mp	215,479
Area [mV*sec]			1444.498	Mz/Mw	1.412
Area% [%]			100.000	Mw/Mn	1.656
[eta]			212882.12150	Mz+1/Mw	1.786

**Figure S37.** GPC of the poly( $\alpha$ -olefin) from table 1, entry 9.

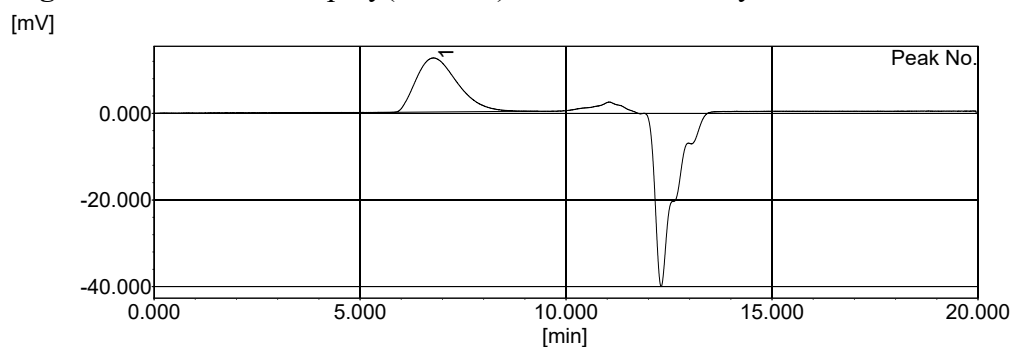


Result of molecular weight calculation (RI)

Peak 1 Base Peak

	[min]	[mV]	[mol]	Mn	
Peak start	5.532	0.129	1,394,081	Mw	177,264
Peak top	6.928	14.384	175,711	Mz	253,153
Peak end	9.022	0.536	7,882	Mz+1	337,655
				Mv	177,264
Height [mV]			14.092	Mp	175,711
Area [mV*sec]			955.262	Mz/Mw	1.428
Area% [%]			100.000	Mw/Mn	1.663
[eta]			177264.00565	Mz+1/Mw	1.905

**Figure S38.** GPC of the poly( $\alpha$ -olefin) from table 1, entry 11.

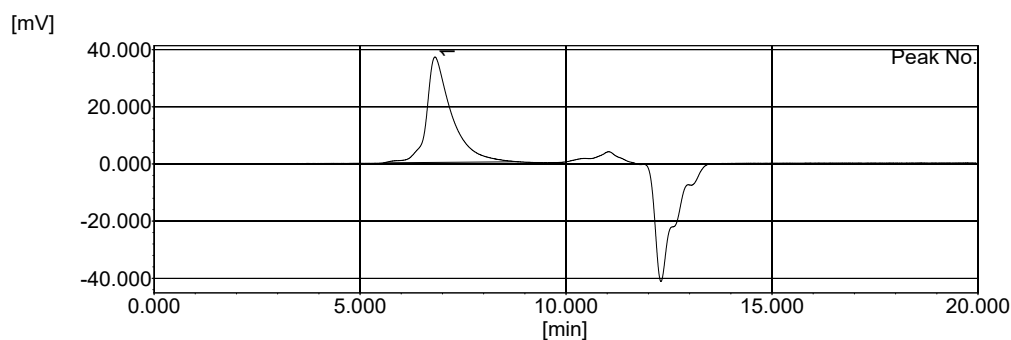


Result of molecular weight calculation (RI)

Peak 1 Base Peak

	[min]	[mV]	[mol]	Mn	
Peak start	5.425	0.218	1,632,992	Mw	128,687
Peak top	6.790	12.815	215,719	Mz	216,728
Peak end	9.298	0.502	5,229	Mz+1	390,398
				Mv	216,728
Height [mV]			12.497	Mp	215,720
Area [mV*sec]			873.349	Mz/Mw	1.407
Area% [%]			100.000	Mw/Mn	1.684
[eta]			216728.31374	Mz+1/Mw	1.801

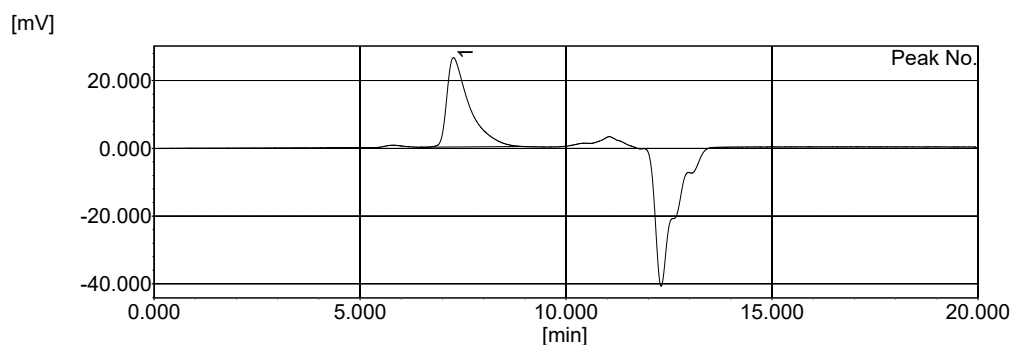
**Figure S39.** GPC of the poly( $\alpha$ -olefin) from table 1, entry 12.



Result of molecular weight calculation (RI)

Peak 1 Base Peak					
	[min]	[mV]	[mol]		
Peak start	5.595	0.399	1,269,112	Mn	125,908
Peak top	6.825	37.416	204,808	Mw	185,079
Peak end	8.830	0.750	10,473	Mz	253,937
				Mz+1	372,019
				Mv	185,079
Height [mV]			36.884	Mp	204,809
Area [mV*sec]			1561.710	Mz/Mw	1.372
Area% [%]			100.000	Mw/Mn	1.470
[eta]			185079.37974	Mz+1/Mw	2.010

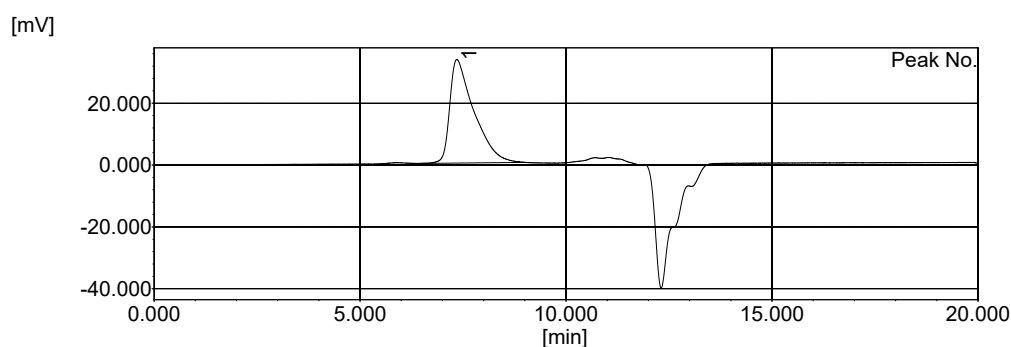
**Figure S40.** GPC of the poly( $\alpha$ -olefin) from table 2, entry 1.



Result of molecular weight calculation (RI)

Peak 1 Base Peak					
	[min]	[mV]	[mol]		
Peak start	6.468	0.346	347,577	Mn	66,981
Peak top	7.260	26.798	107,447	Mw	85,619
Peak end	9.000	0.546	8,139	Mz	99,668
				Mz+1	110,692
				Mv	85,619
Height [mV]			26.389	Mp	107,448
Area [mV*sec]			995.030	Mz/Mw	1.164
Area% [%]			100.000	Mw/Mn	1.278
[eta]			85619.06617	Mz+1/Mw	1.293

**Figure S41.** GPC of the poly( $\alpha$ -olefin) from table 2, entry 4.



Result of molecular weight calculation (RI)

Peak 1 Base Peak					
	[min]	[mV]	[mol]		
Peak start	6.490	0.531	336,587	Mn	59,914
Peak top	7.352	34.181	93,791	Mw	76,069
Peak end	9.000	0.851	8,139	Mz	89,552
				Mz+1	101,198
				Mv	76,069
Height [mV]			33.540	Mp	93,791
Area [mV*sec]			1364.774	Mz/Mw	1.177
Area% [%]			100.000	Mw/Mn	1.270
[eta]			76069.32778	Mz+1/Mw	1.330

**Figure S42.** GPC of the poly( $\alpha$ -olefin) from table 2, entry 10.