

Supporting Information
For
**Kinetic and Microstructural Studies of Cp₂ZrCl₂ and Cp₂HfCl₂-
Catalyzed Oligomerization of Higher α -Olefins in mPAO Oil Base
Stocks Production**

**Ahad Hanifpour¹, Mahdi Hashemzadeh Gargari², Mohammad Reza Rostami
Daroukola¹, Zahra Kalantari¹, Naeimeh Bahri-Laleh^{1*}**

¹Polymerization Engineering Department, Iran Polymer and Petrochemical Institute (IPPI), P.O.
Box 14975/112, Tehran, Iran.

²Miandoab Petrochemical Company, Bakhtar holding, Miandoab, Iran.

**To whom correspondence should be addressed: n.bahri@ippi.ac.ir, Tel: +982148662479, Fax:
982144787021.**

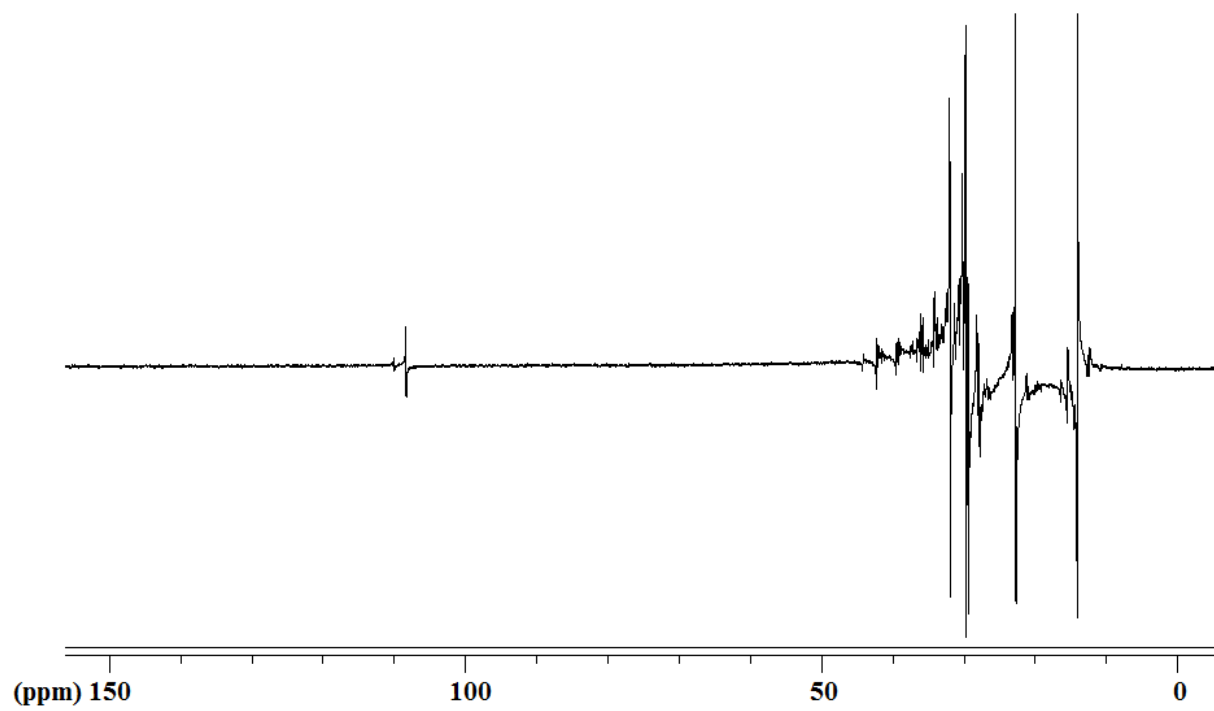


Fig S1. DEPT-135 spectrum of Zr-H sample

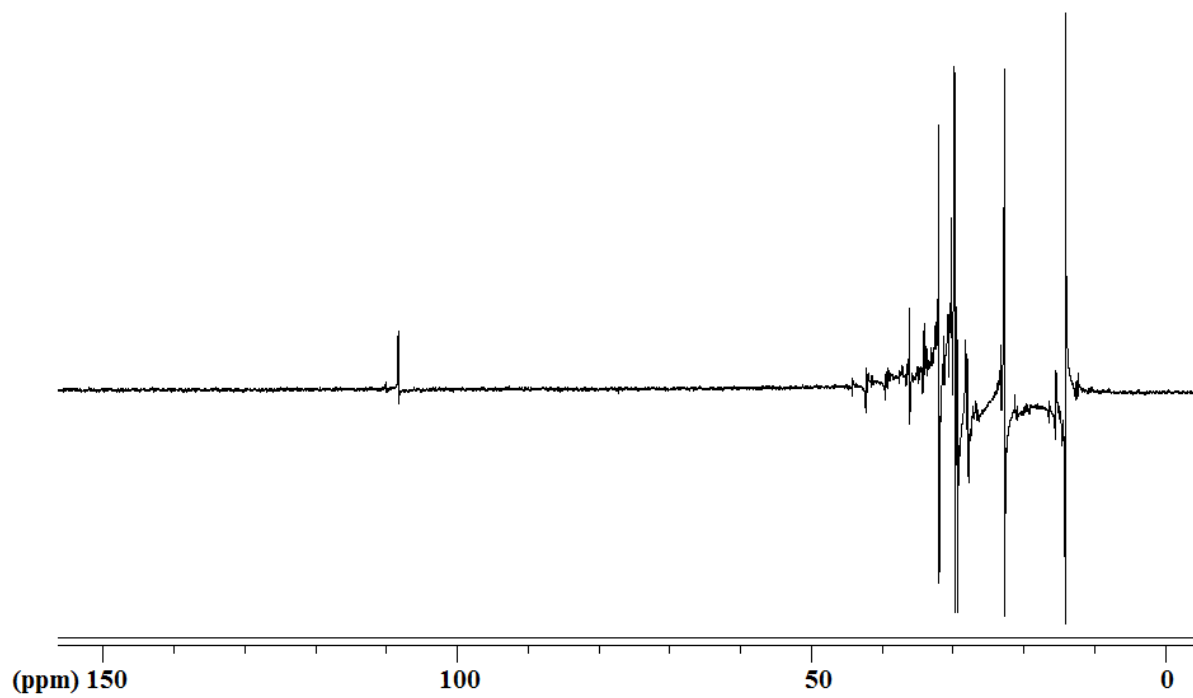


Fig S2. DEPT-135 spectrum of Zr-O sample

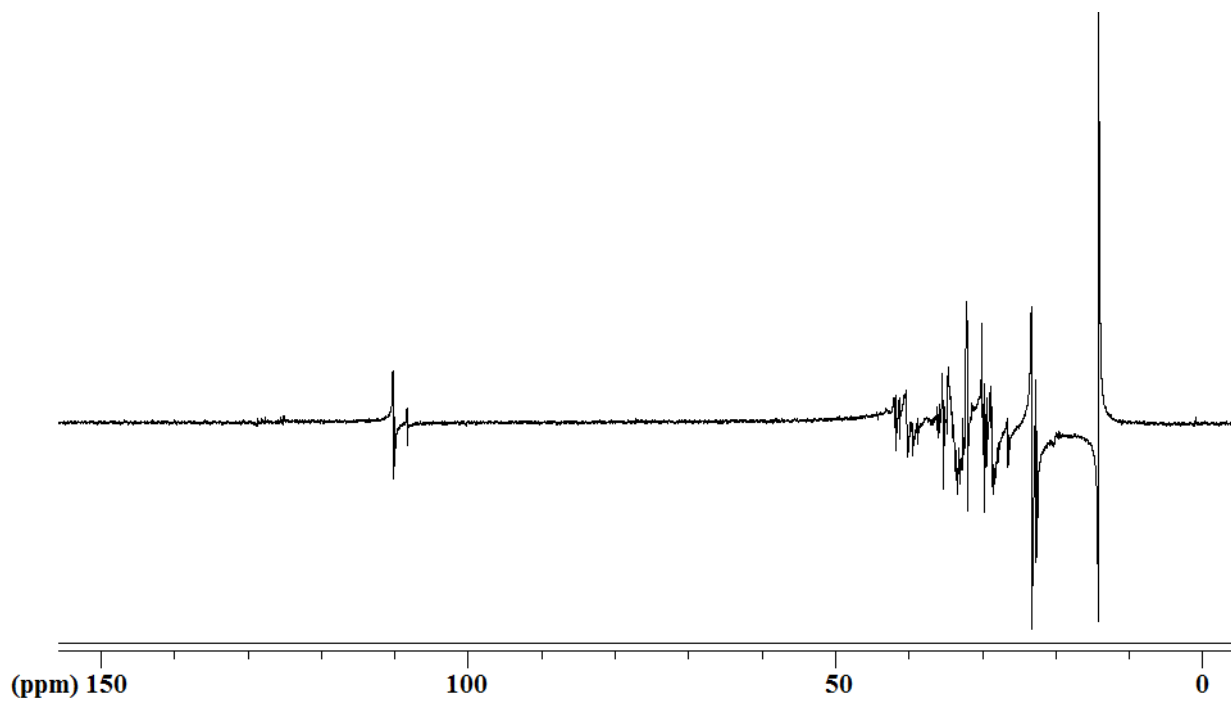


Fig S3. DEPT-135 spectrum of Hf-H sample

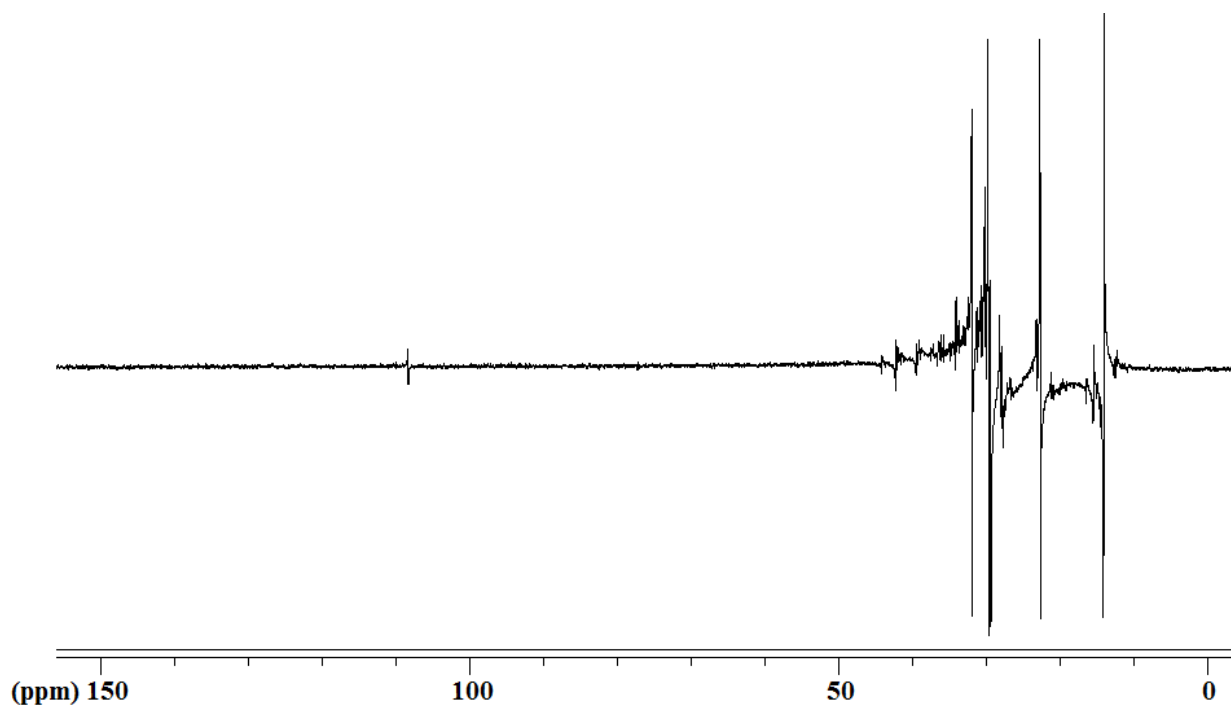


Fig S4. DEPT-135 spectrum of Hf-O sample

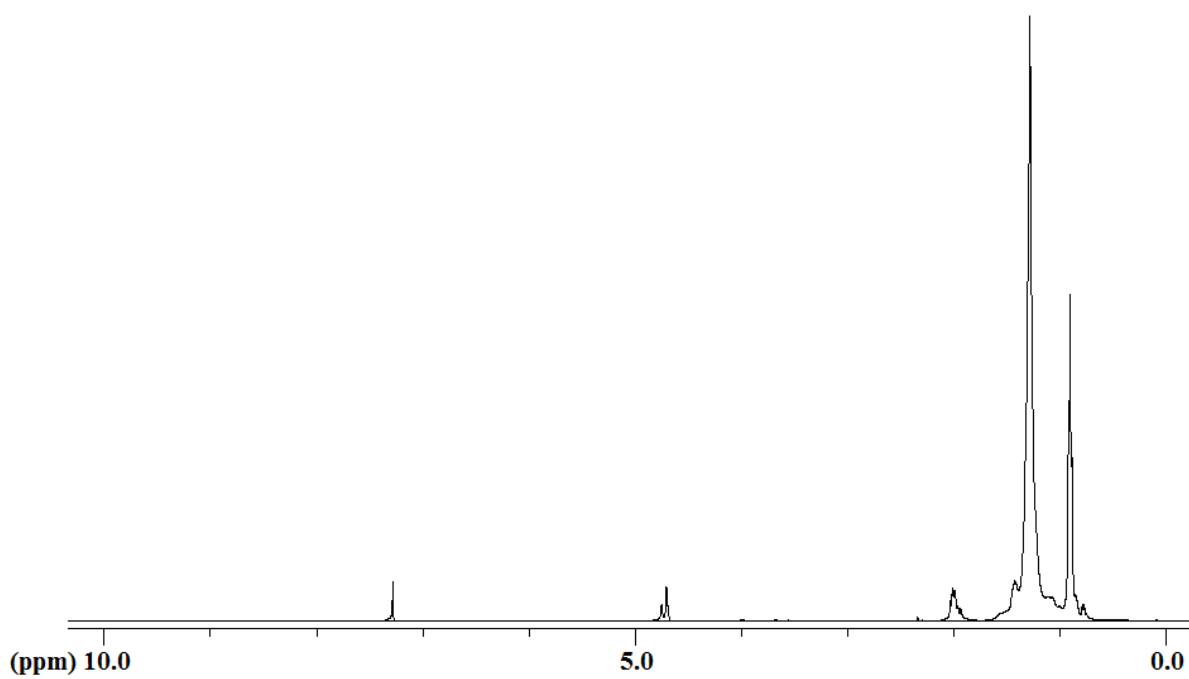


Fig S5. $^1\text{H-NMR}$ spectrum of Zr-H sample

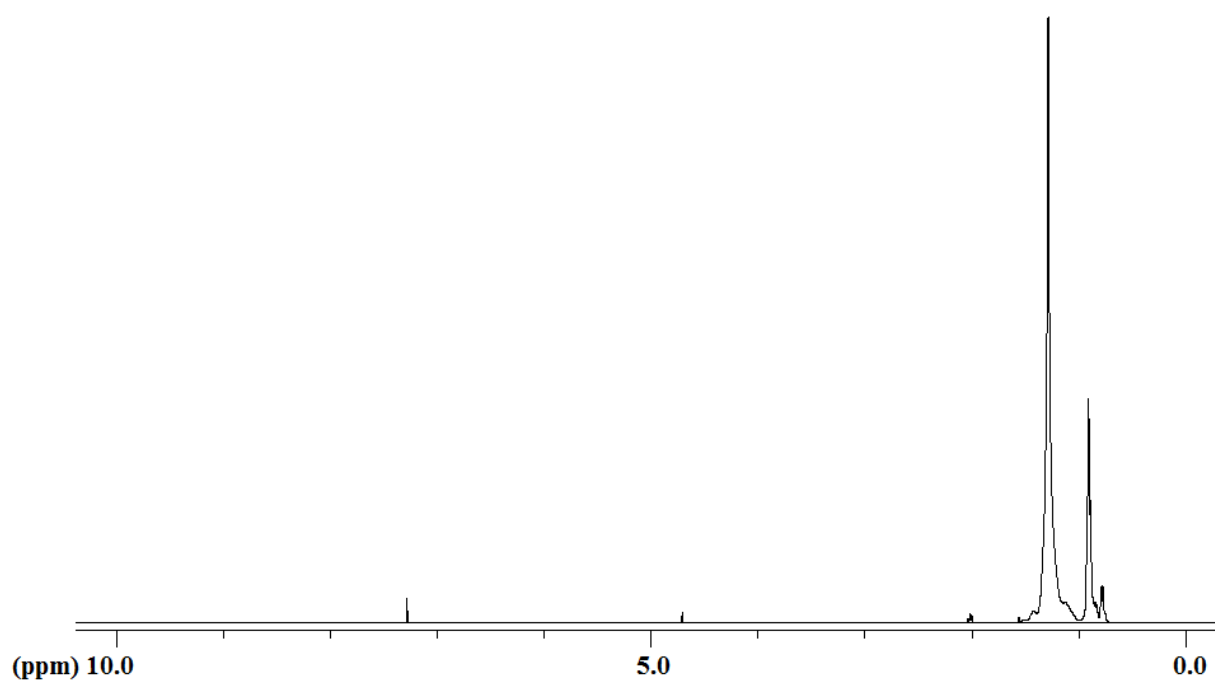


Fig S6. $^1\text{H-NMR}$ spectrum of Zr-O sample

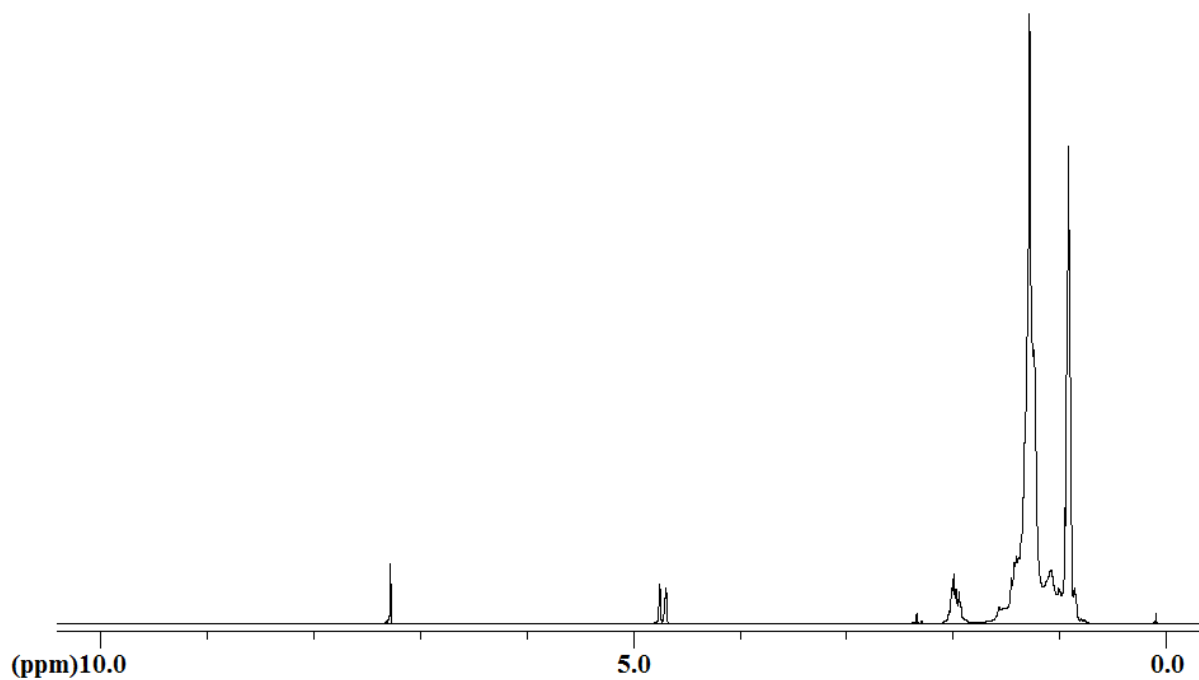


Fig S7. ¹H-NMR spectrum of Hf-H sample

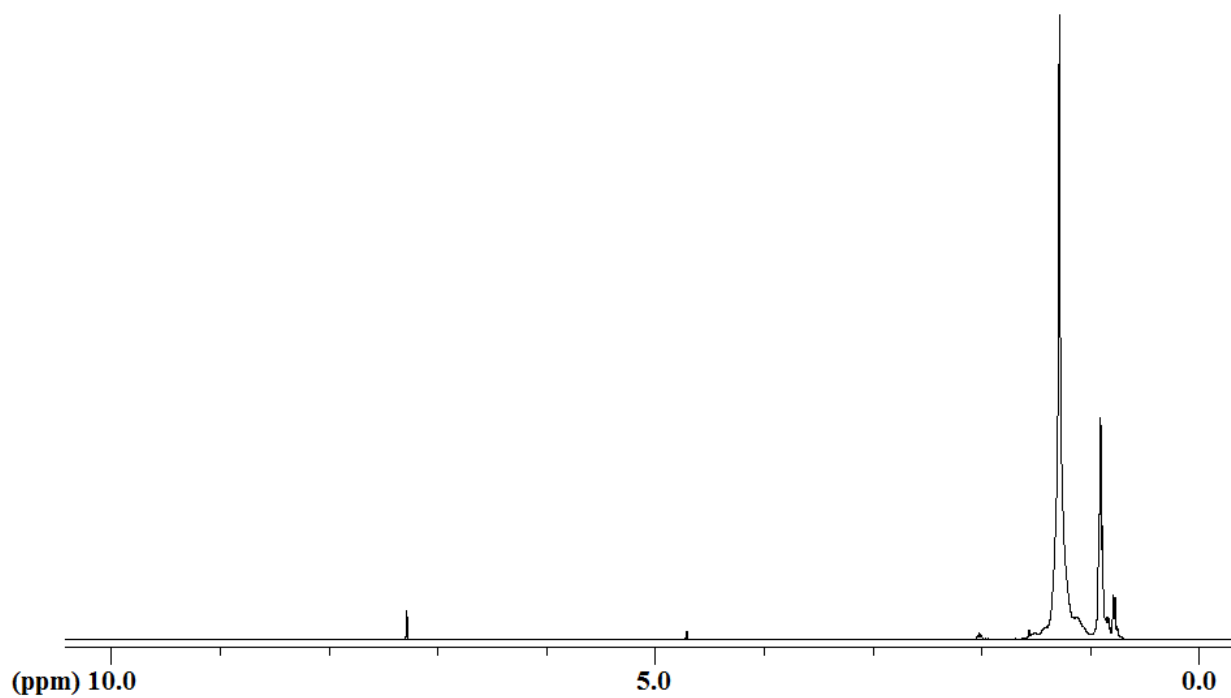
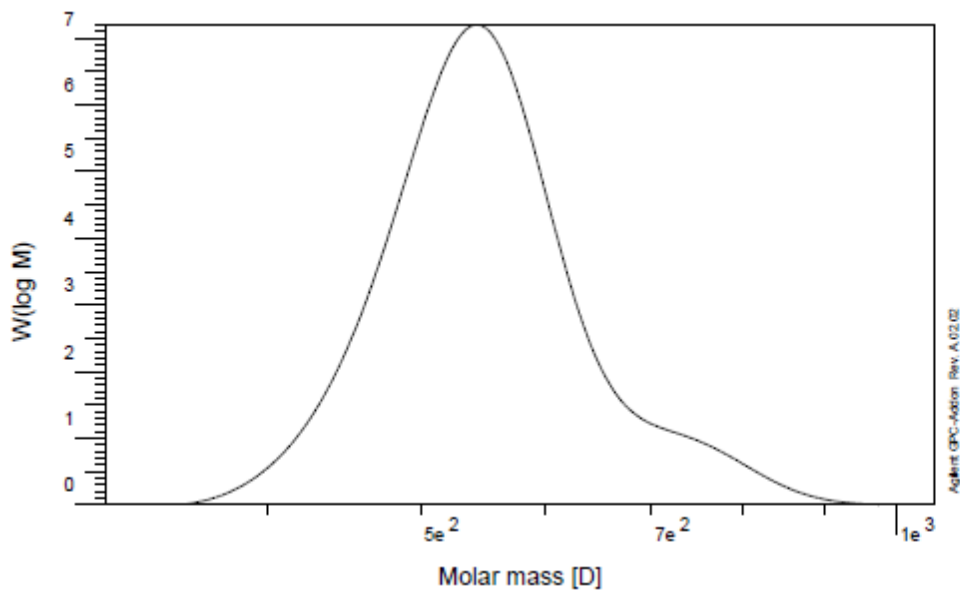


Fig S8. ¹H-NMR spectrum of Hf-O sample



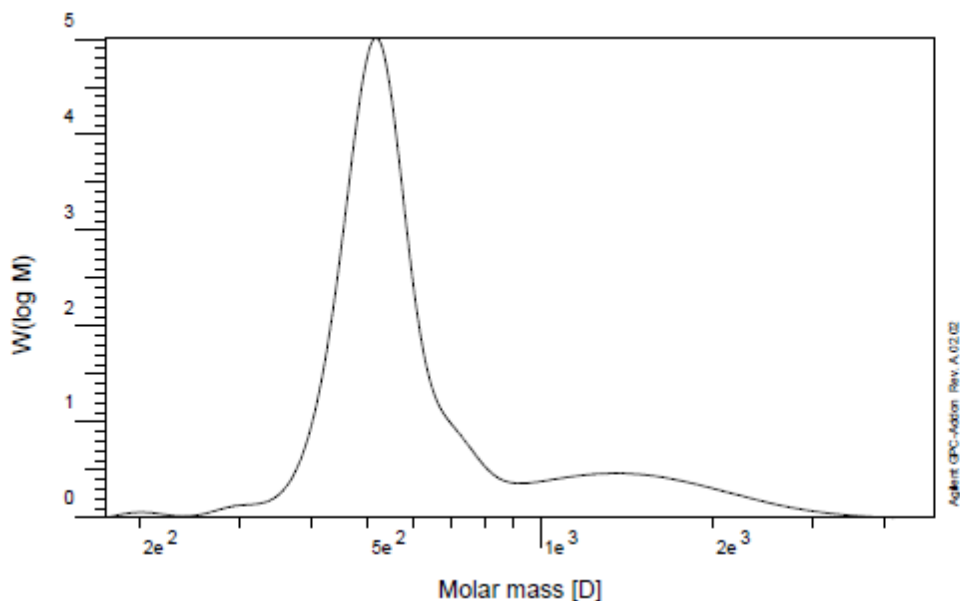
Sample :	6		
Injection Date :	18-Jun-20, 08:50:56		
Calibration File :	C:\HPCHEM\1\DATA\KAZEM\ICAL990312.CAL		
Calibration Date :	Tuesday 20/06/09 13:51:38		
Baseline from :	17.950 min	Baseline to :	19.148 min
Integration from :	17.950 min	Integration to :	19.148 min
MHK - A (Cal.):	0.000000E+0	MHK - K (Cal.):	1.000000E+0 ml/g
Eluent :	THF	Flowrate :	1.000 ml/min
Concentration :	1.000 g/l	Inject volume :	20.000 ul
Column 1 :	PLgel OH-MIXED C	Temperature :	29.960 C
Detector 1 :	RID A, Refractive Index Signal	Delay volume :	0.000 ml
Operator :	IPPI	Acquisition interval :	0.430 sec

rid1A

Mp :	5.4328e2	g/mol
Mw :	5.5555e2	g/mol
Mz :	5.6900e2	g/mol
Mv :	0.000000	g/mol
D :	1.0228e0	
[n] :	0.000000	ml/g
Vp :	1.8612e1	ml
Mp :	5.4254e2	g/mol
A :	5.1335e3	ml ³ V
< 316	0.00	
w%	100.00	
> 1058	0.00	

Fig S9. GPC curve of prepared oligomer with Cp_2ZrCl_2 , [cat]= 10 μmol , [1-hexene]= 0.08 mol,

t=3 h, Al/M= 500, T=80 °C

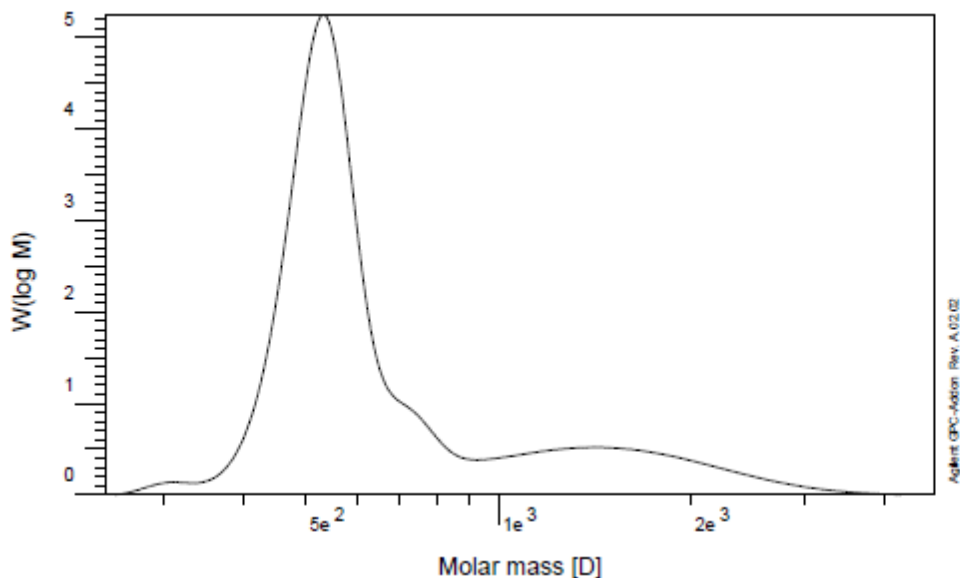


Sample : /
 Injection Date :
 Calibration File : CAL990312.CAL
 Calibration Date :
 Baseline from : 16.447 min
 Integration from: 16.447 min
 MHK - A (Cal.): 0.000000E+0
 Eluent : THF
 Concentration : 1.000 g/l
 Column 1 : ...?
 Detector 1 : RID A, Refractive Index Signal
 Operator : IPPJ
 Baseline to : 19.738 min
 Integration to : 19.738 min
 MHK - K (Cal.): 1.000000E+0 ml/g
 Flowrate : 1.000 ml/min
 Inject volume : 20.000 ul
 Temperature : 23.000 C
 Delay volume : 0.000 ml
 Acquisition interval : 0.430 sec

rid1A
Mn : 5.7779e2 g/mol
Mw : 7.2206e2 g/mol
Mz : 1.0356e3 g/mol
Mv : 0.000000 g/mol
D : 1.2497e0
[n] : 0.000000 ml/g
Vp : 1.8662e1 ml
Mp : 5.1572e2 g/mol
A : 4.2152e3 ml³/V
< 174 : 0.00
w% : 100.00
> 4893 : 0.00

Fig S10. GPC curve of prepared oligomer with Cp_2ZrCl_2 , [cat]= 10 μmol , [1-hexene]= 0.08 mol,

t=9 h, Al/M= 500, T=80 °C



Sample : 8-SECOND
Injection Date : 18-Jun-20, 11:17:22
Calibration File : C:\HPCHEM\1\DATA\KAZEMICAL990312.CAL
Calibration Date : Tuesday 20/06/09 13:51:38
Baseline from : 16.465 min
Integration from: 16.465 min
MHK - A (Cal.): 0.000000E+0
Eluent : THF
Concentration : 1.000 g/l
Column 1 : PLgel OH-MIXED C
Detector 1 : RID A, Refractive Index Signal
Operator : IPP1

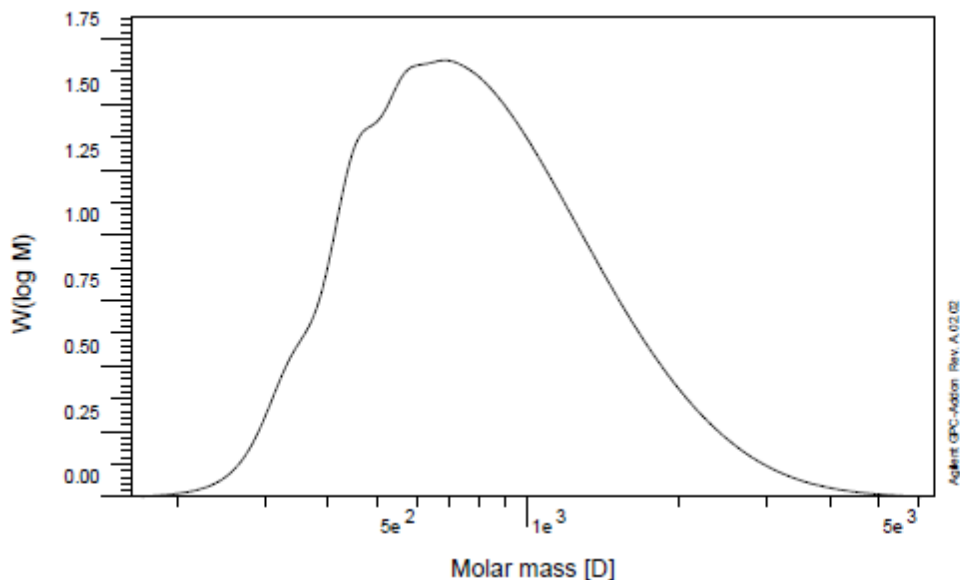
Baseline to : 19.409 min
Integration to : 19.409 min
MHK - K (Cal.): 1.000000E+0 ml/g
Flowrate : 1.000 ml/min
Inject volume : 20.000 ul
Temperature : 29.980 C
Delay volume : 0.000 ml
Acquisition interval : 0.430 sec

rid1A

Mn : 6.1039e2 g/mol
Mw : 7.6793e2 g/mol
Mz : 1.1045e3 g/mol
Mv : 0.000000 g/mol
D : 1.2581e0
[n] : 0.000000 ml/g
Vp : 1.8633e1 ml
Mp : 5.3092e2 g/mol
A : 4.9604e3 ml²/V
< 243 : 0.00
w% : 100.00
> 4807 : 0.00

Fig S11. GPC curve of prepared oligomer with Cp_2ZrCl_2 , [cat]= 10 μmol , [1-hexene]= 0.08 mol,

t=18 h, Al/M= 500, T=80 °C

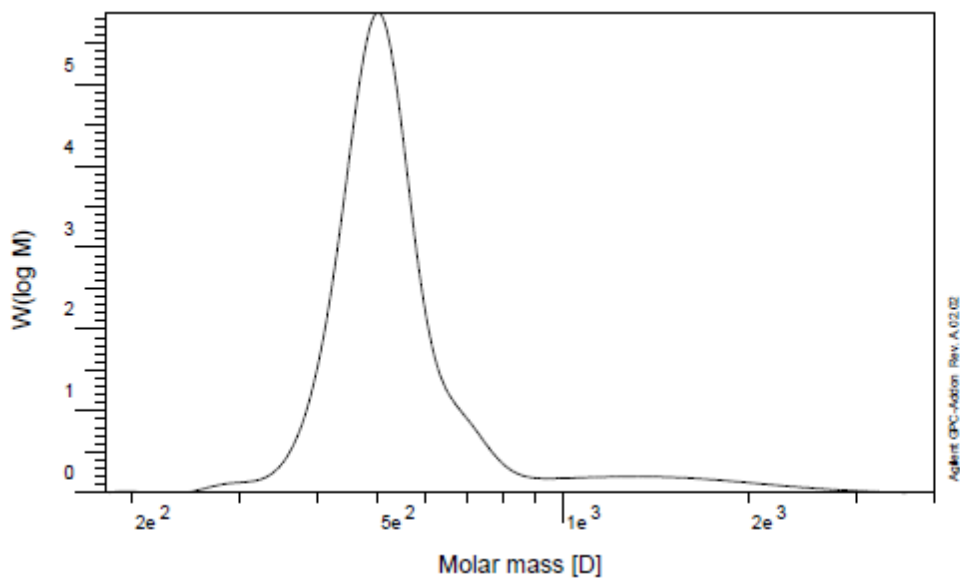


Sample : ZR-HEX-80
Injection Date : 12-Dec-17, 12:58:56
Calibration File : C:\HPCHEM\1\DATA\13960802\96-09-01-cal-01.CAL
Calibration Date : Thursday 17/11/30 09:46:40
Baseline from : 16.080 min
Integration from : 16.080 min
MHK - A (Cal.): 0.000000E+0
Eluent : THF
Concentration : 1.000 g/l
Column 1 : PLgel OH-MIXED C
Detector 1 : RID A, Refractive Index Signal
Operator : IPP1
Baseline to : 19.654 min
Integration to : 19.654 min
MHK - K (Cal.): 1.000000E+0 ml/g
Flowrate : 1.000 ml/min
Inject volume : 20.000 ul
Temperature : 29.970 C
Delay volume : 0.000 ml
Acquisition interval : 0.430 sec

rid1A
Mn : 6.9167e2 g/mol
Mw : 9.2053e2 g/mol
Mz : 1.2805e3 g/mol
Mv : 0.000000 g/mol
D : 1.3309e0
[n] : 0.000000 ml/g
Vp : 1.8259e1 ml
Mp : 6.8406e2 g/mol
A : 1.7531e4 ml³/V
< 162 : 0.00
w% : 100.00
> 6475 : 0.00

Fig S12. GPC curve of prepared oligomer with Cp_2ZrCl_2 , $[\text{cat}] = 10 \mu\text{mol}$, $[\text{1-hexene}] = 0.08 \text{ mol}$,

$t = 24 \text{ h}$, $\text{Al/M} = 500$, $T = 80 \text{ }^\circ\text{C}$

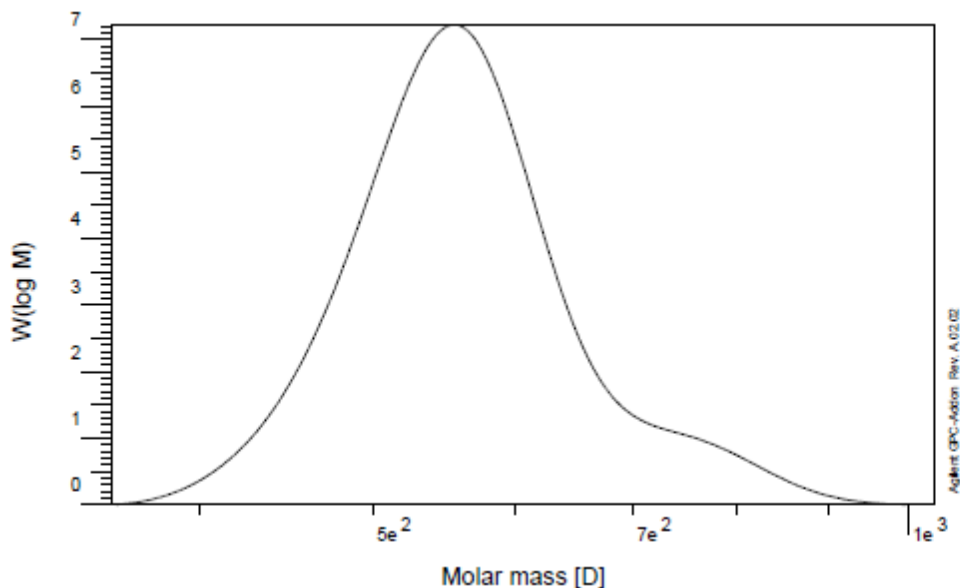


Sample : 7
 Injection Date : 09-Jun-20, 08:59:01
 Calibration File : C:\HPCHEM\1\DATA\KAZEM\ICAL990312.CAL
 Calibration Date : Tuesday 20/06/09 13:51:38
 Baseline from : 16.638 min
 Integration from : 16.638 min
 MHK - A (Cal.): 0.000000E+0
 Eluent : THF
 Concentration : 1.000 g/l
 Column 1 : PLgel OH-MIXED C
 Detector 1 : RID A, Refractive Index Signal
 Operator : IPP1
 Baseline to : 19.699 min
 Integration to : 19.699 min
 MHK - K (Cal.): 1.000000E+0 ml/g
 Flowrate : 1.000 ml/min
 Inject volume : 20.000 ul
 Temperature : 29.930 C
 Delay volume : 0.000 ml
 Acquisition interval : 0.430 sec

rid1A
 Mn : 5.2525e2 g/mol
 Mw : 5.9471e2 g/mol
 Mz : 7.6838e2 g/mol
 Mv : 0.000000 g/mol
 D : 1.1322e0
 [n]: 0.000000 ml/g
 Vp : 1.8691e1 ml
 Mp : 5.0096e2 g/mol
 A : 4.1071e3 ml²/V
 < 180 0.00
 w% : 100.00
 > 4024 0.00

Fig S13. GPC curve of prepared oligomer with Cp_2ZrCl_2 , [cat]= 10 μmol , [1-octene]= 0.08 mol,

t=3 h, A1/M= 500, T=80 °C



Sample : 4
Injection Date : 18-Jun-20, 07:56:51
Calibration File : C:\HPCHEM\1\DATA\KAZEMICAL990312.CAL
Calibration Date : Tuesday 20/06/09 13:51:38
Baseline from : 17.973 min
Integration from : 17.973 min
MHK - A (Cal.): 0.000000E+0
Eluent : THF
Concentration : 1.000 g/l
Column 1 : PLgel OH-MIXED C
Detector 1 : RID A, Refractive Index Signal
Operator : IPP1

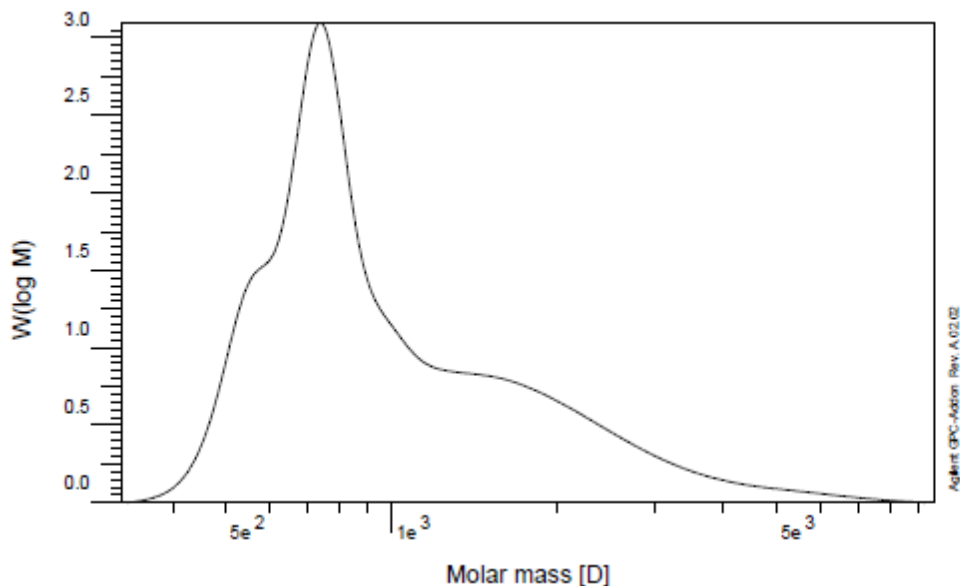
Baseline to : 19.029 min
Integration to : 19.029 min
MHK - K (Cal.): 1.000000E+0 ml/g
Flowrate : 1.000 ml/min
Inject volume : 20.000 ul
Temperature : 30.000 C
Delay volume : 0.000 ml
Acquisition interval : 0.430 sec

rid1A

Mn :	5.5581e2	g/mol
Mw :	5.6812e2	g/mol
Mz :	5.8183e2	g/mol
Mv :	0.000000	g/mol
D :	1.0225e0	
[n] :	0.000000	ml/g
Vp :	1.8590e1	ml
Mp :	5.5451e2	g/mol
A :	3.7559e3	ml ³ /V
< 356	0.00	
w% :	100.00	
> 1034	0.00	

Fig S14. GPC curve of prepared oligomer with Cp_2ZrCl_2 , [cat]= 10 μmol , [1-octene]= 0.08 mol,

$t=9$ h, $\text{Al/M}= 500$, $T=80$ °C

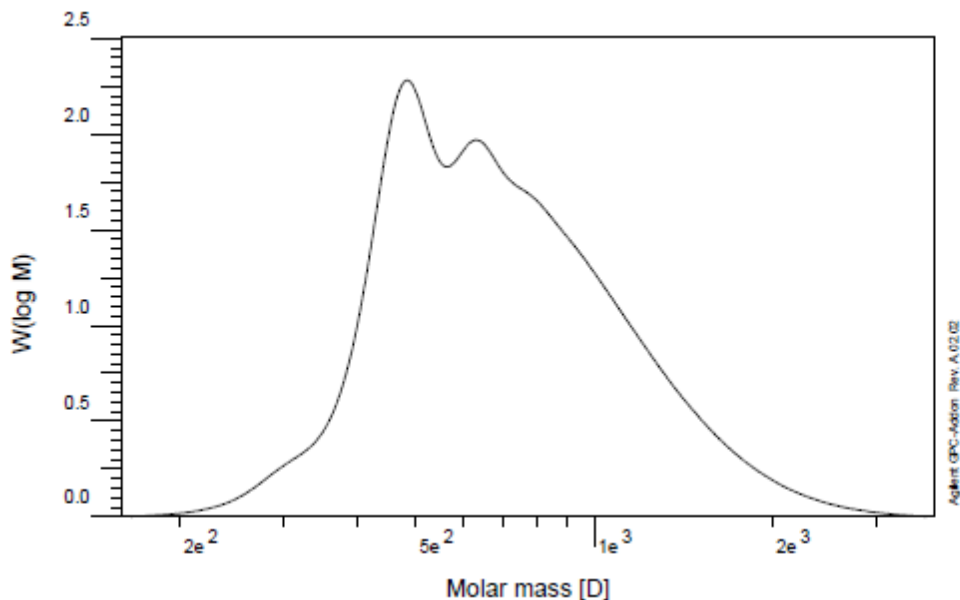


Sample : 2
 Injection Date : 18-Jun-20, 10:15:41
 Calibration File : C:\HPCHEM\1\DATA\KAZEM\ICAL990312.CAL
 Calibration Date : Tuesday 20/06/09 13:51:38
 Baseline from : 15.784 min
 Integration from : 15.784 min
 MHK - A (Cal.): 0.000000E+0
 Eluent : THF
 Concentration : 1.000 g/l
 Column 1 : PLgel OH-MIXED C
 Detector 1 : RID A, Refractive Index Signal
 Operator : IPP1
 Baseline to : 19.130 min
 Integration to : 19.130 min
 MHK - K (Cal.): 1.000000E+0 ml/g
 Flowrate : 1.000 ml/min
 Inject volume : 20.000 ul
 Temperature : 29.990 C
 Delay volume : 0.000 ml
 Acquisition interval : 0.430 sec

rid1A
Mp : 8.7898e2 g/mol
Mw : 1.2015e3 g/mol
Mz : 1.9092e3 g/mol
Mv : 0.000000 g/mol
D : 1.3670e0
[n] : 0.000000 ml/g
Vp : 1.8302e1 ml
Mp : 7.4127e2 g/mol
A : 5.4024e3 ml³/V
 < 322 0.00
 w% : 100.00
 > 9680 0.00

Fig S15. GPC curve of prepared oligomer with Cp_2ZrCl_2 , [cat]= 10 μmol , [1-octene]= 0.08 mol,

t=18 h, Al/M= 500, T=80 °C



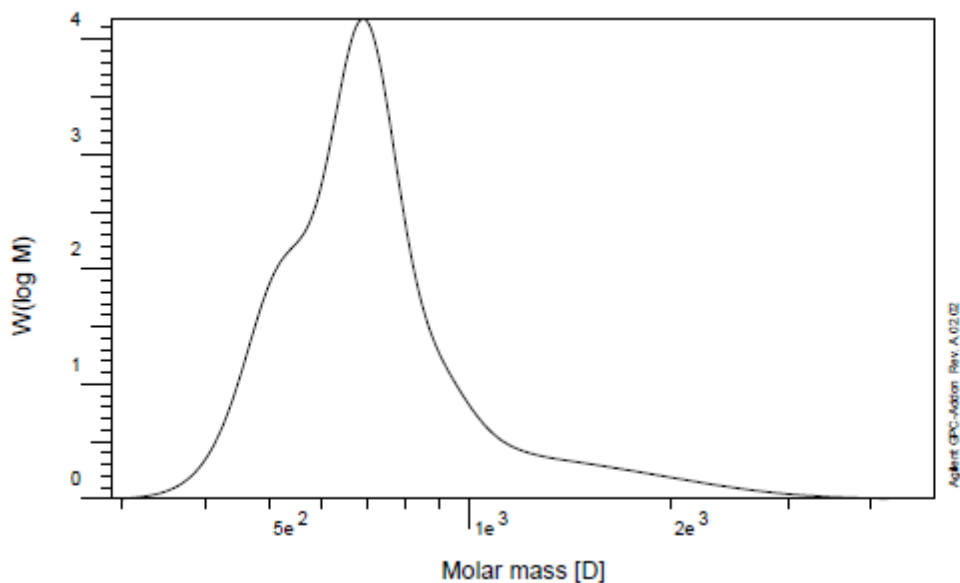
Sample : r-zr-oct-80
 Injection Date : 22-Jan-18, 12:57:18
 Calibration File : C:\HPCHEM\1\DATA\13960802\96-10-01-cal-01.CAL
 Calibration Date : Thursday 18/01/18 08:55:00
 Baseline from : 16.619 min
 Integration from : 16.619 min
 MHK - A (Cal.): 0.000000E+0
 Eluent : THF
 Concentration : 1.000 g/l
 Column 1 : PLgel OH-MIXED C
 Detector 1 : RID A, Refractive Index Signal
 Operator : IPP1
 Baseline to : 19.693 min
 Integration to : 19.693 min
 MHK - K (Cal.): 1.000000E+0 ml/g
 Flowrate : 1.000 ml/min
 Inject volume : 20.000 ul
 Temperature : 30.000 C
 Delay volume : 0.000 ml
 Acquisition interval : 0.430 sec

rid1A

Mn : 6.3162e2 g/mol
Mw : 7.7529e2 g/mol
Mz : 9.7806e2 g/mol
Mv : 0.000000 g/mol
D : 1.2275e0
[n] : 0.000000 ml/g
Vp : 1.8612e1 ml
Mp : 4.8413e2 g/mol
A : 4.5502e3 ml²/V
< 160 : 0.00
w% : 100.00
> 3760 : 0.00

Fig S16. GPC curve of prepared oligomer with Cp_2ZrCl_2 , [cat]= 10 μmol , [1-octene]= 0.08 mol,

t=24 h, Al/M= 500, T=80 °C



Sample : 8
Injection Date :
Calibration File : CAL990312.CAL
Calibration Date :
Baseline from : 16.428 min
Integration from: 16.428 min
MHK - A (Cal.): 0.000000E+0
Eluent :?
Concentration : 1.000 g/l
Column 1 :?
Detector 1 : RID A, Refractive Index Signal
Operator : IPP1

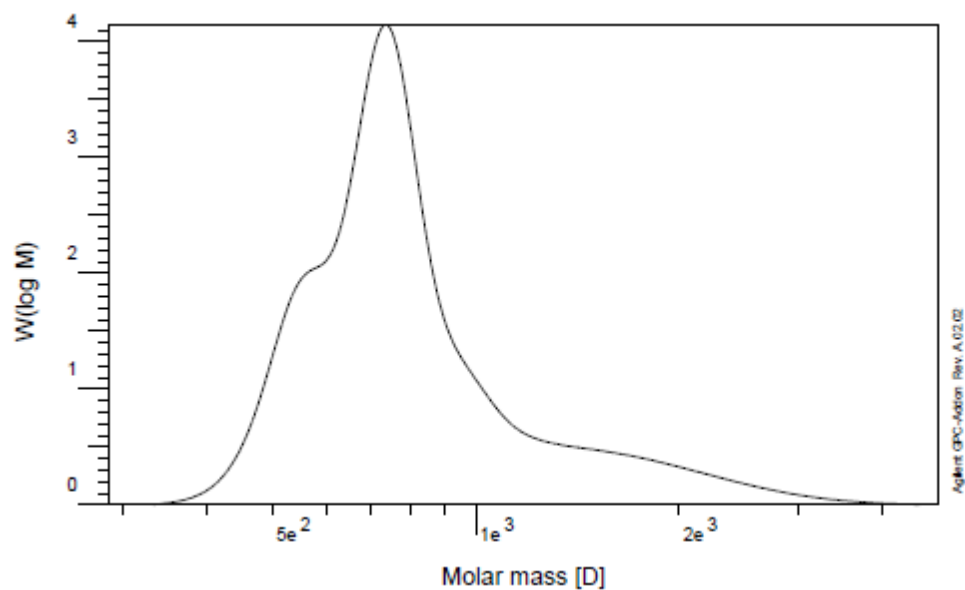
Baseline to : 19.234 min
Integration to : 19.234 min
MHK - K (Cal.): 1.000000E+0 ml/g
Flowrate : 1.000 ml/min
Inject volume : 20.000 ul
Temperature : 23.000 C
Delay volume : 0.000 ml
Acquisition interval : 0.430 sec

rid1A

Mn :	6.8284e2	g/mol
Mw :	7.7689e2	g/mol
Mz :	9.5695e2	g/mol
Mv :	0.000000	g/mol
D :	1.1377e0	
[n] :	0.000000	ml/g
Vp :	1.8374e1	ml
Mp :	6.8934e2	g/mol
A :	4.8463e3	ml ² /V
10% :	4.9251e2	g/mol
30% :	6.0480e2	g/mol
60% :	7.2664e2	g/mol
85% :	9.5542e2	g/mol
90% :	1.1248e3	g/mol

Fig S17. GPC curve of prepared oligomer with Cp_2HfCl_2 , [cat]= 10 μmol , [1-hexene]= 0.08 mol,

t=3 h, Al/M= 500, T=80 °C



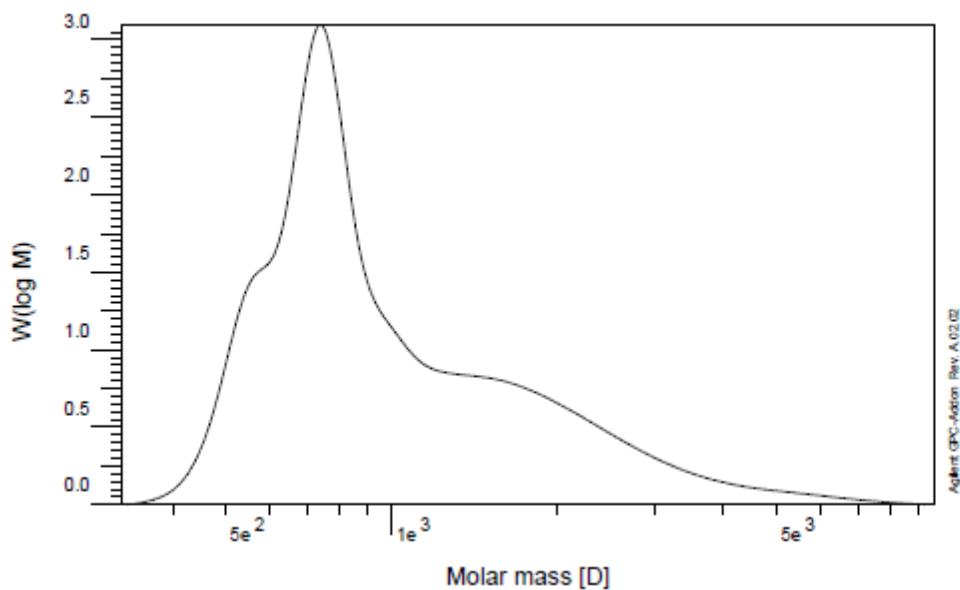
Sample : 7-SECOND
Injection Date : 18-Jun-20, 10:44:35
Calibration File : C:\HPCHEM\1\DATA\KAZEM\ICAL990312.CAL
Calibration Date : Tuesday 20/06/09 13:51:38
Baseline from : 16.457 min
Integration from: 16.457 min
MHK - A (Cal.): 0.000000E+0
Eluent : THF
Concentration : 1.000 g/l
Column 1 : PLgel OH-MIXED C
Detector 1 : RID A, Refractive Index Signal
Operator : IPP1
Baseline to : 19.247 min
Integration to : 19.247 min
MHK - K (Cal.): 1.000000E+0 ml/g
Flowrate : 1.000 ml/min
Inject volume : 20.000 ul
Temperature : 30.010 C
Delay volume : 0.000 ml
Acquisition interval : 0.430 sec

rid1A

Mn : 7.5435e2 g/mol
Mw : 8.8157e2 g/mol
Mz : 1.1188e3 g/mol
Mv : 0.000000 g/mol
D : 1.1686e0
[n] : 0.000000 ml/g
Vp : 1.8310e1 ml
Mp : 7.3592e2 g/mol
A : 5.5023e3 ml²/V
< 286 : 0.00
w% : 100.00
> 4845 : 0.00

Fig S18. GPC curve of prepared oligomer with Cp_2HfCl_2 , [cat]= 10 μmol , [1-hexene]= 0.08 mol,

t=9 h, Al/M= 500, T=80 °C

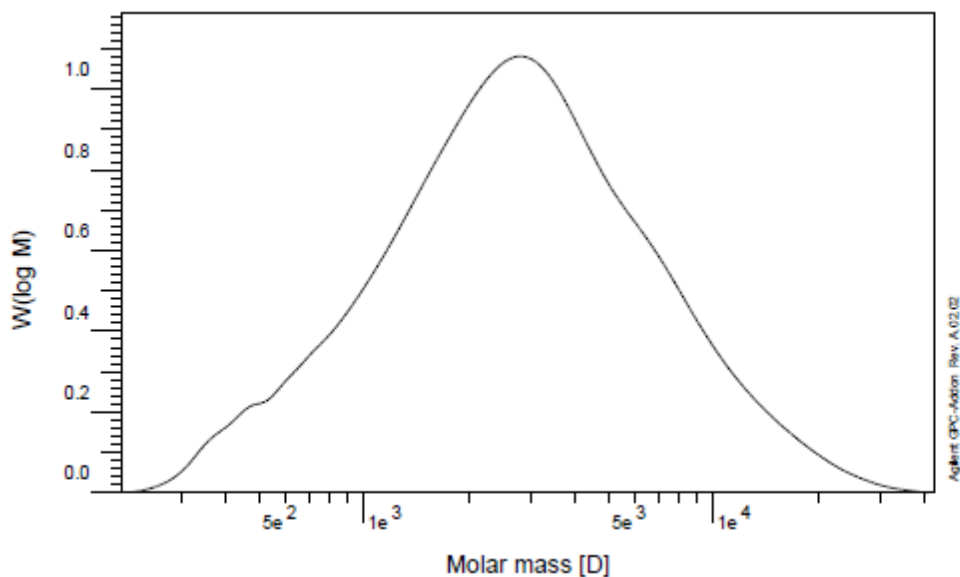


Sample : 2
Injection Date : 18-Jun-20, 10:15:41
Calibration File : C:\HPCHEM\1\DATA\KAZEMICAL990312.CAL
Calibration Date : Tuesday 20/06/09 13:51:38
Baseline from : 15.784 min
Integration from : 15.784 min
MHK - A (Cal.): 0.000000E+0
Eluent : THF
Concentration : 1.000 g/l
Column 1 : PLgel OH-MIXED C
Detector 1 : RID A, Refractive Index Signal
Operator : IPP1
Baseline to : 19.130 min
Integration to : 19.130 min
MHK - K (Cal.): 1.000000E+0 ml/g
Flowrate : 1.000 ml/min
Inject volume : 20.000 ul
Temperature : 29.990 C
Delay volume : 0.000 ml
Acquisition interval : 0.430 sec

rid1A
Mn : 8.7898e2 g/mol
Mw : 1.2015e3 g/mol
Mz : 1.9092e3 g/mol
Mv : 0.000000 g/mol
D : 1.3670e0
[n] : 0.000000 ml/g
Vp : 1.8302e1 ml
Mp : 7.4127e2 g/mol
A : 5.4024e3 ml³/V
< 322 : 0.00
w% : 100.00
> 9680 : 0.00

Fig S19. GPC curve of prepared oligomer with Cp_2HfCl_2 , $[\text{cat}] = 10 \mu\text{mol}$, $[\text{1-hexene}] = 0.08 \text{ mol}$,

$t = 18 \text{ h}$, $\text{Al/M} = 500$, $T = 80 \text{ }^\circ\text{C}$

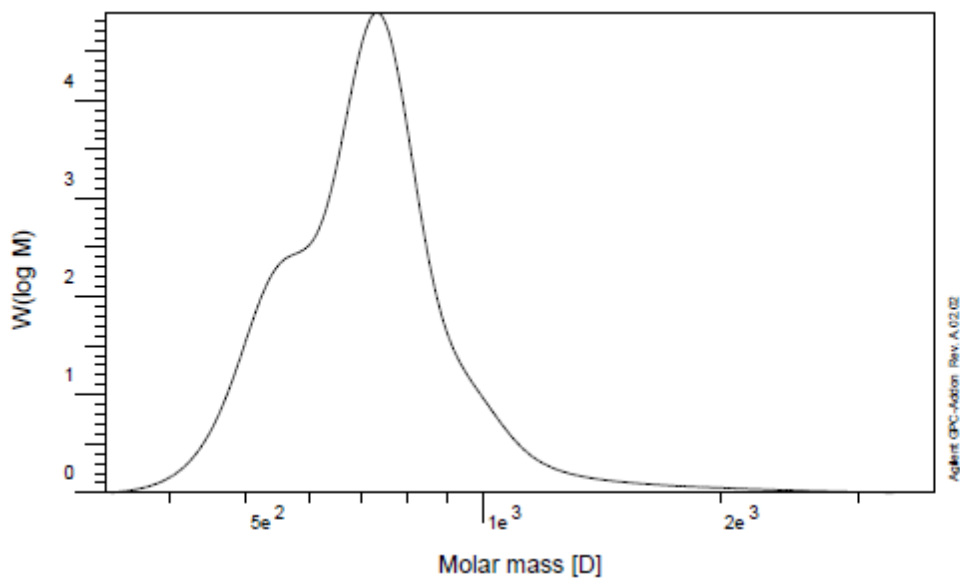


Sample : HF-HEX-RT
Injection Date : 19-Dec-17, 09:25:29
Calibration File : C:\HPCHEM\1\DATA\13960802\06-09-01-cal-01.CAL
Calibration Date : Thursday 17/11/30 09:46:40
Baseline from : 14.241 min
Integration from: 14.241 min
MHK - A (Cal.): 0.000000E+0
Eluent : THF
Concentration : 1.000 g/l
Column 1 : PLgel OH-MIXED C
Detector 1 : RID A, Refractive Index Signal
Operator : IPP1
Baseline to : 19.443 min
Integration to : 19.443 min
MHK - K (Cal.): 1.000000E+0 ml/g
Flowrate : 1.000 ml/min
Inject volume : 20.000 ul
Temperature : 29.980 C
Delay volume : 0.000 ml
Acquisition interval : 0.430 sec

rid1A
Mn : 1.8160e3 g/mol
Mw : 3.9828e3 g/mol
Mz : 7.9717e3 g/mol
Mv : 0.000000 g/mol
D : 2.1932e0
[n] : 0.000000 ml/g
Vp : 1.6891e1 ml
Mp : 2.8052e3 g/mol
A : 6.0696e3 ml²/V
< 200 0.00
w% : 100.00
> 43180 0.00

Fig S20. GPC curve of prepared oligomer with Cp_2HfCl_2 , [cat]= 10 μmol , [1-hexene]= 0.08 mol,

t=24 h, Al/M= 500, T=80 °C

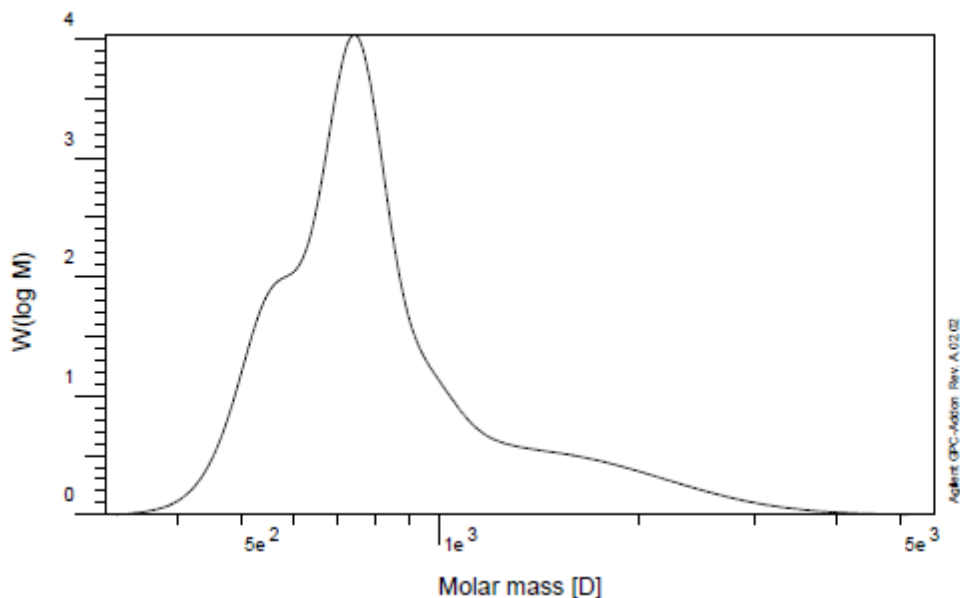


Sample : 1
Injection Date : 18-Jun-20, 09:18:44
Calibration File : C:\HPCHEM\1\DATA\KAZEMICAL990312.CAL
Calibration Date : Tuesday 20/06/09 13:51:38
Baseline from : 16.709 min
Integration from: 16.709 min
MHK - A (Cal.): 0.000000E+0
Eluent : THF
Concentration : 1.000 g/l
Column 1 : PLgel OH-MIXED C
Detector 1 : RID A, Refractive Index Signal
Operator : IPP1
Baseline to : 19.102 min
Integration to : 19.102 min
MHK - K (Cal.): 1.000000E+0 ml/g
Flowrate : 1.000 ml/min
Inject volume : 20.000 ul
Temperature : 30.000 C
Delay volume : 0.000 ml
Acquisition interval : 0.430 sec

rid1A
Mn : 6.8952e2 g/mol
Mw : 7.3789e2 g/mol
Mz : 8.0995e2 g/mol
Mv : 0.000000 g/mol
D : 1.0701e0
[n] : 0.000000 ml/g
Vp : 1.8317e1 ml
Mp : 7.3062e2 g/mol
A : 5.6647e3 ml²/V
< 330 0.00
w% : 100.00
> 3744 0.00

Fig S21. GPC curve of prepared oligomer with Cp_2HfCl_2 , [cat]= 10 μmol , [1-octene]= 0.08 mol,

t=3 h, Al/M= 500, T=80 °C

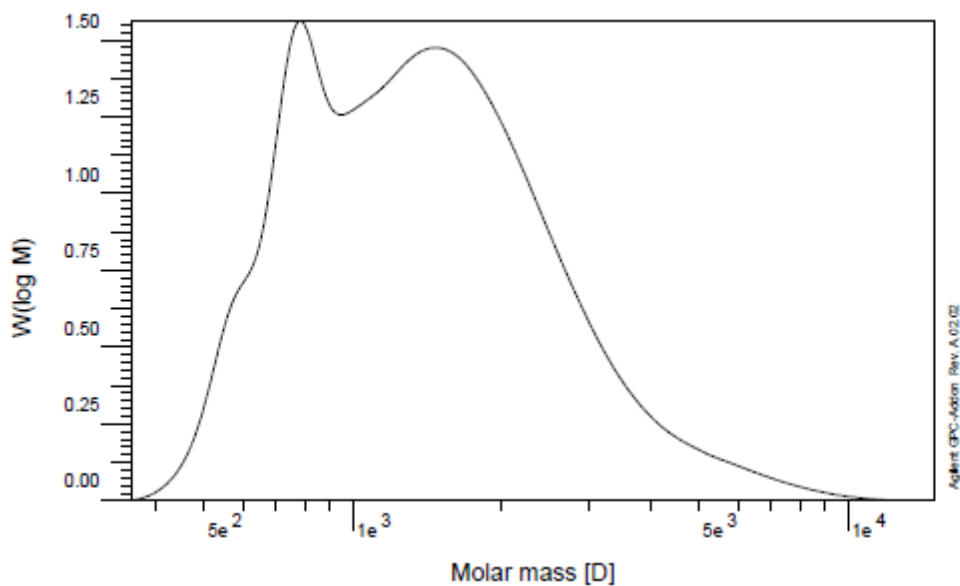


Sample : 3
Injection Date : 18-Jun-20, 09:47:49
Calibration File : C:\HPCHEM\1\DATA\KAZEM\ICAL990312.CAL
Calibration Date : Tuesday 20/06/09 13:51:38
Baseline from : 16.311 min
Integration from : 16.311 min
MHK - A (Cal.): 0.000000E+0
Eluent : THF
Concentration : 1.000 g/l
Column 1 : PLgel OH-MIXED C
Detector 1 : RID A, Refractive Index Signal
Operator : IPP1
Baseline to : 19.161 min
Integration to : 19.161 min
MHK - K (Cal.): 1.000000E+0 ml/g
Flowrate : 1.000 ml/min
Inject volume : 20.000 ul
Temperature : 30.010 C
Delay volume : 0.000 ml
Acquisition interval : 0.430 sec

rid1A
Mp : 7.6988e2 g/mol
Mw : 9.1024e2 g/mol
Mz : 1.1746e3 g/mol
Mv : 0.000000 g/mol
D : 1.1823e0
[n] : 0.000000 ml/g
Vp : 1.8302e1 ml
Mp : 7.4127e2 g/mol
A : 4.9708e3 ml¹V
< 312 0.00
w% 100.00
> 5630 0.00

Fig S22. GPC curve of prepared oligomer with Cp_2HfCl_2 , [cat]= 10 μmol , [1-octene]= 0.08 mol,

t=9 h, Al/M= 500, T=80 °C

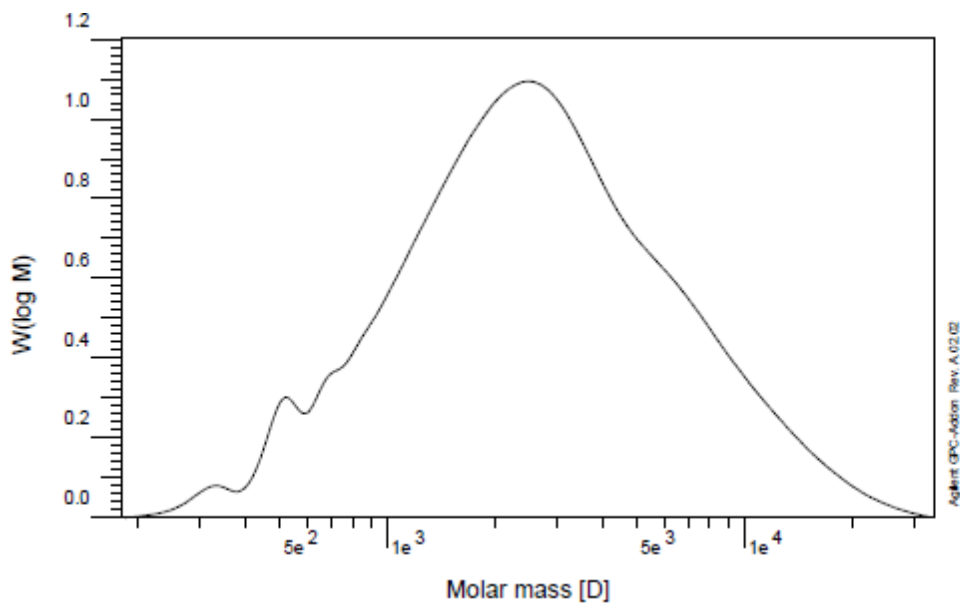


Sample : 5
Injection Date : 18-Jun-20, 07:28:56
Calibration File : C:\HPCHEM\1\DATA\KAZEM\CAL990312.CAL
Calibration Date : Tuesday, 20/06/09 13:51:38
Baseline from : 15.360 min
Integration from : 15.360 min
MHK - A (Cal.): 0.000000E+0
Eluent : THF
Concentration : 1.000 g/l
Column 1 : PLgel OH-MIXED C
Detector 1 : RID A, Refractive Index Signal
Operator : IPP1
Baseline to : 19.029 min
Integration to : 19.029 min
MHK - K (Cal.): 1.000000E+0 ml/g
Flowrate : 1.000 ml/min
Inject volume : 20.000 ul
Temperature : 29.990 C
Delay volume : 0.000 ml
Acquisition interval : 0.430 sec

rid1A
Mn : 1.1865e3 g/mol
Mw : 1.6566e3 g/mol
Mz : 2.4828e3 g/mol
Mv : 0.000000 g/mol
D : 1.3963e0
[n] : 0.000000 ml/g
Vp : 1.8245e1 ml
Mp : 7.8569e2 g/mol
A : 4.0481e3 ml³/V
< 356 : 0.00
w% : 100.00
> 15012 : 0.00

Fig S23. GPC curve of prepared oligomer with Cp_2HfCl_2 , [cat]= 10 μmol , [1-octene]= 0.08 mol,

t=18 h, Al/M= 500, T=80 °C



Sample : R-hf-OCT-80
Injection Date : 22-Jan-18, 09:15:45
Calibration File : C:\HPCHEM\1\DATA\13960802\96-10-01-cal-01.CAL
Calibration Date : Thursday 18/01/18 08:55:00
Baseline from : 14.473 min
Integration from: 14.473 min
MHK - A (Cal.): 0.000000E+0
Eluent : THF
Concentration : 1.000 g/l
Column 1 : PLgel OH-MIXED C
Detector 1 : RID A, Refractive Index Signal
Operator : IPP1

Baseline to : 19.575 min
Integration to : 19.575 min
MHK - K (Cal.): 1.000000E+0 ml/g
Flowrate : 1.000 ml/min
Inject volume : 20.000 ul
Temperature : 29.990 C
Delay volume : 0.000 ml
Acquisition interval : 0.430 sec

rid1A

Mn :	1.7754e3	g/mol
Mw :	3.7812e3	g/mol
Mz :	7.4647e3	g/mol
Mv :	0.000000	g/mol
D :	2.1298e0	
[n] :	0.000000	ml/g
Vp :	1.7021e1	ml
Mp :	2.4882e3	g/mol
A :	3.3221e3	ml ² /V
< 180	0.00	
w% :	100.00	
> 34213	0.00	

Fig S24. GPC curve of prepared oligomer with Cp_2HfCl_2 , [cat]= 10 μmol , [1-octene]= 0.08 mol,

t=24 h, Al/M= 500, T=80 °C