

Material Testing Report

BKSMT-0031

LFT-HPP-NG04

PP+40%LGF

Xiamen LFT composite plastic Co.,Ltd

Report date: 2021-40-30

Test date: 2021-4-30

Measured by: Bangkesi CAE material Lab

Authorized by: Tober

Basic information

Manufacturer	Xiamen LFT composite plastic Co.,Ltd
Trade name	LFT-HPP-NG04
Family name	PP
Filler	Long Glass fiber 40%
Material Type	Semi-crystalline

Parameter Summary

Recommended Processing:

Minimum Melt temperature:	200	°C
Maximum Melt temperature:	260	°C
General Melt temperature:	245	°C
Minimum Mold temperature:	40	°C
Maximum Mold temperature:	60	°C
General Mold temperature:	50	°C
Absolute maximum melt temperature:	280	°C
Ejection temperature:	117	°C
Transition temperature:	131.1	°C
Maximum shear stress:	0.25	MPa
Maximum shear rate:	100000	1/s

Note:

- ✧ Recommended temperature value is provided by material manufacture.
- ✧ Maximum shear stress and maximum shear rate values have been supplemented with generic estimates.

Operator's Notes:

- ✧ Testing was performed per standard testing procedures.
- ✧ No anomalies were noted during the course of testing.

Viscosity:

Modified Cross Model(3)		
n	0.371	-
τ^*	227649.00	dyne/cm ²
D_1	1.92219E+16	poise
D_2	263.15	K
D_3	0.00	(dyne/cm ²) ⁻¹
A_1	33.491	1/ K
\tilde{A}_2	51.60	K

Cross-WLF Model		
n	0.3710	-
τ^*	22764.90	Pa
D_1	1.92219E+15	Pa-s
D_2	263.15	K
D_3	0.00	K/Pa
A_1	33.4910	1/ K
\tilde{A}_2	51.60	K

Pressure-Volume-Temperature:

Melt density	1.0609	g/cm ³
Solid density	1.24517	g/cm ³

2-domain modified Tait PVT model		
b1L	0.8949	cc/g
b2L	0.0004982	cc/g-K
b3L	1303690000	dyne/cm ²
b4L	0.004651	1/K
b1s	0.8296	cc/g
b2s	0.0002319	cc/g-K
b3s	3214600000	dyne/cm ²
b4s	0.0005518	1/K
b5	412.48	K

b6	2.605E-08	cm2.K/dyne
b7	0.0653	cc/g
b8	0.1387	1/K
b9	4.038E-09	cm2/dyne

2-domain modified Tait PVT model		
b5	412.48	K
b6	2.60500E-07	K/Pa
b1m	0.0008949	m3/Kg
b2m	4.98200E-07	m3/(Kg K)
b3m	1.30369E+08	Pa
b4m	0.004651	1/K
b1s	0.0008296	m3/Kg
b2s	2.31900E-07	m3/(Kg K)
b3s	3.21460E+08	Pa
b4s	5.51800E-04	1/K
b7	6.53000E-05	m3/Kg
b8	0.1387	1/K
b9	4.038E-08	1/Pa

Specific heat data:

Cp	
Temperature, °C	Cp, J/Kg K
30	1363.060
50	1452.510
70	1544.460
90	1664.270
100	1747.420
106	1830.220
110	1934.240
113	2099.130
115	2322.130
117	2759.570
118	3123.180
119	3627.130
120	4297.130
121	5108.880
122	5924.290
123	6587.890

124	7012.480
125	7163.230
126	7000.070
127	6451.360
128	5490.280
129	4291.800
130	3230.540
131	2523.630
132	2139.360
133	1953.480
135	1831.760
137	1809.200
140	1809.810
144	1818.430
150	1829.790
160	1848.840
180	1889.460
200	1922.110
220	1948.350

Cp	
Temperature, °C	Cp, erg/g.C
30	1.3631E+07
50	1.4525E+07
70	1.5445E+07
90	1.6643E+07
100	1.7474E+07
106	1.8302E+07
110	1.9342E+07
113	2.0991E+07
115	2.3221E+07
117	2.7596E+07
118	3.1232E+07
119	3.6271E+07
120	4.2971E+07
121	5.1089E+07
122	5.9243E+07
123	6.5879E+07
124	7.0125E+07
125	7.1632E+07
126	7.0001E+07

127	6.4514E+07
128	5.4903E+07
129	4.2918E+07
130	3.2305E+07
131	2.5236E+07
132	2.1394E+07
133	1.9535E+07
135	1.8318E+07
137	1.8092E+07
140	1.8098E+07
144	1.8184E+07
150	1.8298E+07
160	1.8488E+07
180	1.8895E+07
200	1.9221E+07
220	1.9484E+07

Thermal conductivity data:

Thermal conductivity	
Temperature, °C	erg/(sec.cm.°C)
240	25400.000
220	25000.000
200	25100.000
180	24800.000
160	25000.000
140	28300.000
120	28300.000
100	27400.000
80	27500.000
60	27100.000

Thermal conductivity	
Temperature, °C	W/m K
240	0.254
220	0.25
200	0.251
180	0.248
160	0.25
140	0.283

120	0.283
100	0.274
80	0.275
60	0.271

Mechanical Properties:

Elastic modulus				
1st principal direction [E1]	9280.48	Mpa	9.2805E+10	dyne/cm2
2nd principal direction [E2]	4005.99	Mpa	4.0060E+10	dyne/cm2

Poisson's ratio & moldex3D	
Poisson's ratio [v12]	0.4575
Poisson's ratio [v23]	0.4520

Transversely isotropic coefficient of thermal expansion [CTE] data	
Alpha1	1.799200E-05
Alpha2	6.43707E-05

Shear modulus [G12] MPa	1396.36
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Viscosity raw data:

Test standard: ASTM D3835

Pressure drop across the die is measured for each flow rate, and viscosity-shear rate data are calculated

Test instrument: Gottfert RG25

Test specifications:

Pre-processing	dried at:	90°C 3h	
Moisture Level		<0.05%	
Capillary type	Die Dia	1	mm
	Length	30 20 10	mm

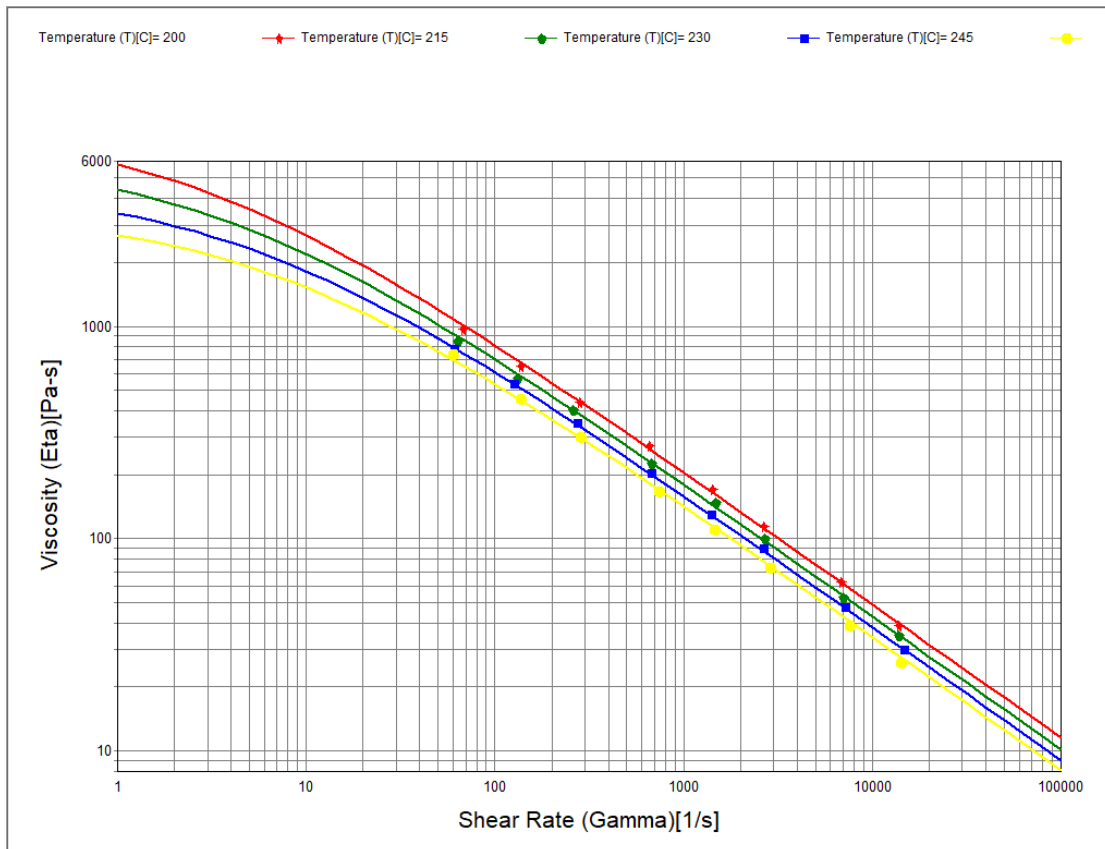
	Die entry angle	90	degrees
Corrections	Bagley,Rabinowitch		

Temperature(°C)	Viscosity(Pa-s) Corrected	Shear rate(1/s) Corrected	Die dia(mm)	L/D
200	975.0965297	67.93677553	1	30
200	650.4454195	137.2828485	1	30
200	440.3810082	280.5260301	1	30
200	275.424217	658.03905	1	30
200	170.5581369	1418.797745	1	30
200	114.4825865	2663.194982	1	30
200	62.75601235	6859.369168	1	30
200	38.96623306	13849.44711	1	30
215	848.6837945	63.37550022	1	30
215	574.0053516	131.6462049	1	30
215	407.437738	260.5652007	1	30
215	228.0004813	673.8245375	1	30
215	147.546299	1468.471262	1	30
215	100.6408938	2683.278023	1	30
215	52.86673269	7043.650753	1	30
215	35.2121215	13849.44711	1	30
230	787.6331479	60.68092664	1	30
230	536.7222835	126.6623393	1	30
230	350.9597288	272.5976493	1	30
230	203.7120294	675.8109892	1	30
230	130.0867001	1406.720067	1	30
230	89.75516075	2656.03502	1	30
230	47.9345913	7170.656736	1	30
230	30.23220049	14665.44621	1	30
245	739.6527033	60.21452142	1	30
245	458.1540929	137.7484147	1	30
245	302.9259655	283.2677744	1	30
245	166.4269199	741.2275865	1	30
245	110.3108666	1449.411405	1	30
245	73.02074921	2876.040349	1	30
245	38.97330713	7573.304805	1	30
245	26.24525535	14125.21215	1	30
200	1168.774079	65.1494599	1	20
200	817.0144342	132.3492529	1	20
200	556.899651	243.8721777	1	20
200	327.5023972	631.140904	1	20
200	225.3209522	1254.174279	1	20

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200	146.3386327	2590.059553	1	20
200	65.30681316	7445.301101	1	20
200	46.215125	13221.21552	1	20
215	975.5161208	73.34966764	1	20
215	684.5655651	146.1784745	1	20
215	470.5669889	276.2947413	1	20
215	269.2869641	737.8362013	1	20
215	181.3689149	1391.953682	1	20
215	99.46765843	3259.992541	1	20
215	58.83502491	7090.750892	1	20
215	38.121545	14224.215	1	20
230	907.8883634	67.56337285	1	20
230	617.8556439	139.5404231	1	20
230	419.6001319	260.7532789	1	20
230	235.87301	660.6859671	1	20
230	147.1617881	1359.323742	1	20
230	95.98052184	2748.960327	1	20
230	50.05247704	6986.402766	1	20
230	33.121245	12224.2155	1	20
245	813.1572207	74.37803651	1	20
245	552.2030589	146.9613231	1	20
245	356.7832523	299.8213882	1	20
245	194.0695387	746.0792197	1	20
245	128.4331729	1440.675194	1	20
245	79.11909577	3035.534566	1	20
245	45.2111125	7254.2544	1	20
245	28.2155	14225.25545	1	20
200	1826.189332	66.85916836	1	10
200	1247.565317	148.3527463	1	10
200	872.8880132	263.8286688	1	10
200	534.5678882	648.3509428	1	10
200	314.2836484	1521.514316	1	10
200	209.0066913	2597.394816	1	10
200	100.2850924	7031.503098	1	10
200	72.0215	11212.12526	1	10
215	1503.905276	72.97223517	1	10
215	1034.630352	142.9452329	1	10
215	708.0485958	265.5196295	1	10
215	407.397444	714.8547549	1	10
215	235.6999964	1557.00037	1	10
215	154.611186	2955.380533	1	10
215	85.28385401	7027.231437	1	10
215	56.22545	13255.2155	1	10

230	1157.802868	93.45052766	1	10
230	833.2200549	164.2243237	1	10
230	533.7417565	315.1822654	1	10
230	275.2010376	914.834279	1	10
230	179.7946584	1804.406579	1	10
230	120.7641904	3528.606438	1	10
230	52.8642643	11298.62744	1	10
245	943.6985109	93.24991181	1	10
245	655.0257394	171.4015652	1	10
245	447.9327509	300.2682874	1	10
245	234.2357557	876.4502829	1	10
245	150.5583339	1832.673741	1	10
245	90.20064403	4065.276884	1	10
245	49.03018376	10449.94044	1	10



PVT raw data:

Test standard: ISO17744

isobaric cooling 5 °C/min The machine is heated to the processing temperature, keeping in fixed pressure, then cooling to 40 °C at constant rate of 5 °C/min. Measure the volume change at least 4 different pressures.

Test instrument: GOTECH PVT6000 (piston type)

Test specifications:

pre-processing	dried at:	90°C 3h
Moisture Level		<0.05%
measure type		isobaric cooling 5° C/min

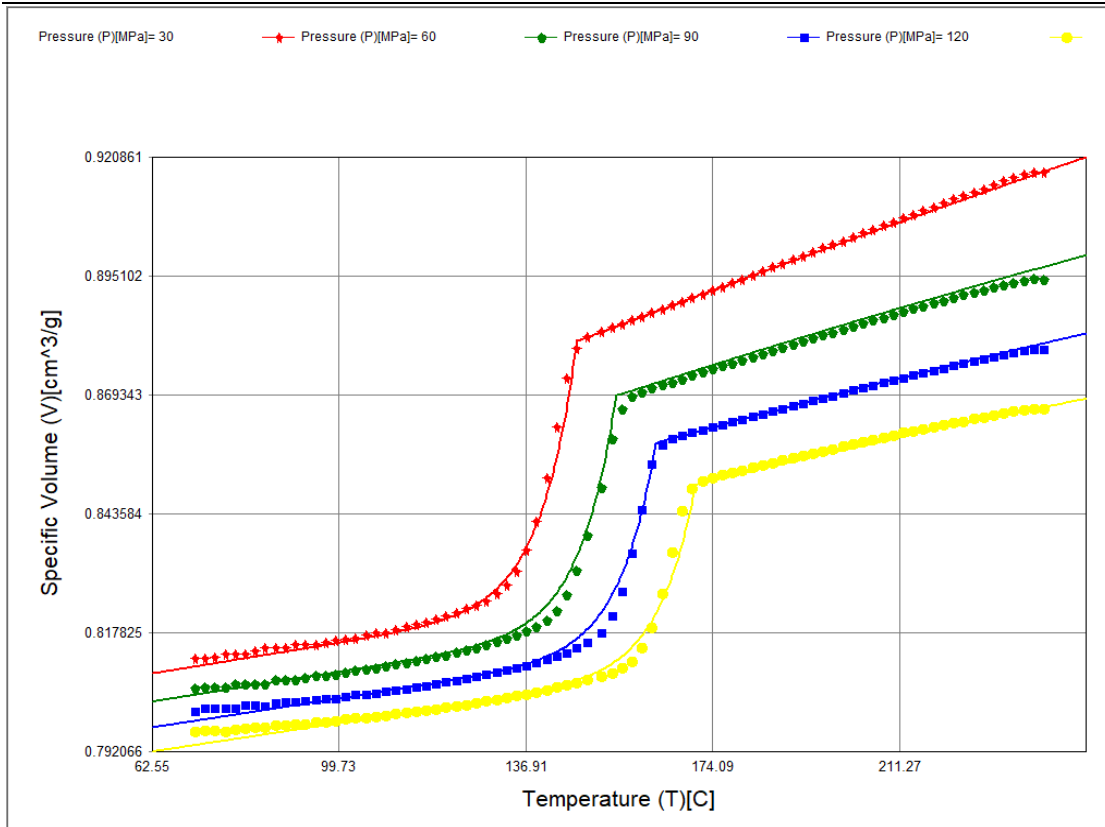
Pressure-Volume-Temperature Data					
Specific Volume cm ³ /g	Pressure Mpa				
Temperature °C	30	60	90	120	150
240	0.9176	0.8945	0.8792	0.8664	0
238	0.9177	0.8946	0.8792	0.8663	0
236	0.9172	0.8942	0.8789	0.8661	0
234	0.9164	0.8938	0.8785	0.8658	0
232	0.9157	0.8933	0.8781	0.8654	0
230	0.9149	0.8928	0.8776	0.8649	0
228	0.914	0.8922	0.8771	0.8646	0
226	0.9133	0.8917	0.8767	0.8642	0
224	0.9125	0.8911	0.8762	0.8637	0
222	0.9118	0.8905	0.8757	0.8634	0
220	0.9109	0.8899	0.8751	0.8629	0
218	0.9101	0.8893	0.8746	0.8625	0
216	0.9093	0.8887	0.8741	0.862	0
214	0.9085	0.8881	0.8736	0.8616	0
212	0.9077	0.8875	0.8731	0.8612	0
210	0.9069	0.8869	0.8726	0.8606	0
208	0.9061	0.8862	0.872	0.8602	0
206	0.9052	0.8856	0.8715	0.8597	0
204	0.9045	0.885	0.8709	0.8592	0
202	0.9036	0.8843	0.8704	0.8587	0
200	0.9028	0.8836	0.8698	0.8582	0
198	0.9019	0.883	0.8692	0.8577	0
196	0.9012	0.8824	0.8687	0.8572	0
194	0.9003	0.8817	0.8681	0.8567	0
192	0.8995	0.881	0.8676	0.8562	0
190	0.8987	0.8803	0.867	0.8557	0
188	0.8979	0.8797	0.8664	0.8552	0
186	0.8971	0.879	0.8658	0.8547	0
184	0.8963	0.8783	0.8652	0.8542	0
182	0.8954	0.8777	0.8647	0.8536	0
180	0.8945	0.877	0.8641	0.8531	0
178	0.8937	0.8763	0.8635	0.8526	0
176	0.8929	0.8757	0.863	0.8521	0

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174	0.892	0.875	0.8624	0.8515	0
172	0.8912	0.8743	0.8618	0.8508	0
170	0.8904	0.8736	0.8612	0.8491	0
168	0.8896	0.8729	0.8606	0.8443	0
166	0.8888	0.8722	0.8599	0.8354	0
164	0.888	0.8716	0.8585	0.8263	0
162	0.8872	0.8709	0.8543	0.819	0
160	0.8863	0.8701	0.8446	0.8145	0
158	0.8856	0.8691	0.835	0.8117	0
156	0.8848	0.8664	0.8268	0.8102	0
154	0.884	0.8598	0.8214	0.8092	0
152	0.8832	0.8493	0.8179	0.8084	0
149	0.8819	0.8389	0.8158	0.8077	0
147	0.8794	0.8315	0.8145	0.8071	0
145	0.8731	0.826	0.8135	0.8066	0
143	0.8625	0.8227	0.8127	0.806	0
141	0.8515	0.8207	0.8121	0.8055	0
139	0.8419	0.8192	0.8114	0.805	0
137	0.8357	0.8182	0.8108	0.8046	0
135	0.8311	0.8174	0.8103	0.8042	0
133	0.8282	0.8167	0.8098	0.8038	0
131	0.8263	0.8159	0.8093	0.8034	0
129	0.8248	0.8153	0.8088	0.803	0
127	0.8239	0.8147	0.8084	0.8027	0
125	0.823	0.8141	0.808	0.8023	0
123	0.8222	0.8136	0.8075	0.802	0
121	0.8215	0.8131	0.8072	0.8017	0
119	0.8208	0.8127	0.8068	0.8013	0
117	0.8201	0.8122	0.8064	0.8011	0
115	0.8197	0.8118	0.8061	0.8008	0
113	0.8192	0.8113	0.8057	0.8005	0
111	0.8185	0.8111	0.8055	0.8003	0
109	0.8179	0.8107	0.8051	0.8	0
107	0.8178	0.8103	0.8048	0.7997	0
105	0.8174	0.8099	0.8045	0.7995	0
103	0.8166	0.8098	0.8044	0.7994	0
101	0.8164	0.8094	0.804	0.7991	0
99	0.8163	0.8088	0.8036	0.7987	0
97	0.8157	0.8087	0.8036	0.7986	0
95	0.8153	0.8086	0.8034	0.7986	0
93	0.8153	0.8081	0.803	0.7981	0
91	0.8152	0.8078	0.8028	0.798	0
89	0.8145	0.8078	0.8028	0.7979	0

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87	0.8145	0.8077	0.8027	0.7979	0
85	0.8145	0.8069	0.802	0.7973	0
83	0.8139	0.8069	0.8021	0.7973	0
81	0.8133	0.8069	0.8021	0.7972	0
79	0.8133	0.8068	0.8016	0.797	0
77	0.8133	0.8061	0.8014	0.7965	0
75	0.8125	0.8062	0.8014	0.7966	0
73	0.8124	0.8062	0.8014	0.7966	0
71	0.8124	0.8058	0.8008	0.7965	0
69	0.8125	0.8054	0.8007	0.796	0
67	0.8115	0.8054	0.8007	0.796	0
65	0.8114	0.8054	0.8007	0.7961	0
63	0.8114	0.8053	0.8006	0.796	0
61	0.8114	0.8045	0.8	0.7955	0
59	0.8112	0.8046	0.8001	0.7956	0
57	0.8103	0.8046	0.8001	0.7956	0
55	0.8105	0.8045	0.8001	0.7956	0
52	0.8105	0.8043	0.8	0.7956	0
50	0.8105	0.8035	0.7994	0.7949	0
48	0.8104	0.8035	0.7995	0.795	0
46	0.8095	0.8035	0.7995	0.795	0
44	0.8096	0.8035	0.7994	0.795	0
42	0.8097	0.8034	0.7993	0.7949	0
40	0.8097	0.8031	0.7992	0.7948	0



Heat Capacity raw data:

Test standard: ASTM E1269

The material is heated to its molten state and then cooled down to 30 °C at a constant rate of 20 °C/min.

Test instrument: NETZSCH DSC 214 Polyma

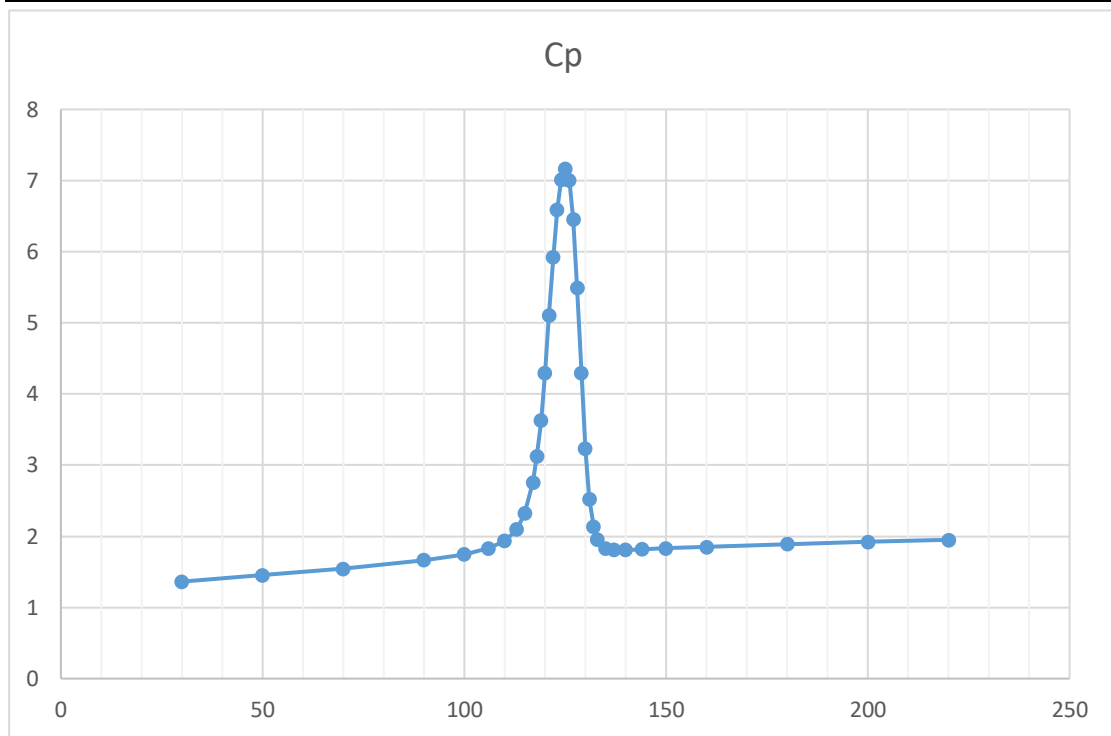
Test specifications:

pre-processing	90°C 3h
Moisture Level	<0.05%
Sample weight	20mg
Cooling rate	20°C/min
Purge gas	Nitrogen

Temperature, °C	Cp, J/g K
30	1.36306
50	1.45251
70	1.54446
90	1.66427
100	1.74742
106	1.83022
110	1.93424

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113	2.09913
115	2.32213
117	2.75957
118	3.12318
119	3.62713
120	4.29713
121	5.10888
122	5.92429
123	6.58789
124	7.01248
125	7.16323
126	7.00007
127	6.45136
128	5.49028
129	4.2918
130	3.23054
131	2.52363
132	2.13936
133	1.95348
135	1.83176
137	1.8092
140	1.80981
144	1.81843
150	1.82979
160	1.84884
180	1.88946
200	1.92211
220	1.94835



Thermal conductivity raw data:

Test standard: ASTM D 5930

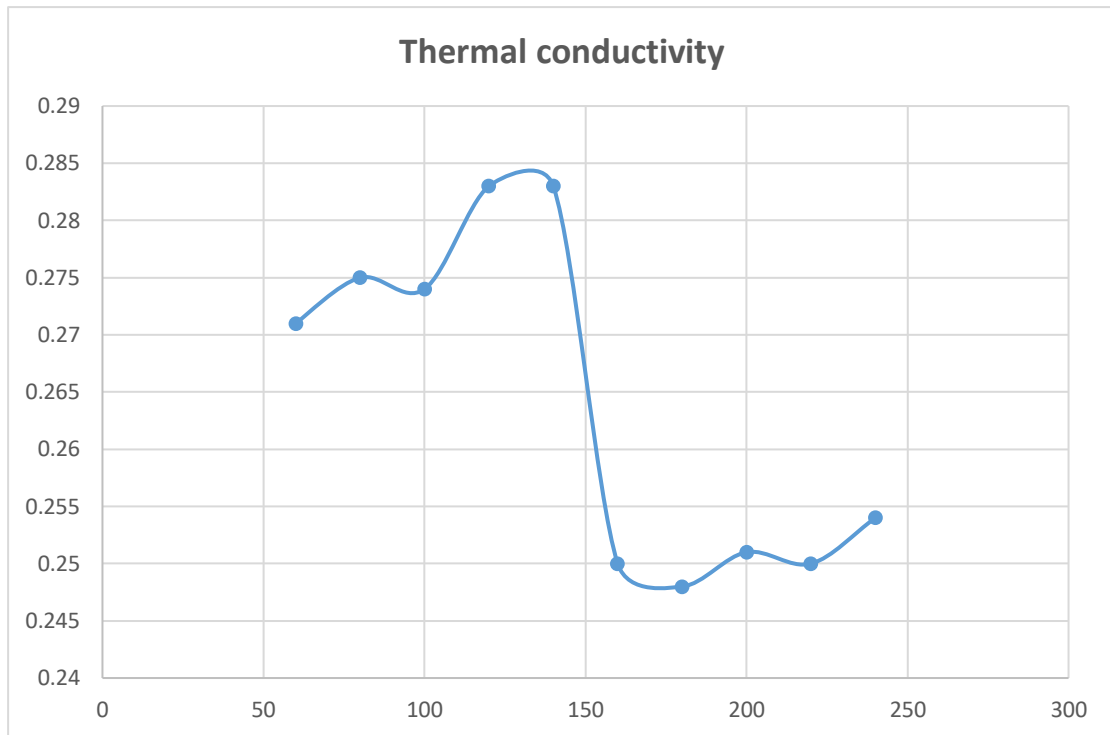
A line source probe is inserted into the molten polymer, and then the temperature gradient is measured after an applied voltage to the probe at each acquisition temperature.

Test instrument: GOTTFERT RG25

Test specifications:

pre-processing	90°C 3h
Moisture Level	<0.05%
Measure type	Isothermal Cooling

Temperature, °C	W/m K
240	0.254
220	0.25
200	0.251
180	0.248
160	0.25
140	0.283
120	0.283
100	0.274
80	0.275
60	0.271



Mechanical raw data

Elastic modulus and Poisson's ratio and shear modulus

Test standard:

ASTM D 638, Standard Test Method for Tensile Properties of Plastics

ASTM E 132, Standard Test Method for Poisson's Ratio at Room Temperature

Test instrument: MTS Universal Testing Machine

Test specifications:

Specimens Tested	5(per direction)
Pre-Processing	23°C ± 2°C at 50% ± 5% humidity for a minimum of 40 hours
Sample Form:	Machined from molded plaques
Test Speed:	5mm/min

	1st principal direction[E1] MPa	2nd principal direction[E2] MPa
piece1	9547.076648	3688.124221
piece2	9201.127642	3997.682918
piece3	9117.943142	4300.162943
piece4	9122.850827	4024.031462
piece5	9413.406923	4019.948354

	1st principal direction[V12]	2nd principal direction[V23]
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piece1	0.45	0.46
piece2	0.45	0.44
piece3	0.46	0.46
piece4	0.47	0.47
piece5	0.45	0.43

Shear modulus [G12] MPa	1396.36
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Coefficient of linear thermal expansion

Test standard: ASTM E831:2012

Test instrument: NETZSCH TMA 402 F3 Hyperion

Test specifications:

Specimens Tested:	3(per direction)
Pre-Processing:	23°C ± 2°C at 50% ± 5% humidity for a minimum of 40 hours
Sample Form:	Machined from molded plaques
Specimen Geometry:	10mm x 10mm x 3.0mm
Temperature Range:	25°C to 85°C

	Alpha 1	Alpha 2
piece1	1.7420E-05	6.3316E-05
piece2	1.7298E-05	6.3516E-05
piece3	1.9258E-05	6.6280E-05

Contact details

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