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APPENDICES

APPENDIX A

Calculations of Capillary Rheometer

- **Determination of True Viscosity and Power law Index**

We assumed that the polymer melt was incompressible, the flow was laminar and fully developed, and there was no slippage at the wall.

The force and plunger speed were converted into the wall shear stress (τ_w) and the apparent strain rate ($\dot{\gamma}_a$) by using the following equations involving the geometry of the capillary and plunger:

The wall shear stress (τ_w) : N/m^2

$$\tau_w = \frac{F}{4A_p l_c / d_c}, \tag{A.1}$$

where F is the piston force (kg), A_p is the cross section area of the plunger (mm^2), l_c is capillary length (mm), and d_c is capillary diameter (mm).

The apparent strain rate ($\dot{\gamma}_a$) : 1/sec

$$\dot{\gamma}_a = \frac{2V_p d^2_b}{15d^3_c}, \tag{A.2}$$

where V_p is the plunger speed (mm/sec) and d_b is barrel diameter (mm).

In this study, the Bagley correction was not applied because l_c/l_d ratio is 33.3 which was sufficient to neglect the end effect.

The apparent viscosity (η) was determined from :

$$\eta = \frac{\tau_w}{\overset{\circ}{\gamma}_a}\ , \tag{A.3}$$

where η is the melt viscosity. We assumed Non-newtonian melt; it obeyed the power law fluid behavior,

$$\tau_w = K(\overset{\circ}{\gamma}_w)^n\ , \tag{A.4}$$

where $\dot{\gamma}_{W}$ is the wall strain rate, n is the power law index and K is a constant. Alternatively we can write equation (A.4) as

$$\tau_w = \eta\overset{\circ}{\gamma}_w\ , \tag{A.5}$$

then it follows that

$$\eta = K(\overset{\circ}{\gamma}_w)^{n-1}. \tag{A.6}$$

From the definition of Robinowitz correction

$$\overset{\circ}{\gamma}_w = \frac{(3n+1)\overset{\circ}{\gamma}_{a,s}}{4n} \tag{A.7}$$

where $\dot{\gamma}_{a,s}$ is the apparent strain rate without slip. It follows that

$$\tau_w = K\left[\frac{(3n+1)}{4n}\overset{\circ}{\gamma}_{a,s}\right]^n\ , \tag{A.8}$$

or

$$\tau_w = K\left[\frac{(3n+1)}{4n}(\overset{\circ}{\gamma}_a - \frac{8V_s}{d_c})\right]\ , \tag{A.9}$$

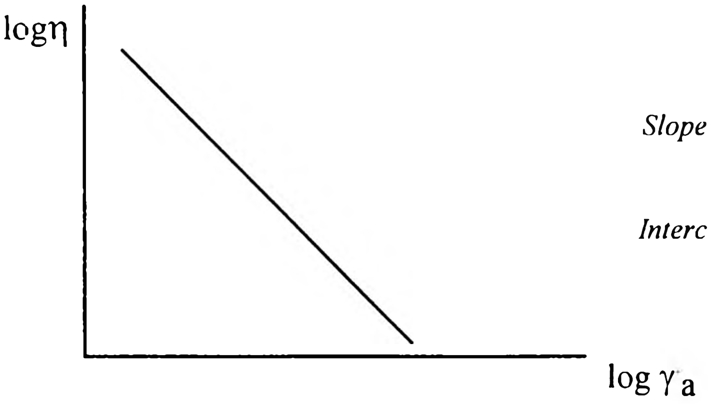
where V_S is the slip velocity. If we assume a small slip so $8V_S/\ d_C$ is much less than $\dot{\gamma}_a$ then,

$$\tau_w \cong K\left[\frac{(3n+1)}{4n}\right]^n(\overset{\circ}{\gamma}_a), \tag{A.10}$$

and

$$\eta \cong K\left[\frac{(3n+1)}{4n}\right]^n(\overset{\circ}{\gamma}_a)^{n-1}\ . \tag{A.11}$$

Thus the power law index (n) and a constant K were obtained from the graph of log η versus log $\dot{\gamma}_a$.



$$Slope = n - 1$$

$$Intercept = \log K\left[\frac{(3n+1)}{4n}\right]^n$$

- **Determination of Slip Velocity in Oscillating Regime**

The slip velocity experiment will be carried out using the capillary rheometer.

Mooney Analysis:

Mooney analysis is based the hypothesis that the apparent strain rate can be decomposed into the apparent strain rate without slip and the slip velocity term

$$\dot{\gamma}_a = \dot{\gamma}_{a,s} + \frac{8V_s}{d_c}, \qquad (A.12)$$

where $\gamma_{a,s}$ is the apparent strain rate corrected for the slip and V_s is the slip velocity. We assumed here that the apparent strain rate corrected for slip and the slip velocity are functions solely of the wall shear stress. A plot of γ_a versus $1/d_c$ will give a slope equal to $8V_s$.

Modified Mooney Analysis:

Modified Mooney Analysis is based on the same hypothesis as equation (A.12). But instead of performing an experiment using dies of various diameters, the apparent strain rate corrected for slip can be calculated directly, based on the non-Newtonian power behavior for melt. We can write

$$\tau_w = K\overset{\circ}{\gamma}_w{}^{n}, \tag{A.13}$$

where γ_W is true wall strain rate, n and K are an exponent and a constant which are to be determined from viscosity - strain rate experiment without slip effect. The modified Mooney analysis is then

$$\overset{\circ}{\gamma}_a = \left(\frac{4n}{3n+1}\right)\left(\frac{\tau}{K}\right)^{\frac{1}{n}} + \frac{8V_s}{d_c}, \tag{A.14}$$

where we have used the Robinowitz correction.

Oscillating Regime Slip :

At a certain flow rate, the load required for a constant piston speed will oscillate in a periodic fashion. We assume that the power behavior of equation (A.7) still hold and fluctuations are small compared to the mean value, we obtain the slip velocity (mm/sec) as:

$$\frac{8V_s}{d_c} = \frac{\Delta\tau_w}{n\eta}, \tag{A.15}$$

where η is the local value of the viscosity at that apparent strain rate. We are the first to derive and to use equation (A.15).

- **Determination of Wavelength in the Oscillating Regime**

The wavelength was obtained in two ways. Manual measurements with a ruler gave smaller values than those obtained from the oscillating load wavelength. The load wavelength were obtained from the period of load versus piston travel. Assuming the melts were incompressible, it can be shown that the expected extrudate wavelength (mm) should be

$$\lambda_e = \left(\frac{d_h}{d_c}\right)^2 \times \Delta T, \tag{A.16}$$

where ΔT is the difference of the plunger travel at a minimum and a maximum.

- **Determination of Extrapolation Length**

The extrapolation length was introduced by Brochard and de Gennes (1992) where they assumed that there was a thin slip layer of polymer melt near a solid wall. The nonzero velocity profile can be extrapolated to a zero value inside a wall at a distance called the extrapolation length "b". It is formally defined as

$$b = \frac{V_s}{\dot{\gamma}_{a,s}}, \qquad \text{(A.17)}$$

Calculations of Parallel Plate Rheometer

- **Normalizations**

Normalizations of the wall shear stress was by the recoverable shear factor, S_R, defined as

$$S_R = \frac{\tau_w}{G'}, \qquad \text{(A.18)}$$

where $\tau_{w,c}$ is the critical wall shear stress and G' is the plateau value of the storage modulus in the limit of large frequency, presumably the glassy storage modulus. We proposed to do the following normalizations:

Asymptotic Normalization was done by setting G' in equation (A.18) equal to G_g of glassy storage modulus:

$$S_R = \frac{\tau_w}{G_g}, \qquad \text{(A.19)}$$

G_g was be obtained from master curves of G' at the melt flow temperature. The master curves were obtained through measurements of G' as a function of frequency at various temperatures. Then the principle of the time-temperature superpositon was applied to shift G′ curves at different temperatures to form a single master curve of a fixed reference temperature.

Local Normalization was done by setting G′ in equation (A.18) equal to $G'_{(\omega)}$ where ω is

$$\omega = 2\pi\gamma^{\circ}_{a}\frac{h}{R}\,. \tag{A.20}$$

where ω is the angular frequency of G′ obtained from the parallel plate rheometer, h is the plate gap and R is the plate radius. Since G_g is the asymptotic state but it is not actual elastic force incurred in the capillary, the local value of G′ seem to be more appropriate elastic force.

APPENDIX B

Data of Flow Curve : The apparent strain rate ($\dot{\gamma}_a$) and the wall shear stress (τ_w).

1) HDPE/PP (P340J) blends of ratio 100/0. (Figure 3.1)

Velocity (mm/min)	Load (Kg)		$\dot{\gamma}_a$ (1/sec)	τ_w (N/m^2)	
	Maximum	Minimum		Maximum	Minimum
0.1	1.35E+01	-	2.71E+00	1.39E+04	-
0.5	2.55E+01	-	1.35E+01	2.63E+04	-
1	6.59E+01	-	2.71E+01	6.80E+04	-
3	1.57E+02	-	8.12E+01	1.62E+05	-
3.2	1.99E+02	-	8.66E+01	2.05E+05	-
5	2.53E+02	-	1.35E+02	2.61E+05	-
5.3	2.73E+02	-	1.43E+02	2.81E+05	-
7	2.88E+02	-	1.89E+02	2.97E+05	-
10	3.17E+02	-	2.71E+02	3.27E+05	-
10.5	3.12E+02	2.52E+02	2.84E+02	3.22E+05	2.60E+05
15	3.22E+02	2.53E+02	4.06E+02	3.32E+05	2.61E+05
20	3.32E+02	2.56E+02	5.41E+02	3.42E+05	2.64E+05
30	3.46E+02	2.60E+02	8.12E+02	3.57E+05	2.68E+05
40	3.41E+02	2.64E+02	1.08E+03	3.52E+05	2.72E+05
50	3.49E+02	2.64E+02	1.35E+03	3.60E+05	2.73E+05
54.6	2.67E+02	-	1.48E+03	2.75E+05	-
60	2.66E+02	-	1.62E+03	2.75E+05	-
70	2.77E+02	-	1.89E+03	2.86E+05	-
80	2.89E+02	-	2.17E+03	2.99E+05	-
90	2.99E+02	-	2.44E+03	3.08E+05	-
100	3.08E+02	-	2.71E+03	3.18E+05	-
102	3.11E+02	-	2.76E+03	3.21E+05	-
150	3.56E+02	-	4.06E+03	3.67E+05	-
200	3.82E+02	-	5.41E+03	3.94E+05	-
300	4.06E+02	-	8.12E+03	4.19E+05	-

2) HDPE/PP (P340J) blends of ratio 0/100. (Figure 3.2)

Velocity (mm/min)	Load (Kg)	γ_a (1/sec)	τ_w (N/m^2)
0.1	1.73E+01	2.71E+00	1.79E+04
0.5	3.68E+01	1.35E+01	3.80E+04
1	6.03E+01	2.71E+01	6.21E+04
3	8.87E+01	8.12E+01	9.14E+04
5	1.05E+02	1.35E+02	1.09E+05
10	1.29E+02	2.71E+02	1.33E+05
15	1.40E+02	4.06E+02	1.44E+05
20	1.48E+02	5.41E+02	1.52E+05
25	1.61E+02	6.77E+02	1.66E+05
30	1.69E+02	8.12E+02	1.74E+05
35	1.93E+02	9.47E+02	1.99E+05
40	1.96E+02	1.08E+03	2.02E+05
45	2.04E+02	1.22E+03	2.10E+05
48.5	2.11E+02	1.31E+03	2.17E+05
50	2.16E+02	1.35E+03	2.23E+05
55	2.30E+02	1.49E+03	2.38E+05
60	2.44E+02	1.62E+03	2.52E+05
70	2.55E+02	1.89E+03	2.63E+05
80	2.68E+02	2.17E+03	2.76E+05
90	2.95E+02	2.44E+03	3.04E+05
100	3.00E+02	2.71E+03	3.09E+05
120	3.16E+02	3.25E+03	3.26E+05
140	3.35E+02	3.79E+03	3.45E+05
160	3.39E+02	4.33E+03	3.49E+05
180	3.63E+02	4.87E+03	3.75E+05
200	3.91E+02	5.41E+03	4.03E+05
250	4.38E+02	6.77E+03	4.52E+05
300	4.47E+02	8.12E+03	4.61E+05

3) HDPE/PP (P340J) blends of ratio 20/80. (Figure 3.3)

Velocity (mm/min)	**Load (Kg)**	γ_a **(1/sec)**	τ_w **(N/m^2)**
1	6.96E+01	2.71E+01	7.17E+04
5	1.19E+02	1.35E+02	1.23E+05
10	1.47E+02	2.71E+02	1.51E+05
15	1.64E+02	4.06E+02	1.69E+05
20	1.78E+02	5.41E+02	1.83E+05
25	1.91E+02	6.77E+02	1.97E+05
30	2.05E+02	8.12E+02	2.11E+05
35	2.18E+02	9.47E+02	2.24E+05
40	2.30E+02	1.08E+03	2.37E+05
45	2.41E+02	1.22E+03	2.48E+05
50	2.55E+02	1.35E+03	2.63E+05
55	2.74E+02	1.49E+03	2.82E+05
59.7	2.93E+02	1.62E+03	3.02E+05
60	3.07E+02	1.62E+03	3.16E+05
68.8	3.23E+02	1.86E+03	3.33E+05
70	3.30E+02	1.89E+03	3.40E+05
75	3.35E+02	2.03E+03	3.46E+05
80	3.40E+02	2.17E+03	3.50E+05
85	3.52E+02	2.30E+03	3.63E+05
90	3.52E+02	2.44E+03	3.63E+05
95	3.50E+02	2.57E+03	3.61E+05
100	3.54E+02	2.71E+03	3.66E+05
110	3.78E+02	2.98E+03	3.89E+05
120	3.84E+02	3.25E+03	3.96E+05
130	3.89E+02	3.52E+03	4.01E+05
140	3.97E+02	3.79E+03	4.09E+05
150	4.19E+02	4.06E+03	4.32E+05
160	4.19E+02	4.33E+03	4.33E+05
170	4.17E+02	4.60E+03	4.30E+05
180	4.17E+02	4.87E+03	4.30E+05
190	4.19E+02	5.14E+03	4.32E+05
200	4.57E+02	5.41E+03	4.71E+05
250	4.71E+02	6.77E+03	4.86E+05
300	5.23E+02	8.12E+03	5.39E+05

4) HDPE/PP (P340J) blends of ratio 30/70. (Figure 3.4)

Velocity (mm/min)	Load (Kg)	γ_a (1/sec)	τ_w (N/m^2)
1	2.83E+01	2.71E+01	2.92E+04
5	1.19E+02	1.35E+02	1.23E+05
10	1.52E+02	2.71E+02	1.57E+05
15	1.73E+02	4.06E+02	1.78E+05
20	1.92E+02	5.41E+02	1.98E+05
25	2.07E+02	6.77E+02	2.14E+05
30	2.23E+02	8.12E+02	2.30E+05
35	2.35E+02	9.47E+02	2.43E+05
40	2.48E+02	1.08E+03	2.56E+05
45	2.62E+02	1.22E+03	2.70E+05
50	2.81E+02	1.35E+03	2.90E+05
52.5	2.85E+02	1.42E+03	2.94E+05
55	2.93E+02	1.49E+03	3.02E+05
60	3.09E+02	1.62E+03	3.19E+05
65	3.10E+02	1.76E+03	3.20E+05
70	3.11E+02	1.89E+03	3.21E+05
71.2	3.13E+02	1.93E+03	3.23E+05
75	3.20E+02	2.03E+03	3.30E+05
80	3.23E+02	2.17E+03	3.33E+05
85	3.22E+02	2.30E+03	3.32E+05
90	3.23E+02	2.44E+03	3.34E+05
95	3.26E+02	2.57E+03	3.36E+05
100	3.35E+02	2.71E+03	3.46E+05
110	3.45E+02	2.98E+03	3.55E+05
120	3.59E+02	3.25E+03	3.70E+05
130	3.76E+02	3.52E+03	3.88E+05
140	3.92E+02	3.79E+03	4.04E+05
150	4.05E+02	4.06E+03	4.18E+05
160	4.18E+02	4.33E+03	4.31E+05
170	4.29E+02	4.60E+03	4.42E+05
180	4.33E+02	4.87E+03	4.47E+05
190	4.43E+02	5.14E+03	4.56E+05
200	4.47E+02	5.41E+03	4.61E+05
250	5.01E+02	6.77E+03	5.17E+05
300	5.42E+02	8.12E+03	5.59E+05

5) HDPE/PP (P340J) blends of ratio 40/60. (Figure 3.5)

Velocity	**Load (Kg)**		$\dot{\gamma}_a$	τ_w **(N/m^2)**	
(mm/min)	**Maximum**	**Minimum**	**(1/sec)**	**Maximum**	**Minimum**
1	4.60E+01	-	2.71E+01	4.74E+04	-
5	1.11E+02	-	1.35E+02	1.15E+05	-
10	1.55E+02	-	2.71E+02	1.60E+05	-
15	1.78E+02	-	4.06E+02	1.83E+05	-
20	1.95E+02	-	5.42E+02	2.02E+05	-
25	2.11E+02	-	6.77E+02	2.18E+05	-
30	2.26E+02	-	8.13E+02	2.33E+05	-
35	2.39E+02	-	9.48E+02	2.46E+05	-
40	2.50E+02	-	1.08E+03	2.58E+05	-
45	2.62E+02	-	1.22E+03	2.70E+05	-
47	2.71E+02	-	1.27E+03	2.80E+05	-
50	2.71E+02	-	1.35E+03	2.80E+05	-
55	2.91E+02	-	1.49E+03	3.00E+05	-
60	3.11E+02	-	1.63E+03	3.21E+05	-
62.7	3.23E+02	-	1.70E+03	3.33E+05	-
65	3.26E+02	-	1.76E+03	3.36E+05	-
66.6	3.27E+02	-	1.80E+03	3.37E+05	-
66.7	3.26E+02	3.08E+02	1.81E+03	3.36E+05	3.17E+05
70	3.27E+02	3.04E+02	1.90E+03	3.38E+05	3.14E+05
75	3.32E+02	3.03E+02	2.03E+03	3.42E+05	3.13E+05
80	3.37E+02	3.01E+02	2.17E+03	3.47E+05	3.10E+05
85	3.38E+02	3.03E+02	2.30E+03	3.48E+05	3.12E+05
90	3.39E+02	3.07E+02	2.44E+03	3.50E+05	3.17E+05
101.6	3.40E+02	-	2.75E+03	3.51E+05	-
110	3.47E+02	-	2.98E+03	3.58E+05	-
120	3.50E+02	-	3.25E+03	3.60E+05	-
130	3.51E+02	-	3.52E+03	3.62E+05	-
140	3.66E+02	-	3.79E+03	3.78E+05	-
150	3.81E+02	-	4.06E+03	3.92E+05	-
160	3.93E+02	-	4.33E+03	4.05E+05	-
170	4.05E+02	-	4.61E+03	4.18E+05	-
180	4.20E+02	-	4.88E+03	4.33E+05	-

(cont.)

Velocity (mm/min)	Load (Kg)		$\dot{\gamma}_a$ (1/sec)	τ_w (N/m^2)	
	Maximum	Minimum		Maximum	Minimum
200	4.25E+02	-	5.42E+03	4.39E+05	-
220	4.65E+02	-	5.96E+03	4.79E+05	-
240	4.98E+02	-	6.50E+03	5.13E+05	-
250	5.21E+02	-	6.77E+03	5.37E+05	-
260	5.26E+02	-	7.04E+03	5.43E+05	-
280	5.47E+02	-	7.59E+03	5.64E+05	-
300	5.55E+02	-	8.13E+03	5.72E+05	-

6) HDPE/PP (P340J) blends of ratio 50/50. (Figure 3.6)

Velocity	**Load (Kg)**		$\dot{\gamma}_a$	τ_w **(N/m^2)**	
(mm/min)	**Maximum**	**Minimum**	**(1/sec)**	**Maximum**	**Minimum**
0.1	1.15E+01	-	2.71E+00	1.19E+04	-
0.5	2.34E+01	-	1.35E+01	2.41E+04	-
1	4.94E+01	-	2.71E+01	5.09E+04	-
3	1.02E+02	-	8.12E+01	1.05E+05	-
5	1.28E+02	-	1.35E+02	1.32E+05	-
10	1.62E+02	-	2.71E+02	1.67E+05	-
15	1.93E+02	-	4.06E+02	1.99E+05	-
20	2.19E+02	-	5.41E+02	2.26E+05	-
25	2.41E+02	-	6.77E+02	2.48E+05	-
30	2.55E+02	-	8.12E+02	2.63E+05	-
35	2.66E+02	-	9.47E+02	2.75E+05	-
40	2.77E+02	-	1.08E+03	2.86E+05	-
46	2.87E+02	-	1.25E+03	2.96E+05	-
46.8	3.08E+02	-	1.27E+03	3.18E+05	-
50	3.13E+02	-	1.35E+03	3.23E+05	-
61	3.20E+02	-	1.65E+03	3.30E+05	-
61.1	3.25E+02	2.93E+02	1.65E+03	3.36E+05	3.03E+05
65	3.24E+02	2.99E+02	1.76E+03	3.35E+05	3.08E+05
70	3.20E+02	2.91E+02	1.89E+03	3.30E+05	3.01E+05
75	3.24E+02	2.93E+02	2.03E+03	3.34E+05	3.02E+05
80	3.33E+02	2.93E+02	2.17E+03	3.44E+05	3.02E+05
85	3.31E+02	2.94E+02	2.30E+03	3.41E+05	3.03E+05
85.4	2.96E+02	-	2.31E+03	3.05E+05	-
90	3.02E+02	-	2.44E+03	3.11E+05	-
100	3.13E+02	-	2.71E+03	3.23E+05	-
125	3.39E+02	-	3.38E+03	3.49E+05	-
150	3.71E+02	-	4.06E+03	3.82E+05	-
175	4.12E+02	-	4.74E+03	4.24E+05	-
200	4.51E+02	-	5.41E+03	4.65E+05	-
250	4.98E+02	-	6.77E+03	5.13E+05	-
300	5.43E+02	-	8.12E+03	5.60E+05	-

7) HDPE/PP (P340J) blends of ratio 60/40. (Figure 3.7)

Velocity (mm/min)	**Load (Kg)**		**$\dot{\gamma}_a$ (1/sec)**	**τ_w (N/m^2)**	
	Maximum	**Minimum**		**Maximum**	**Minimum**
1	4.90E+01	-	2.71E+01	5.05E+04	-
5	1.52E+02	-	1.35E+02	1.57E+05	-
10	1.98E+02	-	2.71E+02	2.04E+05	-
15	2.30E+02	-	4.06E+02	2.37E+05	-
20	2.66E+02	-	5.42E+02	2.74E+05	-
23.2	2.98E+02	-	6.29E+02	3.07E+05	-
25	3.04E+02	-	6.77E+02	3.14E+05	-
29.9	3.21E+02	-	8.10E+02	3.31E+05	-
30	3.22E+02	2.68E+02	8.13E+02	3.32E+05	2.76E+05
35	3.17E+02	2.64E+02	9.48E+02	3.27E+05	2.72E+05
40	3.21E+02	2.64E+02	1.08E+03	3.31E+05	2.72E+05
45	3.24E+02	2.65E+02	1.22E+03	3.35E+05	2.74E+05
50	3.25E+02	2.66E+02	1.35E+03	3.35E+05	2.75E+05
55	3.27E+02	2.77E+02	1.49E+03	3.37E+05	2.86E+05
60	3.38E+02	2.73E+02	1.63E+03	3.49E+05	2.82E+05
66.7	2.67E+02	-	1.81E+03	2.75E+05	-
70	2.69E+02	-	1.90E+03	2.78E+05	-
75	2.94E+02	-	2.03E+03	3.03E+05	-
80	2.89E+02	-	2.17E+03	2.99E+05	-
85	2.93E+02	-	2.30E+03	3.02E+05	-
90	3.01E+02	-	2.44E+03	3.10E+05	-
95	3.08E+02	-	2.57E+03	3.18E+05	-
100	3.17E+02	-	2.71E+03	3.27E+05	-
110	3.33E+02	-	2.98E+03	3.43E+05	-
120	3.47E+02	-	3.25E+03	3.58E+05	-
130	3.58E+02	-	3.52E+03	3.69E+05	-
140	3.72E+02	-	3.79E+03	3.84E+05	-
150	3.83E+02	-	4.06E+03	3.95E+05	-
160	4.02E+02	-	4.33E+03	4.14E+05	-
170	4.20E+02	-	4.61E+03	4.33E+05	-
180	4.33E+02	-	4.88E+03	4.47E+05	-
190	4.48E+02	-	5.15E+03	4.62E+05	-
200	4.64E+02	-	5.42E+03	4.78E+05	-
250	5.27E+02	-	6.77E+03	5.44E+05	-
300	5.54E+02	-	8.13E+03	5.71E+05	-

8) HDPE/PP (P340J) blends of ratio 70/30. (Figure 3.8)

Velocity	**Load (Kg)**		$\dot{\gamma}_a$	τ_w **(N/m^2)**	
(mm/min)	**Maximum**	**Minimum**	**(1/sec)**	**Maximum**	**Minimum**
0.1	1.69E+01	-	2.71E+00	1.74E+04	-
0.5	3.01E+01	-	1.35E+01	3.11E+04	-
1	6.28E+01	-	2.71E+01	6.47E+04	-
3	1.33E+02	-	8.13E+01	1.37E+05	-
4.6	1.77E+02	-	1.25E+02	1.82E+05	-
5	1.87E+02	-	1.35E+02	1.93E+05	-
10	2.46E+02	-	2.71E+02	2.53E+05	-
15	2.91E+02	-	4.06E+02	3.00E+05	-
19.8	3.25E+02	-	5.36E+02	3.35E+05	-
19.9	3.29E+02	2.71E+02	5.39E+02	3.40E+05	2.79E+05
20	3.15E+02	2.69E+02	5.42E+02	3.24E+05	2.78E+05
25	3.25E+02	2.66E+02	6.77E+02	3.35E+05	2.75E+05
30	3.25E+02	2.68E+02	8.13E+02	3.35E+05	2.77E+05
35	3.29E+02	2.68E+02	9.48E+02	3.40E+05	2.76E+05
40	3.29E+02	2.76E+02	1.08E+03	3.40E+05	2.85E+05
45	3.30E+02	2.75E+02	1.22E+03	3.41E+05	2.84E+05
50	3.34E+02	2.75E+02	1.35E+03	3.45E+05	2.84E+05
55	3.42E+02	2.74E+02	1.49E+03	3.53E+05	2.83E+05
60	3.56E+02	2.71E+02	1.63E+03	3.67E+05	2.80E+05
62.1	2.92E+02	-	1.68E+03	3.01E+05	-
65	2.79E+02	-	1.76E+03	2.88E+05	-
70	2.87E+02	-	1.90E+03	2.96E+05	-
75	3.02E+02	-	2.03E+03	3.11E+05	-
80	3.16E+02	-	2.17E+03	3.26E+05	-
85	3.21E+02	-	2.30E+03	3.31E+05	-
90	3.24E+02	-	2.44E+03	3.34E+05	-
93	3.27E+02	-	2.52E+03	3.37E+05	-
95	3.38E+02	-	2.57E+03	3.49E+05	-
100	3.46E+02	-	2.71E+03	3.57E+05	-
105	3.50E+02	-	2.84E+03	3.61E+05	-
110	3.53E+02	-	2.98E+03	3.64E+05	-
115	3.63E+02	-	3.12E+03	3.75E+05	-
120	3.72E+02	-	3.25E+03	3.84E+05	-

(cont.)

Velocity	**Load (Kg)**		$\dot{\gamma}_a$	τ_w **(N/m^2)**	
(mm/min)	**Maximum**	**Minimum**	**(1/sec)**	**Maximum**	**Minimum**
125	3.85E+02	-	3.39E+03	3.97E+05	-
130	3.96E+02	-	3.52E+03	4.08E+05	-
135	4.02E+02	-	3.66E+03	4.15E+05	-
140	4.08E+02	-	3.79E+03	4.20E+05	-
145	4.15E+02	-	3.93E+03	4.28E+05	-
150	4.25E+02	-	4.06E+03	4.38E+05	-
160	4.36E+02	-	4.33E+03	4.49E+05	-
170	4.45E+02	-	4.61E+03	4.59E+05	-
180	4.58E+02	-	4.88E+03	4.73E+05	-
190	4.81E+02	-	5.15E+03	4.96E+05	-
200	5.01E+02	-	5.42E+03	5.16E+05	-
220	5.25E+02	-	5.96E+03	5.41E+05	-
240	5.40E+02	-	6.50E+03	5.57E+05	-
250	5.47E+02	-	6.77E+03	5.64E+05	-
260	5.53E+02	-	7.04E+03	5.70E+05	-
280	5.54E+02	-	7.59E+03	5.71E+05	-
300	5.63E+02	-	8.13E+03	5.80E+05	-

9) HDPE/PP (P340J) blends of ratio 80/20. (Figure 3.9)

Velocity (mm/min)	Load (Kg)		$\dot{\gamma}_a$ (1/sec)	τ_w (N/m^2)	
	Maximum	Minimum		Maximum	Minimum
0.1	1.44E+01	-	2.71E+00	1.49E+04	-
0.5	2.75E+01	-	1.35E+01	2.84E+04	-
1	6.73E+01	-	2.71E+01	6.95E+04	-
5	2.00E+02	-	1.35E+02	2.06E+05	-
10	2.73E+02	-	2.71E+02	2.82E+05	-
12.6	3.05E+02	-	3.41E+02	3.15E+05	-
15	3.22E+02	-	4.06E+02	3.32E+05	-
16.7	3.42E+02	-	4.52E+02	3.53E+05	-
16.8	3.47E+02	2.70E+02	4.55E+02	3.57E+05	2.78E+05
20	3.49E+02	2.70E+02	5.42E+02	3.60E+05	2.78E+05
25	3.52E+02	2.68E+02	6.77E+02	3.63E+05	2.76E+05
30	3.54E+02	2.69E+02	8.13E+02	3.65E+05	2.77E+05
35	3.58E+02	2.81E+02	9.48E+02	3.69E+05	2.90E+05
40	3.61E+02	2.82E+02	1.08E+03	3.73E+05	2.91E+05
45	3.63E+02	2.81E+02	1.22E+03	3.75E+05	2.89E+05
50	3.65E+02	2.79E+02	1.35E+03	3.77E+05	2.88E+05
55	3.65E+02	2.79E+02	1.49E+03	3.76E+05	2.88E+05
56.6	2.86E+02	-	1.53E+03	2.95E+05	-
60	2.78E+02	-	1.63E+03	2.87E+05	-
65	2.84E+02	-	1.76E+03	2.93E+05	-
70	2.93E+02	-	1.90E+03	3.02E+05	-
75	3.05E+02	-	2.03E+03	3.14E+05	-
80	3.17E+02	-	2.17E+03	3.27E+05	-
85	3.28E+02	-	2.30E+03	3.38E+05	-
90	3.36E+02	-	2.44E+03	3.47E+05	-
95	3.43E+02	-	2.57E+03	3.54E+05	-
100	3.66E+02	-	2.71E+03	3.77E+05	-
105	3.72E+02	-	2.84E+03	3.84E+05	-
110	3.79E+02	-	2.98E+03	3.91E+05	-
115	3.84E+02	-	3.12E+03	3.96E+05	-
120	3.92E+02	-	3.25E+03	4.04E+05	-
125	4.01E+02	-	3.39E+03	4.14E+05	-
130	4.10E+02	-	3.52E+03	4.23E+05	-

(cont.)

Velocity	**Load (Kg)**		**γ_a**	**τ_w (N/m^2)**	
(mm/min)	**Maximum**	**Minimum**	**(1/sec)**	**Maximum**	**Minimum**
139.2	4.19E+02	-	3.77E+03	4.32E+05	-
140	4.23E+02	-	3.79E+03	4.36E+05	-
145	4.29E+02	-	3.93E+03	4.42E+05	-
150	4.36E+02	-	4.06E+03	4.50E+05	-
160	4.53E+02	-	4.33E+03	4.67E+05	-
170	4.64E+02	-	4.61E+03	4.78E+05	-
180	4.71E+02	-	4.88E+03	4.85E+05	-
190	4.78E+02	-	5.15E+03	4.93E+05	-
200	4.68E+02	-	5.42E+03	4.83E+05	-
220	5.07E+02	-	5.96E+03	5.23E+05	-
240	5.35E+02	-	6.50E+03	5.51E+05	-
260	5.55E+02	-	7.04E+03	5.72E+05	-
280	5.63E+02	-	7.59E+03	5.81E+05	-
300	5.72E+02	-	8.13E+03	5.90E+05	-

10) HDPE/PP (P400S) blends of ratio 70/30. (Figure 3.10)

Velocity	**Load (Kg)**		γ_a	τ_w **(N/m²)**	
(mm/min)	**Maximum**	**Minimum**	**(1/sec)**	**Maximum**	**Minimum**
0.1	1.18E+01	-	2.71E+00	1.22E+04	-
0.5	2.51E+01	-	1.35E+01	2.58E+04	-
1	6.11E+01	-	2.71E+01	6.30E+04	-
5	1.53E+02	-	1.35E+02	1.57E+05	-
10	1.92E+02	-	2.71E+02	1.98E+05	-
11.4	2.07E+02	-	3.09E+02	2.14E+05	-
15	2.32E+02	-	4.06E+02	2.39E+05	-
20	2.64E+02	-	5.42E+02	2.73E+05	-
25	2.93E+02	-	6.77E+02	3.02E+05	-
28.7	3.07E+02	-	7.78E+02	3.16E+05	-
28.8	3.10E+02	2.80E+02	7.80E+02	3.19E+05	2.88E+05
30	3.10E+02	2.81E+02	8.13E+02	3.19E+05	2.89E+05
35	3.15E+02	2.81E+02	9.48E+02	3.25E+05	2.90E+05
40	3.20E+02	2.82E+02	1.08E+03	3.30E+05	2.91E+05
45	3.23E+02	2.83E+02	1.22E+03	3.33E+05	2.92E+05
50	3.26E+02	2.84E+02	1.35E+03	3.36E+05	2.93E+05
55	3.25E+02	2.85E+02	1.49E+03	3.36E+05	2.94E+05
60	3.27E+02	2.86E+02	1.63E+03	3.37E+05	2.94E+05
65	3.26E+02	2.86E+02	1.76E+03	3.36E+05	2.95E+05
69.5	2.86E+02	-	1.88E+03	2.94E+05	-
70	2.88E+02	-	1.90E+03	2.97E+05	-
80	3.07E+02	-	2.17E+03	3.16E+05	-
90	3.21E+02	-	2.44E+03	3.31E+05	-
100	3.33E+02	-	2.71E+03	3.43E+05	-
150	3.94E+02	-	4.06E+03	4.06E+05	-
200	4.56E+02	-	5.42E+03	4.70E+05	-
250	5.11E+02	-	6.77E+03	5.27E+05	-
300	5.53E+02	-	8.13E+03	5.71E+05	-

Data of Hysteresis of bifurcation diagram in the oscillating regime : The apparent strain rate (γ_a) and the wall shear stress (τ_w).

1) The onset of the oscillating regime at HDPE/PP (P340J):100/0.

(Figure 3.26a)

Piston speed increasing

Velocity (mm/min)	**Load (Kg)**		**γ_a (1/sec)**	**τ_w (N/m^2)**	
	Maximum	**Minimum**		**Maximum**	**Minimum**
10.3	3.15E+02	-	2.79E+02	3.25E+05	-
10.4	3.14E+02	-	2.82E+02	3.24E+05	-
10.5	3.17E+02	-	2.84E+02	3.27E+05	-
10.6	3.20E+02	-	2.87E+02	3.30E+05	-
10.7	3.22E+02	-	2.90E+02	3.32E+05	-
10.8	3.24E+02	-	2.92E+02	3.34E+05	-
10.9	3.25E+02	-	2.95E+02	3.35E+05	-
11	3.26E+02	-	2.98E+02	3.36E+05	-
11.1	3.38E+02	2.51E+02	3.00E+02	3.49E+05	2.59E+05
11.2	3.39E+02	2.50E+02	3.03E+02	3.49E+05	2.58E+05
11.3	3.40E+02	2.48E+02	3.06E+02	3.51E+05	2.56E+05
11.4	3.41E+02	2.47E+02	3.09E+02	3.52E+05	2.55E+05
11.5	3.41E+02	2.46E+02	3.11E+02	3.52E+05	2.53E+05
11.6	3.41E+02	2.46E+02	3.14E+02	3.52E+05	2.53E+05
11.7	3.43E+02	2.44E+02	3.17E+02	3.53E+05	2.52E+05

Piston speed decreasing

Velocity (mm/min)	Load (Kg)		$\dot{\gamma}_a$ (1/sec)	τ_w (N/m^2)	
	Maximum	Minimum		Maximum	Minimum
10	3.35E+02	-	2.71E+02	3.46E+05	-
10.1	3.36E+02	-	2.73E+02	3.46E+05	-
10.2	3.37E+02	-	2.76E+02	3.47E+05	-
10.3	3.38E+02	-	2.79E+02	3.49E+05	-
10.4	3.40E+02	-	2.82E+02	3.51E+05	-
10.5	3.40E+02	-	2.84E+02	3.51E+05	-
10.6	3.42E+02	-	2.87E+02	3.53E+05	-
10.7	3.43E+02	-	2.90E+02	3.54E+05	-
10.8	3.49E+02	2.51E+02	2.92E+02	3.60E+05	2.59E+05
10.9	3.48E+02	2.53E+02	2.95E+02	3.59E+05	2.60E+05
11	3.46E+02	2.52E+02	2.98E+02	3.57E+05	2.60E+05
11.1	3.47E+02	2.45E+02	3.00E+02	3.58E+05	2.53E+05
11.2	3.45E+02	2.48E+02	3.03E+02	3.56E+05	2.56E+05
11.3	3.43E+02	2.50E+02	3.06E+02	3.54E+05	2.58E+05
11.4	3.44E+02	2.52E+02	3.09E+02	3.54E+05	2.59E+05

2) The end of the oscillating regime at HDPE/PP (P340J):100/0. (Figure 3.11b)

Piston speed increasing

Velocity	Load (Kg)		γ_a	τ_w (N/m^2)	
(mm/min)	Maximum	Minimum	(1/sec)	Maximum	Minimum
50	3.64E+02	2.56E+02	1.35E+03	3.75E+05	2.64E+05
51	3.65E+02	2.63E+02	1.38E+03	3.76E+05	2.71E+05
52	3.64E+02	2.62E+02	1.41E+03	3.76E+05	2.71E+05
53	3.66E+02	3.11E+02	1.43E+03	3.77E+05	3.21E+05
54	2.66E+02	-	1.46E+03	2.75E+05	-
54.1	2.66E+02	-	1.46E+03	2.75E+05	-
54.2	2.66E+02	-	1.47E+03	2.74E+05	-

Piston speed decreasing

Velocity	Load (Kg)		γ_a	τ_w (N/m^2)	
(mm/min)	Maximum	Minimum	(1/sec)	Maximum	Minimum
50	3.73E+02	2.54E+02	1.35E+03	3.84E+05	2.62E+05
51	3.73E+02	2.57E+02	1.38E+03	3.84E+05	2.65E+05
52	3.72E+02	2.59E+02	1.41E+03	3.84E+05	2.67E+05
53	3.73E+02	2.61E+02	1.43E+03	3.84E+05	2.69E+05
54.2	2.61E+02	-	1.47E+03	2.69E+05	-
54.4	2.63E+02	-	1.47E+03	2.71E+05	-
54.6	2.64E+02	-	1.48E+03	2.72E+05	-

Data of wavelength : The load wavelength (λ_l), the skin wavelength (λ_e), the wavelength ratio (r) and the apparent strain rate ($\dot{\gamma}_a$)

1) HDPE/PP (P340J) blends of ratio 100/0. (Figure 3.27 and Figure 3.30)

$\dot{\gamma}_a$ **(1/sec)**	λ_l **(mm)**	λ_e **(mm)**	**r**
2.84E+02	6.82E+02	3.16E+02	2.16
4.06E+02	4.37E+02	2.20E+02	2.15
5.41E+02	3.72E+02	1.88E+02	1.98
8.12E+02	3.34E+02	1.50E+02	2.23
1.08E+03	6.04 E+02	2.87E+02	2.10
1.35E+03	7.16E+02	3.36E+02	2.13

2) HDPE/PP (P340J) blends of ratio 80/20. (Figure 3.28 and Figure 3.30)

$\dot{\gamma}_a$ **(1/sec)**	λ_l **(mm)**	λ_e **(mm)**	**r**
^{1} 4.55E+02	6.04E+02	1.81E+02	3.33
5.42E+02	2.54E+02	6.65E+01	3.81
6.77E+02	1.52E+02	3.74E+01	4.06
^{2} 8.13E+02	1.23E+02	2.65E+01	4.66
9.48E+02	5.99E+02	1.27E+02	4.73
1.08E+03	5.62E+02	1.12E+02	4.99
1.22E+03	5.37E+02	1.01E+02	5.29
1.36E+03	4.94E+02	9.61E+01	5.13
1.49E+03	4.67E+02	8.64E+01	5.41

Note: superscript 1 = 1st barrel

superscript 1 = 2nd barrel

3) HDPE/PP (P340J) blends of ratio 70/30. (Figure 3.29 and Figure 3.30)

$\dot{\gamma}_a$ (1/sec)	λ_l (mm)	λ_e (mm)	r
[1]4.55E+02	6.04E+02	1.81E+02	3.33
5.42E+02	2.54E+02	6.65E+01	3.81
[2] 6.77E+02	1.52E+02	3.74E+01	4.06
8.13E+02	1.23E+02	2.65E+01	4.66
9.48E+02	5.99E+02	1.27E+02	4.73
[3] 1.08E+03	5.62E+02	1.12E+02	4.99
1.22E+03	5.37E+02	1.01E+02	5.29
1.36E+03	4.94E+02	9.61E+01	5.13
1.49E+03	4.67E+02	8.64E+01	5.41

Data of Slip Velocity and Extrapolation:

1) The slip velocity (V_S), the extrapolation length (b) and the apparent strain rate ($\dot{\gamma}_a$) of HDPE/PP (P340J) blends. (Figures 3.31-3.34)

ratio : 100/0

$\dot{\gamma}_a$ (1/sec)	b (mm)	V_S (mm/sec)
257	0.011	2.58
360	0.012	4.41
473	0.013	6.22
710	0.014	9.78
954	0.013	12.36
1182	0.013	16.37

ratio : 80/20

$\dot{\gamma}_a$ (1/sec)	b (mm)	V_S (mm/sec)
398	0.013	5.31
472	0.014	6.56
585	0.015	8.63
697	0.015	10.62
832	0.013	11.10
948	0.014	12.84
1061	0.014	14.72
1174	0.014	16.88
1292	0.014	18.51

ratio : 70/30

$\dot{\gamma}_a$ (1/sec)	b (mm)	V_s (mm/sec)
484	0.011	5.11
485	0.011	5.35
607	0.011	6.55
731	0.010	7.56
847	0.011	9.43
983	0.009	9.41
1103	0.010	10.82
1218	0.012	12.75
1321	0. 012	15.79

ratio : 60/40

$\dot{\gamma}_a$ (1/sec)	b (mm)	V_s (mm/sec)
732	0.010	7.54
856	0.010	8.65
971	0.011	10.53
1088	0.011	12.23
1211	0.011	13.37
1336	0.012	14.40

ratio : 50/50

$\dot{\gamma}_a$ (1/sec)	b (mm)	V_s (mm/sec)
1677	0.005	7.74
1749	0.005	9.39
1914	0.006	10.84
2014	0.007	14.16
2149	0.007	14.21

ratio : 40/60

$\dot{\gamma}_a$ (1/sec)	b (mm)	V_s (mm/sec)
1750	0.003	5.35
1806	0.004	8.47
1933	0.005	9.20
2032	0.006	12.56
2147	0.007	14.53
2284	0.006	14.36

Data of Critical Parameter for HDPE/PP (P340J) blends :

Oscillation Regime

Ratio	$\gamma^{\cdot}_{a,c}$ (1/sec)	$\tau_{w,c}$ (N/m^2)
0/100	-	-
20/80	-	-
30/70	-	-
40/60	1.80E+03	3.37E+05
50/50	1.65E+03	3.29E+05
60/40	8.10E+02	3.31E+05
70/30	5.36E+02	3.35E+05
80/20	4.52E+02	3.53E+05
100/0	2.98E+02	3.36E+05

Melt Fracture Regime

Ratio	$\gamma^{\cdot}_{a,c}$ (1/sec)	$\tau_{w,c}$ (N/m^2)
0/100	-	-
20/80	1.86E+03	3.33E+05
30/70	1.93E+03	3.22E+05
40/60	2.75E+03	3.51E+05
50/50	2.31E+03	3.05E+05
60/40	1.81E+03	2.75E+05
70/30	2.52E+03	3.37E+05
80/20	3.72E+03	4.31E+05
100/0	2.76E+03	3.21E+05

Data of Viscosity in Steady State and Oscillatory State :

1) HDPE/PP blends of ratio : 100/0. (Figure 3.40)

$\dot{\gamma}_a$ (1/sec) (Capillary)	$\dot{\gamma}_w$ (1/sec) (Parallel)	η' (Pa-sec) (Capillary)	η' (Pa-sec) (Parallel)	η^* (Pa-sec) (Parallel)	ω (rad/sec)
2.71E+00	2.09E-01	6.60E+03	4.49E+03	5.17E+03	1.00E-01
1.35E+01	2.64E-01	2.80E+03	4.02E+03	4.60E+03	1.26E-01
2.71E+01	3.32E-01	2.30E+03	3.70E+03	4.10E+03	1.58E-01
8.12E+01	4.18E-01	1.13E+03	3.52E+03	3.87E+03	2.00E-01
1.35E+02	5.26E-01	8.02E+02	3.38E+03	3.68E+03	2.51E-01
2.71E+02	6.62E-01	4.91E+02	3.21E+03	3.46E+03	3.16E-01
4.06E+02	8.33E-01	3.56E+02	2.97E+03	3.21E+03	3.98E-01
5.41E+02	1.05E+00	2.82E+02	2.78E+03	3.01E+03	5.01E-01
6.77E+02	1.32E+00	2.45E+02	2.62E+03	2.84E+03	6.31E-01
8.12E+02	1.66E+00	2.14E+02	2.47E+03	2.68E+03	7.94E-01
9.47E+02	2.09E+00	2.10E+02	2.33E+03	2.53E+03	1.00E+00
1.08E+03	2.64E+00	1.87E+02	2.19E+03	2.39E+03	1.26E+00
1.22E+03	3.32E+00	1.73E+02	2.05E+03	2.24E+03	1.58E+00
1.31E+03	4.18E+00	1.65E+02	1.91E+03	2.11E+03	2.00E+00
1.35E+03	5.26E+00	1.65E+02	1.78E+03	1.98E+03	2.51E+00
1.49E+03	6.62E+00	1.60E+02	1.65E+03	1.85E+03	3.16E+00
1.62E+03	8.33E+00	1.55E+02	1.53E+03	1.72E+03	3.98E+00
1.89E+03	1.05E+01	1.39E+02	1.41E+03	1.60E+03	5.01E+00
2.17E+03	1.32E+01	1.28E+02	1.29E+03	1.49E+03	6.31E+00
2.44E+03	1.66E+01	1.25E+02	1.17E+03	1.37E+03	7.94E+00
2.71E+03	2.09E+01	1.14E+02	1.07E+03	1.26E+03	1.00E+01
3.25E+03	2.64E+01	1.00E+02	9.63E+02	1.16E+03	1.26E+01
3.79E+03	3.32E+01	9.10E+01	8.67E+02	1.06E+03	1.58E+01
4.33E+03	4.18E+01	8.06E+01	7.76E+02	9.65E+02	2.00E+01
4.87E+03	5.26E+01	7.69E+01	6.91E+02	8.76E+02	2.51E+01
5.41E+03	6.62E+01	7.44E+01	6.12E+02	7.92E+02	3.16E+01
6.77E+03	8.33E+01	6.68E+01	5.41E+02	7.14E+02	3.98E+01
8.12E+03	1.05E+02	5.67E+01	4.75E+02	6.42E+02	5.01E+01
-	1.32E+02	-	4.16E+02	5.75E+02	6.31E+01
-	1.66E+02	-	3.61E+02	5.13E+02	7.94E+01
-	2.09E+02	-	3.11E+02	4.56E+02	1.00E+02

2) HDPE/PP blends of ratio : 0/100. (Figure 3.41)

γ_a (1/sec) (Capillary)	$\dot{\gamma}_w$ (1/sec) (Parallel)	η' (Pa-sec) (Capillary)	η' (Pa-sec) (Parallel)	η^* (Pa-sec) (Parallel)	ω (rad/sec)
2.71E+00	2.09E-01	5.14E+03	3.48E+04	6.52E+04	1.00E-01
1.35E+01	2.64E-01	1.95E+03	3.17E+04	5.74E+04	1.26E-01
2.71E+01	3.32E-01	2.51E+03	2.85E+04	5.03E+04	1.58E-01
8.12E+01	4.18E-01	2.00E+03	2.56E+04	4.40E+04	2.00E-01
8.66E+01	5.26E-01	2.36E+03	2.31E+04	3.85E+04	2.51E-01
1.35E+02	6.62E-01	1.93E+03	2.08E+04	3.39E+04	3.16E-01
1.43E+02	8.33E-01	1.96E+03	1.89E+04	2.99E+04	3.98E-01
2.17E+02	1.05E+00	1.46E+03	1.71E+04	2.64E+04	5.01E-01
2.71E+02	1.32E+00	1.21E+03	1.55E+04	2.34E+04	6.31E-01
2.84E+02	1.66E+00	1.02E+03	1.41E+04	2.08E+04	7.94E-01
4.06E+02	2.09E+00	7.31E+02	1.28E+04	1.86E+04	1.00E+00
5.41E+02	2.64E+00	5.59E+02	1.17E+04	1.66E+04	1.26E+00
8.12E+02	3.32E+00	3.85E+02	1.06E+04	1.49E+04	1.58E+00
1.08E+03	4.18E+00	2.88E+02	9.68E+03	1.34E+04	2.00E+00
1.35E+03	5.26E+00	2.34E+02	8.78E+03	1.21E+04	2.51E+00
1.48E+03	6.62E+00	1.86E+02	7.97E+03	1.09E+04	3.16E+00
1.62E+03	8.33E+00	1.69E+02	7.23E+03	9.83E+03	3.98E+00
1.89E+03	1.05E+01	1.51E+02	6.55E+03	8.89E+03	5.01E+00
2.17E+03	1.32E+01	1.38E+02	5.90E+03	8.03E+03	6.31E+00
2.44E+03	1.66E+01	1.26E+02	5.31E+03	7.24E+03	7.94E+00
2.71E+03	2.09E+01	1.17E+02	4.77E+03	6.54E+03	1.00E+01
2.76E+03	2.64E+01	1.16E+02	4.25E+03	5.89E+03	1.26E+01
4.06E+03	3.32E+01	9.04E+01	3.78E+03	5.30E+03	1.58E+01
5.41E+03	4.18E+01	7.28E+01	3.36E+03	4.77E+03	2.00E+01
8.12E+03	5.26E+01	5.15E+01	2.96E+03	4.27E+03	2.51E+01
-	6.62E+01	-	2.59E+03	3.82E+03	3.16E+01
-	8.33E+01	-	2.26E+03	3.41E+03	3.98E+01
-	1.05E+02	-	1.95E+03	3.03E+03	5.01E+01
-	1.32E+02	-	1.67E+03	2.70E+03	6.31E+01
-	1.66E+02	-	1.42E+03	2.39E+03	7.94E+01
-	2.09E+02	-	1.18E+03	2.11E+03	1.00E+02

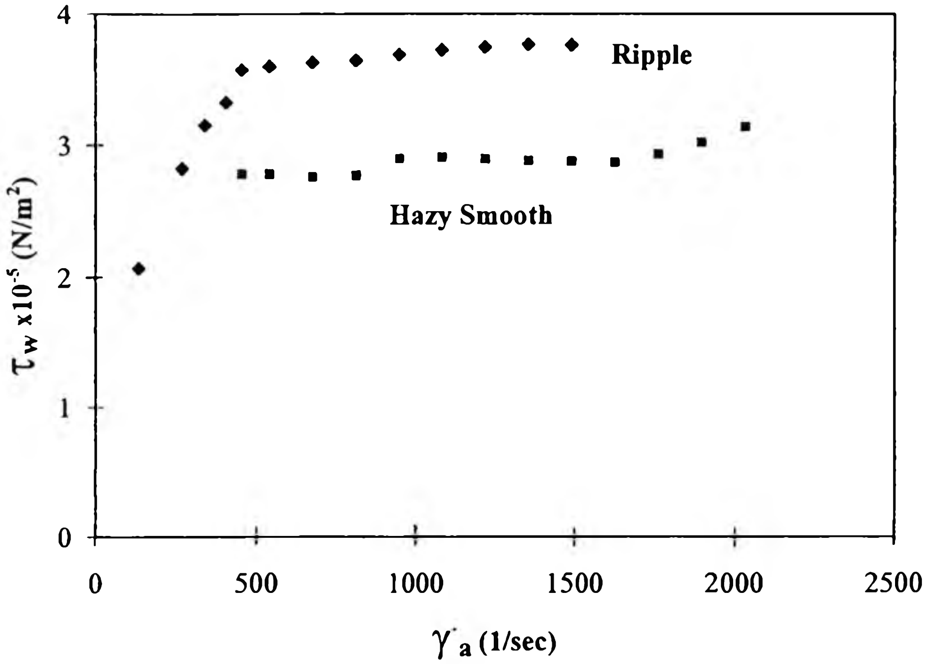


Figure B.1 Flow curve of HDPE/PP (P340J) : 80/20 blends.

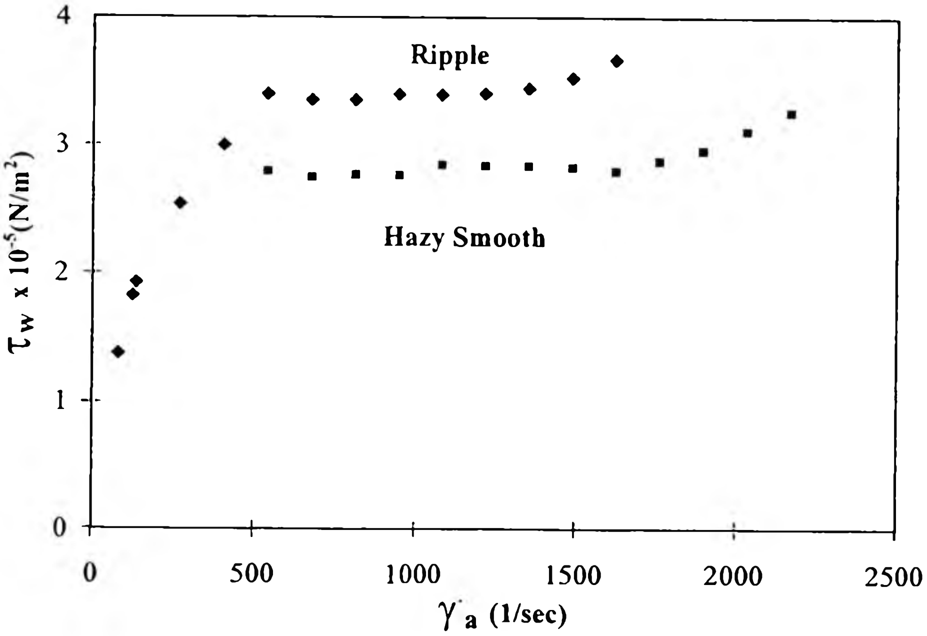


Figure B.2 Flow curve of HDPE/PP (P340J) : 70/30 blends.

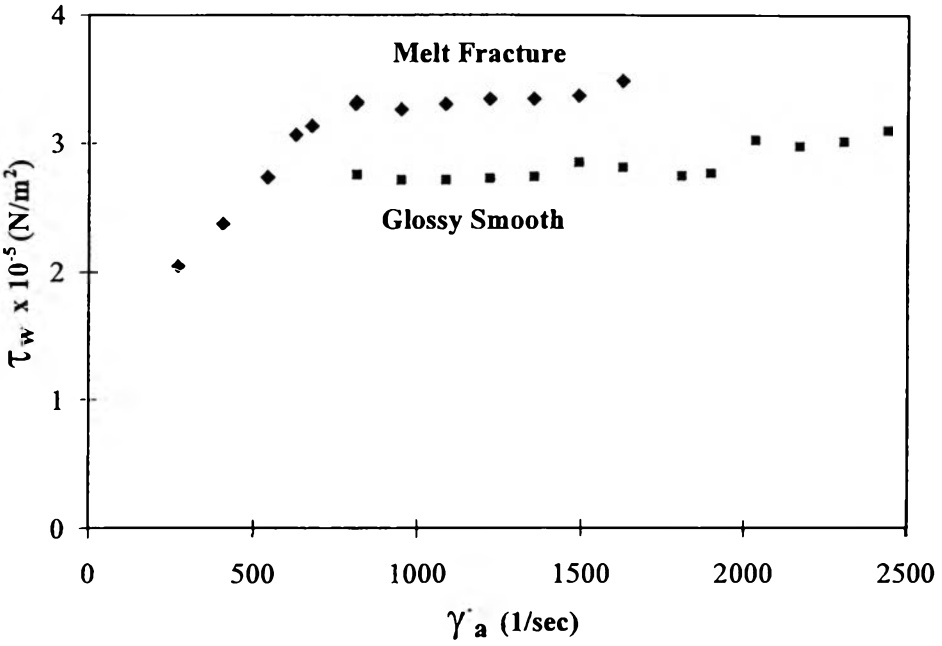


Figure B.3 Flow curve of HDPE/PP (P340J) : 60/40 blends.

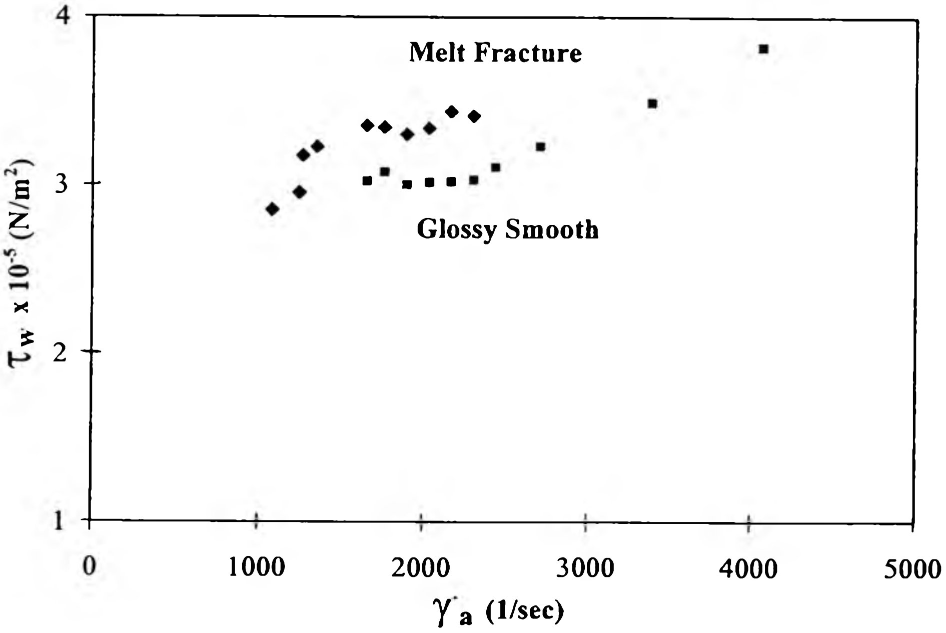


Figure B.4 Flow curve of HDPE/PP (P340J) : 50/50 blends.

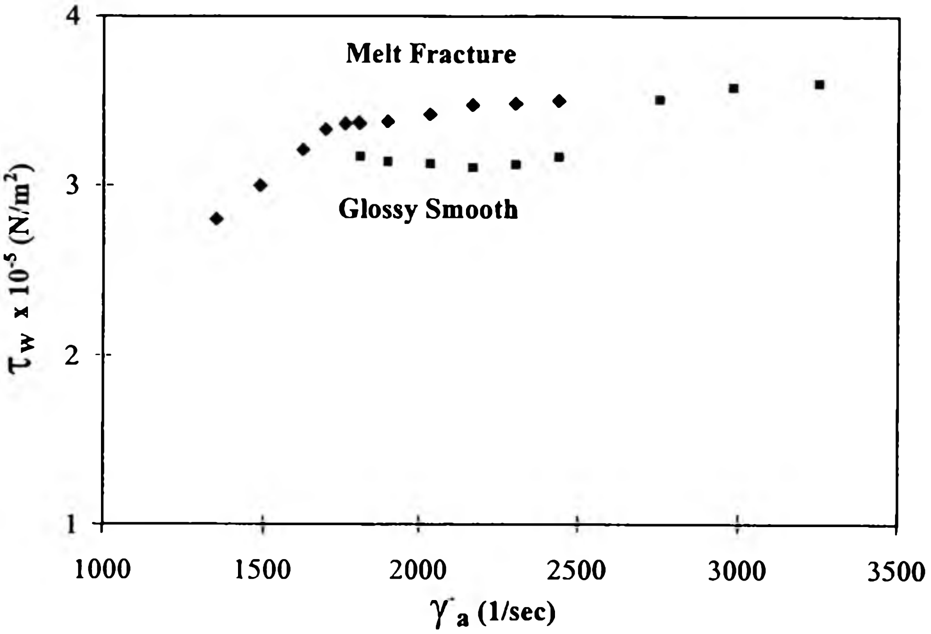
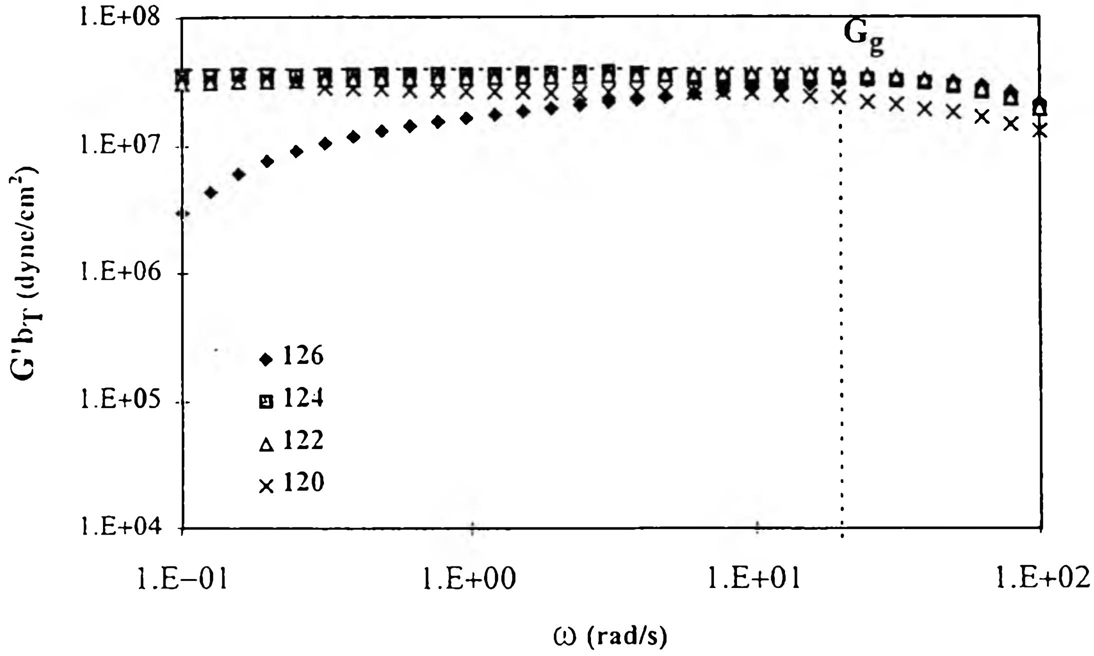


Figure B.5 Flow curve of HDPE/PP (P340J) : 40/60 blends.



FigureB.6 The reduced storage modulus of HDPE/PP (P340J) : 80/20 blends.

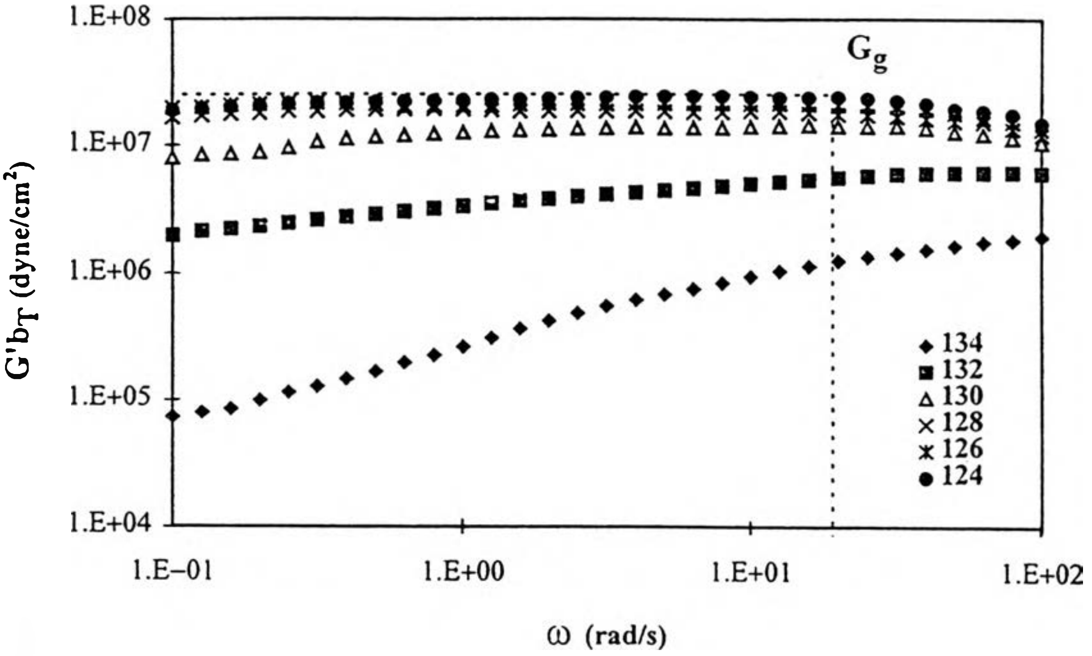


Figure B.7 The reduced storage modulus of HDPE/PP (P340J) : 70/30 blends.

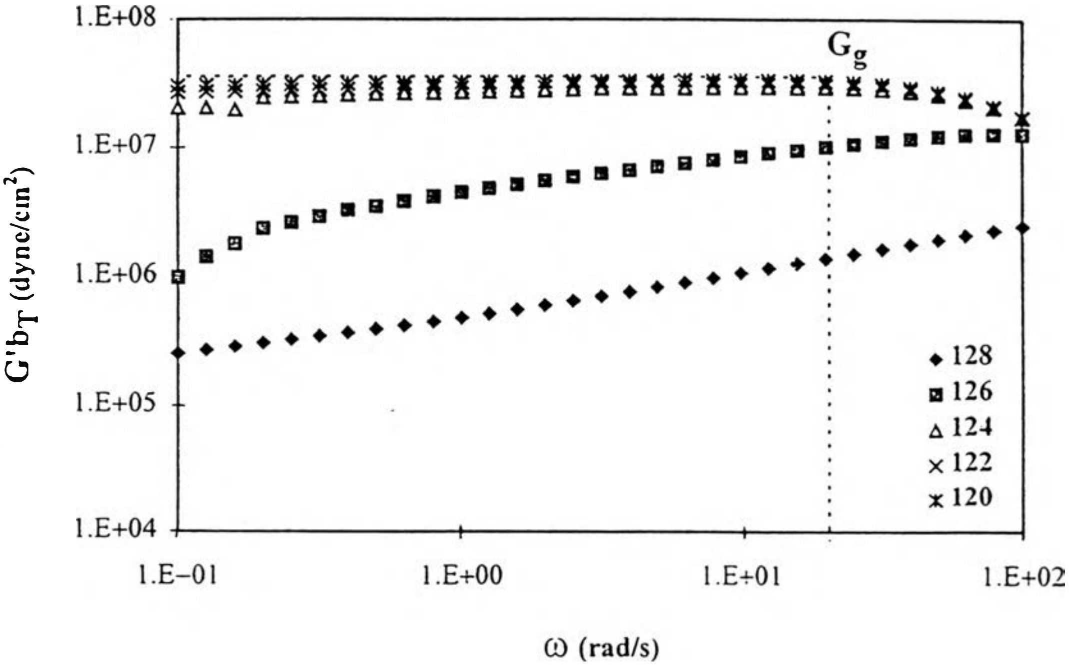


Figure B.8 The reduced storage modulus of HDPE/PP (P340J) : 60/40 blends.

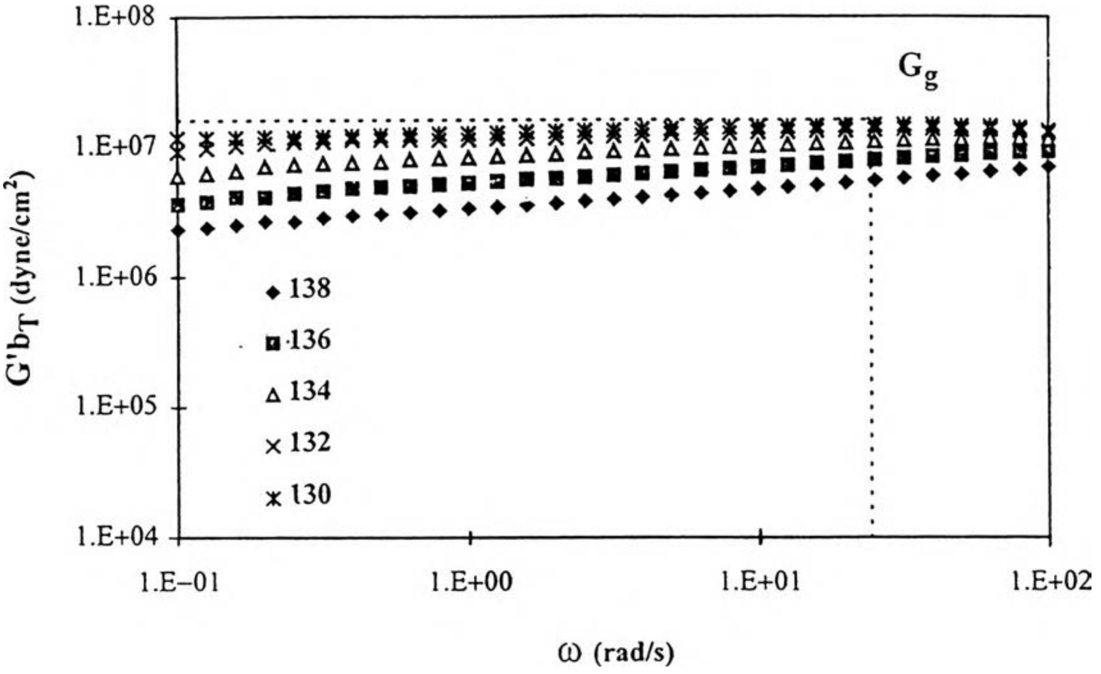


Figure B.9 The reduced storage modulus of HDPE/PP (P340J) : 50/50 blends.

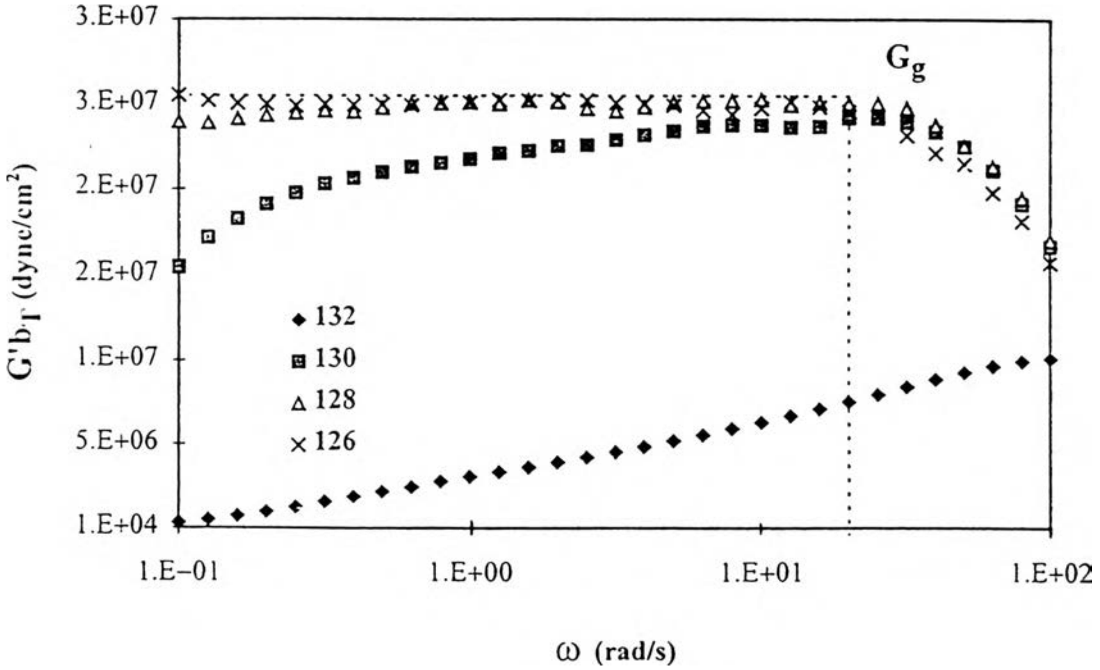


Figure B.10 The reduced storage modulus of HDPE/PP (P340J) : 40/60 blends.

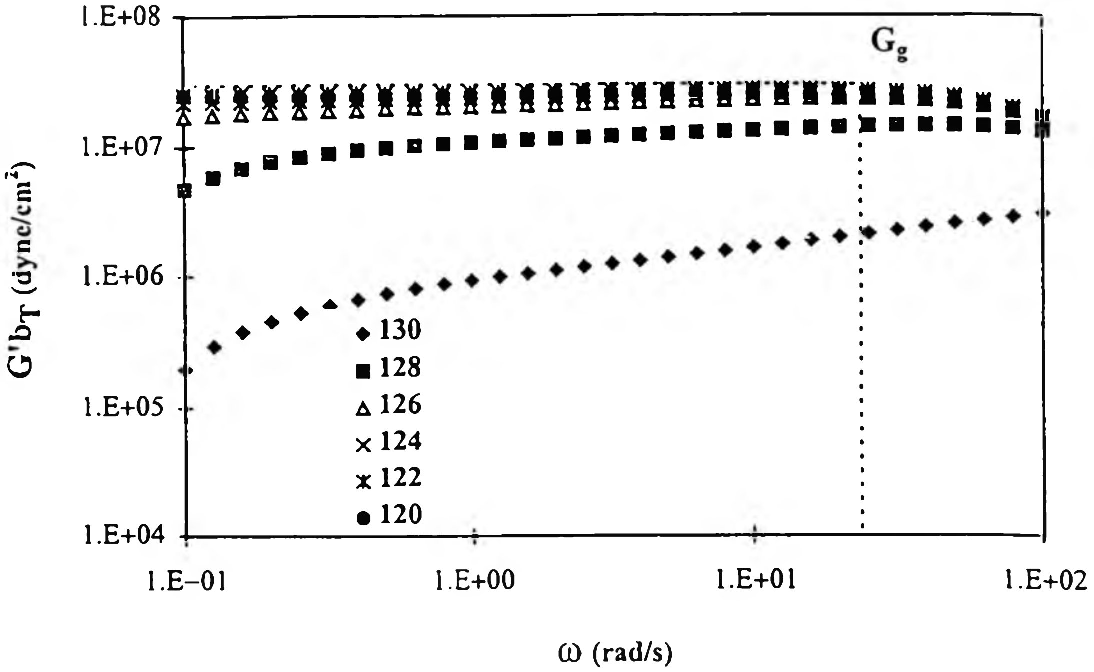


Figure B.11 The reduced storage modulus of HDPE/PP (P340J) : 30/70 blends.

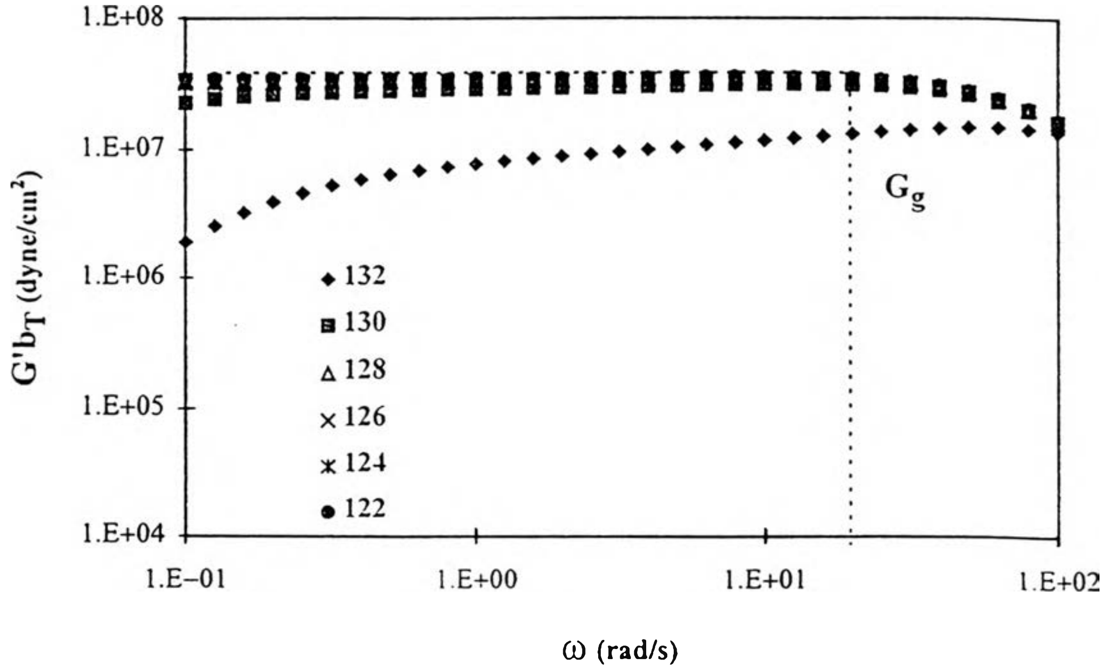


Figure B.12 The reduced storage modulus of HDPE/PP (P340J) : 20/80 blends.

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