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APPENDIX A

THE RHEOLOGY CHARACTERIZATIONS

Table A1 The molecular weight characterization data by the rheological method

Material Type	PS	PP
Test Temperature (^{0}C)	160	190
Relaxation Time Exponent	3.4	3.6
Plateau Modulus (dyn/cmsq)	1.7E+06	4.5E+06
Activation Energy (kJ/mol K)	57	42
Front Factor	7.9E-08	2.01E-22
Entanglement M_w (g/mol)	17400	6520
Reptation M_w (g/mol)	35000	13040
Mixing Rule	Double Reptation	

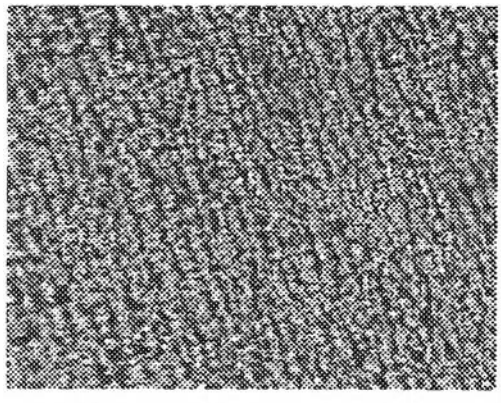
Polymer	T (^{0}C)	Molecular weight (g/mole)						Polydispersity		
		M_w			M_n					
		1	2	AVG.	1	2	AVG.	1	2	AVG.
PP(1)	190	7.16E+06	8.79E+06	7.98E+06	3.41E+05	3.40E+05	3.41E+05	21.0	25.9	23.4
Company		8.53E+06			4.40E+05			19.4		
PP(2)	190	6.67E+06	7.50E+06	7.09E+06	3.50E+05	3.14E+05	3.32E+05	19.1	23.9	21.5
Company		7.35E+06			3.60E+05			20.4		
PP(3)	190	6.29E+06	6.10E+06	6.20E+06	3.08E+05	2.15E+05	2.62E+05	20.4	28.4	24.4
Company		6.78E+06			5.43E+05			12.5		
PP(4)	190	4.59E+06	4.32E+06	4.46E+06	2.21E+05	2.08E+05	2.15E+05	20.8	20.8	20.8
Company		5.10E+06			3.31E+05			15.4		
PS(1)	160	2.34E+05	2.89E+05	2.62E+05	9.59E+04	1.49E+05	1.22E+05	2.4	1.9	2.2
Company		-			-			-		
PS(2)	160	1.84E+05	1.54E+05	1.69E+05	5.58E+04	2.95E+04	4.27E+04	3.3	5.2	4.3
Company		-			-			-		
PS(3)	160	8.40E+04	7.69E+04	8.05E+04	2.73E+03	2.71E+03	2.72E+03	30.8	28.4	29.6
Company		-			-			-		

Table A2 The zero shear viscosity of the homopolymer at 220 ^{0}C

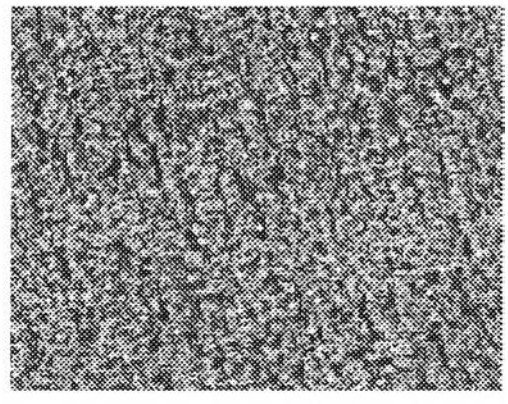
Polymers	Zero shear viscosity (Poise)					AVG. (Poise)
	1	2	3	4	5	
PP(1)	1.04E+05	9.83E+04	9.54E+04	8.12E+04	8.93E+04	9.36±0.87 (x 10^4)
PP(2)	5.98E+04	6.66E+04	6.18E+04	6.76E+04	6.03E+04	6.32±0.36 (x 10^4)
PP(3)	4.45E+04	4.42E+04	4.46E+04	4.43E+04	4.42E+04	4.44±0.02 (x 10^4)
PP(4)	1.85E+04	1.65E+04	1.90E+04	1.61E+04	1.80E+04	1.76±0.13 (x 10^4)
PS(1)	1.27E+05	1.27E+05	1.27E+05	1.26E+05	1.27E+05	1.27±0.04 (x 10^5)
PS(2)	1.51E+04	1.76E+04	1.36E+04	1.36E+04	1.49E+04	1.50±0.16 (x 10^4)
PS(3)	9.07E+03	8.42E+03	9.73E+03	9.34E+03	9.12E+03	9.14±0.47 (x 10^3)

APPENDIX B
MICROGRAPHS OF THE BLENDS

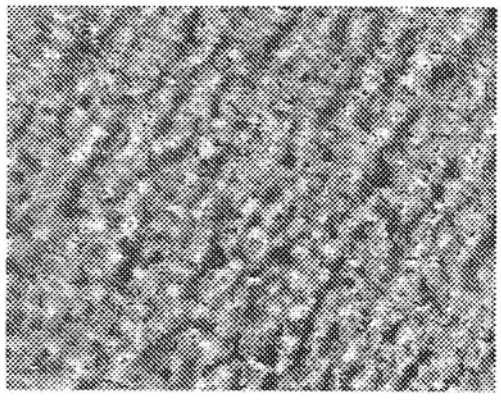
Figure B1 Micrographs of the PS/PP blends of various thicknesses at the shear strain rate of 10 s^{-1}, 220 ^{0}C, magnification: 500 times.



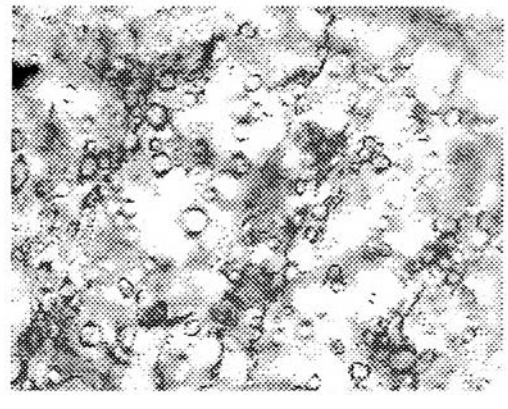
Thickness = 10 μm



Thickness = 12 μm

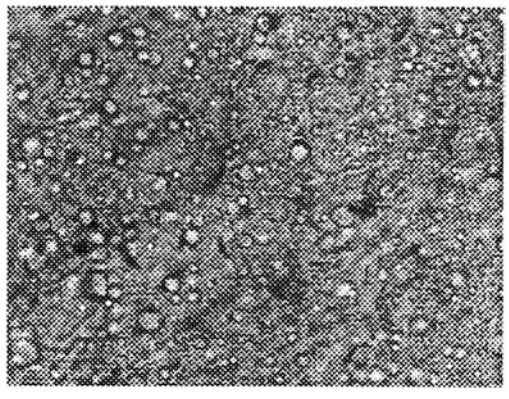


Thickness = 14 μm

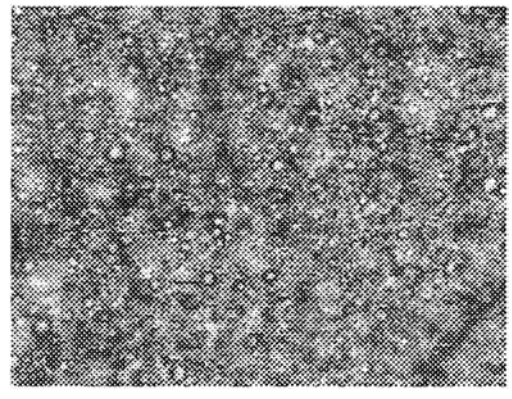


Thickness = 16μm

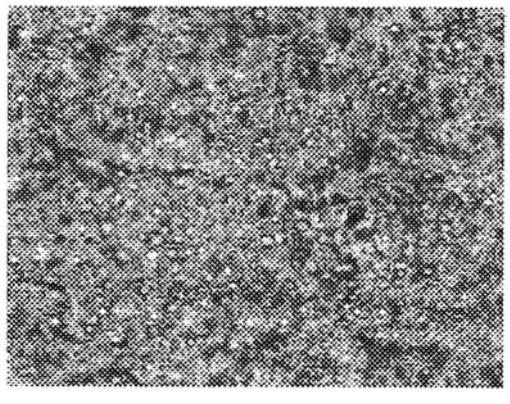
Figure B2 Micrographs of PS(2)/PP(3) blends at various shearing times at the shear strain rate of 10 s^{-1}, and at 220 ^{0}C, magnification: 500 times. (Figure 4.5)



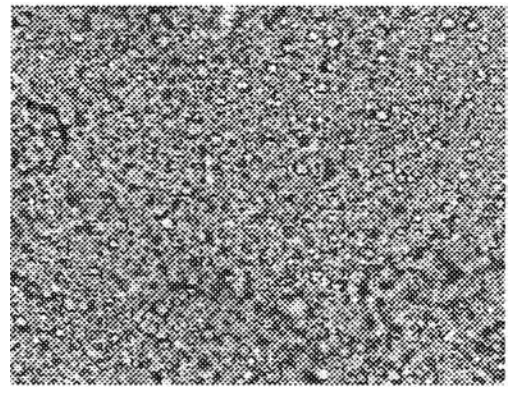
Shearing time = 300 s



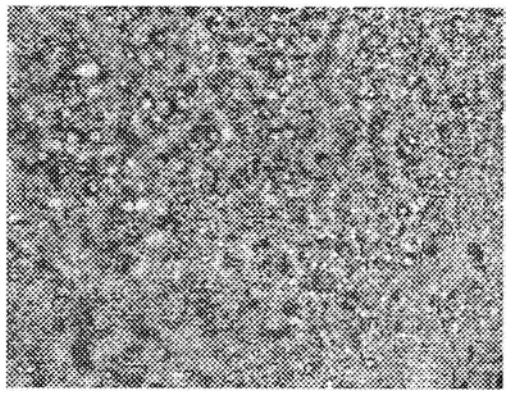
Shearing time = 500 s



Shearing time = 1000 s

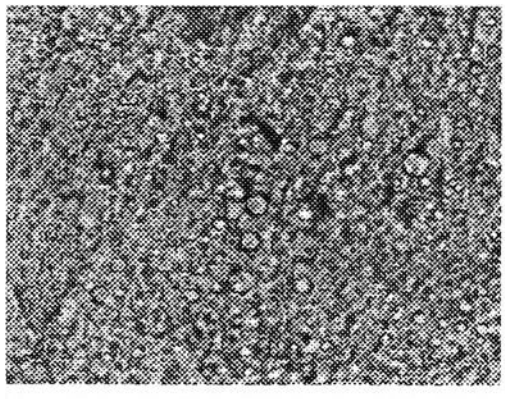


Shearing time = 1500 s

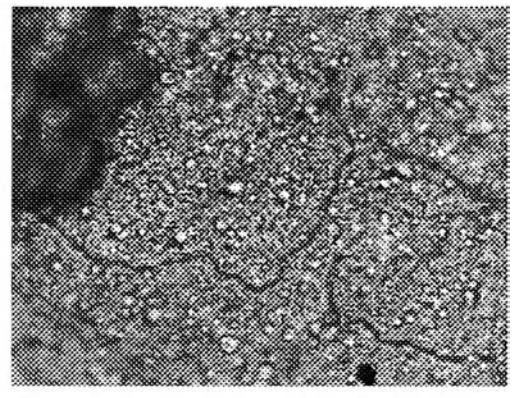


Shearing time = 2000 s

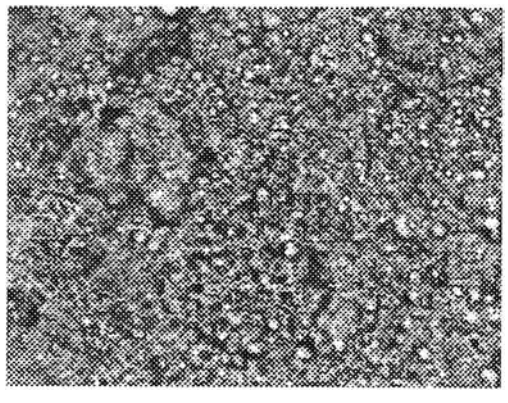
Figure B3 Micrographs of PS(2)/PP(3) blends at various shearing times at the shear strain rate 100 s^{-1},and at 220 ^{0}C, magnification: 500 times. (Figure 4.5)



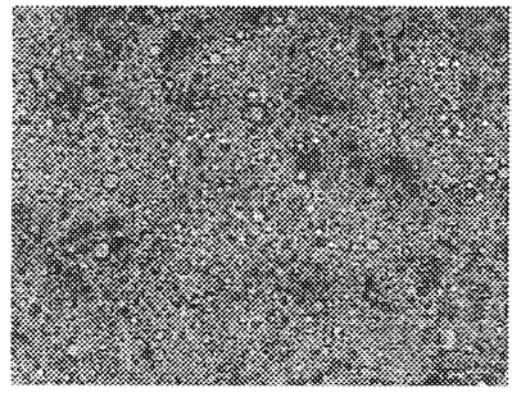
Shearing time = 30 s



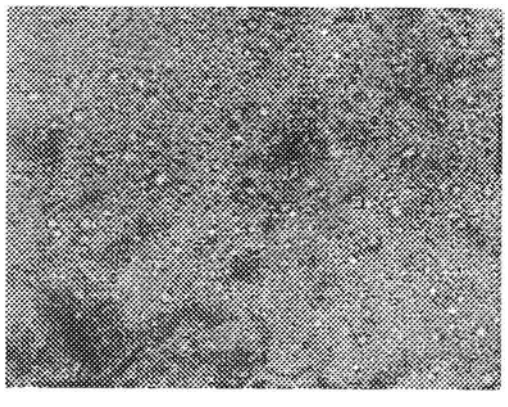
Shearing time = 50 s



Shearing time = 100 s

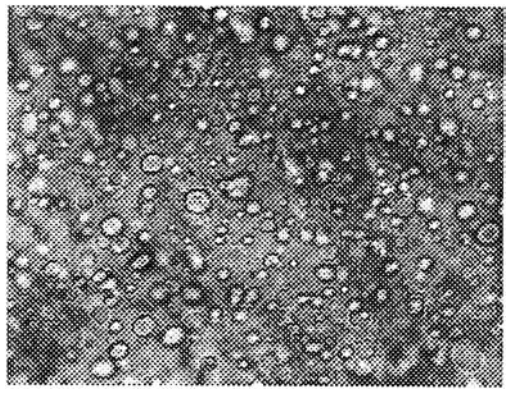


Shearing time = 150 s

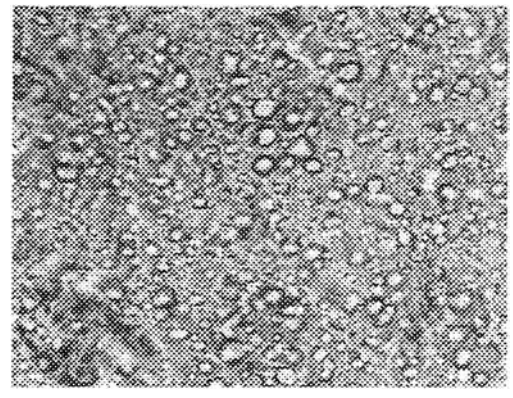


Shearing time = 200 s

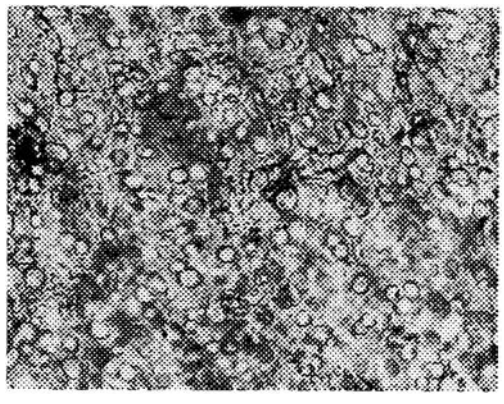
Figure B4 Micrographs of PS(1)/PP(4) blends at various shearing times at the shear strain rate 10 s^{-1}, and at 220 ^{0}C, magnification: 500 times. (Figure 4.5)



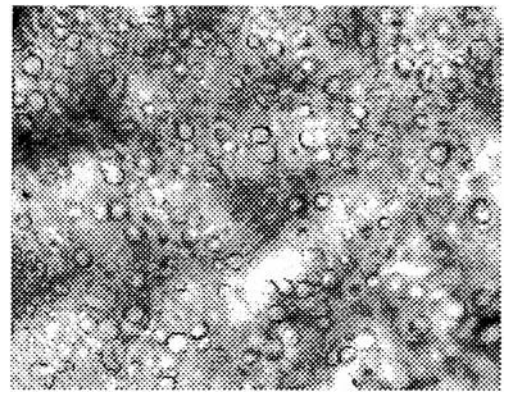
Shearing time = 300 s



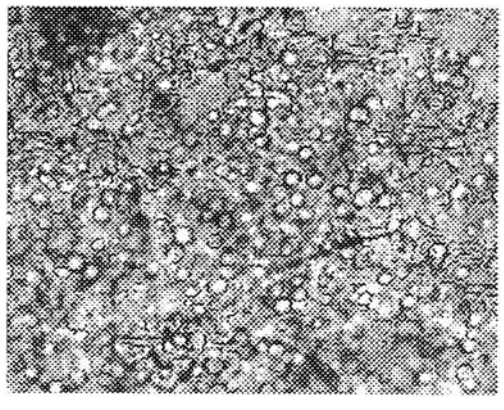
Shearing time = 500 s



Shearing time = 1000 s

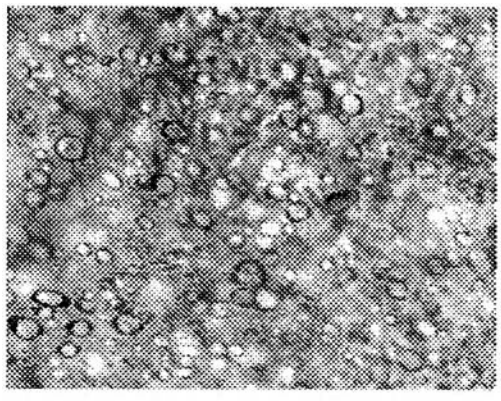


Shearing time = 1500 s

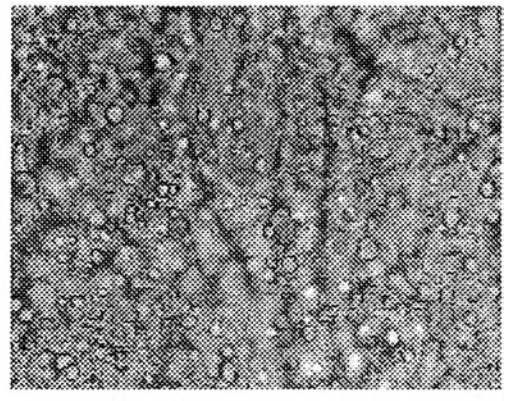


Shearing time = 2000 s

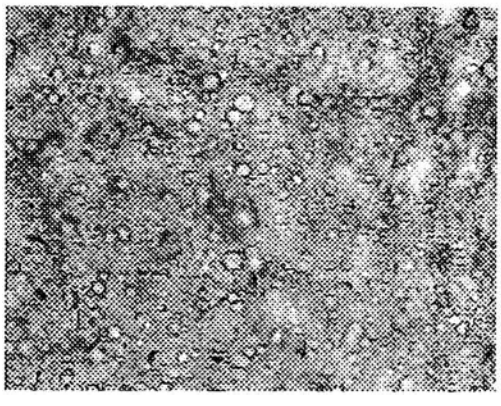
Figure B5 Micrographs of PS(1)/PP(4) blends at various shearing times at the shear strain rate 100 s^{-1}, and at 220 ^{0}C, magnification: 500 times. (Figure 4.5)



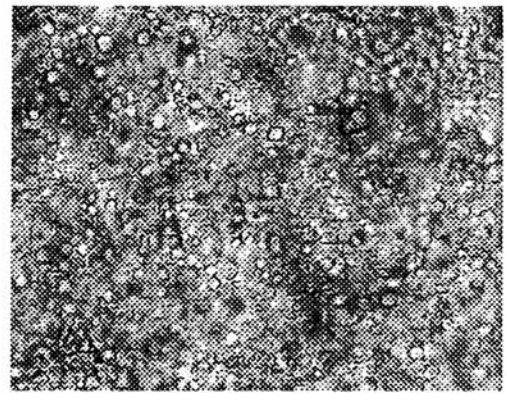
Shearing time = 30 s



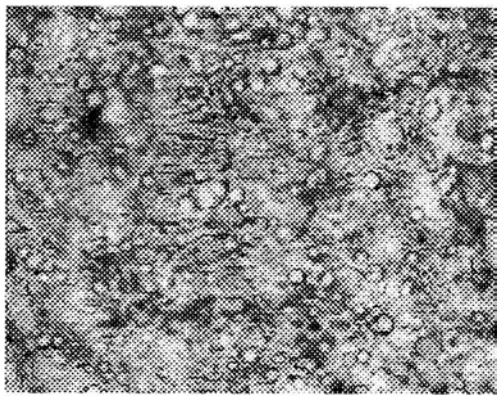
Shearing time = 50 s



Shearing time = 100 s

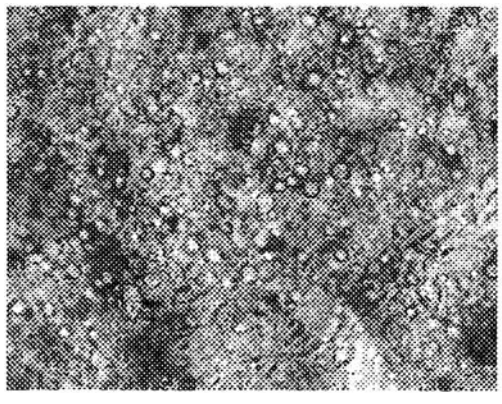


Shearing time = 150 s

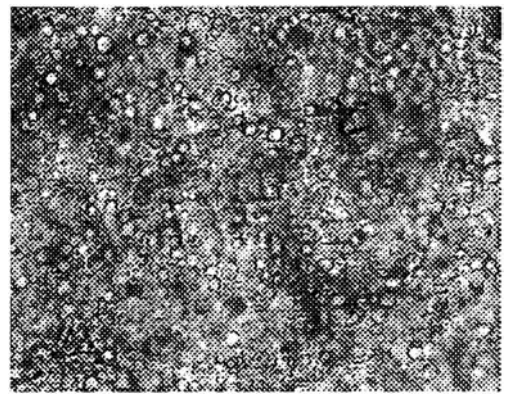


Shearing time = 200 s

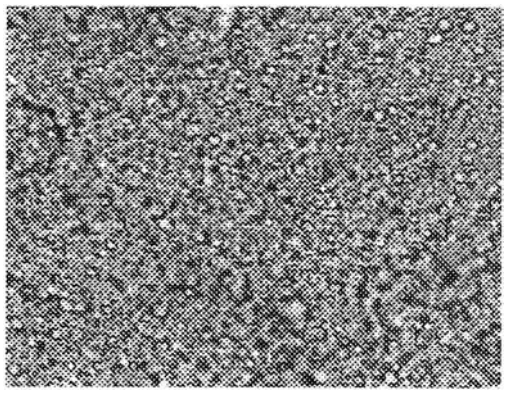
Figure B6 Micrographs of PS(2)/PP(3) blends at various shear strain rates at 220 ^{0}C, magnification: 500 times. (Figure 4.11)



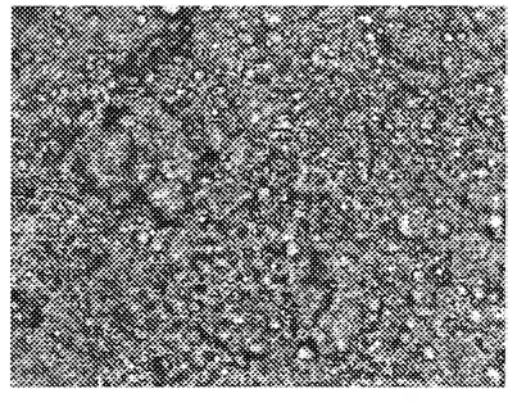
Shear strain rate = 10 s^{-1}



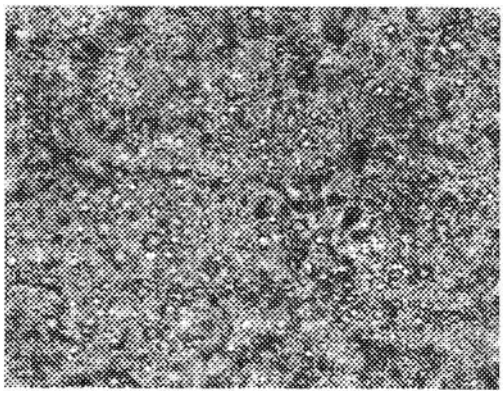
Shear strain rate = 30 s^{-1}



Shear strain rate = 70 s^{-1}

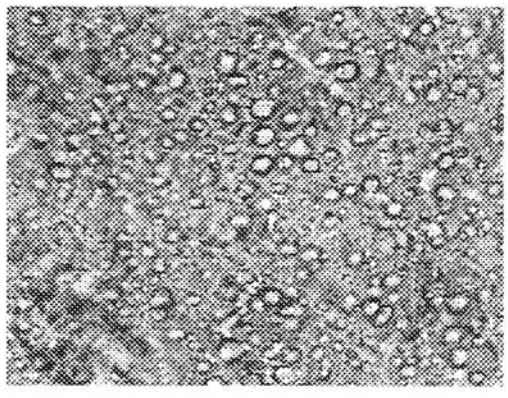


Shear strain rate = 100 s^{-1}

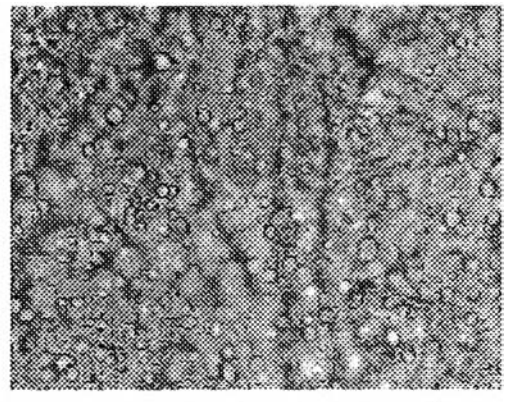


Shear strain rate = 200 s^{-1}

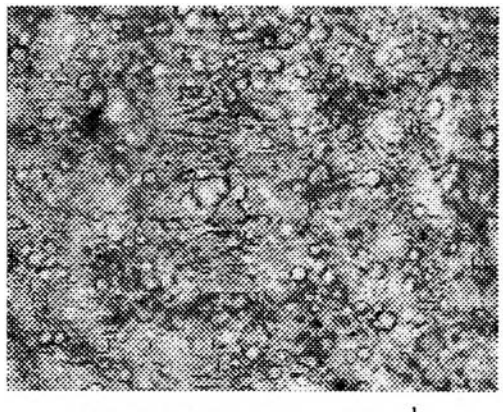
Figure B7 Micrographs of PS(1)/PP(4) blends at various shear strain rates at 220 ^{0}C, magnification: 500 times. (Figure 4.11)



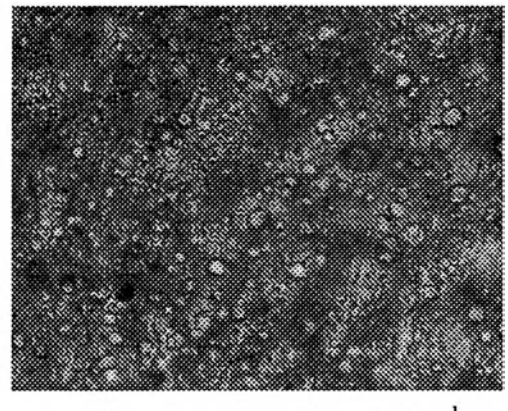
Shear strain rate = 10 s^{-1}



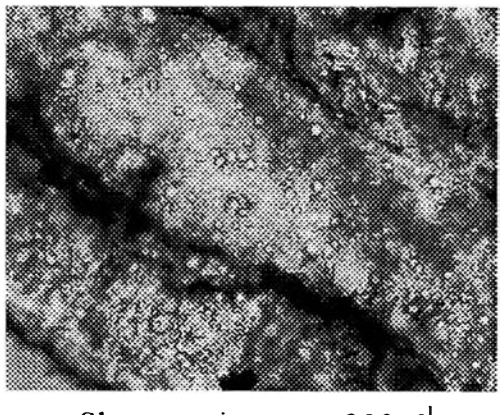
Shear strain rate = 30 s^{-1}



Shear strain rate = 70 s^{-1}



Shear strain rate = 100 s^{-1}



Shear strain rate = 200 s^{-1}

APPENDIX C

DROPLET SIZE DISTRIBUTION FUNCTIONS

Table C1 Droplet size distribution functions for PS(1)/PP(4) at the shear strain rate of 10 s^{-1}, 220 ^{0}C (Figure 4.7)

Shearing time									
300 s		500 s		1000 s		1500 s		2000 s	
d	f(d)	d	f(d)	d	f(d)	d	f(d)	d	f(d)
6.125	0.0000	4.875	0.0000	5.875	0.0000	5.625	0.0000	5.125	0.0000
6.375	0.0511	5.125	0.0073	6.375	0.0543	6.375	0.0730	6.375	0.0800
6.875	0.0876	6.375	0.0584	6.875	0.1783	6.875	0.1679	6.875	0.2320
7.625	0.1679	6.875	0.1168	7.625	0.5581	7.625	0.5255	7.625	0.4320
8.125	0.0876	7.625	0.2409	8.125	0.1628	8.125	0.1533	8.125	0.1680
8.375	0.0146	8.125	0.1241	8.875	0.0465	8.875	0.0803	8.875	0.0880
8.625	0.0511	8.625	0.0876	9.375	0.0000	9.625	0.0000	9.625	0.0000
8.875	0.0876	8.875	0.1387						
9.125	0.3796	9.125	0.1168						
9.375	0.0365	9.375	0.0219						
9.875	0.0073	9.875	0.0073						
10.125	0.0000	10.125	0.0000						

Table C2 Droplet size distribution functions for PS(1)/PP(4) at the shear strain rate of 100 s^{-1}, 220 ^{0}C (Figure 4.7)

Shearing time									
30 s		50 s		100 s		150 s		200 s	
d	f(d)	d	f(d)	d	f(d)	d	f(d)	d	f(d)
2.875	0.0000	1.625	0.0000	1.625	0.0000	0.875	0.0000	1.875	0.0000
3.125	0.0728	2.375	0.1748	2.375	0.0365	2.375	0.0114	2.375	0.0114
3.375	0.0048	3.125	0.2961	3.125	0.3125	3.125	0.3466	3.125	0.3182
3.875	0.0485	3.375	0.1505	3.375	0.3802	3.375	0.2727	3.375	0.2955
4.375	0.4320	3.875	0.2039	3.875	0.1771	3.875	0.2386	3.625	0.2500
4.625	0.1019	4.375	0.1408	4.375	0.0052	4.375	0.0056	3.875	0.1193
4.875	0.0291	5.125	0.0146	6.375	0.0000	4.625	0.0000	4.375	0.0056
5.125	0.0388	5.625	0.0048					4.875	0.0000
5.625	0.0097	6.375	0.0000						
6.125	0.0583								
6.375	0.1990								
6.625	0.0437								
6.875	0.0048								
7.125	0.0000								

Table C3 Droplet size distribution functions for PS(2)/PP(3) at the shear strain rate of 10 s^{-1}, 220 ^{0}C (Figure 4.7)

Shearing time									
300 s		500 s		1000 s		1500 s		2000 s	
d	f(d)	d	f(d)	d	f(d)	d	f(d)	d	f(d)
2.875	0.0000	2.125	0.0000	1.875	0.0000	1.875	0.0000	1.875	0.0000
3.125	0.0528	2.375	0.1626	2.375	0.0918	2.375	0.1500	2.375	0.1351
3.625	0.0244	3.125	0.2520	3.250	0.5102	3.250	0.4167	3.250	0.4505
3.875	0.2480	3.875	0.1667	3.875	0.3469	3.875	0.2833	3.875	0.3063
4.125	0.2114	4.125	0.2358	4.375	0.0459	4.375	0.1333	4.375	0.0946
4.375	0.0650	4.375	0.0732	4.625	0.0051	4.625	0.0167	4.625	0.0135
5.125	0.0650	5.125	0.0732	5.125	0.0000	5.125	0.0000	5.125	0.0000
5.625	0.0528	5.625	0.0325						
6.125	0.1341	5.875	0.0041						
6.375	0.0163	6.125	0.0000						
6.625	0.0000								

Table C4 Droplet size distribution functions for PS(2)/PP(3) at the shear strain rate of 100 s^{-1}, 220 ^{0}C (Figure 4.7)

Shearing time									
30 s		50 s		100 s		150 s		200 s	
d	f(d)	d	f(d)	d	f(d)	d	f(d)	d	f(d)
8.750	0.0000	8.750	0.0000	0.625	0.0000	0.875	0.0000	0.875	0.0000
1.125	0.0332	1.125	0.0403	1.125	0.0368	1.125	0.0387	1.375	0.0860
1.375	0.0379	1.375	0.0498	1.375	0.0784	1.375	0.0825	1.625	0.1465
1.625	0.0877	1.625	0.1209	1.625	0.1618	1.625	0.1701	2.125	0.2674
1.875	0.1209	1.875	0.1635	2.125	0.2868	1.875	0.2268	2.625	0.0791
2.125	0.2133	2.125	0.2346	2.375	0.1127	2.125	0.2552	2.875	0.0395
2.375	0.1398	2.375	0.1445	2.875	0.0319	2.375	0.1186	3.125	0.0256
2.625	0.0758	2.625	0.0758	3.125	0.0123	2.625	0.0644	3.375	0.0140
2.875	0.0948	2.875	0.0948	3.375	0.0002	2.875	0.0335	3.625	0.0000
3.125	0.0545	3.125	0.0521	3.875	0.0000	3.125	0.0103		
3.375	0.0237	3.375	0.0237			3.375	0.0000		
3.625	0.0308	3.625	0.0000						
3.875	0.0711								
4.125	0.0004								
4.375	0.0118								
4.625	0.0000								

Table C5 Droplet size distribution functions for PS(1)/PP(4) as a function of shear strain rate at 220 ^{0}C (Figure 4.12)

Shear strain rate (s^{-1})									
10		30		70		100		200	
d	f(d)	d	f(d)	d	f(d)	d	f(d)	d	f(d)
5.625	0.0000	4.125	0.0000	2.875	0.0000	2.125	0.0000	1.875	0.0000
6.375	0.0730	4.625	0.0584	3.125	0.0185	3.125	0.0243	2.375	0.2063
6.875	0.1679	5.375	0.2409	3.625	0.0148	3.375	0.1505	3.125	0.4260
7.625	0.5255	5.875	0.1898	4.375	0.1519	3.875	0.2039	3.875	0.1794
8.125	0.1533	6.875	0.0730	4.875	0.2593	4.375	0.2524	4.375	0.0852
8.875	0.0803	7.625	0.0219	5.125	0.1148	4.875	0.1117	5.125	0.0045
9.625	0.0000	8.125	0.0000	5.625	0.0148	5.125	0.0146	5.625	0.0045
				5.875	0.0000	5.625	0.0049	5.875	0.0000
						5.875	0.0000		

Table C6 Droplet size distribution functions for PS(2)/PP(3) as a function of shear strain rate at 220 ^{0}C (Figure 4.13)

Shear strain rate (s^{-1})									
10		30		70		100		200	
d	f(d)	d	f(d)	d	f(d)	d	f(d)	d	f(d)
1.875	0.0000	1.625	0.0000	1.375	0.0000	0.875	0.0000	0.625	0.0000
2.375	0.0918	2.125	0.0635	1.625	0.0561	1.125	0.0368	0.875	0.0285
3.125	0.5102	2.375	0.1637	1.875	0.1429	1.375	0.0784	1.125	0.3264
3.875	0.3469	2.625	0.4133	2.125	0.6837	1.625	0.1618	1.625	0.2383
4.375	0.0459	3.125	0.5102	2.375	0.1173	2.125	0.2868	1.875	0.1425
4.625	0.0051	3.375	0.2635	2.625	0.0000	2.375	0.1127	2.125	0.0907
5.125	0.0000	3.625	0.0876			2.875	0.0319	2.375	0.0751
		3.875	0.0000			3.125	0.0123	2.625	0.0000
						3.375	0.0024		
						3.625	0.0000		

Table C7 The ensemble averages of droplet size of PS/PP blends at 220 ^{0}C (Figure 4.5)

Polymer pairs	shear strain rate (s^{-1})	Droplet size	Shear strain unit				
			3000	5000	10000	15000	20000
PS(1)/PP(4)	10	AVG. (μm)	8.36	8.01	7.57	7.57	7.53
		STD.	0.91	0.9	0.57	0.63	0.67
		Max. (μm)	9.86	9.86	8.86	8.86	8.86
		Min. (μm)	6.26	5.10	6.26	6.26	6.26
	100	AVG. (μm)	4.87	4.01	3.36	3.42	3.40
		STD.	1.01	0.82	0.34	0.32	0.30
		Max. (μm)	6.79	5.7	4.43	4.43	4.43
		Min. (μm)	3.05	2.49	2.04	2.49	2.49
PS(2)/PP(3)	10	AVG. (μm)	4.62	3.7	3.33	3.39	3.36
		STD.	0.92	0.85	0.50	0.62	0.58
		Max. (μm)	6.39	5.83	4.55	4.55	4.55
		Min. (μm)	3.05	2.49	2.49	2.49	2.49
	100	AVG. (μm)	2.45	2.14	1.98	1.97	2.02
		STD.	0.76	0.52	0.41	0.41	0.50
		Max. (μm)	4.42	3.47	3.32	3.2	3.47
		Min. (μm)	1.01	1.01	1.01	1.01	0.87

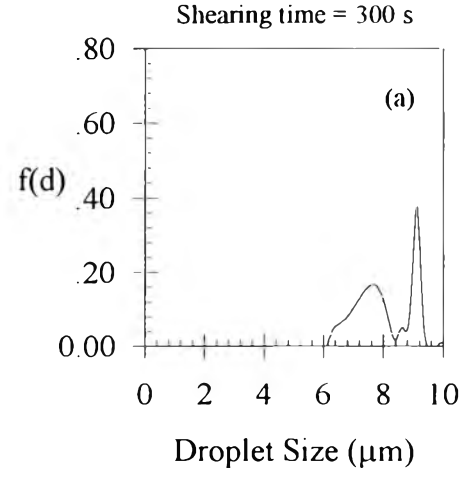
Table C8 The ensemble averages droplet size of PS/PP blends as a function of shear strain rate at 220 ^{0}C (Figure 4.11)

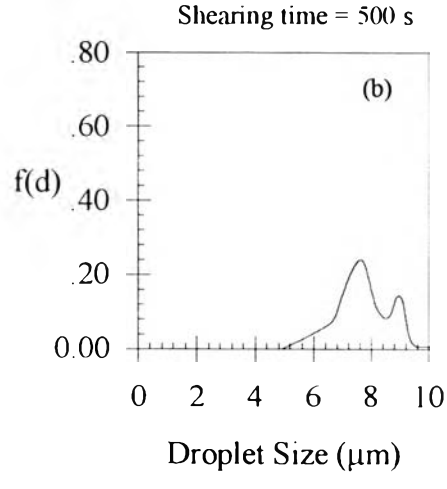
Polymer pairs	Statistical equilibrium	Shear strain rate (s^{-1})				
		10	30	70	100	200
PS(1)/PP(4)	AVG (μm)	7.58	5.68	4.48	3.9	3.24
	STD.	0.62	0.61	0.53	0.78	0.6
	Max (μm)	8.86	7.6	5.71	5.71	5.71
	Min (μm)	6.27	4.57	3.05	2.49	2.49
PS(2)/PP(3)	AVG (μm)	3.33	2.73	2.14	1.99	1.55
	STD.	0.5	0.35	0.21	0.41	0.41
	Max (μm)	4.55	3.05	2.49	3.31	2.44
	Min (μm)	2.49	2.26	1.61	1.01	0.82

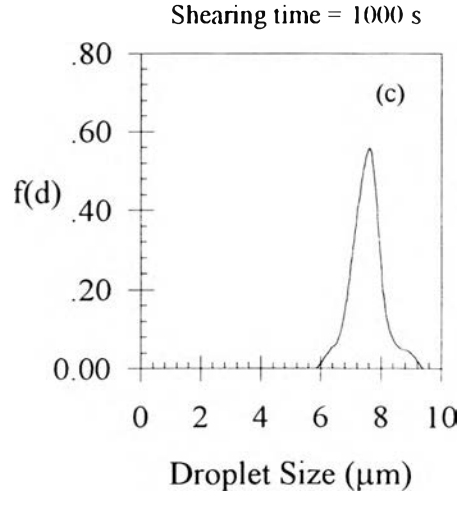
Figure C1 Distribution function of droplet size of PS(1)/PP(4) at shear strain rate of 10 s^{-1}, 220 ^{0}C (Figure 4.7).

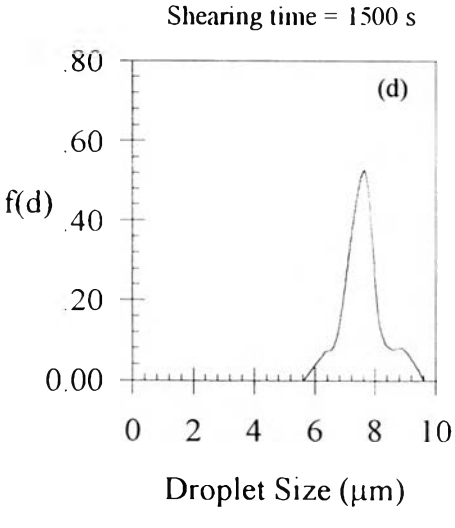
Compression conditions:

Heating temperature	: 175 ^{0}C
Preheating time	: 5 min
Load	: 10 tons
Compression time under load	: 3 min
Cooling temperature	: 40 ^{0}C









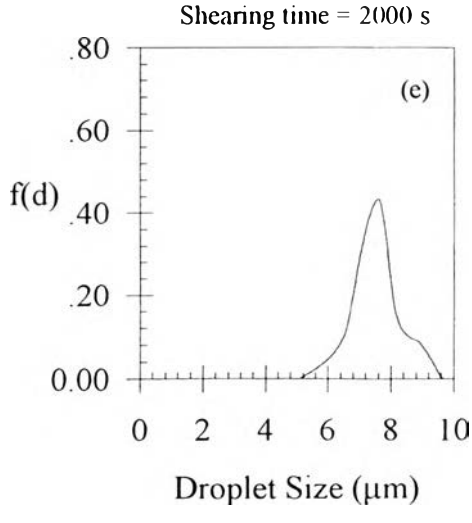


Figure C2 Distribution function of droplet size of PS(1)/PP(4) at the shear strain rate of 100 s^{-1}, 220 ^{0}C (Figure 4.8).

Compression conditions:

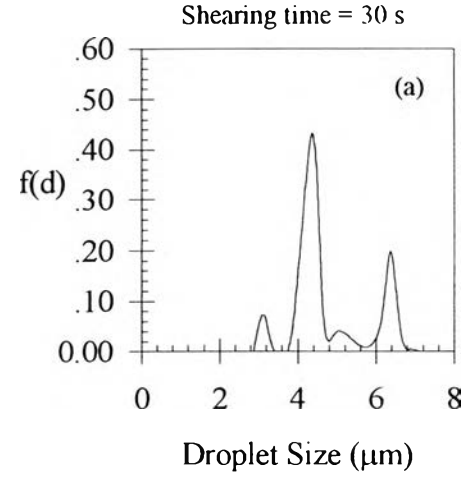
Heating temperature : 175 ^{0}C

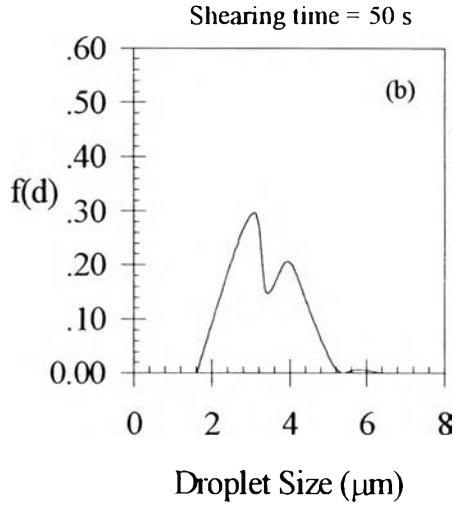
Preheating time : 5 min

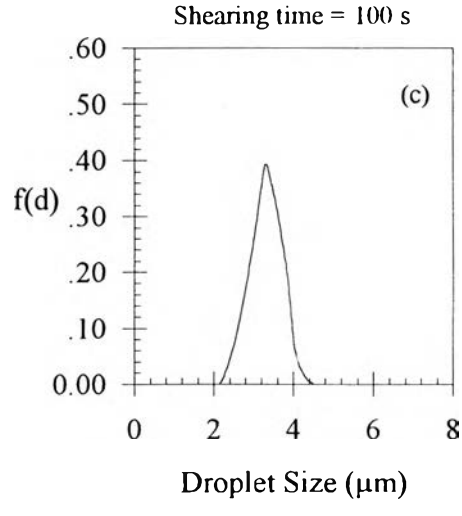
Load : 10 tons

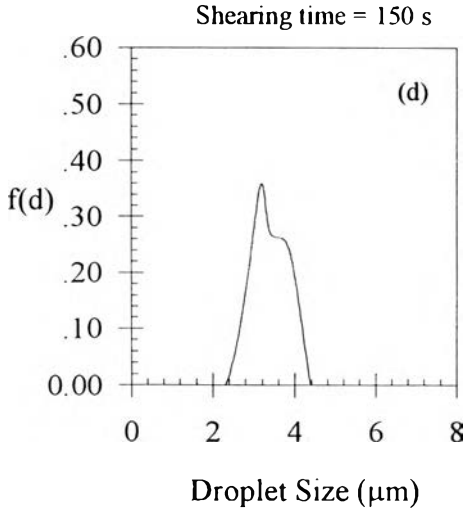
Compression time under load: 3 min

Cooling temperature : 40 ^{0}C









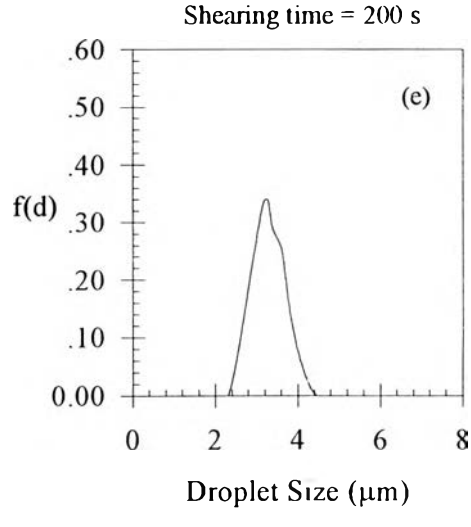


Figure C3 Distribution function of droplet size of PS(2)/PP(3) at the shear strain rate of 10 s^{-1}, 220 ^{0}C (Figure 4.9).

Compression conditions:

Heating temperature	:	175 ^{0}C
Preheating time	:	5 min
Load	:	10 tons
Compression time under load	:	3 min
Cooling temperature	:	40 ^{0}C

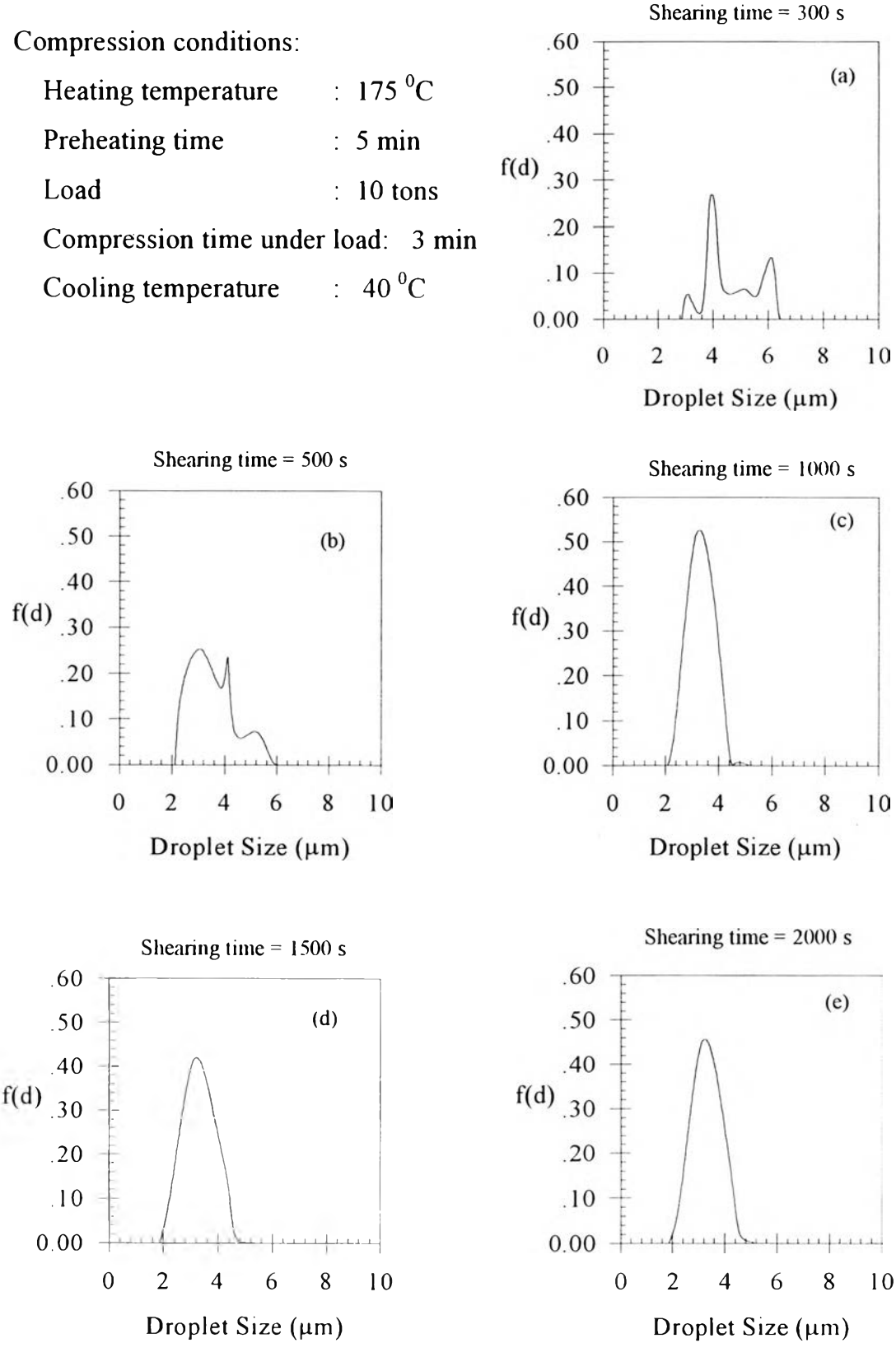


Figure C4 Distribution function of droplet size of PS(2)/PP(3) at the shear strain rate of 100 s^{-1}, 220 ^{0}C (Figure 4.10).

Compression conditions:

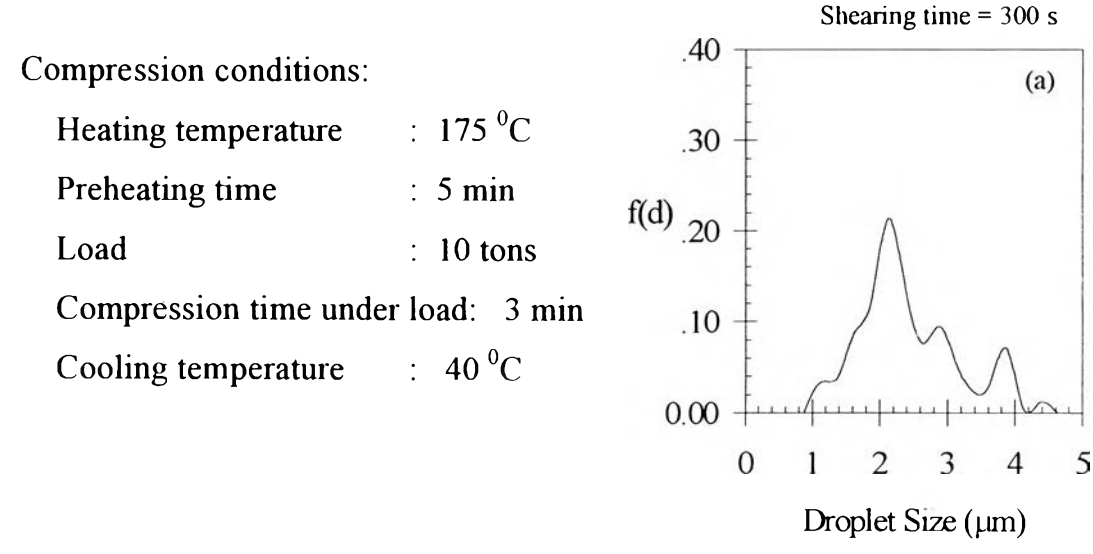
Heating temperature : 175 ^{0}C

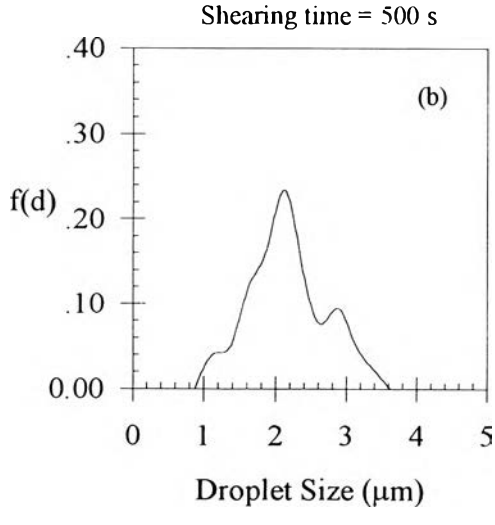
Preheating time : 5 min

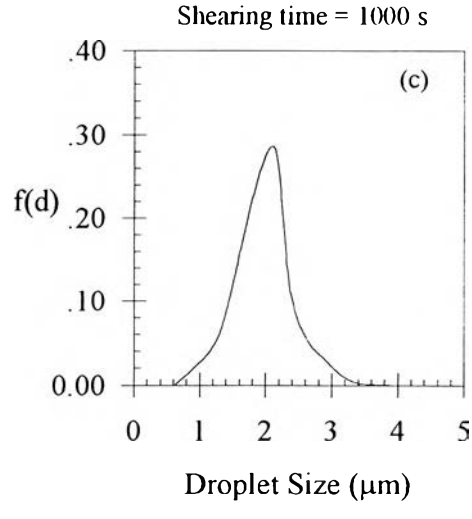
Load : 10 tons

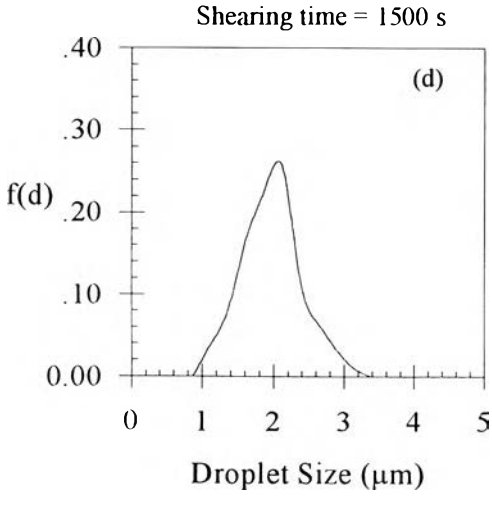
Compression time under load: 3 min

Cooling temperature : 40 ^{0}C









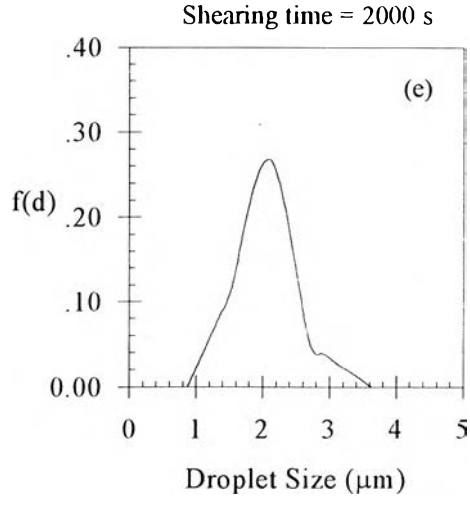


Figure C5 Distribution function of droplet size of PS(1)/PP(4) as a function of shear strain rate at 220 ^{0}C (Figure 4.12).

Compression conditions:

Heating temperature	: 175 ^{0}C
Preheating time	: 5 min
Load	: 10 tons
Compression time under load	: 3 min
Cooling temperature	: 40 ^{0}C

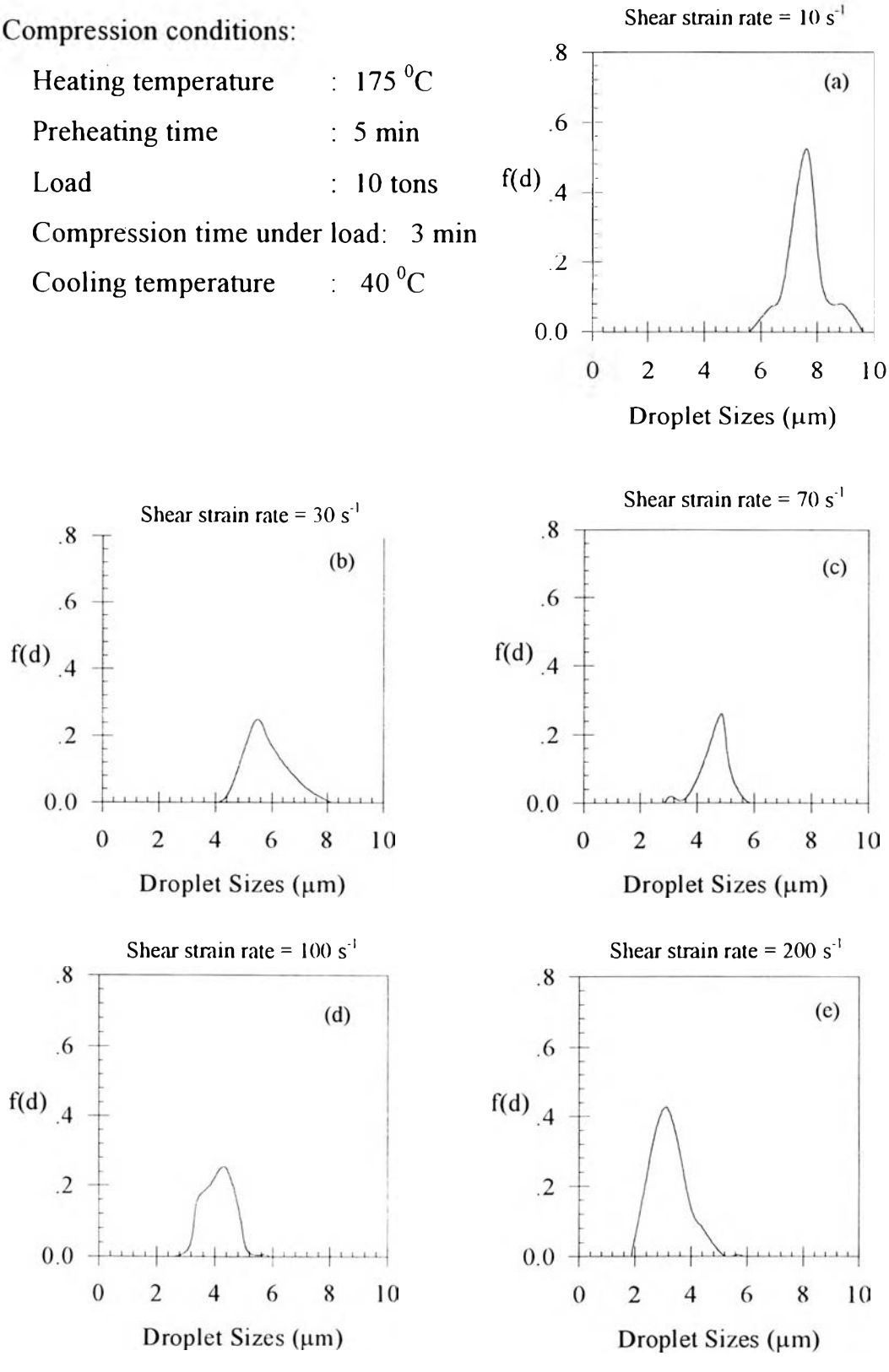
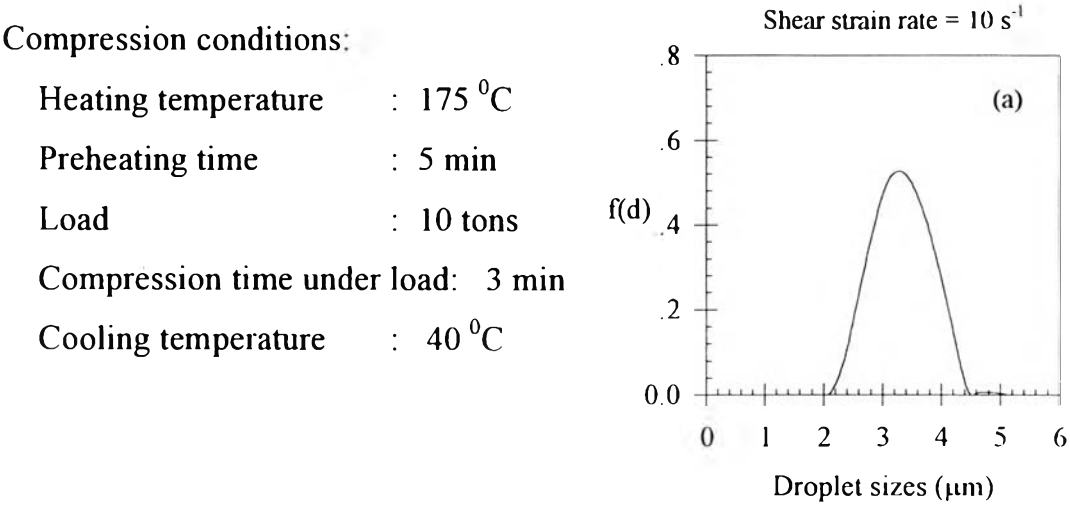
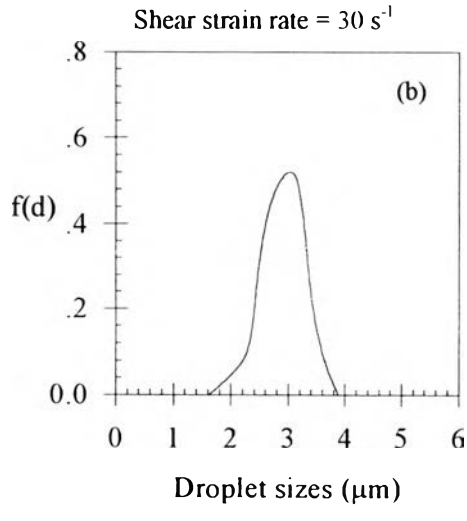


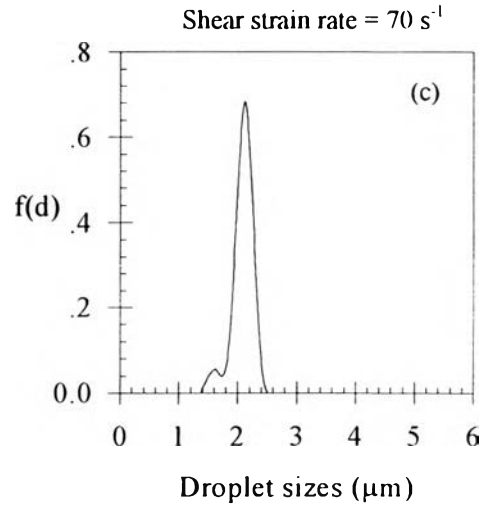
Figure C6 Distribution function of droplet size of PS(2)/PP(3) as a function of shear strain rate at 220 ^{0}C (Figure 4.13).

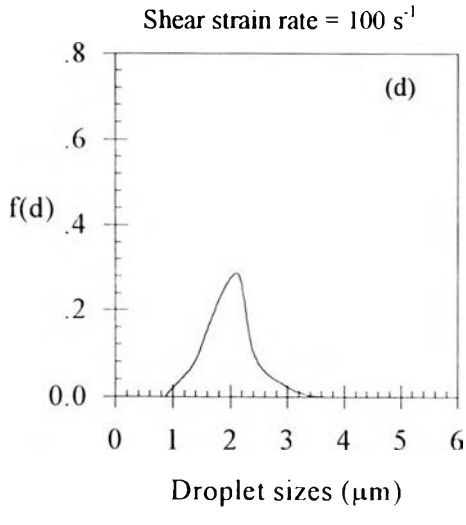
Compression conditions:

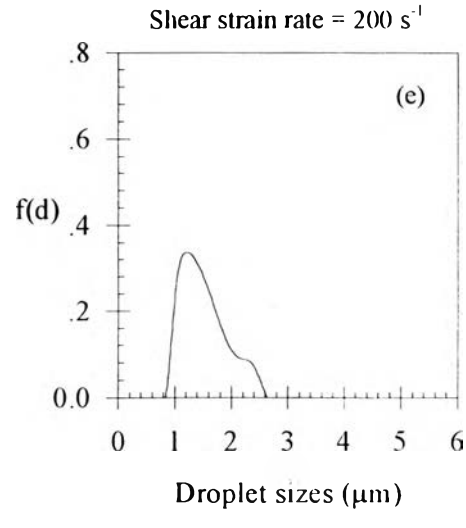
Heating temperature	: 175 ^{0}C
Preheating time	: 5 min
Load	: 10 tons
Compression time under load	: 3 min
Cooling temperature	: 40 ^{0}C











APPENDIX D
INTERFACIAL TENSION OF PS/PP BLENDS

The interfacial tension, Γ_{12}, between 2 homopolymers making up an immiscible blend was calculated from the surface tension of each component, assuming that no chemical reaction took place. Both surface and interfacial tension decrease with increasing temperature. The values of surface tension for the homopolymers have been published (Brandrup, 1989). The surface tension of a polymer at any temperature can be calculated from the temperature coefficient of surface tension and surface tension at a reference temperature as

$$\gamma_T = \gamma_r - \frac{d\gamma}{dT}(T - 20) \qquad \text{(D-1)}$$

where γ_T is the surface tension at a required temperature, γ_r is the surface tension at a reference temperature, $(d\gamma/dT)$ is a temperature coefficient, and T is the temperature (^{0}C). The surface tension consists of disperse-contribution and polar-contribution

$$\gamma = \gamma^d + \gamma^p \qquad \text{(D-2)}$$

$$\chi^p = \frac{\gamma^p}{\gamma} \qquad \text{(D-3)}$$

$$\chi^d = \frac{\gamma^d}{\gamma} \qquad \text{(D-4)}$$

$$\chi^p + \chi^d = 1 \qquad \text{(D-5)}$$

where γ^d is dispersion component (arising from dispersion force interactions), γ^p is polar component (arising from various dipolar and specific interactions), χ^p is the polarity of polymers (depending on chemical structure of polymer), and χ^d is the dispersion value of polymers. The interfacial tension is related to

the surface tension and the polarity of two contiguous phase by the harmonic-mean equation.

$$\Gamma_{12} = \gamma_1 + \gamma_2 - \frac{4\gamma_1^d\gamma_2^d}{\gamma_1^d + \gamma_2^d} - \frac{4\gamma_1^p\gamma_2^p}{\gamma_1^p + \gamma_2^p} \qquad \text{(D-6)}$$

where Γ_{12} is an interfacial tension between polymer pair, the subscripts 1 and 2 refer to the two individual phases. The harmonic-mean equation has been shown to predict the interfacial tension between polymers satisfactorily.

The surface tension and interfacial tension at temperature 220 ^{0}C are shown in Table D1 and D2, respectively.

Table D1 Surface tension of homopolymer at 20, 150 and 200°C

Polymers	γ (dyn/cm)			χ^p	χ^d	γ^d			γ^p		
	20°C	150°C	200°C			20°C	150°C	200°C	20°C	150°C	200°C
PP	29.4	22.1	19.3	0	1	0	0	0	29.4	22.1	19.3
PS	40.7	31.4	27.8	0.17	0.83	6.8	5.2	4.6	33.8	26.1	23.1

Table D2 The interfacial tension of PS/PP blends at 20, 150 and 200°C

Polymer blend system	Γ_{12} of PS/PP (dyn/cm)				Γ_{12} from references[@] at 220 ^{0}C (dyn/cm)
	20°C *	150°C *	200°C *	220°C +	
PS/PP	7.15	5.61	5.02	4.78	5.00

* from calculation

\+ from Figure D1

[@] Levitt *et al.*, 1996

The surface tension of polymer is usually a linear function of temperature. The interfacial tension is found to decrease linearly with temperature. So the interfacial tension of PS/PP blends at 220°C are also obtained from the relation of interfacial tension and temperature as shown in Figure D1. From the linear regression, the interfacial tension of PS/PP blends at 220 ^{0}C is 4.78 dyn/cm.

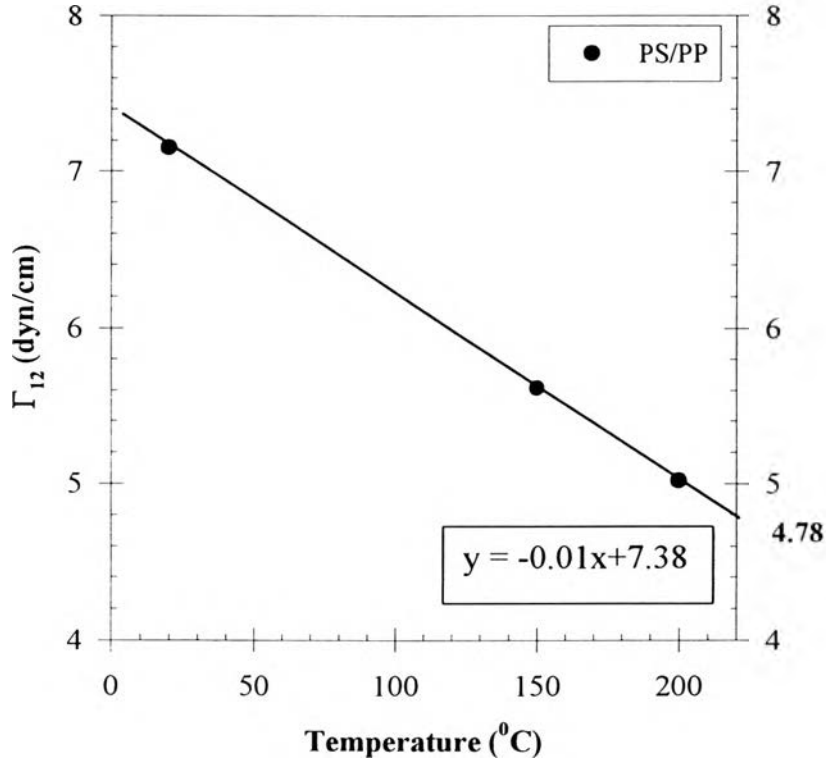


Figure D1 The interfacial tension of PS/PP blends as a function of temperature.

APPENDIX E

CAPILLARY NUMBER, VISCOSITY RATIO, AND THE FIRST NORMAL STRESS DIFFERENCE RATIO OF PS/PP BLENDS

Table E1 The dimensionless parameters for PS/PP blends of pre-shearing at the viscosity ratio of 0.5, 220 ^{0}C (Figure 4.14)

Polymer pairs	Γ * (dyn/cm)	γ (s^{-1})	D (μm)	η_d (Poise)	η_m (Poise)	η_r	$N_{1,d}$ (dyn/cm^2)	$N_{1,m}$ (dyn/cm^2)	$N_{1,r}$	Ca
PS(3)/PP(3)	4.78	30	3.21 ± 0.65	3.78E+04	7.13E+04	0.53	1.90E+05	5.57E+05	0.34	14.36 ± 2.91
PS(2)/PP(3)	4.78	10	5.16 ± 1.44	6.82E+04	1.42E+05	0.48	9.23E+04	2.50E+05	0.37	15.34 ± 4.27
PS(2)/PP(3)	4.78	20	3.97 ± 1.72	5.17E+04	1.09E+05	0.47	1.75E+05	4.33E+05	0.40	18.12 ± 7.84
PS(3)/PP(3)	4.78	50	3.48 ± 0.88	2.89E+04	5.44E+04	0.53	3.02E+05	6.16E+05	0.49	19.82 ± 5.02
PS(2)/PP(1)	4.78	50	4.07 ± 1.11	3.25E+04	6.09E+04	0.53	3.94E+05	7.16E+05	0.55	25.92 ± 7.08

* calculated from Harmonic equation (Appendix D)

Table E2 The dimensionless parameters for PS/PP blends of pre-shearing at the viscosity ratio of 1, 220 ^{0}C (Figure 4.14)

Polymer pairs	Γ* (dyn/cm)	γ (s^{-1})	D (μm)	η_d (Poise)	η_m (Poise)	η_r	$N_{1,d}$ (dyn/cm^2)	$N_{1,m}$ (dyn/cm^2)	$N_{1,r}$	Ca
PS(3)/PP(2)	4.78	30	1.43 ± 0.30	3.22E+04	4.08E+04	0.79	1.40E+05	4.01E+05	0.35	3.66 ± 0.76
PS(2)/PP(2)	4.78	20	1.60 ± 0.48	4.86E+04	5.92E+04	0.82	1.57E+05	3.82E+05	0.41	3.96 + 1.20
PS(2)/PP(2)	4.78	30	1.70 ± 0.41	4.25E+04	4.08E+04	1.04	2.13E+05	4.01E+05	0.53	4.35 ± 1.04
PS(3)/PP(3)	4.78	100	1.11 ± 0.36	2.13E+04	1.86E+04	1.14	4.64E+05	6.72E+05	0.69	4.32 ± 1.43
PS(3)/PP(4)	4.78	50	1.37 ± 0.38	3.45E+04	3.29E+04	1.05	3.33E+05	3.62E+05	0.92	4.71 ± 0.98
PS(2)/PP(4)	4.78	50	1.66 ± 0.42	2.77E+04	2.83E+04	0.98	4.05E+05	3.62E+05	1.12	4.91 ± 1.20

Table E3 The dimensionless parameters for PS/PP blends of pre-shearing at the viscosity ratio of 2, 220 ^{0}C (Figure 4.14)

Polymer pairs	Γ^* (dyn/cm)	γ (s^{-1})	D (μm)	η_d (Poise)	η_m (Poise)	η_r	$N_{1,d}$ (dyn/cm^2)	$N_{1,m}$ (dyn/cm^2)	$N_{1,r}$	Ca
PS(2)/PP(2)	4.78	50	3.89 ± 0.89	3.25E+04	1.94E+04	1.68	3.91E+05	4.16E+05	0.94	7.88 ± 1.81
PS(3)/PP(4)	4.78	100	3.87 ± 1.03	1.99E+04	1.02E+04	1.95	4.98E+05	4.30E+05	1.16	8.25 ± 2.20
PS(1)/PP(3)	4.78	30	3.60 ± 0.92	1.35E+05	7.13E+04	1.90	8.39E+05	5.57E+05	1.51	15.88 ± 4.14
PS(1)/PP(3)	4.78	70	3.56 ± 1.16	7.46E+04	3.09E+04	2.41	1.08E+06	6.38E+05	1.68	16.11 ± 5.18

Table E4 The dimensionless parameters for PS/PP blends of pre-shearing at the viscosity ratio of 3, 220 ^{0}C (Figure 4.14)

Polymer pairs	Γ^* (dyn/cm)	γ (s^{-1})	D (μm)	η_d (Poise)	η_m (Poise)	η_r	$N_{1,d}$ (dyn/cm^2)	$N_{1,m}$ (dyn/cm^2)	$N_{1,r}$	Ca
PS(1)/PP(2)	4.78	10	3.40 ± 0.93	2.83E+05	1.12E+05	2.53	3.85E+05	2.76E+05	1.40	7.94 ± 2.17
PS(1)/PP(3)	4.78	100	3.10 ± 0.74	5.60E+04	1.86E+04	3.01	9.83E+05	6.72E+05	2.33	11.32 ± 2.69
PS(1)/PP(4)	4.78	30	4.53 ± 1.03	1.45E+05	4.55E+04	3.19	9.39E+05	2.77E+05	3.39	12.94 ± 2.95
PS(1)/PP(4)	4.78	20	5.24 ± 1.04	1.90E+05	6.08E+04	3.12	9.12E+05	2.11E+05	4.31	13.33 ± 2.66

Table E5 The dimensionless parameters for PS/PP blends after shearing 5000 strain unit at the viscosity ratio of 0.5, 220 ^{0}C (Figure 4.15)

Polymer pairs	Γ * (dyn/cm)	γ (s^{-1})	D (μm)	η_d (Poise)	η_m (Poise)	η_r	$N_{1,d}$ (dyn/cm^2)	$N_{1,m}$ (dyn/cm^2)	$N_{1,r}$	Ca
PS(3)/PP(3)	4.78	30	3.21 ± 0.65	3.51E+03	6.88E+03	0.51	6.30E+04	1.97E+05	0.32	13.26 ± 2.68
PS(2)/PP(3)	4.78	10	5.16 ± 1.44	6.81E+03	1.31E+04	0.52	5.24E+04	1.50E+05	0.35	13.52 ± 3.77
PS(2)/PP(3)	4.78	20	3.97 ± 1.72	5.22E+03	1.02E+04	0.51	6.72E+04	1.64E+05	0.41	16.28 ± 7.04
PS(3)/PP(3)	4.78	50	3.48 ± 0.88	2.88E+03	5.33E+03	0.54	1.21E+05	2.58E+05	0.47	18.57 ± 4.71
PS(2)/PP(1)	4.78	50	4.07 ± 1.11	3.28E+03	6.56E+03	0.50	2.19E+05	4.30E+05	0.51	26.75 ± 7.29

Table E6 The dimensionless parameters for PS/PP blends after shearing 5000 strain unit at the viscosity ratio of 1, 220 ^{0}C (Figure 4.15)

Polymer pairs	Γ* (dyn/cm)	γ (s^{-1})	D (μm)	η_d (Poise)	η_m (Poise)	η_r	$N_{1,d}$ (dyn/cm^2)	$N_{1,m}$ (dyn/cm^2)	$N_{1,r}$	Ca
PS(3)/PP(2)	4.78	30	1.43 ± 0.30	3.47E+03	3.66E+03	0.95	1.08E+05	2.41E+05	0.45	3.28 + 0.68
PS(2)/PP(2)	4.78	20	1.60 ± 0.48	5.16E+03	5.11E+03	1.01	1.05E+05	2.29E+05	0.46	3.43 + 1.04
PS(2)/PP(2)	4.78	30	1.70 ± 0.41	4.24E+03	3.66E+03	1.16	1.49E+05	2.41E+05	0.62	3.90 + 0.94
PS(3)/PP(3)	4.78	100	1.11 ± 0.36	1.99E+03	1.71E+03	1.16	2.10E+05	2.83E+05	0.74	3.98 + 1.32
PS(3)/PP(4)	4.78	50	1.37 ± 0.38	2.87E+03	2.79E+03	1.03	1.74E+05	2.17E+05	0.80	4.01 + 0.84
PS(2)/PP(4)	4.78	50	1.66 ± 0.42	3.24E+03	2.79E+03	1.16	2.19E+05	2.17E+05	1.01	4.85 + 1.22

Table E7 The dimensionless parameters for PS/PP blends after shearing 5000 strain unit at the viscosity ratio of 2, 220 ^{0}C (Figure 4.15)

Polymer pairs	Γ^* (dyn/cm)	γ (s^{-1})	D (μm)	η_d (Poise)	η_m (Poise)	η_r	$N_{1,d}$ (dyn/cm^2)	$N_{1,m}$ (dyn/cm^2)	$N_{1,r}$	Ca
PS(2)/PP(2)	4.78	50	3.89 ± 0.89	3.24E+03	1.70E+03	1.91	2.20E+05	2.50E+05	0.88	6.60 ± 1.51
PS(3)/PP(4)	4.78	100	3.87 ± 1.03	1.99E+03	1.02E+03	1.95	2.99E+05	2.58E+05	1.16	7.89 ± 2.10
PS(1)/PP(3)	4.78	30	3.60 ± 0.92	1.35E+04	6.88E+03	1.97	4.89E+05	1.97E+05	2.48	14.87 ± 3.82
PS(1)/PP(3)	4.78	70	3.56 ± 1.16	7.37E+03	3.76E+03	1.96	9.31E+05	2.73E+05	3.41	18.75 ± 6.11

Table E8 The dimensionless parameters for PS/PP blends after shearing 5000 strain unit at the viscosity ratio of 3, 220 ^{0}C (Figure 4.15)

Polymer pairs	Γ^* (dyn/cm)	γ (s^{-1})	D (μm)	η_d (Poise)	η_m (Poise)	η_r	$N_{1,d}$ (dyn/cm^2)	$N_{1,m}$ (dyn/cm^2)	$N_{1,r}$	Ca
PS(1)/PP(2)	4.78	10	3.40 ± 0.93	2.82E+04	9.38E+03	3.01	3.86E+05	1.66E+05	2.33	6.38 ± 1.74
PS(1)/PP(3)	4.78	100	3.10 ± 0.74	5.24E+03	1.71E+03	3.06	9.83E+05	2.83E+05	3.47	10.66 ± 2.53
PS(1)/PP(4)	4.78	30	4.53 ± 1.03	1.35E+04	4.55E+03	2.97	8.29E+05	1.66E+05	4.99	12.37 ± 2.81
PS(1)/PP(4)	4.78	20	5.24 ± 1.04	1.81E+04	6.08E+03	2.97	6.56E+05	1.27E+05	5.17	12.75 ± 2.54

APPENDIX F

VISCOSITY RATIO AND THE FIRST NORMAL STRESS DIFFERENCE RATIO OF PS/PP BLENDS

Table F1 The shear viscosity ratio at pre-shearing of PS/PP blends, 220 ^{0}C

γ (s^{-1})	PS(1)/ PP(1)	PS(1)/ PP(2)	PS(1)/ PP(3)	PS(1)/ PP(4)	PS(2)/ PP(1)	PS(2)/ PP(2)	PS(2)/ PP(3)	PS(2)/ PP(4)	PS(3)/ PP(1)	PS(3)/ PP(2)	PS(3)/ PP(3)	PS(3)/ PP(4)
10	1.592	2.533	1.989	4.050	0.384	0.611	0.480	0.977	0.288	0.458	0.359	0.732
20	1.190	2.877	1.660	3.123	0.340	0.822	0.474	0.850	0.268	0.649	0.374	0.670
30	1.503	3.314	1.897	3.194	0.473	1.043	0.597	0.935	0.386	0.793	0.530	0.763
50	1.535	4.826	1.717	3.345	0.533	1.677	0.597	0.981	0.474	1.491	0.531	1.053
70	2.125	5.309	2.413	4.790	0.722	1.803	0.820	1.627	0.696	1.740	0.791	1.570
100	2.572	5.738	3.009	5.142	0.859	1.917	1.005	1.718	0.977	2.179	1.143	1.952

Table F2 The first normal stress difference ratio at pre-shearing of PS/PP blends, 220 ^{0}C

γ (s^{-1})	PS(1)/ PP(1)	PS(1)/ PP(2)	PS(1)/ PP(3)	PS(1)/ PP(4)	PS(2)/ PP(1)	PS(2)/ PP(2)	PS(2)/ PP(3)	PS(2)/ PP(4)	PS(3)/ PP(1)	PS(3)/ PP(2)	PS(3)/ PP(3)	PS(3)/ PP(4)
10	1.760	1.404	2.573	6.498	0.238	0.315	0.368	0.878	0.155	0.205	0.226	0.571
20	1.626	2.387	2.105	4.313	0.313	0.409	0.405	0.830	0.213	0.312	0.275	0.564
30	1.575	2.341	1.559	3.389	0.417	0.529	0.446	0.898	0.300	0.346	0.341	0.646
50	1.342	2.309	1.684	2.656	0.552	0.938	0.595	1.115	0.406	0.699	0.492	0.924
70	1.171	2.338	1.505	2.538	0.542	1.081	0.696	1.174	0.452	0.903	0.581	0.980
100	1.218	2.027	2.334	2.185	0.582	0.969	0.667	1.044	0.646	1.075	0.687	1.159

Table F3 The shear viscosity ratio after shearing 5000 strain unit of PS/PP blends, 220 ^{0}C

γ (s^{-1})	PS(1)/ PP(1)	PS(1)/ PP(2)	PS(1)/ PP(3)	PS(1)/ PP(4)	PS(2)/ PP(1)	PS(2)/ PP(2)	PS(2)/ PP(3)	PS(2)/ PP(4)	PS(3)/ PP(1)	PS(3)/ PP(2)	PS(3)/ PP(3)	PS(3)/ PP(4)
10	1.635	3.011	2.157	4.050	0.394	0.726	0.520	0.977	0.295	0.544	0.390	0.732
20	1.312	3.538	1.766	2.974	0.375	1.011	0.505	0.850	0.296	0.798	0.398	0.670
30	1.408	3.695	1.965	2.970	0.443	1.163	0.618	0.935	0.361	0.949	0.505	0.763
50	1.423	5.506	1.752	3.345	0.495	1.913	0.609	1.162	0.440	1.701	0.541	1.033
70	1.667	6.924	1.955	4.790	0.566	2.351	0.664	1.627	0.546	2.270	0.641	1.570
100	1.913	7.327	3.057	5.142	0.639	2.447	1.021	1.718	0.726	2.782	1.161	1.952

Table F4 The first normal stress difference ratio after shearing 5000 strain unit of PS/PP blends, 220 ^{0}C

γ (s^{-1})	PS(1)/ PP(1)	PS(1)/ PP(2)	PS(1)/ PP(3)	PS(1)/ PP(4)	PS(2)/ PP(1)	PS(2)/ PP(2)	PS(2)/ PP(3)	PS(2)/ PP(4)	PS(3)/ PP(1)	PS(3)/ PP(2)	PS(3)/ PP(3)	PS(3)/ PP(4)
10	1.760	2.327	2.573	6.498	0.238	0.315	0.348	0.878	0.155	0.205	0.226	0.571
20	1.948	2.859	2.521	5.166	0.313	0.459	0.405	0.830	0.213	0.312	0.275	0.564
30	2.320	3.448	2.480	4.992	0.417	0.620	0.446	0.898	0.300	0.446	0.321	0.646
50	2.544	4.378	2.957	5.037	0.512	0.881	0.595	1.014	0.406	0.699	0.472	0.804
70	2.654	5.298	3.412	5.752	0.542	1.081	0.696	1.174	0.452	0.903	0.581	0.980
100	3.030	5.045	3.473	5.438	0.582	0.969	0.667	1.044	0.646	1.075	0.740	1.159

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