

CONTENTS

Abstract (in English).....	I
Abstract (in Chinese).....	III
Contents.....	V
List of Schemes.....	VIII
List of Tables.....	IV
List of Figures.....	X

Chapter 1 Introduction of Reactive Polymer Blends

1.1 Background.....	1
1.2 Classification of Polymer Blends.....	3
1.3 Compatibilization of Immiscible Polymer Blends.....	5
1.3.1 Problems Encountered in Immiscible Blends.....	5
1.3.2 Compatibilization Strategies.....	6
1.3.2.1 Addition of Block and Graft Copolymers.....	7
1.3.2.2 Utilization of Specific Interactions.....	8
1.3.2.3 Reactive Compatibilization.....	9
1.4 Reactive Blending by Extruder.....	12
1.5 Research Motivation.....	14
References.....	16

Chapter 2 A Novel Compatibilization Strategy on Immiscible Polypropylene and Polystyrene Blend

Abstract.....	21
2.1 Introduction.....	22
2.2 Experimental.....	25
2.2.1 Materials.....	25
2.2.2 Extrusion and Injection Molding.....	25
2.2.3 Infrared Spectroscopy.....	26
2.2.4 Torque versus Time Measurement.....	26
2.2.5 Thermal Properties.....	26
2.2.6 Scanning Electron Microscopies.....	26
2.2.7 Mechanical Properties.....	27

2.3 Results and Discussion.....	28
2.3.1 Chemistry.....	28
2.3.2 FT-IR Spectroscopy.....	28
2.3.3 Torque versus Time.....	30
2.3.4 Morphologies.....	31
2.3.5 Thermal Properties.....	32
2.3.6 Mechanical Properties.....	34
2.4 Conclusions.....	36
References.....	37

Chapter 3 Reactive Compatibilized Poly (2,6-dimethyl-1,4-phenyl ether) and Polyamide-6,6 Blends with the addition of low molecular weight Poly (2,6-dimethyl-1,4-phenyl ether)

Abstract.....	51
3.1 introduction.....	52
3.2 Experimental.....	55
3.2.1 Materials.....	55
3.2.2 Extrusion and Injection Molding.....	55
3.2.3 Dynamic Mechanical Analysis measurements.....	56
3.2.4 Scanning Electron Microscopies.....	56
3.2.5 Mechanical Properties.....	56
3.3 Results and discussion.....	58
3.3.1 Relaxation Behavior.....	58
3.3.2 Morphology.....	61
3.3.2.1 Effect of Viscosity Ratio and Interfacial Tension.....	61
3.3.2.2 Reactive Compatibilized Blend.....	64
3.3.3 Mechanical Properties.....	65
3.4 Conclusions.....	67
References.....	68

Chapter 4 Reactive compatibilized Polypropylene and Modified Poly (2,6-dimethyl-1,4-phenyl ether) Blend

Abstract.....	83
4.1 Introduction.....	84

4.2 Experimental.....	86
4.2.1 Materials.....	86
4.2.2 Extrusion and Injection Molding.....	86
4.2.3 Dynamic Mechanical Analysis (DMA).....	87
4.2.4 Scanning Electron Microscopies.....	87
4.2.5 Mechanical Properties.....	87
4.3 Results and Discussion.....	89
4.3.1 Chemistry.....	89
4.3.2 Dynamic Mechanical Analysis.....	89
4.3.2.1 Storage Modulus.....	89
4.3.2.2 Heat Distortion Temperature (HDT) VS Storage Modulus.....	91
4.3.3 Morphologies.....	92
4.3.4 Mechanical Properties.....	93
4.4 Conclusions.....	95
References.....	96
Chapter 5 Conclusions.....	106



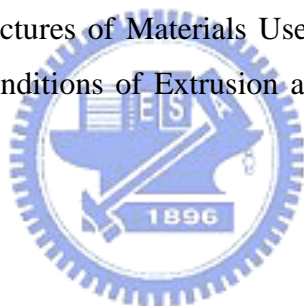
LIST OF SCHEMES

Scheme 2-1	The Simplified Reaction Mechanism between Anhydride and Epoxy (a) Ring Opening Reaction of Anhydride by Vapor Water (b) Reaction of Ring Opened Anhydride with Epoxy.....	50
Scheme 3-1	Chemical Reactions Involved in this Study.....	72
Scheme 3-2	Schematic Diagram of Compatibilization Mechanism.....	73
Scheme 4-1	Chemical Reactions Involved in this Study.....	98
Scheme 4-2	Schematic Diagram Showing How to Use the Modulus Temperature Plot to Predict HDT.....	99



LIST OF TABLES

Table 4-3	Sales Volume and Producers of Important Polymer Blends.....	19
Table 4-3	Motivation for Polymer Blending.....	20
Table 4-3	Properties of Materials Used in this Study.....	39
Table 4-3	Chemical Structures of Materials Used in this Study.....	40
Table 4-3	Processing Conditions of Extrusion and Injection Molding.....	41
Table 4-3	DSC Results of Pure Components and Corresponding Blends.....	42
Table 4-3	Properties of Materials Used in this Study.....	74
Table 4-3	Chemical structures of materials used in this study.....	75
Table 4-3	Processing Conditions.....	76
Table 4-3	T _g s of PA-6,6 and PPE in Various PA-6,6/PPE Blends Obtained from DMA Test.....	77
Table 4-3	Properties of Materials Used in this Study.....	100
Table 4-3	Chemical Structures of Materials Used in this Study.....	101
Table 4-3	Processing Conditions of Extrusion and Injection Molding.....	102



LIST OF FIGURES

Figure 2-1	FTIR spectrum for SMA melt blended with various amount of TGDDM in 1900-1700cm ⁻¹ region.....	43
Figure 2-2	FTIR spectrum for PP-g-MA melt blended with 3phr TGDDM in 1900-1700cm ⁻¹ region.....	44
Figure 2-3	Plot of torque versus time for various PP-g-MA/SMA/TGDDM blends. Blends were prepared at 240°C and 40rpm in a Brabender mixer.....	45
Figure 2-4	SEM micrographs of cryogenic fractured surfaces for PP/PS and various physically functionalized PP/PS blends(×1000): (a) PP/PS=75/25; (b) PP/PP-g-MA/SMA/PS=55/20/1/24; (c) PP/PP-g-MA/SMA/PS=55/20/2/23; (d) PP/PP-g-MA/SMA/PS=55/20/3/22.....	46
Figure 2-5	SEM micrographs of PP/PP-g-MA/SMA/PS=70/20/1/24 blends containing (a) PP/PS-75/25, (b) 0.16phr; (c) 0.32phr; (d) 0.48phr of TGDDM.....	47
Figure 2-6	Effect of TGDDM amount on the tensile strength of various PP/PP-g-MA/SMA/PS blends.....	48
Figure 2-7	Effect of TGDDM amount on the flexural modulus of various PP/PP-g-MA/SMA/PS blends.....	49
Figure 3-1	Screw configuration used in the twin screw extruder.....	78
Figure 3-2	SEM micrographs of cryogenic fractured surfaces for various PA-6,6/PPE blends(×500), (a) PA-6,6/PPE = 50/50, (b) PA-6,6/PPE/Epon828=50/50/1phr (c) PA-6,6/PPE/lmw PPE =50/30/20.....	79
Figure 3-3	SEM micrographs of cryogenic fractured surfaces for various PA-6,6/PPE blends(×3000): (a) PA-6,6/PPE = 50/50, (b) PA-6,6/PPE/Epon828 = 50/50/1phr, (c) PA-6,6/PPE/lmw PPE/Epon828 = 50/30/20, (d) PA-6,6/PPE/lmw PPE/Epon828 = 50/30/20/1phr.....	80
Figure 3-4	SEM micrographs of fractured surfaces for various PA-6,6/PPE blends(×3000) at room temperature: (a) PA-6,6/PPE = 50/50, (b)	

	PA-6,6/PPE/Epon828 = 50/50/1phr, (c) PA-6,6/PPE/1mw PPE/Epon828 = 50/30/20/1phr.....81
Figure 3-5	Mechanical properties of various PA 6,6/PPE blends: (A) Tensile strength, (B) Flexural modulus, (C) Unnotched impact strength...82
Figure 4-1	Modulus temperature plot of various PP/mPPO blends.....103
Figure 4-2	SEM micrographs of cryogenic fractured surfaces for various PP/mPPO blends($\times 1K$): (a) PP/mPPO=70/30, (b) PP/PP-g-MA/mPPO/1mw PPE=60/10/20/10, (c) PP/PP-g-MA/mPPO/1mw PPE/Epon828=60/10/20/10/0.5phr, (d) PP/PP-g-MA/mPPO/1mw PPE/Epon828=60/10/20/10/2phr, (e) PP/PP-g-MA/mPPO/1mw PPE/TGDDM=60/10/20/10/0.5phr, (f) PP/PP-g-MA/mPPO/1mw PPE/Epon828=60/10/20/10/2phr.....104
Figure 4-3	Tensile strength at break and flexural modulus of various PP/mPPO blends.....105

