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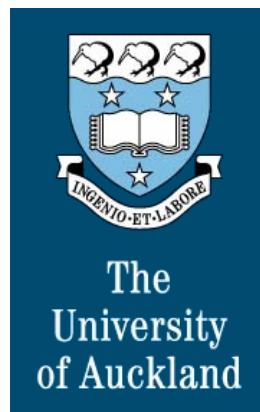
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Characterisation of Poly (ethylene naphthalate) -based polymer blends

by

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Abstract

This investigation presents research on the characteristic properties of Nylon66 and poly(ethylene naphthalate) (Ny66/PEN), and poly(butylene terephthalate) and poly(ethylene naphthalate) (PBT/PEN) blends with several weight compositions made by melt blending, by the use of ^{13}C and ^1H Nuclear magnetic resonance (NMR), Fourier transform infrared spectroscopy (FTIR), Raman spectroscopy, X-ray photoelectron spectroscopy (XPS), Scanning electron microscopy (SEM), Differential scanning calorimetry (DSC) and Dynamic mechanical thermal analysis (DMTA), X-ray diffraction (X-RD), tensile, impact and stress relaxation tests.

Ny66/PEN blends including several additives do not improve the miscibility of the constituent polymers and show lower tensile strength than those of homopolymers. However, PBT/PEN blends reveal improved tensile strengths of the blends between the ROM and MROM predictions lines with more than 50 % volume fraction of PEN.

On the other hand, NMR spectra show no evidence of interchange reaction in both Ny66/PEN and PBT/PEN blends. SEM micrographs of fracture surfaces in PBT/PEN blends reveal a very small (sub-micron) domain size in contrast to large domains in Ny66/PEN blends, which indicates partial miscibility of PBT and PEN. DSC and DMTA demonstrate partial miscibility of PBT/PEN blends by the change of T_g s of each component according to the weight proportions of the constituent polymers.

Stress relaxation tests for the specimens of PBT/PEN blends and the homopolymers, using the Taguchi method of experimental design, determine that the most significant factor is the temperature, followed by PEN content and then the initial stress, and interaction effects between factors are insignificant. To fit the relaxation curves of the PBT/PEN blends and the homopolymers at different temperatures, PEN contents and initial stresses, four different equations have been used. The coefficients of the equation that fit best are used to predict the relaxation behaviour of PBT/PEN blends at a temperature between 30°C and 60°C, and at the initial stresses of 7 MPa.

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Table of Contents

CHAPTER 1. INTRODUCTION.....	1
1. Background and objective	1
2. Scope of Thesis and Outline of Chapters	2
References	4
CHAPTER 2. REVIEW OF LITERATURE AND EXPERIMENTAL TECHNIQUES	5
1. Introduction	5
1.1. Polymer selection and property modification.....	5
1.1.1. Polymer classifications.....	5
1.1.2. Morphology classifications	7
1.1.3. Amorphous - Crystalline Blends	8
1.1.4. Other alloys and blend combinations	8
1.2. Property modification.....	10
1.2.1. Polymer-polymer combination technology	10
1.2.2. Compatibility and Miscibility.....	11
1.2.3. Compatibility Agents.....	13
2. Materials	14
2.1. PEN.....	14
2.2. PBT.....	15
2.3. Polyamide (PA)	17

3. Blending methods and Modifications.....	19
3.1. In-situ reactive blending (Reactive Injection Moulding)	19
3.2. Microfibrilisation (MFC).....	20
3.3. Adding compatibilisers.....	23
4. Taguchi Method of Experimental Design	24
5. Experimental Techniques and Instruments	25
5.1. Mechanical Testing facilities and Techniques	25
5.2. Differential Scanning Calorimeter	26
5.3. Dynamic Mechanical Thermal Analyser.....	28
5.4. Infrared Spectroscopy.....	32
5.5. Raman Spectroscopy	34
5.6. Nuclear Magnetic Resonance	38
5.7. X-ray Photoelectron Spectroscopy.....	41
5.8. Scanning Electron Microscopy.....	44
5.9. X-ray Diffraction	46
References	48
CHAPTER 3. CHARACTERISATION OF NY66/PEN BLENDS.....	54
1. Introduction	54
2. Experimental.....	55
2.1. Material.....	55
2.2. Experimental Details	56
3. Results and Discussion	57

3.1. NMR spectroscopy	57
3.2. FTIR, XPS and SEM Analyses	66
4. Conclusions	73
References	73
CHAPTER 4. MECHANICAL AND THERMAL PROPERTIES OF NY66/PEN AND PBT/PEN BLENDS.....	75
1. Introduction	75
2. Experimental.....	76
2.1. Material.....	76
2.2. Mechanical measurement	77
2.3. Rheological measurement	78
2.4. Morphological measurement	78
3. Results and Discussion	79
3.1. Thermal analysis.....	79
3.2. Mechanical analysis.....	86
3.3. Morphological analysis	90
4. Conclusions	95
References	97

CHAPTER 5. NMR Analysis of pbt/pen blends	99
1. Introduction	99
2. Experimental.....	100
3. Results and Discussion	101
3.1. ^1H NMR spectra	101
3.2. Estimation of molar ratios from ^1H NMR spectra.....	105
3.3. ^{13}C NMR spectra	107
4. Conclusions	109
References	110
CHAPTER 6. SPECTROSCOPIC ANALYSIS OF PBT/PEN BLENDS	112
1. Introduction	112
2. Experimental.....	114
2.1. Material.....	114
2.2. Experimental Details	114
3. Results and Discussion	115
3.1. FT-IR spectroscopy	115
3.2. Raman spectroscopy	118
3.3. X-ray diffraction (X-RD)	120
3.4. X-ray photoelectron spectroscopy (XPS).....	122
4. Conclusions	126

References	127
CHAPTER 7. VISCOELASTIC PRPPERTIES OF PBT/PEN BLENDS	130
1. Introduction	130
2. Experimental.....	131
2.1. Material.....	131
2.2. Experimental Details	131
3. Results and Discussion	134
3.1. Taguchi method of experimental design	134
3.2. Fitting Functions to the Relaxation Curve.	141
4. Conclusions	147
References	147
CHAPTER 8. CONCLUSIONS AND FURTHER WORK.....	150
1. Conclusions	150
2. Achievements and Recommendations for Further Work	152
3. Publications	153
APPENDIX A: TWO LEVEL THREE-FACTOR DESIGN.....	155
1. Design Matrix.....	155

2. Graphical display of factor effects	159
APPENDIX B: PICTURES OF EXPERIMENTAL APPARATUSES	161
APPENDIX C: XPS SUB-BAND ANALYSIS FOR NY66/PEN.....	170
APPENDIX D: RESPECTIVE FT-IR SPECTRUM OF PEN/PBT BLENDS	175
APPENDIX E: RESPECTIVE RAMAN SPECTRUM OF PBT/PEN BLENDS	179
APPENDIX F: MATLAB™ M-FILE USED TO DETERMINE THE FUNCTIONS FITTED TO THE RELAXATION CURVES.....	183
APPENDIX G: COEFFICIENTS FOR THE FUNCTIONS FIT TO THE STRESS RELAXATION DATA OF PBT/PEN BLENDS	185

List of Figures

CHAPTER 2. REVIEW OF LITERATURE AND EXPERIMENTAL TECHNIQUES

Fig. 2-1. Polymer-polymer combinations that can be used to modify physical, mechanical, electrical, thermal, and cost properties.....	6
Fig. 2-2. Homogeneity on a macroscopic level and a single bulk property profile exhibited by alloys and blends	11
Fig. 2- 3. Miscible, partially miscible, and immiscible polymer blends on a microscopic scale	12
Fig. 2-4. Compatibility agent improves interfacial adhesion between the polymers or phases of partially miscible and immiscible blends	13
Fig. 2-5. Structure formulae of PEN and PET.....	14
Fig. 2-6. Formation of PBT by the reaction of DMT with butanediol	16
Fig. 2-7. Constituents of Nylons: (a) Diamines and dibasic acids (b) ω -amino acid (c) lactams.....	17
Fig. 2-8. Schematic illustration of the formation of an MFC-structure out of different polycondensates A and B: (a) macroscale and (b) microscale	21
Fig. 2-9 . Schematic representation of a typical DSC sample cell showing the sample (S) and reference (R) pans, as well as the heating and temperature sensing elements	27
Fig. 2-10. Typical DSC curve, using convention that endothermic peak goes down. Δ indicates the differential signal of temperature between reference and sample.....	27
Fig. 2-11. Sinusoidal stress and the strain response curve, showing the phase angle lag, due to the viscoelastic behaviour	29

Fig. 2-12. The relationship between the complex modulus and phase angle	30
Fig. 2-13. Rheometric (Polymer Laboratories) DMTA. A bar sample is clamped rigidly at both ends and its centre vibrated sinusoidally.....	31
Fig. 2-14. Types of Sample Clamps and Measuring Modes	31
Fig. 2-15. Schematic Diagram of an Infrared Spectrophotometer	33
Fig. 2-16. Vibrational energy level diagram demonstrating the transition mechanisms for infrared absorption and emission in addition to Rayleigh and Raman scattering	35
Fig. 2-17. The spin states of a proton both in the absence and in the presence of applied magnetic field	40
Fig. 2-18. Schematic diagram of XPS spectrometer	42
Fig. 2-19. Schematic diagram of a Scanning Electron Microscope	45
Fig. 2-20. Wide-angle and small-angle x-ray diffraction techniques.....	47
CHAPTER 3. CHARACTERISATION OF NY66/PEN BLENDS.....	54
Fig. 3-1. ¹³ C NMR spectra of Ny66/PEN (wt%/wt%) blends, from the first series of experiments: (a), (0/100); (b) (50/50+GMA (3 wt%)); (c), (30/70); (d), (50/50); (e), (70/30); (f), (100/0).	58
Fig. 3-2. ¹ H NMR spectra of Ny66, PEN and Ny66/PEN (wt%/wt%) blends, from the first series of experiments: (a) (0/100), (b) (50/50+GMA (3 wt%)), (c) (30/70), (d) (50/50), (e) (70/30), (f) (100/0).	60
Fig. 3-3. ¹³ C NMR spectra of Ny66/PEN (wt%/wt%) blends, from the second series of experiments: (a), (0/100); (b) (50/50+GMA (3 wt%)); (c), (30/70); (d), (50/50); (e), (70/30); (f), (100/0), (g) CDCl ₃ + TFA solvent.....	62
Fig. 3-4. Magnified spectra of TFA from the second series of experiments.....	63

Fig. 3-5. ^1H NMR spectra of Ny66, PEN and Ny66/PEN (wt%/wt%) blends, from the second series of experiments: (a) (0/100), (b) (50/50+GMA (3 wt%)), (c) (30/70), (d) (50/50), (e) (70/30), (f) (100/0), (g) CDCl_3 + TFA solvent.....	64
Fig. 3-6. FTIR spectra of Ny66 and PEN, and subtraction spectra of Ny66/PEN (wt%/wt%) blends: (a) PEN, (b) Ny66/PEN (30/70); (c) Ny66/PEN (50/50); (d) Ny66/PEN (50/50) GMA (3 wt%); (e) Ny66/PEN (70/30); (f) Ny66.....	66
Fig. 3-7. XPS survey spectra of Ny66/PEN blends. (a) PEN, (b) Ny66/PEN (30/70); (c) Ny66/PEN (50/50); (d) Ny66/PEN (50/50) GMA (3 wt%); (e) Ny66/PEN (70/30); (f) Ny66. Note that the scans have been displaced on the vertical axis for clarity.	67
Fig. 3-8. Atomic concentrations in Ny66, PEN and Ny66/PEN blends. Unshaded symbol refers to the blend with 3% compatibiliser.....	68
Fig. 3-9. Sub-band analysis of the C 1s scans for Ny66.....	68
Fig. 3-10. Sub-band analysis of the C 1s scans for PEN.....	70
Fig. 3-11. Sub-band analysis of the O 1s scans for PEN.....	70
Fig. 3-12. SEM image of the fracture surface of Ny66/PEN (70/30) etched with trifluoroethanol.....	71
Fig. 3-13. SEM image of the fracture surface of Ny66/PEN (50/50) etched with trifluoroethanol.....	72
Fig. 3-14. SEM image of the fracture surface of Ny66/PEN (30/70) etched with trifluoroethanol.....	72

CHAPTER 4. MECHANICAL AND THERMAL PROPERTIES OF NY66/PEN AND PBT/PEN BLENDS..... 75

Fig. 4-1. Temperature dependence of $\tan\delta$ for PBT, PEN and PBT/PEN blends	79
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Fig. 4-2. The temperature dependence of the tensile storage modulus (E') for PBT, PEN and PBT/PEN blends	80
Fig. 4-3. Differential scanning calorimeter scans for PBT, PEN and PBT/PEN blends. The legend gives homopolymer proportions in weight %	81
Fig. 4-4. Composition dependence of the T_g s (glass transition temperatures) of PBT and PEN components in the PBT/PEN blends determined using DSC and DMTA.....	83
Fig. 4-5. Crystallisation temperatures for the Ny66 and PEN phases of Ny66/PEN blends... ..	84
Fig. 4-6. Melting temperatures for (a) the PEN-rich phase of PBT/PEN blends and (b) the PBT-rich phase of PBT/PEN blends.	85
Fig. 4-7. (a) Stress-strain line of PBT and PEN to the respective yield tensile strengths. (b) Method of relating composite strength (σ_c) to volume fraction of PEN using modified rule of mixtures.....	87
Fig. 4-8. Tensile strength of Nylon66/PEN blends with and without compatibiliser	88
Fig. 4-9. Tensile modulus of PBT, PEN and PBT/PEN blends.....	89
Fig. 4-10. Tensile modulus of Nylon66, PEN and Nylon66/PEN blends	89
Fig. 4-11. Impact strength of PBT, PEN and PBT/PEN blends	90
Fig. 4-12. SEM image of the fracture surfaces of the PBT/PEN (wt / wt %) blends from impact test: (a) (70/30), (b) (60/40), (c) (50/50), (d) (40/60) and (e) (30/70).....	93
Fig. 4-13. SEM image of the fracture surfaces of Ny66/PEN (wt / wt %) blends by cryogenic method: (a) (70/30), (b) (50/50) and (c) (30/70)	95

CHAPTER 5. NMR ANALYSIS OF PBT/PEN BLENDS..... 99

- Fig. 5-1. ^1H NMR spectra of PBT, PEN and PBT/PEN (wt%/wt%) blends: (a) (0/100), (b) (30/70), (c) (40/60), (d) (50/50), (e) (60/40), (f) (70/30), (g) (100/0), (h) CDCl_3 + TFA solvent..... 101
- Fig. 5-2. Expanded scale ^1H NMR spectra of PBT, PEN and PBT/PEN (wt%/wt%) blends: (a) (0/100), (b) (30/70), (c) (40/60), (d) (50/50), (e) (60/40), (f) (70/30), (g) (100/0) 103
- Fig. 5-3. Possible ester-interchange reaction mechanism between PBT and PEN 104
- Fig. 5-4. Typical integration of area of hydrogen signals of PBT/PEN blend (50/50) 106
- Fig. 5-5. ^{13}C NMR spectra of PBT, PEN and PBT/PEN (wt%/wt%) blends: (a) (0/100), (b) (30/70), (c) (40/60), (d) (50/50), (e) (60/40), (f) (70/30), (g) (100/0), (h) CDCl_3 + TFA solvent..... 107
- Fig. 5-6. Expanded scale ^{13}C NMR spectra of the aromatic ring carbons of PBT of PBT/PEN (wt%/wt%) blends: (a) (0/100), (b) (30/70), (c) (40/60), (d) (50/50), (e) (60/40), (f) (70/30), (g) (100/0)..... 109

CHAPTER 6. SPECTROSCOPIC ANALYSIS OF PBT/PEN BLENDS 112

- Fig.6-1. FTIR spectra of PBT/PEN (wt% / wt%) blends: (a) 0/100, (b) 30/70, (c) 40/60, (d) 50/50, (e) 60/40, (f) 70/30 and (g) 100/0..... 116
- Fig.6-2. Expanded FTIR spectra of PBT/PEN (wt% / wt%) blends: (a) 0/100, (b) 30/70, (c) 40/60, (d) 50/50, (e) 60/40, (f) 70/30 and (g) 100/0. 117
- Fig.6-3. Raman spectra of PBT/PEN (wt% / wt%) blends: (a) 0/100, (b) 30/70, (c) 40/60, (d) 50/50, (e) 60/40, (f) 70/30 and (g) 100/0. 118

Fig.6-4. Expanded Raman spectra of PBT/PEN (wt% / wt%) blends: (a) 0/100, (b) 30/70, (c) 40/60, (d) 50/50, (e) 60/40, (f) 70/30 and (g) 100/0.	119
Fig.6-5. WAXS of unannealed PBT/PEN (wt% / wt%) blends: (a) 0/100, (b) 30/70, (c) 40/60, (d) 50/50, (e) 60/40, (f) 70/30 and (g) 100/0.	120
Fig.6-6. WAXS of annealed PBT/PEN (wt% / wt%) blends at 200 °C for 19 hrs in an oven: (a) 0/100, (b) 30/70, (c) 40/60, (d) 50/50, (e) 60/40, (f) 70/30 and (g) 100/0.	121
Fig.6-7. XPS survey spectra of PBT/PEN (wt% / wt%) blends: (a) 0/100, (b) 30/70, (c) 40/60, (d) 50/50, (e) 60/40, (f) 70/30 and (g) 100/0.	123
Fig.6-8. Sub-band analysis of the C1s scans for PBT	123
Fig.6-9. Sub-band analysis of the O1s scans for PBT	124
Fig.6-10. Valence spectra of PBT/PEN (wt % / wt %) blends: (a) 0/100, (b) 30/70, (c) 40/60, (d) 50/50, (e) 60/40, (f) 70/30 and (g) 100/0.	125

CHAPTER 7. VISCOELASTIC PRPPERTIES OF PBT/PEN BLENDS 130

Fig.7-1. Stress relaxation curves of PBT/PEN blends at different temperatures and initial stress (NB37 means PEN 30 wt% and PBT 70 wt% of PBT/PEN blends, and NB64 means PEN 60 wt% and PBT 30 wt% of PBT/PEN blends. The order of a curve matches with that of the legend.): (a) at 7 MPa (b) at 17 MPa (NOTE: Since $\sigma(t)$ is divided by constant initial strain (ϵ_0), $E(t)$ vs time graphs will only change the positions in the vertical direction and shapes will be the same.)	134
Fig.7-2. Stress relaxation curves of homopolymers at different temperatures and initial stress (The order of a curve matches with that of the legend.): (a) at 7 MPa (b) at 17	

MPa. (NOTE: Initial Strains of PBT and PEN (7 MPa, 30°C) are 0.46 and 0.39 %.	
Initial Strains of PBT and PEN (17 MPa, 30°C) are 1.22 and 1.15 %.).....	135
Fig.7-3. Estimated main and interaction effects (as indicated) of the three factors in experiment 1: “A” represents PEN content, “B” represents temperature and “C” represents initial stress. The subscripts “1” and “2” represents level 1 and level 2 respectively.....	138
Fig.7-4. Estimated main and interaction effects (as indicated) of the three factors in experiment 2: “A” represents homopolymers, “B” represents temperature and “C” represents initial stress. The subscripts “1” and “2” represents level 1 and level 2 respectively.....	139
Fig.7-5. Interaction effects for experiment 1 where “A” represents PEN content, “B” represents temperature and “C” represents initial stress.	140
Fig.7-6. Interaction effects for experiment 2 where “A” represents homopolymers, “B” represents temperature and “C” represents initial stress.	141
Fig.7-7. Four different equations that have been used to fit the relaxation curve of PBT/PEN blends (40 /60 wt %) at 60°C and 7 MPa	142
Fig.7-8. The (a) “A” coefficient, (b) “B” coefficient, (c) “a” coefficient, and (d) “b” coefficient for Equation 4 versus PEN content at two different temperatures of initial stress 7 MPa.....	144
Fig.7-9. The predicted stress relaxation curve of PBT/PEN blends (50 weight % PEN content) at temperature of 30°C and 60°C of initial stress 7 MPa	145
APPENDIX A: TWO LEVEL THREE-FACTOR DESIGN.....	155
Fig.A-1. Graphical presentation of factor effects.....	159

APPENDIX B: PICTURES OF EXPERIMENTAL APPARATUSES	161
Fig.B-1. Vacuum dry oven	161
Fig.B-4. A. Tensile (a), DMTA (b) and impact (c) specimens, B. Schematic diagram of tensile bar (dumb-bell type)	163
Fig.B-5. Instron machine: Model 5567	164
Fig.B-6. Environmental Chamber	164
Fig.B-7. Impact Tester: CEAST RESIL 25	165
Fig.B-8. NMR: Bruker DRX-400.....	165
Fig.B-9. XPS: Kratos XSAM 800	166
Fig.B-10. SEM: Philips XL 30S(FGG)	166
Fig.B-11. FTIR: BIO-RAD FTS-60	167
Fig.B-12. DMTA: Rheometric Scientific Mark IV	167
Fig.B-13. DSC: Rheometric Scientific DSP.....	168
Fig.B-14. Raman spectrometer: Reinshaw Model 1000	168
Fig.B-15. X-ray diffractometer: Bruker Model AXS D8 ADVANCE	169
APPENDIX C: XPS SUB-BAND ANALYSIS FOR NY66/PEN.....	170
Fig.C-1. Sub-band analysis of the C 1s scans for Ny66/PEN (70 wt % / 30 wt %).....	171
Fig.C-2. Sub-band analysis of the O 1s scans for Ny66/PEN (70 wt % / 30 wt %).....	171
Fig.C-3. Sub-band analysis of the C 1s scans for Ny66/PEN (50 wt % / 50 wt %).....	172
Fig.C-4. Sub-band analysis of the O 1s scans for Ny66/PEN (50 wt % / 50 wt %).....	172
Fig.C-5. Sub-band analysis of the C 1s scans for Ny66/PEN (30 wt % / 70 wt %).....	173
Fig.C-6. Sub-band analysis of the O 1s scans for Ny66/PEN (30 wt % / 70 wt %).....	173

Fig.C-7. Sub-band analysis of the C 1s scans for Ny66/PEN (50 wt % / 50 wt %) + GMA	174
Fig.C-8. Sub-band analysis of the O 1s scans for Ny66/PEN (50 wt % / 50 wt %) + GMA..	174
APPENDIX D: RESPECTIVE FT-IR SPECTRUM OF PEN/PBT BLENDS	175
Fig.D-1. FT-IR spectrum of PEN	175
Fig.D-2. FT-IR spectrum of PBT/PEN (30 wt% / 70 wt%) blend	175
Fig.D-3. FT-IR spectrum of PBT/PEN (40 wt% / 60 wt%) blend	176
Fig.D-4. FT-IR spectrum of PBT/PEN (50 wt% / 50 wt%) blend	176
Fig.D-5. FT-IR spectrum of PBT/PEN (60 wt% /40 wt%) blend	177
Fig.D-6. FT-IR spectrum of PBT/PEN (70 wt% / 30 wt%) blend	177
Fig.D-7. FT-IR spectrum of PBT	178
APPENDIX E: RESPECTIVE RAMAN SPECTRUM OF PEN/PBT BLENDS	179
Fig.E-1. Raman spectrum of PEN	179
Fig.E-2. Raman spectrum of PBT/PEN (30 wt% / 70 wt%) blend	179
Fig.E-3. Raman spectrum of PBT/PEN (40 wt% / 60 wt%) blend	180
Fig.E-4. Raman spectrum of PBT/PEN (50 wt% / 50 wt%) blend	180
Fig.E-5. Raman spectrum of PBT/PEN (60 wt% /40 wt%) blend	181
Fig.E-6. Raman spectrum of PBT/PEN (70 wt% / 30 wt%) blend	181

List of Tables

CHAPTER 2. REVIEW OF LITERATURE AND EXPERIMENTAL TECHNIQUES

Table.2- 1. Examples of crystalline, amorphous and elastomer blend components.....	7
Table.2-2. Applications of alloys and blends	9
Table.2-3. Nuclei used in Polymer NMR.....	38

CHAPTER 3. CHARACTERISATION OF NY66/PEN BLENDS..... 54

Table.3-1. Assignment of ^{13}C NMR spectra.	59
Table.3-2. Assignment of ^1H NMR spectra.....	61
Table.3-3. Binding energies, full widths at half maximum (FWHM) and atomic concentration (%) from narrow scans of pure Ny66 and PEN.....	69

CHAPTER 4. MECHANICAL AND THERMAL PROPERTIES OF NY66/PEN AND PBT/PEN BLENDS..... 75

Table.4-1. Glass transition temperatures of PBT/PEN blends measured using DMTA	80
Table.4-2. Transition temperatures and enthalpies for PBT/PEN blends from DSC	82

CHAPTER 5. NMR ANALYSIS OF PBT/PEN BLENDS..... 99

Table.5-1. Assignment of ^1H NMR spectra of the homopolymers	102
Table.5-2. Integration of area of hydrogen signals of PBT/PEN blends.....	106
Table.5-3. Assignment of ^{13}C NMR spectra of the homopolymers	108

CHAPTER 6. SPECTROSCOPIC ANALYSIS OF PBT/PEN BLENDS 112

Table.6-1. Binding energies, full widths at half maximum (FWHM) and atomic concentration (%) from narrow scans of pure PBT and PEN.	125
--	-----

CHAPTER 7. VISCOELASTIC PRPPERTIES OF PBT/PEN BLENDS 130

Table.7-1. The different conditions in experiment 1 as assigned by Taguchi method for analysing the relaxation behaviour of PBT/PEN blends	133
Table.7-2. The different conditions in experiment 2 as assigned by Taguchi method for analysing the relaxation behaviour of PBT/PEN homopolymers.....	133
Table.7-3. Response Table for experiment 1.....	136
Table.7-4. Response Table for experiment 2.....	137
Table.7-5. Example of how the AB interaction for experiment 1 is calculated.....	140
Table.7-6. Coefficients for the equations fit to the experimental relaxation data of the PBT/PEN blend (40 /60 wt %) at 60°C and 7 MPa shown in Fig.7-7.	143
Table.7-7. The coefficients used for simulation of the predicted stress relaxation curves of PBT/PEN blends (50 weight % PEN content) at temperature of 30°C and 60°C of initial stress 7 MPa.....	146

APPENDIX A: TWO LEVEL THREE-FACTOR DESIGN..... 155

Table.A-1. Design matrix for a three-factor, eight-run experiment	155
Table.A-2. Design matrix for a three-factor, eight-run experiment using alternate (-1,1) notation.....	156
Table.A-3. Response table for a three-factor experiment.....	158

APPENDIX C: XPS SUB-BAND ANALYSIS FOR NY66/PEN..... 170

Table.C-1. Binding energies, full widths at half maximum (FWHM) and atomic concentration (%) from narrow scans of Ny66/PEN blends	170
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APPENDIX G: COEFFICIENTS FOR EQUATIONS FIT TO THE STRESS**RELAXATION DATA OF PBT/PEN BLENDS 185**

Table.G-1. Coefficients for the equations fit to the experimental relaxation data of the PBT at 30°C and 7 MPa.....	185
Table.G-2. Coefficients for the equations fit to the experimental relaxation data of the PBT at 30°C and 17 MPa.....	185
Table.G-3. Coefficients for the equations fit to the experimental relaxation data of the PBT at 60°C and 7 MPa.....	185
Table.G-4. Coefficients for the equations fit to the experimental relaxation data of the PBT at 60°C and 17 MPa.....	186
Table.G-5. Coefficients for the equations fit to the experimental relaxation data of the PBT/PEN blend (30 /70 wt %) at 30°C and 7 MPa.....	186
Table.G-6. Coefficients for the equations fit to the experimental relaxation data of the PBT/PEN blend (30 /70 wt %) at 30°C and 17 MPa.....	186
Table.G-7. Coefficients for the equations fit to the experimental relaxation data of the PBT/PEN blend (30 /70 wt %) at 60°C and 7 MPa.....	187

Table.G-8. Coefficients for the equations fit to the experimental relaxation data of the PBT/PEN blend (30 /70 wt %) at 60°C and 17 MPa.....	187
Table.G-9. Coefficients for the equations fit to the experimental relaxation data of the PBT/PEN blend (60 /40 wt %) at 30°C and 7 MPa.....	187
Table.G-10. Coefficients for the equations fit to the experimental relaxation data of the PBT/PEN blend (60 /40 wt %) at 30°C and 17 MPa.....	188
Table.G-11. Coefficients for the equations fit to the experimental relaxation data of the PBT/PEN blend (60 /40 wt %) at 60°C and 17 MPa.....	188
Table.G-12. Coefficients for the equations fit to the experimental relaxation data of the PEN at 30°C and 7 MPa	188
Table.G-13. Coefficients for the equations fit to the experimental relaxation data of the PEN at 30°C and 17 MPa	189
Table.G-14. Coefficients for the equations fit to the experimental relaxation data of the PEN at 60°C and 7 MPa	189
Table.G-15. Coefficients for the equations fit to the experimental relaxation data of the PEN at 60°C and 7 MPa	189