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**PHASE DIAGRAM OF
POLYMER BLENDED WITH LOW MOLAR MASS LIQUID CRYSTAL**



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สถาบันวิทยบริการ
จุฬาลงกรณ์มหาวิทยาลัย

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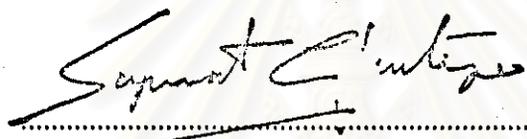
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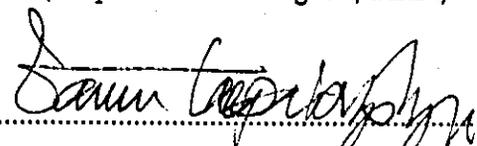

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งานวิจัยนี้ได้ทำการศึกษาแผนภาพเฟสของพอลิสไตรีน (PS) และพอลิคาร์บอเนต (PC) ที่ผสมกับผลึกเหลวมวลโมเลกุลต่ำในกลุ่มของ phenyl-cyclohexylbenzoates คือ HP35 และ HP5N ในช่วงที่มีผลึกเหลวมวลโมเลกุลต่ำในปริมาณน้อย ซึ่งแบ่งออกได้เป็น 4 ระบบคือ 1) PS ผสมกับ HP35 2) PS ผสมกับ HP5N 3) PC ผสมกับ HP35 และ 4) PC ผสมกับ HP5N ของผสมจะถูกเตรียมโดยวิธีการหล่อขึ้นรูปด้วยสารละลาย (solvent casting) และตรวจวัดค่าอุณหภูมิเปลี่ยนสถานะ (transition temperature) ที่อุณหภูมิอบสมดุลง (annealed temperature) ต่างๆ โดยใช้ differential scanning calorimeter (DSC) งานวิจัยนี้ได้พัฒนาวิธีมาตรฐานในการศึกษาแผนภาพเฟสของของผสมที่ตรวจพบค่าอุณหภูมิการเปลี่ยนสถานะคล้ายแก้ว (T_g) ของ PS หรือ PC ในของผสมส่วนที่มี PS หรือ PC อยู่มากเท่านั้น พฤติกรรมของเฟส (phase behaviour) ในแผนภาพเฟสที่สร้างขึ้นจะถูกตรวจสอบเพื่อยืนยันด้วยรูปถ่ายจากกล้องจุลทรรศน์อิเล็กตรอนแบบส่องกราด (scanning electron microscope, SEM) พบว่าพฤติกรรมของเฟสที่วิเคราะห์จากผลที่ได้จาก DSC ตรงกันกับที่วิเคราะห์จากผลที่ได้จาก SEM แผนภาพเฟสของ PS ที่ผสม HP35 น่าจะมีพฤติกรรมแบบ upper critical solution temperature (UCST) แผนภาพเฟสของ PS ที่ผสมกับ HP5N จะมีช่วง partially miscible ที่ความเข้มข้นของ HP5N ใน PS ต่ำกว่า 5% โดยน้ำหนัก แผนภาพเฟสของ PC ที่ผสมกับ HP35 มีขอบเขตการแยกเฟสลักษณะคล้ายขอบเขตการแยกเฟสแบบนาฬิกาทราย (hour-glass shape) และ แผนภาพเฟสของ PC ที่ผสมกับ HP5N มีลักษณะคล้ายแผนภาพเฟสแบบที่เกิดการแยกเฟสภายในวงกลม (immiscible loop) นอกจากนี้ยังพบว่า HP35 และ HP5N ผสมเข้ากับ PC ได้ดีกว่า PS และเป็นสารเติมหล่อ่าย (plasticizer) ของทั้ง PS และ PC เพราะทำให้ค่า T_g ของ PS และ PC ลดลงอย่างเห็นได้ชัด

สถาบันวิทยบริการ
จุฬาลงกรณ์มหาวิทยาลัย

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ลายมือชื่อนิติกร ศิริพร ตั้งจิตราพิทักษ์
ลายมือชื่ออาจารย์ที่ปรึกษา
ลายมือชื่ออาจารย์ที่ปรึกษาร่วม

พิมพ์ต้นฉบับบทความวิจัยวิทยานิพนธ์ภายในกรอบสี่เหลี่ยมนี้เพียงแผ่นเดียว

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SIRIPORN TUNGJITRAPITUK : PHASE DIAGRAM OF POLYMER BLENDED WITH LOW MOLAR MASS LIQUID CRYSTAL. THESIS ADVISOR : M.L. SUPAKANOK THONGYAI, Ph.D. THESIS COADVISOR : SIRIPORN PAVAWONGSAK, Ph.D.

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The phase diagrams of the blend systems of polystyrene (PS) and poly(bisphenol-A-carbonate) (PC) with two low molar mass liquid crystals in phenyl-cyclohexylbenzoates group (HP35 and HP5N) at low concentration range of low molar liquid crystal are studied in this work. Four different systems are: 1) blend of PS with HP35, 2) blend of PS with HP5N, 3) blend of PC with HP35, and 4) blend of PC with HP5N. The blends were prepared by solvent casting and their transition temperatures were measured at various annealed temperatures by differential scanning calorimeter (DSC). The standard procedure to study the phase diagrams of the blends of which only the glass transition temperature (T_g) of PS or PC rich phase in the blends can be detected, was developed in this work. Scanning electron microscope (SEM) pictures were used to confirm the phase behaviour in the constructed phase diagrams. The phase behaviour determined from the DSC results was consistent with the micrographs from SEM. It was found that the phase diagram of PS blended with HP35 is likely to show the upper critical solution temperature (UCST) behaviour. The phase diagram of PS blended with HP5N is partially miscible under 5.0 percent by weight of HP5N with PS. The phase diagram of PC blended with HP35 seems to be an hourglass-shaped phase boundary. The phase diagram of PC blended with HP5N seems to be an immiscible loop type. It was also found that both HP35 and HP5N are more compatible with PC than PS and can act as plasticizers for PS and PC as evidenced by the decreasing in the T_g of PS and PC.

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CONTENTS

	PAGE
ABSTRACT (IN THAI).....	i
ABSTRACT (IN ENGLISH).....	ii
ACKNOWLEDGEMENTS.....	iii
CONTENTS.....	iv
LIST OF TABLES.....	viii
LIST OF FIGURES.....	xi
 CHAPTER	
I. INTRODUCTION.....	1
1.1 The Objective of the Present Study.....	3
1.2 The Scope of the Present Study.....	3
II. LITERATURE REVIEW.....	4
III. THEORY.....	11
3.1 Polystyrene (PS).....	11
3.2 Poly(bisphenol A carbonate), (PC).....	13
3.3 Liquid Crystal.....	14
3.3.1 Definition of a Liquid Crystal.....	14
3.3.2 Liquid Crystal Classification.....	15
3.3.3 Mesophasic Transition Temperature.....	18
3.4 The Preparation of the Blends.....	19
3.4.1 Melt Mixing.....	20
3.4.2 Cast From Common Solvents.....	20

CONTENTS (continued)

	PAGE
3.4.3 Freeze Drying.....	21
3.4.4 Emulsions.....	22
3.4.5 Mixing via Reaction.....	22
3.5 Miscibility Characteristics of the Blends.....	23
3.5.1 Gibb's Free Energy and Miscibility Characteristics.....	24
3.5.2 The Phase Diagram of Polymer Blends.....	24
3.6 Determination of Miscibility.....	27
3.6.1 Glass Transition Criteria for Compatibility.....	27
3.6.2 Scattering.....	33
3.6.3 Microscopy.....	34
3.6.4 Melting Point Depression.....	36
IV EXPERIMENT.....	38
4.1 Materials.....	38
4.1.1 Polystyrene (PS).....	38
4.1.2 Poly(bisphenol A carbonate), PC.....	39
4.1.3 Liquid Crystal.....	40
4.2 Equipment.....	42
4.2.1 Digital Hot Plate Stirrer.....	42
4.2.2 Vacuum Oven & Pump.....	42
4.2.3 Differential Scanning Calorimeter (DSC).....	42
4.2.4 Scanning Electron Microscope (SEM).....	43
4.3 Sample Preparation Procedure.....	44
4.4 Method of Measuring Transition Temperature.....	45
4.4.1 Erasure of Sample Thermal History.....	45

CONTENTS (continued)

	PAGE
4.4.2 Sample Annealing	47
4.4.3 Sample Quenching.	47
4.4.4 Sample Scanning.....	48
4.4.5 Determination Transition Temperature.....	48
4.5 Method of Observation of Blend Morphology.....	54
V RESULTS & DISCUSSIONS.....	55
5.1 Determination of Experimental Procedure.....	56
5.2 Phase Diagram Construction Procedure.....	58
5.3 System I: Polystyrene & HP35.....	69
5.3.1 Effects of HP35 on Polystyrene (PS).....	69
5.3.2 The Transition Temperatures of HP35 in the Blends.....	74
5.3.3 Phase Diagram Construction of System I: PS & HP35.....	75
5.3.4 Scanning Electron Microscope (SEM) of System I: PS & HP35.....	81
5.4 System II: Polystyrene & HP5N.....	84
5.4.1 Effects of HP5N on Polystyrene (PS).....	84
5.4.2 The Transition Temperatures of HP5N in the Blends.....	84
5.4.3 Phase Diagram Construction of System II: PS & HP5N.....	89
5.4.4 Scanning Electron Microscope (SEM) of System II: PS & HP5N.....	99
5.5 System III: Poly(bisphenol A carbonate) & HP35.....	102
5.5.1 Effects of HP35 on Poly(bisphenol A carbonate) (PC).....	102
5.5.2 Transition Temperatures of HP35 in the Blends.....	107
5.5.3 Phase Diagram Construction of System III: PC & HP35.....	108

CONTENTS (continued)

	PAGE
5.5.4 Scanning Electron Microscope (SEM) of System III: PC & HP35.....	117
5.6 System IV: Poly(bisphenol A carbonate) & HP5N.....	120
5.6.1 Effects of HP5N on Poly(bisphenol A carbonate) (PC).....	120
5.6.2 The Transition Temperatures of HP5N in the Blends.....	124
5.6.3 Phase Diagram Construction of System IV: PC & HP5N.....	125
5.6.4 Scanning Electron Microscope (SEM) of System IV: PC & HP5N.....	134
5.7 Discussion on the Results between Systems.....	137
5.7.1 Comparison of the Effects of HP35 and HP5N on Polystyrene (PS).....	137
5.7.2 Comparison of the Effects of HP35 and HP5N on Poly(bisphenol A carbonate) (PC).....	142
5.7.3 Comparison of the Effects of HP35 on PC and PS.....	146
5.7.4 Comparison of the Effects of HP5N on PC and PS.....	146
VI CONCLUSIONS AND RECOMMENDATIONS.....	147
6.1 Conclusions.....	147
6.2 Recommendations for Further Studies.....	149
REFERENCES.....	150
APPENDIX.....	155
VITA.....	160

LIST OF TABLES

TABLE	PAGE
3-1 The examples of mesogens.....	16
4-1 Properties of HP35.....	41
4-2 Properties of HP5N.....	41
5-1 Transition temperature of 25% by weight HP35 with PS, which annealed at 87°C, at the first and a second trials.....	56
5-2 Transition temperature of 15% by weight HP5N with PS, which annealed at 120°C, at the first and a second trials.....	57
5-3 Transition temperature of 20% by weight HP35 with PC, which annealed at 120°C, at the first and a second trials.....	57
5-4 Transition temperature of 30% by weight HP5N with PC, which annealed at 100°C, at the first and a second trials.....	57
5-5 The glass transition temperatures (T_g) of PS rich phase in the blends of HP35 & PS detected by differential scanning calorimeter (DSC) at each annealed temperature and weight percent HP35 with PS.....	63
5-6 Gradient value calculation from data in Table 5-5.....	63
5-7 The criteria used for determining the phase behaviour of the blends from gradient value and the symbols of each region.....	64

LIST OF TABLES (continued)

TABLE	PAGE
5-8 Four regions divided from gradient value of system I: PS & HP35.....	65
5-9 Transition temperatures detected by differential scanning calorimeter (DSC) of system I: PS & HP35.....	70
5-10 Relation between the T_g of the PS in the blends and weight percent HP35 with PS.....	78
5-11 Transition temperatures detected by differential scanning calorimeter (DSC) of system II: PS & HP5N.....	85
5-12 Relation between the T_g of the PS rich phase in the blends and weight percent HP5N with PS.....	92
5-13 The glass transition temperatures (T_g) of PS rich phase in the blends of HP5N & PS detected by differential scanning calorimeter (DSC) at each annealed temperature and weight percent HP5N with PS.....	96
5-14 Gradient value of system II: PS & HP5N.....	96
5-15 Four regions divided from gradient value of system I: PS & HP5N.....	97
5-16 Transition temperatures detected by differential scanning calorimeter (DSC) of system III: PC & HP35.....	103
5-17 Relation between the T_g of the PC rich phase in the blends and weight percent HP35 with PC.....	111
5-18 The glass transition temperatures (T_g) of PC rich phase in the blends of HP35 & PC detected by differential scanning calorimeter (DSC) at each annealed temperature and weight percent HP35 with PC.....	114
5-19 Gradient value of system III: PC & HP35.....	114
5-20 Four regions divided from gradient value of system III: PC & HP35.....	115

LIST OF TABLES (continued)

TABLE	PAGE
5-21 Transition temperatures detected by differential scanning calorimeter (DSC) of system IV: PC & HP5N.....	121
5-22 Relation between the T_g of the PC rich phase in the blends and weight percent HP5N with PC.....	129
5-23 The glass transition temperatures (T_g) of PC rich phase in the blends of HP5N & PC detected by differential scanning calorimeter (DSC) at each annealed temperature and weight percent HP5N with PC.....	131
5-24 Gradient value of system IV: PC & HP5N.....	131
5-25 Four regions divided from gradient value of system IV: PC & HP5N.....	132
A-1 The T_g of the blends of PC and low molar mass liquid crystal predicted from Flory-Fox equation.....	158
A-2 Gradient value ($\tan\theta$) and θ (degree) calculated from the T_g of the blends of PC and low molar mass liquid crystal predicted from Flory-Fox equation in Table A-1.....	158

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LIST OF FIGURES

FIGURE	PAGE
2-1 A typical phase diagram of flexible polymer in nematic solvent.....	6
2-2 Glass transition temperature depression in blend of bisphenol-A-polycarbonate and p-pentyloxycinnamic acid.....	8
2-3 Summary of DSC results combining the diagram.....	10
3-1 Main classification of liquid crystalline phase.....	17
3-2 Schematic representation of six possible phase equilibrium diagrams for binary mixtures in which the shaded areas represent phase separation.....	26
3-3 Size range covered by differential experimental techniques for the assessment of miscibility.....	28
4-1 The structure of polystyrene.....	38
4-2 The structure of poly(bisphenol A carbonate).....	39
4-3 The structure of HP35.....	40
4-4 The structure of HP5N.....	41
4-5 Schematic representation of DSC. S and R denote sample and reference, respectively.....	43
4-6 Schematic diagram of sample preparation procedure.....	46
4-7 Schematic diagram of method of measuring transition temperature.....	49
4-8 Two manner in which the glass transition temperature has been defined.....	50
4-9 An example of the glass transition temperature (T_g) of PS film, which annealed at 80°C, determined at inflection of the curve.....	52

LIST OF FIGURES (continued)

FIGURE	PAGE
4-10 An example of the mesophasic transition temperature of HP35 determined at the maximum peak	53
5-1 Schematic diagram that represented the angle (θ) of miscibility.....	64
5-2 Phase diagram at low concentration of system I: PS and HP35 constructed by gradient method.....	66
5-3 The DSC thermogram of the blends of PS and HP35.....	73
5-4a Glass transition temperature depression in the blends of system I: PS & HP35 annealed at 48°C, 54°C, 65°C and 80°C.....	76
5-4b Glass transition temperature depression in the blends of system I: PS & HP35 annealed at 87°C, 100°C and 120°C.....	77
5-5 Phase diagram at low concentration of system I: PS & HP35 constructed by method of depression trend.....	79
5-6 Scanning electron micrograph of 10 percent by weight HP35 with PS, which annealed at 87°C. (a) the lower magnification (x100) (b) higher magnification (x750).....	82
5-7 Scanning electron micrograph (x1500 magnification) of 25 percent by weight HP35 with PS, which annealed at 100°C.....	83
5-8 The DSC thermograms of the blends of PS and HP5N.....	88
5-9a Glass transition temperature depression in the blends of system I: PS & HP5N annealed at 48°C, 54°C, 65°C and 80°C.....	90
5-9b Glass transition temperature depression in the blends of system II: PS & HP5N annealed at 87°C, 100°C and 120°C.....	91

LIST OF FIGURES (continued)

FIGURE	PAGE
5-10 Phase diagram at low concentration of system II: PS & HP5N constructed by method of depression trend.....	94
5-11 Phase diagram at low concentration of system II: PS and HP5N constructed by gradient method.....	98
5-12 Scanning electron micrograph of 5 percent by weight HP5N with PS, which annealed at 100°C. (a) the lower magnification (x750) (b) the higher magnification (x1500).....	100
5-13 Scanning electron micrograph of 20 percent by weight HP5N with PS, which annealed at 100°C. (a) the lower magnification (x750) (b) the higher magnification (x1500).....	101
5-14 The DSC thermograms of the blends of PC and HP35.....	106
5-15a Glass transition temperature depression in the blends of system III: PC & HP35 annealed at 60°C, 80°C and 100°C.....	109
5-15b Glass transition temperature depression in the blends of system III: PC & HP35 annealed at 120°C, 140°C and 170°C.....	110
5-16 Phase diagram at low concentration of system III: PC & HP35 constructed by method of depression trend.....	112
5-17 Phase diagram at low concentration of system III: PC and HP35 constructed by gradient method.....	116
5-18 Scanning electron micrograph (x1500) of 10 percent by weight HP35 with PC, which annealed at 140°C.....	118
5-19 Scanning electron micrograph (x1500) of 25 percent by weight HP35 with PC, which annealed at 120°C.....	119

LIST OF FIGURES (continued)

FIGURE	PAGE
5-20 The DSC thermograms of the blends of PC and HP5N.....	123
5-21a Glass transition temperature depression in the blends of system IV: PC & HP5N annealed at 60°C, 80°C and 100°C.....	127
5-21b Glass transition temperature depression in the blends of system IV: PC & HP5N annealed at 120°C, 140°C and 170°C.....	128
5-22 Phase diagram at low concentration of system IV: PC & HP5N constructed by method of depression trend.....	130
5-23 Phase diagram at low concentration of system IV: PC and HP5N constructed by gradient method.....	133
5-24 Scanning electron micrograph (x 1000 magnification) of 20 percent by weight HP5N with PC, which annealed at 120°C.....	135
5-25 Scanning electron micrograph of 30 percent by weight HP5N with PC, which annealed at 140°C. (a) the lower magnification (x500) (b) the higher magnification (x750).....	136
5-26 The glass transition temperature of PS in the blends at 5 weight percent HP35 and HP5N.....	138
5-27 The glass transition temperature of PS in the blends at 10 weight percent HP35 and HP5N.....	138
5-28 The glass transition temperature of PS in the blends at 15 weight percent HP35 and HP5N.....	140
5-29 The glass transition temperature of PS in the blends at 20 weight percent HP35 and HP5N.....	140

LIST OF FIGURES (continued)

FIGURE	PAGE
5-30 The glass transition temperature of PS in the blends at 25 weight percent HP35 and HP5N.....	141
5-31 The glass transition temperature of PC in the blends at 5 weight percent HP35 and HP5N.....	143
5-32 The glass transition temperature of PC in the blends at 10 weight percent HP35 and HP5N.....	143
5-33 The glass transition temperature of PC in the blends at 15 weight percent HP35 and HP5N.....	144
5-34 The glass transition temperature of PC in the blends at 20 weight percent HP35 and HP5N.....	144
5-35 The glass transition temperature of PC in the blends at 25 weight percent HP35 and HP5N.....	145
5-36 The glass transition temperature of PC in the blends at 30 weight percent HP35 and HP5N.....	145
A-1 The graph of the glass transition temperature (T_g) of the blends against the weight percent of low molar mass liquid crystal.....	157

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