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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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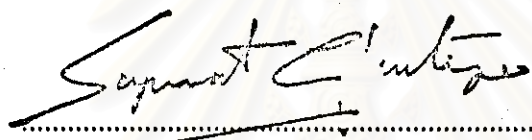
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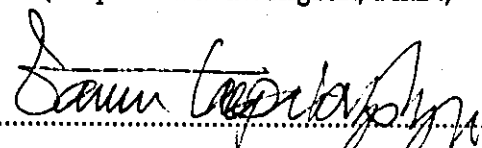
  
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พิมพ์ต้นฉบับบทความวิทยานิพนธ์ภายในกรอบสีเขียวนี้เพียงแผ่นเดียว

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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 อยู่มากกว่านั้น 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

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ลายมือชื่อนิสิต ..... ศิริพร ตั้งจิตราพิทักษ์  
ลายมือชื่ออาจารย์ที่ปรึกษา .....  
ลายมือชื่ออาจารย์ที่ปรึกษาร่วม .....

พิมพ์ต้นฉบับบทความวิจัยวิทยานิพนธ์ภายในกรอบสีเขียวนี้เพียงแผ่นเดียว

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KEY WORD: PHASE DIAGRAM / POLYSTYRENE / POLY(BISPHENOL-A-CARBONATE) / LOW MOLAR MASS LIQUID CRYSTAL

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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