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นางสาวศิริพร แคนศรี

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ลิขสิทธิ์ของจุฬาลงกรณ์มหาวิทยาลัย



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INFLUENCES OF CHEMICALS IN SURROGATE GASOHOL
ON GLASS FIBER REINFORCED NYLON 6 COMPOSITES



Miss Siriporn Kaensri

A Thesis Submitted in Partial Fulfillment of the Requirements
for the Degree of Master of Engineering Program in Chemical Engineering

Department of Chemical Engineering

Faculty of Engineering

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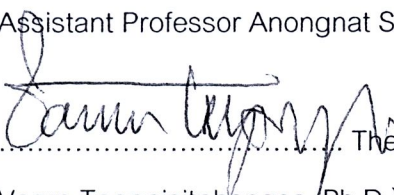
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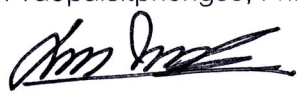
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อ.ที่ปรึกษาวิทยานิพนธ์หลัก: อ.ดร.วรัญญู แต่ไพสิฐพงษ์, 175 หน้า.

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งานวิจัยนี้มุ่งศึกษาอิทธิพลของสารเคมีในตัวแทนน้ำมันแก๊สโซฮอลล์ต่อสมบัติเชิงกายภาพ สมบัติเชิงความร้อน และสมบัติเชิงกลของวัสดุประกอบแต่งไนลอน 6 เสริมแรงด้วยเส้นใยแก้ว ชิ้นงานทดสอบของวัสดุไนลอน 6 และไนลอน 6 เสริมแรงด้วยเส้นใยแก้วในปริมาณ 15% และ 30% โดยนำหนักถูกขึ้นรูปด้วยเครื่องอัดขึ้นรูปและเครื่องฉีดขึ้นรูป ชิ้นงานทดสอบถูกแช่ในไอโซออกเทน โทลูอีน แอ็กเกรสซีฟเอทานอล และเอทานอล ที่อุณหภูมิห้องเป็นเวลา 16 สัปดาห์ โดยที่สารเคมีถูกเปลี่ยนทุก 6 สัปดาห์ การเปลี่ยนแปลงด้านน้ำหนักและขนาด อุณหภูมิที่ทำให้วัสดุโค้งตัวภายใต้แรง ดัดโค้ง อุณหภูมิแปรสภาพแก้ว สมบัติด้านรับแรงดึง ด้านการบิดงอ ด้านการกดอัด และด้านการ กระแทกของชิ้นงานทดสอบถูกวัด ผลการทดลองแสดงให้เห็นว่า เส้นใยแก้วเสริมแรงสามารถ ปรับปรุงความเสถียรด้านมวลและขนาดของชิ้นงานได้ด้วยการจำกัดการเคลื่อนไหวของเส้นสายโซ่ ของพอลิเมอร์ เส้นใยแก้วเสริมแรงช่วยปรับปรุงความแข็งแรงการรับแรงดึง โมดูลัสการรับแรงดึง ความแข็งแรงการรับแรงดัดโค้ง โมดูลัสการรับแรงดัดโค้ง ความแข็งแรงการรับแรงกด และความ แข็งแรงการรับแรงกระแทกแบบไอซอดของวัสดุประกอบแต่งไนลอน 6 เสริมแรงด้วยเส้นใยแก้วได้ เพราะการเชื่อมพันธะอย่างดีตรงพื้นผิวระหว่างไนลอน 6 และเส้นใยแก้วเสริมแรง ซึ่งทำให้ความเค้น สามารถถูกถ่ายโอนไปยังเส้นใยแก้วเสริมแรงได้ เอทานอลและแอ็กเกรสซีฟเอทานอลมีอิทธิพลอย่าง มีนัยสำคัญต่อสมบัติเชิงกายภาพ เชิงความร้อน และเชิงกลของวัสดุไนลอน 6 และวัสดุประกอบแต่ง ไนลอน 6 เสริมแรงด้วยเส้นใยแก้วมากกว่าไอโซออกเทนและโทลูอีน เพราะเอทานอลและแอ็กเกรส ซีฟเอทานอลสามารถถูกดูดซับเข้าไปในไนลอน 6 ได้ง่ายกว่า สมบัติเชิงความร้อนและเชิงกลของ ชิ้นงานทดสอบยกเว้นค่าความทนแรงกระแทกแบบไอซอดมีค่าลดลงตามปริมาณสารเคมีที่ถูกดูดซับ เข้าไปในชิ้นงาน แต่วัสดุประกอบแต่งไนลอน 6 เสริมแรงด้วยเส้นใยแก้วได้รับผลกระทบน้อยกว่า เพราะเส้นใยแก้วช่วยลดการเคลื่อนไหวของสายโซ่พอลิเมอร์ โดยรวมผลกระทบของแก๊สโซฮอลล์ ต่อสมบัติของไนลอน 6 มาจากองค์ประกอบที่เป็นแอลกอฮอล์ ดังนั้นวัสดุประกอบแต่ง ไนลอน 6 เสริมแรงด้วยเส้นใยแก้วควรถูกใช้กับแก๊สโซฮอลล์ที่มีเอทานอลเป็นส่วนผสมในปริมาณต่ำ

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สาขาวิชา.....วิศวกรรมเคมี.....
ปีการศึกษา.....2553.....

ลายมือชื่อผู้นิสิต.....สิริพร แคนศรี.....
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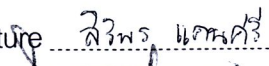
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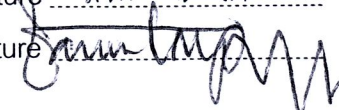
In this study, the influence of chemicals in surrogate gasohol on physical, thermal and mechanical properties of glass fiber reinforced nylon 6 (PA6) composites were investigated. Test specimens of neat PA6 and PA6 compound with 15%wt and 30%wt glass fiber were prepared by compression and injection molding machines. These specimens were immersed in isooctane, toluene, aggressive ethanol, and ethanol at room temperature for 16 weeks. The chemicals were changed every 6 weeks. Mass and dimensional stability, heat distortion temperature (HDT), glass transition temperature (T_g), tensile, flexural, compressive and Izod impact properties were investigated. The results showed that the glass fiber provided dimensional stability by restricting the movement of polymer chains. The glass fiber could improve the tensile strength, tensile modulus, flexural strength, flexural modulus, compressive strength and Izod impact strength of PA6/GF composites due to good interfacial bonding between PA6 and GF and stress could transfer to glass fiber. Ethanol and aggressive ethanol significantly affected the physical, thermal, and mechanical properties of neat PA6 and PA6/GF composites more than isooctane and toluene because they could be absorbed into PA6 matrix easier. The thermal and mechanical properties except Izod impact strength of specimens decreased with increased amount of chemicals absorbed. But the effects were reduced in the PA6/GF composites because the fiber glass could reduce the movement of polymer chains. Overall, the effects of gasohol on properties of PA6 were mainly from alcohol component than gasoline component. Therefore, PA6 and PA6/GF composites should be used with gasohol with low ethanol volume content.

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Student's Signature 

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