

PROCESSING OF POLYMERS FROM SiO₂ AND GLYCEROL



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for the Degree of Master of Science
The Petroleum and Petrochemical College, Chulalongkorn University
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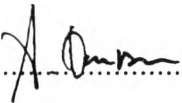
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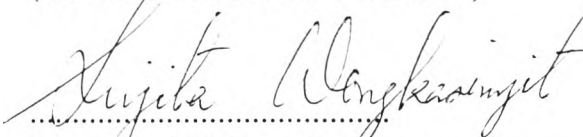
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ABSTRACT

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KEY WORD : CROSSLINKED GLYCOLATO SILOXANE POLYMER/
PROPERTIES / OOPS PROCESS

THANYALAK CHAISUWAN : PROCESSING OF
POLYMERS FROM SiO_2 AND GLYCEROL : SYNTHESIS
AND PRIMARILY INVESTIGATION ON PHYSICAL
PROPERTIES OF CROSSLINKED GLYCOLATO SILOXANE
POLYMER. THESIS ADVISORS : ASSOC. PROF. RICHARD
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SiO_2 can react with ethylene glycol (EG) in the presence of triethylenetetramine (TETA) as a base, in an oxide one pot synthesis (“OOPS”) process to produce glycolato siloxane polymer. The resulting product was then crosslinked to form a network-like polymer by using glycerol as a crosslinking agent. The final product was a white fine powder. This polymer was characterized by FTIR, ^1H -NMR, ^{13}C -NMR and Thermogravimetry (TGA). The crosslinked polymer was cast as a film and the modulus measured using a rheometer to study the mechanical properties at different temperatures (from 25° to 250°C) obtained by the variation of TETA concentration and crosslinking reaction time.

บทคัดย่อ

รัญญลักษณ์ ฉายสุวรรณ : การขึ้นรูปพอลิเมอร์ที่ผลิตจากซิลิกา และกลีเซอรอล (Processing of Polymers from SiO₂ and Glycerol) อาจารย์ที่ปรึกษา : ร.ศ. ดร. ริชาร์ด เอ็ม. เลิน (Assoc. Prof. Richard M. Laine) และ ผศ. ดร. สุจิตรา วงศ์เกษมจิตต์ (Asst. Prof. Sujitra Wongkasemjit), 54 หน้า ISBN 974-636-124-4

การสังเคราะห์ สารไกลโคลาโตไซลออกเซน พอลิเมอร์ ทำได้จากการทำปฏิกิริยาของซิลิกา กับเอทิลีน ไกลคอล โดยมีเอมีนเบสเป็นตัวเร่งปฏิกิริยา กระบวนการที่ใช้ในการทำปฏิกิริยานี้ เรียกว่า “อูบส์ พรอเซส” (OOPS process : ซึ่งย่อมาจาก Oxide one pot synthesis process) พอลิเมอร์ที่ได้จากการทำปฏิกิริยานี้ จะถูกเชื่อมประสานกันโดยใช้กลีเซอรอล ซึ่งทำหน้าที่เป็นตัวเชื่อม

ผลิตภัณฑ์สุดท้ายที่ได้เป็นผงละเอียดสีขาว ซึ่งถูกนำไปวิเคราะห์โดย FTIR, ¹H-NMR, ¹³C-NMR และ Thermogravimetry (TGA) พอลิเมอร์ที่ได้ยังถูกนำไปแปรรูปเป็นฟิล์มเพื่อทดสอบสมบัติทางเชิงกล ณ อุณหภูมิต่าง ๆ (จาก 25 ถึง 250 องศาเซลเซียส) ซึ่งได้จากการแปรเปลี่ยนความเข้มข้นของ TETA และ ระยะเวลาในการเชื่อมประสาน โดยใช้ rheometer

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