

**BIODIESEL PRODUCTION USING SOLID ACID CATALYSTS VIA  
ESTERIFICATION OF OLEIC ACID**

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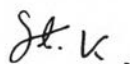


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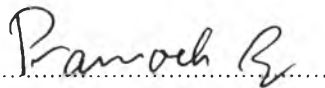
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## ABSTRACT

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The sulfonated lignin catalysts were used as the catalyst in biodiesel production via esterification from oleic acid. The sulfonated lignin catalysts are prepared by 2 steps. First, lignin is extracted from the pretreatment process of corncob, then it was sulfonated with sulfuric acid. In this research, the effect of sulfonation temperature, sulfonation time, the amount of catalyst, molar ratio of methanol to oil, the catalyst stability, and catalyst reusability on biodiesel yield were studied by using solid acid catalyst via esterification from oleic acid. The catalysts are characterized by BET, XRD, FT-IR, SEM, NH<sub>3</sub>-TPD, and Titration Method while biodiesel is quantified by GC. The catalyst sulfonated of 110 °C 5 h had the highest biodiesel yield of 89.8 % under optimum condition at 8 h of reaction time, 15:1 molar ratio of methanol to oil, amount of catalyst 5wt%.

## บทคัดย่อ

กนกวรรณ นามวงศ์ : การผลิตไบโอดีเซลจากกรดโอเลอิกผ่านปฏิกิริยาเอสเทอร์ฟิเคชัน โดยใช้ตัวเร่งปฏิกิริยาของแข็งชนิดกรด (Biodiesel Production using Solid Acid Catalyst via Esterification of Oleic Acid) อ. ที่ปรึกษา : รศ. ดร. อาภาณี เหลืองนฤมิตชัย

ตัวเร่งปฏิกิริยาซัลโฟเนติกถูกใช้เป็นตัวเร่งปฏิกิริยาในการผลิตไบโอดีเซลผ่านปฏิกิริยาเอสเทอร์ฟิเคชันจากกรดโอเลอิก ตัวเร่งปฏิกิริยาซัลโฟเนติกเตรียมผ่าน 2 ขั้นตอน ขั้นตอนแรกลิกนินถูกแยกออกมาจากขี้ข้าวโพดโดยกระบวนการฟิรติ้งด้วยกรดซัลฟิวริกเจือจาง หลังจากนั้นนำลิกนินไปทำปฏิกิริยาซัลโฟเนชันด้วยกรดซัลฟิวริกเข้มข้น ในงานวิจัยนี้ได้ศึกษาผลของอุณหภูมิในการทำปฏิกิริยาซัลโฟเนชัน เวลาในการทำปฏิกิริยาซัลโฟเนชัน ปริมาณตัวเร่งปฏิกิริยา อัตราส่วนโดยโมลระหว่างเมทานอลกับกรดโอเลอิก ความเสถียรของตัวเร่งปฏิกิริยา และการนำตัวเร่งปฏิกิริยากลับมาใช้ใหม่ นอกจากนี้ยังได้พิสูจน์เอกลักษณ์ของตัวเร่งปฏิกิริยาโดยใช้เทคนิคต่างๆ ประกอบด้วย BET, XRD, FT-IR, SEM,  $\text{NH}_3$ -TPD และวิธีการไตเตรท ขณะที่ไบโอดีเซลถูกวิเคราะห์ด้วยเครื่องก๊าซโครมาโตกราฟี จากการทดลองพบว่าตัวเร่งปฏิกิริยาที่ผ่านการซัลโฟเนชันที่อุณหภูมิ 110 °C 5 ชั่วโมง ให้ร้อยละของไบโอดีเซลสูงที่สุดที่ 89.8%. ภายใต้สภาวะที่เหมาะสมที่อัตราส่วนโดยโมลระหว่างเมทานอลกับกรดโอเลอิกเท่ากับ 15:1 ปริมาณตัวเร่งปฏิกิริยาร้อยละ 5 โดยน้ำหนัก อุณหภูมิในการเกิดปฏิกิริยา 60 องศาเซลเซียส และเวลาที่ใช้ในการทำปฏิกิริยา 8 ชั่วโมง

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