

**SOLID ACID CATALYSTS FOR BIODIESEL PRODUCTION VIA  
ESTERIFICATION FROM OLEIC ACID**

Suppasate Dechakhumwat

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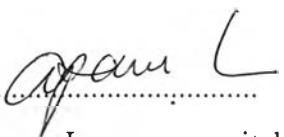
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**By:** Suppasate Dechakhumwat  
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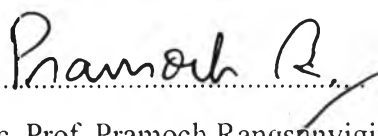
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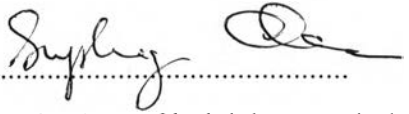
Accepted by The Petroleum and Petrochemical College, Chulalongkorn University, in partial fulfilment of the requirements for the Degree of Master of Science.

  
..... College Dean  
(Asst. Prof. Pomthong Malakul)

**Thesis Committee:**

  
.....  
(Assoc. Prof. Apanee Luengnaruemitchai)

  
.....  
(Assoc. Prof. Pramoch Rangsunvigit)

  
.....  
(Assoc. Dr. Suphang Chulalaksananukul)

**ABSTRACT**

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Esterification of oleic acid with methanol using treated solid residue as a catalyst was studied for biodiesel production. The solid acid catalyst was prepared by sulfonation of p-toluenesulfonic acid on corncob waste obtained from butanol production. Its activity was compared with the corncob activated by concentrated sulfuric acid ( $H_2SO_4$ ). The result from gas chromatography showed that the catalyst activated by TsOH can catalyze the reaction faster than that activated by  $H_2SO_4$ , at reaction temperature of  $60^\circ C$  for 2 h. The characterization results from an acid-base titration method and surface area analysis indicated that TsOH treated catalyst have lower acid sites than  $H_2SO_4$ ; however, it exhibited higher specific surface area and pore specific volume.

## บทคัดย่อ

ศุภเสถียร เดชาคุ้มวัฒน์: ตัวเร่งปฏิกิริยาของแข็งชนิดกรดสำหรับการผลิตไบโอดีเซลจากปฏิกิริยาเอสเทอร์ฟิเคชันของกรดโอเลอิก (Solid Acid Catalyst for Biodiesel Production via Esterification from Oleic Acid) อาจารย์ที่ปรึกษา: รศ. ดร. อาภาณี เหลืองนฤมิตชัย 73 หน้า

ปฏิกิริยาเอสเทอร์ฟิเคชันของกรดโอเลอิกที่ทำปฏิกิริยากับเมทานอลโดยใช้ตัวเร่งปฏิกิริยาจากวัสดุเหลือทิ้งทางการเกษตรถูกนำมาศึกษาเพื่อใช้ในกระบวนการผลิตไบโอดีเซล ตัวเร่งปฏิกิริยาของแข็งชนิดกรดถูกเตรียมจากซังข้าวโพดเหลือทิ้งจากกระบวนการผลิตบิวทานอล ผ่านกระบวนการซัลโฟเนชันด้วยกรดพี-โทลูอินซัลโฟนิก เพื่อเปรียบเทียบความสามารถในการเร่งปฏิกิริยากับตัวเร่งปฏิกิริยาที่ถูกเตรียมผ่านกระบวนการซัลโฟเนชันด้วยกรดซัลฟูริกเข้มข้น ผลจากการตรวจสอบด้วยเทคนิคแก๊สโครมาโตกราฟีบ่งบอกว่าตัวเร่งปฏิกิริยาที่ได้รับการกระตุ้นด้วยกรดพี-โทลูอินซัลโฟนิก สามารถเร่งปฏิกิริยาได้เร็วกว่าตัวเร่งปฏิกิริยาที่ได้รับการกระตุ้นด้วยกรดซัลฟูริกเข้มข้น สำหรับปฏิกิริยาเอสเทอร์ฟิเคชันที่ 60 องศาเซลเซียส เป็นเวลา 2 ชั่วโมง และจากผลการตรวจสอบคุณลักษณะของตัวเร่งปฏิกิริยาดังกล่าว ด้วยวิธีการไตเตรตและเครื่องมือวิเคราะห์พื้นที่ผิว พบว่าตัวเร่งปฏิกิริยาดังกล่าว มีปริมาณตำแหน่งที่เป็นกรด ต่ำกว่าตัวเร่งปฏิกิริยาที่กระตุ้นด้วยกรดซัลฟูริก แต่มีพื้นที่ผิวสัมผัสจำเพาะและปริมาตรรูพรุนจำเพาะที่สูงกว่า

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