

**DEOXYGENATION OF JATROPHA OIL FOR THE PRODUCTION OF
HYDROGENATED BIODIESEL: EFFECT OF ACTIVE METALS**



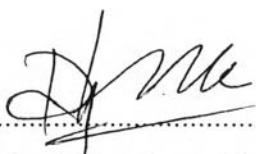
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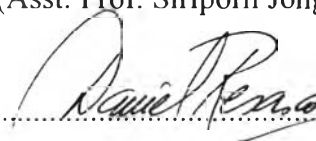
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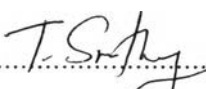

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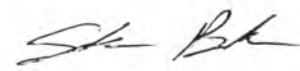
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ABSTRACT

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Hydrogenated biodiesel is referred to as diesel-like hydrocarbons that do not contain oxygen in their molecules. Its properties are much better than those of typical biodiesel such as higher heating value, higher cetane number, and lower corrosiveness. It can be produced via deoxygenation process. In this work, the production of hydrogenated biodiesel from jatropha oil was studied over catalysts containing different active metals. The studied catalysts are Pd/Al₂O₃, Pt/Al₂O₃, Cu/Al₂O₃, NiCu/Al₂O₃, NiMo/Al₂O₃, and CoMo/Al₂O₃. The reactions were carried out in a continuous flow packed-bed reactor at 325°C, 500 psig, H₂/feed molar ratio of 30 by varying liquid hourly space velocities (LHSV) (0.5, 1, 2, 3, and 4 h⁻¹). The results showed that Pt/Al₂O₃ catalyst gave the highest catalytic activity among the others at the same LHSV. The liquid products obtained over these catalysts are hydrocarbons in the range of diesel fuel. The different catalysts give different product distributions. The hydrocarbons obtained over Pd/Al₂O₃, Pt/Al₂O₃, and NiCu/Al₂O₃ catalysts are mainly n-heptadecane (n-C17). In contrast, Cu/Al₂O₃, NiMo/Al₂O₃, and CoMo/Al₂O₃ give n-octadecane (n-C18) as the main product. Moreover, the reaction intermediates which are stearic acid, palmitic acid, hexadecanol, octadecanol, monoglycerides, and fatty esters were also observed. The amount of intermediates increased with increasing LHSV.

บทคัดย่อ

ธีรลักษณ์ ธรารุช : การผลิตไฮโดรเจนเตไบโอดีเซลจากน้ำมันสบู่ดำ: ผลของโลหะบนตัวเร่งปฏิกิริยา (Deoxygenation of Jatropha Oil for the Production of Hydrogenated Biodiesel: Effect of Active Metals) อ. ที่ปรึกษา: ผศ. ดร. ศิริพร จงผาดิวุฒิ ศ. ดร. สมชาย โอสวรรณ และ ศ. ดร. แคนเน็ล อีริชส์โก 71 หน้า

ไฮโดรเจนเตไบโอดีเซลคือน้ำมันดีเซลที่มีองค์ประกอบเป็นสารไฮโดรคาร์บอนซึ่งไม่มีออกซิเจนอยู่ในโครงสร้างโมเลกุลทำให้มีสมบัติที่ดีกว่าไบโอดีเซลทั่วไป เช่น ค่าพลังงานความร้อนเมื่อเผาไหม้และค่าซีเทนที่สูงกว่า อีกทั้งมีคุณสมบัติในการกักกรองน้ำ การสังเคราะห์ไฮโดรเจนเตไบโอดีเซลจากน้ำมันพืชทำได้โดยผ่านกระบวนการคือออกซิเจนชั้น ในงานวิจัยนี้ทำการศึกษการผลิตไฮโดรเจนเตไบโอดีเซลจากน้ำมันสบู่ดำโดยใช้ตัวเร่งปฏิกิริยาที่มีโลหะต่างชนิดกัน ได้แก่ Pd/Al₂O₃, Pt/Al₂O₃, Cu/Al₂O₃, NiCu/Al₂O₃, NiMo/Al₂O₃, และ CoMo/Al₂O₃ โดยได้ทำการศึกษาภายใต้เครื่องปฏิกรณ์แบบไหลต่อเนื่องชนิดเบดนิ่งที่สภาวะอุณหภูมิ 325°C, ความดัน 500 psig. สัดส่วนโดยโมลไฮโดรเจนต่อน้ำมันสบู่ดำเท่ากับ 30 โดยแปรผันระยะเวลาของสารที่อยู่ในเครื่องปฏิกรณ์ (LHSV) 0.5, 1, 2, 3, และ 4 h⁻¹ จากผลการทดลองพบว่า Pt/Al₂O₃ มีประสิทธิภาพในการเร่งปฏิกิริยาสูงสุดเมื่อเทียบกับตัวเร่งปฏิกิริยาชนิดอื่นที่ LHSV เท่ากัน สารผลิตภัณฑ์ของเหลวที่ได้จากตัวเร่งปฏิกิริยาทุกชนิดเป็นไฮโดรคาร์บอนในช่วงน้ำมันดีเซล โดยตัวเร่งปฏิกิริยาต่างชนิดกันจะให้การกระจายตัวของสารผลิตภัณฑ์ที่ต่างกัน ปฏิกิริยาบน Pd/Al₂O₃, Pt/Al₂O₃, และ NiCu/Al₂O₃ จะได้เฮปตะเดเคนเป็นผลิตภัณฑ์หลัก ในขณะที่ Cu/Al₂O₃, NiMo/Al₂O₃, และ CoMo/Al₂O₃ ให้ผลิตภัณฑ์หลักเป็นออกตะเดเคน นอกจากนี้ยังพบสารมัธยันต์ได้แก่ กรดสเตียริก, กรดปาล์มมิติก, เฮกซะเดคานอล, ออกตะเดคานอล, โมโนกลีเซอไรด์, และเอสเทอร์ปนอยู่ในสารผลิตภัณฑ์ โดยปริมาณของสารตัวกลางจะเพิ่มขึ้นเมื่อ LHSV สูงขึ้น

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