

**FORMATION OF VEGETABLE OIL BASED MICROEMULSION BIOFUEL
WITH ETHANOL/BUTANOL IN PALM OIL/DIESEL BLENDS**

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A Thesis Submitted in Partial Fulfillment of the Requirements
for the Degree of Master of Science
The Petroleum and Petrochemical College, Chulalongkorn University
in Academic Partnership with
The University of Michigan, The University of Oklahoma,
Case Western Reserve University, and Institut Français du Pétrole
2015

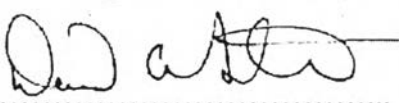
Thesis Title: Formation of Vegetable Oil based Microemulsion Biofuel
with Ethanol/Butanol in Palm Oil/Diesel Blends
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Program: Petrochemical Technology
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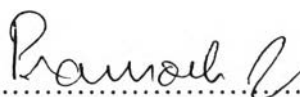
Accepted by The Petroleum and Petrochemical College, Chulalongkorn
University, in partial fulfillment of the requirements for the Degree of Master of
Science.

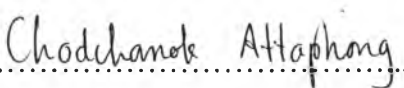

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ABSTRACT

5671036063: Petrochemical Technology

Waritta Apichatyothin: Formation of Vegetable Oil based
Microemulsion Biofuel with Ethanol/Butanol in Palm Oil/Diesel
Blends.

Thesis Advisors: Dr. Ampira Charoensaeng, and Prof. David A.
Sabatini 78 pp.

Keywords: Microemulsion biofuel/ Viscosity reducer/ Pseudo ternary phase
diagram

Vegetable oil is an option for renewable fuels production to replace the diesel oils. Because vegetable oils have higher viscosity than diesel oils, the usability of neat vegetable oils can lead to engine stability problems such as poor atomization of the fuel. However, vegetable oil viscosity can be reduced by blending with diesel fuel in thermodynamically stable mixtures using microemulsion formulation. This work focused on the formation of microemulsion biofuels consisting of palm oil/diesel and refined bleached deodorized palm oil (RBDPO)/diesel blends as an oil phase with ethanol and butanol blend as a viscosity reducer. Methyl oleate (MO) and palm oil methyl ester (POME) were used as a surfactant and 1-octanol was used as a cosurfactant at 1:8 surfactant:cosurfactant molar ratio. This work studied the effects of surfactant structure, ethanol/butanol blending ratios, palm oil/diesel blending ratios on phase behaviour, kinematic viscosity, microemulsion droplet size and fuel properties for microemulsion fuel formation and compared their fuel properties to regular biodiesel (B100) and diesel (No.2). The result showed that the phase behaviors of different surfactant systems had similar trend of the miscibility curve. The microemulsion biofuels containing butanol in the mixture showed a remarkable result on phase behavior. Based on our findings, the blending ratios of ethanol/butanol is a major parameter for optimizing the viscosity and other fuel properties of microemulsion biofuels.

บทคัดย่อ

วิทยุสา อภิชชาติโยธิน : การผลิตเชื้อเพลิงชีวภาพจากน้ำมันพืชด้วยวิธีการไมโครอิมัลชัน โดยใช้อีทานอลและบิวทานอลในของผสมระหว่างน้ำมันปาล์มและน้ำมันดีเซล (Formation of Vegetable Oil Based Microemulsion Biofuel with Ethanol/Butanol in Palm Oil/Diesel Blends)
 อ. ที่ปรึกษา : ดร. อัมพิรา เจริญแสง และ Prof. David A. Sabatini 78 หน้า

น้ำมันพืชเป็นทางเลือกสำหรับการผลิตพลังงานหมุนเวียนเพื่อทดแทนน้ำมันดีเซล เนื่องจากน้ำมันพืชมีความหนืดสูงกว่าน้ำมันดีเซล การนำน้ำมันพืชมาใช้ทดแทนน้ำมันดีเซลจะก่อให้เกิดปัญหาด้านความเสถียรของเครื่องยนต์ดีเซล เช่น ประสิทธิภาพของการกลายเป็นอะตอมของเชื้อเพลิงจะต่ำ ความหนืดของน้ำมันพืชถูกทำให้ลดลงได้โดยการนำไปผสมกับน้ำมันดีเซลให้เกิดเป็นของผสมที่มีความเสถียรทางอุณหพลศาสตร์ด้วยวิธีการไมโครอิมัลชัน งานวิจัยนี้มีมุ่งหมายเพื่อผลิตเชื้อเพลิงชีวภาพด้วยวิธีไมโครอิมัลชันซึ่งประกอบไปด้วยน้ำมันปาล์มผสมกับน้ำมันดีเซล และน้ำมันปาล์มยังไม่แยกไขผสมกับน้ำมันดีเซลในส่วนของวัฏภาคน้ำมัน รวมทั้งเอทานอลและบิวทานอลที่นำมาใช้ในส่วนของการลดความหนืด เมทิล โอลิเอตและกรดไขมันของเมทิล-เอสเตอร์นำมาใช้ในส่วนของการลดแรงตึงผิวและสารลดแรงตึงผิวร่วมออกทานอลในอัตราส่วน 1:8 โดยโมล งานวิจัยนี้ศึกษาผลของโครงสร้างของสารลดแรงตึงผิว อัตราส่วนผสมระหว่างเอทานอลและบิวทานอล อัตราส่วนระหว่างน้ำมันปาล์มและน้ำมันดีเซล และการใช้น้ำมันปาล์มยังไม่แยกไขผสม อันส่งผลกระทบต่อพฤติกรรมวัฏภาค ความหนืด ขนาดของอนุภาคไมโครอิมัลชัน และคุณสมบัติต่างๆของเชื้อเพลิงชีวภาพเปรียบเทียบกับมาตรฐานของเชื้อเพลิงดีเซลและไบโอดีเซล จากการทดลองพบว่าสารลดแรงตึงผิวทั้งสองชนิดให้ผลของพฤติกรรมวัฏภาคที่มีทิศทางไปในทางเดียวกัน โดยเส้นขอบเขตระหว่างการผสมให้เป็นเนื้อเดียวกัน เชื้อเพลิงชีวภาพที่มีการผสมบิวทานอลในองค์ประกอบให้ผลที่น่าสนใจในด้านพฤติกรรมวัฏภาค จากผลการศึกษาพบว่าอัตราส่วนการผสมของเอทานอลและบิวทานอลคือปัจจัยหลักสำหรับความเหมาะสมที่สุดของความหนืดและคุณสมบัติอื่นๆของเชื้อเพลิงชีวภาพ

ACKNOWLEDGEMENTS

The author is grateful thanks for the scholarship and funding of the thesis work provided by the Petroleum and Petrochemical College; and the National Center of Excellence for Petroleum, Petrochemicals, and Advanced Materials, Thailand; and the new researcher from the Thailand Research Fund (TRG 5780163). In addition, I extend my gratitude to thank Werasuwan Co., Ltd., for providing palm oil methyl ester (POME).

I would like to express my sincere appreciation to my advisors, Dr. Ampira Charoensang and Prof. David A. Sabatini for their invaluable guidance, help, encouragement and support provided throughout this research. Additionally, I would like to thank members of my committee, Assoc. Prof. Pramoch Rangsunvigit and Dr. Chodchanok Attaphong. I also extend my heartfelt and sincere thanks to Assoc. Prof. Sutha Khaodhiar, Ramnaree Netvichien, and Noulkamol Arpornpong, for suggestion, valuable comment and Department of Environmental Engineering, Faculty of Engineering, Chulalongkorn University for additional laboratory testing and equipment supports for this study. I also would like to thank the officers and my friends at The Petroleum and Petrochemical College, especially Mr. Sachart Manaphati. Finally, I thank my family for their love and encouragement. This thesis would not have been completed without all the supports that I have always received from them.

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