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IMPROVEMENT OF LUBRICITY OF SULFONATED METHYL ESTER FROM
VEGETABLE OIL SOAPSTOCKS

Miss Harinate Mungpayaban

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for the Degree of Master of Science Program in Petrochemistry and Polymer Science

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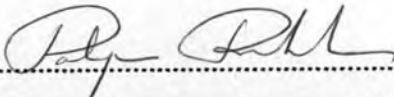
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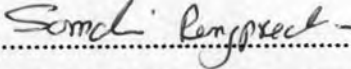
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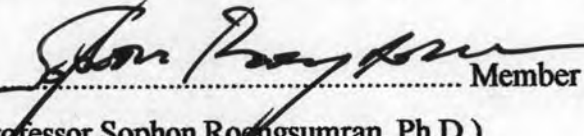
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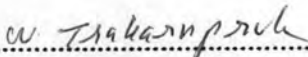
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งานวิจัยนี้มีจุดประสงค์เพื่อสังเคราะห์สารประกอบซัลโฟเนตเมทิลเอสเทอร์ที่มีสมบัติ
 ปรับปรุงสภาพหล่อลื่นจากสตีออลของน้ำมันปาล์มและน้ำมันรำข้าว โดยในขั้นแรกทำการ
 เปลี่ยนสตีออลดังกล่าวไปเป็นสารประกอบเมทิลเอสเทอร์ โดยปฏิกิริยาเอสเทอริฟิเคชัน โดยใช้
 เมทานอลและมีกรดซัลฟิวริกเป็นตัวเร่งปฏิกิริยา จากนั้นนำมาทำปฏิกิริยากับไอเดียมได้เป็น
 สารประกอบซัลโฟเนตเมทิลเอสเทอร์ พิสูจน์เอกลักษณ์ของสารประกอบที่ได้โดยเทคนิคทาง
 สเปกโทรสโกปี ได้แก่ อินฟราเรดสเปกโทรสโกปี นิวเคลียร์แมกเนติกเรโซแนนซ์สเปกโทรสโกปี
 และเอกซ์เรย์ฟลูออเรสเซนส์ สารประกอบซัลโฟเนตเมทิลเอสเทอร์ที่ได้สามารถละลายในน้ำมัน
 ดีเซลพื้นฐานได้ง่ายและเมื่อนำมาทดสอบความสามารถในการหล่อลื่น โดยเปรียบเทียบกับน้ำมัน
 ดีเซลพื้นฐาน โดยใช้สารประกอบซัลโฟเนตเมทิลเอสเทอร์ 5 เปอร์เซ็นต์โดยน้ำหนัก พบว่า
 สารประกอบซัลโฟเนตเมทิลเอสเทอร์ที่ได้จากสตีออลของน้ำมันรำข้าวและน้ำมันปาล์ม มีค่า
 การสึกหรอเป็น 192 ไมโครเมตร ซึ่งตามมาตรฐานกำหนดให้มีค่าการสึกหรอได้ไม่เกิน 460
 ไมโครเมตร แสดงว่าสารประกอบที่ได้สามารถปรับปรุงสภาพการหล่อลื่นในน้ำมันดีเซลพื้นฐานได้

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The purpose of this study was to synthesis sulfonated methyl ester with lubricating property from palm oil and rice bran oil soapstocks. Firstly, soapstocks were changed to methyl esters by esterification using methanol and concentrated sulfuric acid as a catalyst. Then methyl ester products were reacted with oleum to produce sulfonated methyl esters. The sulfonated methyl esters were identified by spectroscopic techniques, such as infrared spectroscopy, nuclear magnetic resonance spectroscopy, and x-ray fluorescence spectrometer. The resulting sulfonated methyl esters could be easily blended with base diesel fuel and used as lubricity improver. At 5% by weight, both sulfonated methyl esters gave the same value of mean wear scar diameter of 192 μm , as the standard value of mean wear scar diameter was less than 460 μm . Therefore, these products could improve the lubricity performance of base diesel fuel.

Field of Study: Petrochemistry and Polymer Science Student's Signature Harinate Mungpayaban
 Academic Year: 2006 Advisor's Signature Somchai Pengprecha

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LIST OF ABBREVIATIONS

Å	Angstrom
°C	Degree Celsius
°F	Degree Fahrenheit
BOCLE	Ball-on-Cylinder Lubricity Evaluator
FT-IR	Fourier-Transform Infrared Spectrophotometer
FT-NMR	Fourier-Transform NMR Spectrometer
HFRR	High Frequency Reciprocating Rig
XRF	X-ray Fluorescence Spectrometer
DI	Direct injection
IDI	Indirect injection
PM	Particulate Matter
API	American Petroleum Institute
ASTM	American Society for Testing and Materials
CEC	Coordinating European Council
DOE	Department of Energy (USA)
DOT	Department of Transportation (USA)
EIA	The Electronic Industries Alliance
EPA	Environmental Protection Agency
ORNL	Oak Ride National Laboratory
ISO	International Standards Organization
SAE	Society of Automotive Engineers
cSt	Centistroke

rpm	Round per minute
g	gram
ml	Millilitre (s)
mg	Milligram (s)
μm	Micrometre
ppm	parts per million
%vol	percent by volume
% wt	percent by weight
WSD	Wear Scar Diameter
NPG	Neopentyl glycol
TMP	Trimeylol propane
PE	Pentaerythritol
SMP	Sulfonated methyl ester of palm oil soapstock
SMR	Sulfonated methyl ester of rice bran oil soapstock
SO ₃	Sulfur trioxide