

การทำใบโอดีเซลให้บริสุทธิ์โดยใช้สารดูดซับ

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วิทยานิพนธ์นี้เป็นส่วนหนึ่งของการศึกษาตามหลักสูตรปริญญาวิทยาศาสตรมหาบัณฑิต
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PURIFICATION OF BIODIESEL USING ADSORBENTS

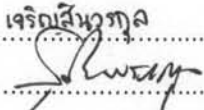
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นางสาวจิรพรรณ เจริญสินวรกุล : การทำไบโอดีเซลให้บริสุทธิ์โดยใช้สารดูดซับ.
(PURIFICATION OF BIODIESEL USING ADSORBENTS)
อ.ที่ปรึกษา : ผศ. ดร. สุรัชชัย พรภคกุล, 86 หน้า.

วัตถุประสงค์ของงานวิจัยนี้ เพื่อลดปริมาณกรดไขมันอิสระในไบโอดีเซลที่สังเคราะห์จากน้ำมันปาล์มดิบที่ผ่านกระบวนการ โดยมีเบสเป็นตัวเร่งปฏิกิริยา ไบโอดีเซลได้จากกระบวนการทรานส์เอสเทอร์ฟิเคชันของน้ำมันปาล์มดิบกับเมทานอลที่ใช้โซเดียมไฮดรอกไซด์เป็นตัวเร่งปฏิกิริยา สภาพที่เหมาะสมสำหรับผลิตไบโอดีเซลใช้อัตราส่วนระหว่างเมทานอลต่อน้ำมันเป็น 16:1 โซเดียมไฮดรอกไซด์ 1.4 เปอร์เซ็นต์โดยน้ำหนักและที่อุณหภูมิ 50 องศาเซลเซียสเป็นเวลา 1.50 ชั่วโมง การใช้ที่สภาวะนี้จะได้ไบโอดีเซล 88-96 เปอร์เซ็นต์ ไบโอดีเซลที่ได้มีกรดไขมันอิสระ 0.184 เปอร์เซ็นต์ จากนั้นทำให้บริสุทธิ์โดยสารดูดซับ ได้แก่ แมกนีซอล ถ่านกัมมันต์ อะลูมินาชนิดเบส โมเลคิวลาร์ซีฟ(4Å) ดินเบนโทไนด์ และดินเบนโทไนด์ที่ผ่านการทรีตด้วยโซเดียมไฮดรอกไซด์ ผลการทดลองแสดงให้เห็นว่าถ่านกัมมันต์ในรูปผงและแมกนีซอลสามารถลดปริมาณกรดไขมันอิสระเหลือเพียง 0.014 และ 0.016 เปอร์เซ็นต์ตามลำดับ ดังนั้น จึงใช้ถ่านกัมมันต์ในรูปผงเป็นสารดูดซับที่มีข้อดีในการศึกษา

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JIRAPHAN CHAROENSINVORAKUL: PURIFICATION OF BIODIESEL USING ADSORBENTS. THESIS ADVISOR: ASST. PROF. SURACHAI PORNPAKAKUL, Ph.D., 86 pp.

The purpose of this research is to reduce the free fatty acids (FFAs) in biodiesel synthesized from crude palm oil via a base-catalyzed process. The biodiesel was obtained by the transesterification of crude palm oil with methanol using sodium hydroxide as a catalyst. The optimum conditions for biodiesel production were obtained using a 16:1 molar ratio of methanol:oil, 1.4%wt of sodium hydroxide and reaction temperature of 50°C for 1.50 h. Using these conditions, the 88-96% yield of biodiesel was obtained. The biodiesel with 0.184% of FFAs was further purified by adsorbents including magnesol, activated charcoal, basic alumina, molecular sieve (4Å), bentonite clay and NaOH-treated bentonite clay. The results showed that the activated charcoal and magnesol could reduced FFAs to 0.014% and 0.016%, respectively. Therefore, the activated charcoal was used as an advantage adsorbent in this study.

Field of study ..Petrochemistry and Polymer Science.. Student's signature.....Jiraphan Charoensinvorakul
 Academic year2006..... Advisor's signature.....S. Pornpakakul

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CONTENTS

	Page
ABSTRACT (in Thai).....	iv
ABSTRACT (in English).....	v
ACKNOWLEDGEMENTS.....	vi
CONTENTS.....	vii
LIST OF TABLES.....	x
LIST OF FIGURES.....	xii
LIST OF ABBREVIATIONS.....	xv
DEFINITIONS.....	xvi
 CHAPTER	
I INTRODUCTION.....	1
1.1 Introduction.....	1
1.2 Objective.....	2
1.3 Scope of the study.....	3
II THEORETICAL CONSIDERATIONS.....	4
2.1 Alternative renewable energy.....	4
2.2 The appropriate oils or fats for production of biodiesel	8
2.3 The production of biodiesel.....	10
2.3.1. acids-catalyzed processes	11
2.3.2. base-catalyzed processes	12
2.3.3. lipase-catalyzed processes	12
2.3.4. non-ionic base-catalyzed processes	13
2.3.5. heterogeneously catalyzed processes	13
2.3.6. noncatalytic process.....	14
2.4 Combustion, emission, engine problems and deposit.....	17
2.5 Biodiesel quality.....	19
2.6 History of biofuel in Thailand.....	22

	Page
2.7 Palm oil.....	22
2.8 Chemical composition and properties of palm oil.....	24
2.9 Suitably obtainable area for oil palm plantation in Thailand	25
2.10 Other sources of biodiesel.....	28
2.11 Adsorption.....	28
2.12 Impacted parameters of adsorption.....	29
2.13 Literature review.....	32
 III EXPERIMENTAL.....	 34
3.1 Materials and equipments.....	34
3.1.1 Chemicals and equipments for transesterification process.....	34
3.1.2 Materials and equipments for purification of methyl ester....	35
3.2 Synthesis of methyl ester.....	35
3.2.1 Synthesis of methyl ester via base-catalyzed process	35
3.2.2 Synthesis of methyl ester via 2-step catalyzed process	37
3.3 Procedure for purification of methyl ester with adsorbents.....	38
3.4 Procedure for recovering the adsorbents.....	39
 IV RESULTS AND DISCUSSION.....	 40
4.1 Synthesis of methyl ester from crude palm oil	40
4.2 Determination of FFAs content in methyl ester.....	47
4.3 Determination of metal contents in methyl ester	51
4.4 Determination of total moisture in methyl ester.....	52
4.5 BET Surface analysis.....	53
4.6 Recovering adsorbent.....	58
4.7 The value of adsorbents in Thailand	59
 V CONCLUSION	 61
5.1 Conclusion.....	61

	Page
5.2 Suggestion.....	62
REFERENCES	63
APPENDICS	68
Appendix A OIL-PRODUCING CROPS	69
Appendix B CALCULATIONS.....	70
Appendix C COMPOSITION OF FATTY ACIDS IN CRUDE PALM OIL.....	73
Appendix D SPECTRA.....	74
Appendix E OTHER INFORMATIONS.....	84
BIOGRAPHY.....	86

LIST OF TABLES

	Page
2.1 Fatty acid compositions of vegetable oil.....	5
2.2 Typical fatty acid composition-common oil sources.....	5
2.3 Names and structures of the most common fatty acids.....	6
2.4 Relationships between biodiesel properties and fatty acids composition.....	9
2.5 Interaction between the chemical parameters and behavior.....	9
2.6 Classification of processes use different catalysts for the preparation of biodiesel.....	14
2.7 Physical properties of chemical related to transesterification.....	16
2.8 Melting points of fatty acids, methyl esters and mono-, di- and triglyceride.....	16
2.9 Selected fuel properties for diesel and biodiesel fuels.....	20
2.10 Characteristic and quality of biodiesel (methyl ester of fatty acids) in Thailand	21
2.11 Typical (%) fatty acids composition of palm oil and palm kernel oil.....	25
2.12 Typical FFAs composition (%) of crude palm oil in Thailand.....	27
3.1 Tested method of purified methyl ester.....	39
4.1 Compositions of fatty acids in crude palm oil	40
4.2 Molar ratio converts crude palm oil as palm oil methyl ester via base-catalyzed process.....	41
4.3 Yields (%) of the synthetic methyl ester from palm oil by base- catalyzed process and two-step process.....	43
4.4 Summarized GC of palm methyl ester via base-catalyzed process...	46
4.5 Physical properties of methyl ester obtained from the base- catalyzed process from crude palm oil	46
4.6 Content of FFAs in methyl ester after adsorbed with basic alumina (at 30 °C).....	47

	Page
4.7 Results of treatments with different adsorbents on the FFAs of methyl ester.....	49
4.8 Effect of temperatures on the FFAs adsorption of activated charcoal (powder form).....	50
4.9 The metal contents were adsorbed activated charcoal (powder form) in methyl ester base-process	52
4.10 Comparative total moisture content in methyl ester obtained from the base-catalyzed process after the treatment with activated charcoal (powder form) at 60°C and 30 min.....	53
4.11 Comparison of surface area from magnesol and activated charcoal (powder form) by BET Surface Area Analyzer.....	54
4.12 Number of times of activated charcoal and magnesol reused adsorption by analyzed FFAs content in methyl ester (at 60°C and 30 min).....	58
4.13 The value of several adsorbents which used in this investigation (As of April/2007).....	60
4.14 General properties of adsorbents which presented in this investigation.....	60

LIST OF FIGURES

	Page
1.1 Diesel fuel consumption of Thailand in 2001-2006	1
2.1 General equation for transesterification reaction.....	10
2.2 Transesterification of vegetable oils.....	11
2.3 The reaction of sodium soap.....	12
2.4 Samples of non-ionic base-catalysts.....	13
2.5 The transesterification reactions of vegetable oil with alcohol to ester and glycerol	15
2.6 Process for biodiesel production.....	15
2.7 Composition of palm oil fruit.....	23
2.8 Diagram of the production of crude palm oil.....	24
2.9 Summary of existing and suitably available lands for oil palm plantation among studied provinces	26
3.1 The apparatus set for transesterification.....	36
3.2 Base-catalyzed transesterification on the laboratory scale.....	36
3.3 Two-step catalyzed process on the laboratory scale.....	38
4.1 Reproductive TLC of methyl ester which synthesized with base- catalyzed process.....	41
4.2 Reproductive TLC of methyl ester which synthesized with 2-step catalyzed process.....	42
4.3a ¹ H-NMR spectrum of crude palm oil in CDCl ₃	43
4.3b ¹ H-NMR spectrum of palm oil methyl ester in CDCl ₃	44
4.3c ¹³ C-NMR spectrum of crude palm oil in CDCl ₃	44
4.3d ¹³ C-NMR spectrum of palm oil methyl ester in CDCl ₃	45
4.4 Diagram of FFAs in methyl ester after adsorbed with basic alumina	47
4.5 Diagram of FFAs after adsorbed with different adsorbents.....	50
4.6 % FFAs after the treatment with activated charcoal (powder form) at various temperatures.....	51
4.7 Adsorption isotherm of (a) magnesol and (b) activated charcoal after and before methyl ester adsorption.....	55

	Page
4.8 The pore volume distribution for (a) magnesol and (b) activated charcoal after and before methyl ester adsorption.....	56
4.9 The t-plot of (a) magnesol and (b) activated charcoal after and before methyl ester adsorption obtained from the adsorption isotherm.....	57
4.10 Photographs of activated charcoal by SEM; (a) before methyl ester adsorption (b) after methyl ester adsorption and (c) inactive adsorption. Resolution \times 3000.....	59
1E Gas chromatogram of analyzed palm methyl ester	74
2E Mass spectrum of palm methyl ester at retention time of 5.618 min	74
3.1E Mass spectrum of methyl myristate (methyl tetradecanoate; 14:0) at retention time of 9.787 min	75
3.2E Structure of methyl myristate (methyl tetradecanoate)	75
4.1E Mass spectrum of methyl palmitate (methyl hexadecanoate;16:0) at retention time of 14.511 min	76
4.2E Structure of methyl palmitate (methyl hexadecanoate)	76
5.1E Mass spectrum of methyl linoleate (methyl octadecadienoate; 18:2) at retention time of 18.52 min	77
5.2E Structure of methyl linoleate (methyl octadecadienoate)	77
6.1E Mass spectrum of methyl oleate (methyl octadecenoate; 18:1) at retention time of 18.627 min	78
6.2E Structure of methyl oleate (methyl octadecenoate)	78
7.1E Mass spectrum of methyl stearate (methyl octadecanoate; 18:0) at retention time of 19.097 min	79
7.2E Structure of methyl stearate (methyl octadecanoate)	79
8E $^1\text{H-NMR}$ spectrum of methyl ester (base-catalyzed process).....	80
9E $^1\text{H-NMR}$ spectrum of methyl ester adsorbed with magnesol.....	80
10E $^1\text{H-NMR}$ spectrum of methyl ester adsorbed with basic alumina....	81
11E $^1\text{H-NMR}$ spectrum of methyl ester adsorbed with activated charcoal (powder).....	81

	Page
12E ¹ H-NMR spectrum of methyl ester adsorbed with activated charcoal (granule).....	82
13E ¹ H-NMR spectrum of methyl ester adsorbed with molecular sieve (4Å).....	82
14E ¹ H-NMR spectrum of methyl ester adsorbed with bentonite clay (standard).....	83
15E ¹ H-NMR spectrum of methyl ester adsorbed with bentonite clay (treated NaOH).....	83

LIST OF ABBREVIATIONS

AOAC	=	Association of Official Analytical Chemists/Official Methods of Analysis of AOAC
ASTM	=	American Society for Testing and Materials
°C	=	Degree Celsius
¹³ C-NMR	=	Carbon-13 Nuclear Magnetic Resonance
CN	=	Cetane number
CO	=	Carbon monoxide
CO ₂	=	Carbon dioxide
CPO	=	Crude palm oil
δ	=	Delta
DF	=	Diesel fuel
EN	=	European Standards
FAME	=	Fatty acid methyl ester
FFA	=	Free fatty acid
g	=	Gram
¹ H-NMR	=	Proton Nuclear Magnetic Resonance
h	=	Hour
K	=	Degree Kelvin
KTOE	=	Kilo Ton of Oil Equivalent
mg	=	Milligram
min	=	Minute
ml	=	Milliliter
NO _x	=	Nitrogen oxides
PAHs	=	Polycyclic aromatic hydrocarbon compounds
rpm	=	Round per minute
sq. m.	=	Square meter, m ²
TLC	=	Thin Layer Chromatography
TLC-FID	=	Thin Layer Chromatography-Flame Ionization Detector
% wt	=	Percent by weight
% yield	=	Percent yield

DEFINITIONS

- Cetane number = A measure of the ignition quality of a diesel fuel, as determined in a standard single cylinder test engine, which measures ignition delay, compared to primary reference fuels. The higher the Cetane Number, the easier a high-speed, direct-injection engine will start, and the less "white smoking" and "diesel knock" after start-up.
- Cloud point = The start of crystal formation in the oil. As the temperature is lowered, the crystals continue to grow until the oil is no longer fluid but a solid.
- Flash point = The lowest temperature at which evaporation of a substance produces sufficient vapor to form an ignitable mixture with air.
- Magnesol = It is a registered trademark of The Dallas Group of America, Inc. for a synthetic, amorphous, hydrous form of magnesium silicate. With a porous internal structure and enormous activated surface, Magnesol[®] products are ideal for use as adsorbents, anti-static flow agents, anti-caking agents, catalyst supports, carriers, and reinforcing fillers.
- PAHs = Polynuclear aromatic hydrocarbons (PAHs) are hydrocarbon compounds with multiple benzene rings. PAHs are typical components of asphalts, fuels, oils and greases. Because of, they are insoluble in water but dissolve readily in fats and oils.
- Pour point = The lowest temperature at which it will pour or flow under prescribed conditions. It is a rough indication of the lowest temperature at which oil is readily pumpable. Also, the pour point can be defined as the minimum temperature of a liquid, particularly a lubricant, after which, on decreasing the temperature, the liquid ceases to flow.
- Transesterification = It is used to describe the direct conversion of triacylglycerols lipids by alcohols to alkyl esters without first isolating the free fatty acids (FFAs).