REFERENCES

Abdel-Rehim, M.A., Carlota, B.S.A., Camorim, V.L.L., and Faro, Jr A.C. (2006) Acid–base reactions on alumina-supported niobia. Applied Catalysis A: General, 305, 211-218.

Agarwal, D., Sinha, S., and Agarwal, K.A. (2006) Experimental investigation of control of NO_x emissions in biodiesel-fueled compression ignition engine. Renewable Energy, 31, 2356-2369.

Alonso, M.D., Mariscal, R., Moreno-Tost, R., Poves, M.D.Z., and Granados, M.L. (2007) Potassium leaching during triglyceride transesterification using K/γ-Al_2O_3 catalysts. Catalysis Communications, 8, 2080-2086.

Arzamendi, G., Campo, I., Arguiñarena, E., Sánchez, M., Montes, M., and Gandía, L.M. (2007) Synthesis of biodiesel with heterogeneous NaOH/alumina catalysts: Comparison with homogeneous NaOH. Chemical Engineering Journal, 134, 123-130.

Ban-Weiss, A.G., Chen, J.Y., Buchholz, A.B., and Dibble, W.R. (2007) A numerical investigation into the anomalous slight NOx increase when burning biodiesel; A new (old) theory. Fuel Processing Technology, 88, 659-667.

Barthomeuf, D. (1991) Acidity and basicity in zeolite. Studies in Surface Science and Catalysis. 65,157-169.

Brazlauskas, M. and Kitrys, S. (2008) Synthesis and properties of CuO/Zeolite sandwich type adsorbent-catalysts. Chinese Journal of Catalysis, 29, 25-30.

Canakci, M., Monyem, A., and Van Gerpen J.H. (1999) Accelerated oxidation process in biodiesel. Transactions of the American Society of Agricultural Engineers, 42, 1565-1572.

Chang, C.C. and Wan, S.W. (1947) China's motor fuels from tung oil. Industrial & Engineering Chemistry Research, 39, 1543-1548.

Choudhary, V.R. and Rane, H.V. (1990) A novel method for measuring base strength distribution on basic solid catalysts under operating conditions. Catalysis Letters, 4, 101-106.

Davis, R.J. (2003) New perspectives on basic zeolites as catalysts and catalyst supports. Journal of Catalysis, 216, 396-405.

Demirbas, A. (2003) Biodiesel fuels from vegetable oils via catalytic and non-catalytic supercritical alcohol transesterifications and other methods: a survey. Energy Conversion and Management, 44, 2093-2109.

Di Serio, M., Tesser, R., Casale L., D'Angelo, A., Trifuoggi, M., and Santacesaria, E. (2010) Heterogeneous catalysis in biodiesel production: The influence of leaching. Topics in Catalysis, 53, 811–819.

Dorado, M.P., Ballesteros, E., López, J.F., and Mittelbach, M. (2004) Optimization of alkali-catalyzed transesterification of *Brassica Carinata* oil for biodiesel production. Energy & Fuels, 18, 77-83.

Ebiura, T., Echizen, T., Ishikawa, A., Murai, K., and Baba, T. (2005) Selective transesterification of triolein with methanol to methyl oleate and glycerol using alumina loaded with alkali metal salt as a solid-base catalyst. Applied Catalysis A: General, 283, 111-116.

Fu, C., Hung, T., Su, C., Suryani, D., Wu, W., Dai, W., and Yeh, Y. (2011) Immobilization of calcium oxide onto chitosan beads as a heterogeneous catalyst for biodiesel production. Polymer International, 60, 957-962.

Fukuda, H., Kondo, A., and Noda, H. (2001) Biodiesel fuel production by transesterification of oils. Journal of Bioscience and Bioengineering, 92, 405-416.

Groen, J.C., Sano, T., Moulijn, J.A., and Pérez-Ramírez, J. (2007) Alkaline-mediated mesoporous mordenite zeolites for acid-catalyzed conversions. Journal of Catalysis, 251, 21-27

Hill, J., Nelson, E., Tilman, D., Polasky, S., and Tiffany, D. (2006) Environmental, economic, and energetic costs and benefits of biodiesel and ethanol biofuels. Proceedings of the National Academy of Sciences of the United State of America, 103, 11206-11210.

Holčapek, M., Jandera, P., Fischer, J., and Prokes, B. (1999) Analytical monitoring of the production of biodiesel by highperformance liquid chromatography with various detection methods. Journal of Chromatography A, 858, 13-31.

Hsieh, L., Kumar, U., and Wu, C.S.J. (2010) Continuous production of biodiesel in a packed-bed reactor using shell–core structural $Ca(C_3H_7O_3)_2/CaCO_3$ catalyst. Chemical Engineering Journal, 158, 250-256.

Imahara, H., Minami, E., Hari, S., and Saka, S. (2006, November) Thermal stability of biodiesel fuel as prepared by supercritical methanol process. Paper presented at The 2nd Joint International Conference on "Sustainable Energy and Environment (SEE 2006)", Bangkok, Thailand.

Iangthanarat, S. (2008) Transesterification of palm oil using KOH/ZrO_2 and KOH/Mordenite as a heterogeneous catalyst. M.S. Thesis, The Petroleum and Petrochemical College, Chulalongkorn University, Bangkok, Thailand.

Istadi, and Amin, N.A.S. (2006) Synergistic effect of catalyst basicity and reducibility on performance of ternary CeO_2-based catalyst for CO_2 OCM to C_2 hydrocarbons. Journal of Molecular Catalysis A: Chemical, 259, 61-66.

Jin, L., Zhang, Y., Dombrowski, J.P., Chen, C., Pravatas, A., Xu, L., Perkins, C., and Sui, S.L. (2011) $ZnO/La_2O_2CO_3$ layered composite: A new heterogeneous catalyst for the efficient ultra-fast microwave biofuel production. Applied Catalysis B: Environmental, 103, 200-205.

Kim, H., Kang, B., Kim, Min., Park, M.Y., Kim, D., Lee, J., and Lee, K. (2004) Transesterification of vegetable oil to biodiesel using heterogeneous base catalyst. Catalysis Today, 93-95, 315-320.

Kincs, F.R. (1985) Meat Fat Formulation. Journal of the American Oil Chemists' Society, 62, 815-818.

Kuś, S., Otremba, M., Tórz, A., and Taniewski, M. (2002) Further evidence of responsibility of impurities of MgO for various ability in its basicity and catalytic performance in oxidative coupling of methane. Fuel, 81, 1755-1760.

Laspéras, M., Cambon, H., Brunel, D., Rodriguez, I., and Geneste, P. (1996) Cesium oxide encapsulation in faujasite zeolites effect of framework composition on the nature and basicity of intrazeolitic species. Microporous Materials, 7, 61-72.

Li, G., Larsen, S.C., and Grassian, H.V. (2005) An FT-IR study of NO_2 reduction in nanocrystalline NaY zeolite: effect of zeolite crystal size and adsorbed water. Catalysis Letters, 103, 1-2.

Li, X., Lu, G., Guo, Y., Guo, Y., Wang, Y., Zhang Z., Liu, X., and Wang, Y. (2007) A novel solid superbase of Eu_2O_3/Al_2O_3 and its catalytic performance for the transesterification of soybean oil to biodiesel. Catalysis Communications, 8, 1969-1972.

Liu, X., He, H., Wang, Y., and Zhu, S. (2007) Transesterification of soybean oil to biodiesel using SrO as a solid base catalyst. Catalysis Communications, 8, 1107-1111.

Lotero, E., Liu, Y., Lopez, E.D., Suwannakarn, K., Bruce, A.D., and Goodwin, Jr. G.J. (2005) Synthesis of biodiesel via acid catalysis. Industrial & Engineering Chemistry Research, 44, 5353-5363.

Ma, F. and Hanna, A.M. (1999) Biodiesel production: a review. Bioresource Technology, 70, 1-15.

Ma, F., Clements, L.D., and Hanna, A.M. (2009) Biodiesel fuel from animal fat. Ancillary studies on transesterification of beef tallow. Industrial & Engineering Chemistry Research, 37, 3768-3771.

Macleoda, C.S., Harvey, A.P., Lee, A.F., and Wilson, K. (2008) Evaluation of the activity and stability of alkali-doped metal oxide catalysts for application to an intensified method of biodiesel production. Chemical Engineering Journal, 135, 63-70.

Madhavi, G., Kulkarni, J.S., Murthy, K.V.V.S.B.S.R., Viswanathan, V., and Raghavan, V.K. (2003) Side-chain alkylation of 4-picoline with formaldehyde over alkali-modified zeolites. Applied Catalysis A: General, 246, 265-282.

Maher, K.D., and Bressler, D.C. (2006) Pyrolysis of triglyceride materials for the production of renewable fuels and chemicals. Bioresource Technology, 98, 2351-2368.

Maka, K.P., Tripathi, V., and Singh, P.R. (2007) Synthesis of biodiesel fuel from safflower oil using various reaction parameters. Journal of Oleo Science, 56, 9-12.

Meher, C.L., Vidya, S.D., and Naik, N.S. (2006) Technical aspects of biodiesel production by transesterification–a review. Renewable and Sustainable Energy Reviews, 10, 248–268.

Meneghetti, P.M.S., Meneghetti, R.M., Wolf, R.C., Silva, C.E., Lima, S.E.G., Silva, L. de L., Serra, M.T., Cauduro, F., and Oliveira, de G.L. (2006) Biodiesel from castor oil: a comparison of ethanolysis versus methanolysis. Energy & Fuels, 20, 2262-2265.

Meunier, F.C. and Ni, J. (2007) Esterification of free fatty acids in sunflower oil over solid acid catalysts using batch and fixed bed-reactors. Applied Catalysis A: General, 333, 122-130.

Niehaus, R.A., Goering, C.E., Savage, L.D., and Sorenson, S.C., (1986) Cracked soybean oil as a fuel for a diesel-engine. Transactions of the American Society of Agricultural Engineers, 29 (3), 683-689.

Noiroj, K., Intarapong, P., Luengnaruemitchai, A., and Jai-In, S. (2009) A comparative study of KOH/Al_2O_3 and KOH/NaY catalysts for biodiesel production via transesterification from palm oil. Renewable Energy, 34, 1145-1150.

Park, Y., Lee, D., Kim, D., Lee, J., and Lee, K. (2008) The heterogeneous catalyst system for the continuous conversion of free fatty acids in used vegetable oils for the production of biodiesel. Catalysis Today, 131, 238-243.

Pedroso, L. M., Ferreira, J.L., Falcão, J., Simões, P.N., Simão, A.V., and Portugal, A. "Biodiesel–alternative fuel" National Biodiesel Board. March 2005. 8 June 2010 <http://www.eq.uc.pt/cem/glicerol/LMP_Chempor_05-1.pdf>.

Schwab, A.W., Bagby, M.O., and Freedman, B. (1987) Preparation and properties of diesel fuels from vegetable oils. Fuel, 66, 1372-1378.

Schwab, A.W., Dykstra, G.J., Selke, E., Sorenson, S.C., and Pryde, E.H. (1988) Diesel fuel from thermal-decomposition of soybean oil. Journal of the American Oil Chemists' Society, 65 (11), 1781-1786.

Serio, D.M., Cozzolino, M., Tesser, R., Patrono, P., Pinzari, F., Bonelli, B., and Santacesaria, E. (2007) Vanadyl phosphate catalysts in biodiesel production. Applied Catalysis A: General, 320, 1-7.

Serio, D.M., Ledda, M., Cozzolino, M., Minutillo, G., Tesser, R., and Santacesaria, E. (2006) Transesterification of soybean oil to biodiesel by using heterogeneous basic catalysts. Industrial & Engineering Chemistry Research, 45, 3009-3014.

Shibasaki-Kitakawa, N., Honda, H., Kuribayashi, H., Toda, T., Fukumura T., and Yonemoto, T. (2007) Biodiesel production using anionic ion-exchange resin as heterogeneous catalyst. Bioresource Technology, 98, 416-421.

Sing, W.S.K., Everett, H.D., Haul, W.A.R., Moscou, L., Pierotti, A.R., Rouquerol, J., and Siemieniewska, T. (1985) Reporting physisorption data for gas/solid systems with special reference to the determination of surface area and porosity. Pure and Applied Chemistry, 57, 603-619.

Singh, A.K. and Fernando, S.D. (2008) Transesterification of soybean oil using heterogeneous catalysts. Energy & Fuels, 22, 2067-2069

Srivastava, A. and Prasad, R. (2000) Triglycerides–based diesel fuels. Renewable and Sustainable Energy Reviews, 4, 111-133.

Suppes, J.G., Dasari, A.M., Doskocil, J.E., Mankidy, J.P., and Goff, J.M. (2004) Transesterification of soybean oil with zeolite and metal catalysts. Applied Catalysis A: General, 257, 213-223.

Thoret, J., Man, P.P., and Fraissard, J. (1996) Solid-solid interaction and reaction between antimony oxide, Sb_2O_3, and NaY or LaNaY zeolites. Comparison with V_2O_5 and MoO_3. Zeolites, 18, 152-161.

Tong, L.T., Wu, F., Li, G.H., Yan, S.S., Ji, T.H., and Lin, B.X., (1996) Direct-Current Magnetization of Y-Type Zeolites Containing Fe Ions. Chinese Physics Letters, 13, 223-226.

Wang, Y., Huang, Y.W., Chun, Y., Xia, R.J., and Zhu, H.J. (2001) Dispersion of Potassium Nitrate and the Resulting Strong Basicity on Zirconia. Chemistry of Materials, 13, 670-677.

Wellert, S., Karg, M., Imhof, H., Steppin, A., Altmann, H.J., Dolle, M., Richardt, A., Tiersch, B., Koetzd, J., Lapp, A., and Hellweg, T. (2008) Structure of biodiesel based bicontinuous microemulsions for environmentally compatible decontamination: A small angle neutron scattering and freeze fracture electron microscopy study. Journal of Colloid and Interface Science, 325, 250-258.

Wypych, F. and Satyanarayana, K.G. (2004) Clay Surfaces Fundamentals and Applications, Boston: Elsevier Academic Press.

Xie, W., Peng, H., and Chen, L. (2005) Transesterification of soybean oil catalyzed by potassium loaded on alumina as a solid-base catalyst. Applied Catalysis A: General, 300, 67-74.

Xie, W., Peng, H., and Chen, L. (2006) Transesterification of soybean oil catalyzed by potassium loaded on alumina as a solid-base catalyst. Applied Catalysis A: General, 300, 67-74.

Xie, W., Huang, X., and Li, H. (2007) Soybean oil methyl esters preparation using NaX zeolites loaded with KOH as a heterogeneous catalyst. Bioresource Technology, 98, 936-939.

Yagi, F., Kanuka, N., Tsuji, H., Kita, H., and Hattori, H. (1994) Preparation of Basic zeolite. Studies in Surface Science and Catalysis, 90, 349-354.

Zhu, J., Chun, Y., Wang, Y., and Xu, Q. (1999) Attempts to create new shape-selective solid strong base catalysts. Catalysis Today, 51, 103-111.

APPENDICES

Appendix A Temperature-programmed Desorption (TPD)

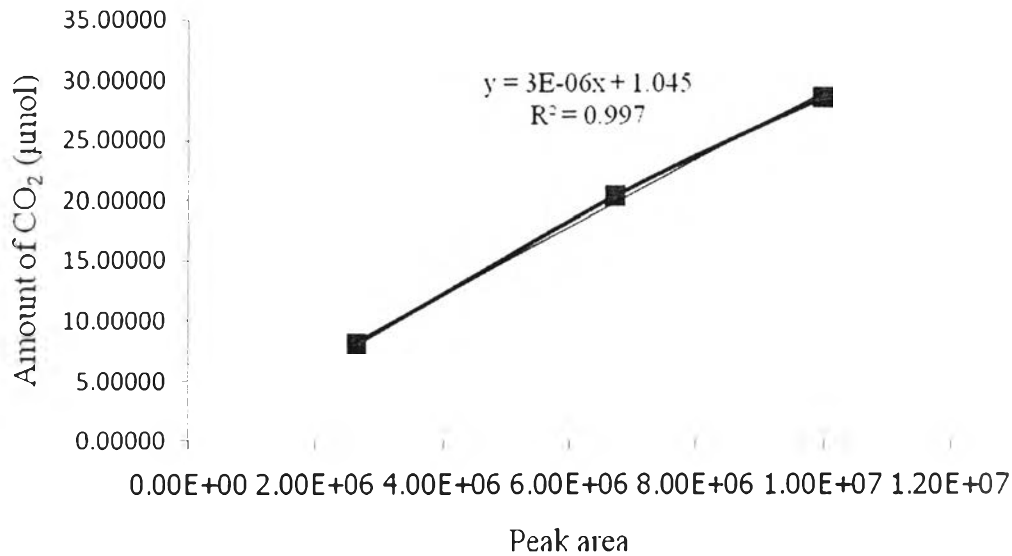

Figure A1 Calibration curve of CO_2 Temperature-programmed desorption (CO_2-TPD).

Table A1 The results for calculation the amount of CO_2 from TPD

P (atm)	V (ml)	R (Latm/Kmol)	T (K)	Amount of CO_2 (μmol)	Peak Area	Average Peak
1	0.2	0.082507	298	8.17896	2.68E+06	2.64E+06
1	0.2	0.082507	298	8.17896	2.63E+06	
1	0.2	0.082507	298	8.17896	2.61E+06	
1	0.5	0.082507	298	20.44740	6.94E+06	6.71E+06
1	0.5	0.082507	298	20.44740	6.68E+06	
1	0.5	0.082507	298	20.44740	6.51E+06	
1	0.7	0.082507	298	28.62636	1.01E+07	9.96E+06
1	0.7	0.082507	298	28.62636	9.99E+06	
1	0.7	0.082507	298	28.62636	9.86E+06	

P = Pressure, V= Volume of gas, R = Gas constant, T = Absolute temperature

Table A2 Calculation the basic site of catalysts

Sample	Weight of Sample	Area of Sample	Temperature Desorption (°C)	Amount of CO_2 (μmol/g)
NaY	0.1047	4.20E+07	184	1203.15
5 %K/NaY	0.1142	3.45E+07	154	905.25
10 %K/NaY	0.1104	1.37E+07	210	372.55
	0.1104	2.39E+06	398	64.94
15 %K/NaY	0.1120	1.90E+06	222	50.89
	0.1120	1.33E+07	397	356.25
20 %K/NaY	0.1000	1.24E+07	399	372.00

Appendix B Acid Titration Method

1. Standardization of KOH was measured by using potassium acid phatalate (titration grade)

$$\text{Normality} = (Wp*1000)/(\text{MW}*(V-Vb))$$

Where Wp = Weight of potassium acid phatalate (g)

V = Amount of KOH was used in titration sample (ml)

Vb = Amount of KOH was used in titration blank (ml)

MW = Molecular weight of potassium acid phatalate

2. A 0.02 M of KOH solution was used to measure the concentration of HCl solution.

$$KOH + HCl \rightarrow H_2O + KCl$$

3. To evaluate the basicity of catalysts, the remained HCl in the solution was calculated.

Table B1 Calculation the basic site of catalysts

Sample	No.	Volume (ml)		KOH (ml)	HCl (ml)	Weight of Catalyst	Back Titration	Total Basic Site (mmol)	Total Basic Site (mmol/g)	Avg.
		Start	Final							
Bentonite	1	10	13.95	3.95	5	0.1005	2.25	0.0476	0.473	0.475
	2	10	13.9	3.9	5	0.102	2.3	0.0486	0.476	
5 %K/bentonite	1	13	13.55	0.55	5	0.1008	5.65	0.1195	1.185	1.192
	2	14	14.45	0.45	5	0.1015	5.75	0.1216	1.198	

Appendix C Gas Chromatography (GC)

Table C1 Calculation of the methyl ester yield and weight of palm oil

Free Fatty Acid	Molecular	Molecular weight (X1)	Methyl ester (wt%) (X2)	(X1 x X2)
caprylic (C8:0)	$C_{27}H_{50}O_2$	470	0.01	0.05
carpic (C10:0)	$C_{33}H_{62}O_2$	554	0.01	0.06
Lauric (C12:0)	$C_{39}H_{74}O_2$	638	0.20	1.28
Myristic (C14:0)	$C_{45}H_{86}O_2$	722	0.83	5.99
Palmitic (C16:0)	$C_{51}H_{98}O_2$	806	40.29	324.74
Stearic (C18:0)	$C_{57}H_{96}O_2$	890	3.70	32.93
Oleic (C18:1)	$C_{57}H_{94}O_2$	884	43.73	386.57
Linoleic (C18:2)	$C_{57}H_{92}O_2$	878	10.64	93.42
Linolenic (C18:3)	$C_{57}H_{90}O_2$	872	0.19	1.66
Arachidic (C20:0)	$C_{63}H_{122}O_2$	974	0.30	2.92
Total			100	849.61

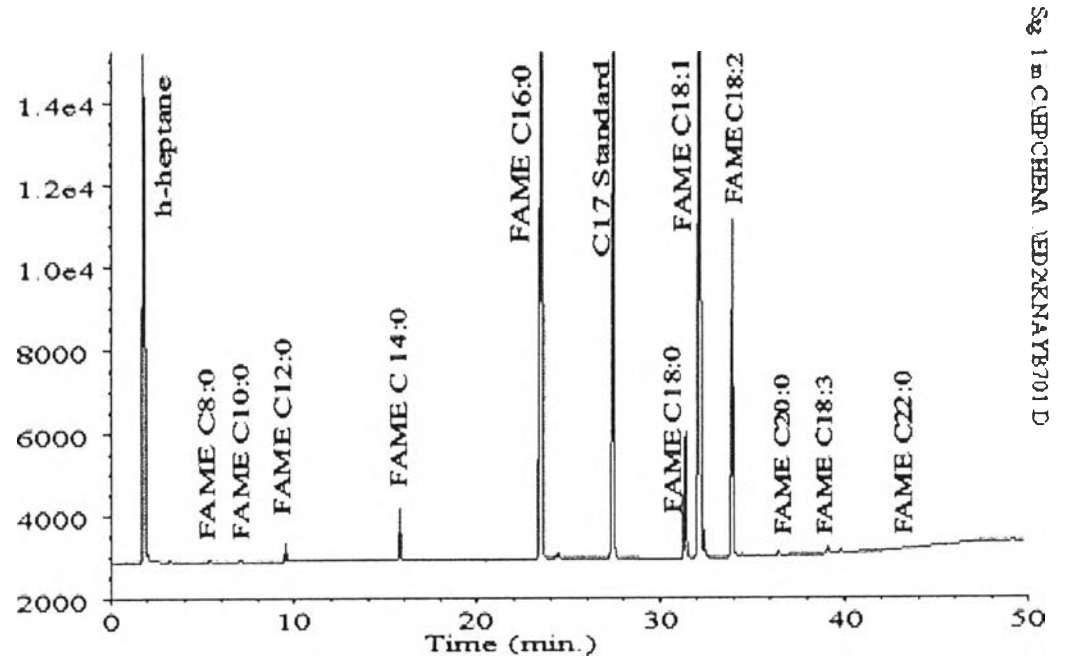

Figure C1 Chromatogram of fatty acid methyl ester (FAMEs) in biodiesel.

Appendix D High Performance Liquid Chromatography (HPLC)

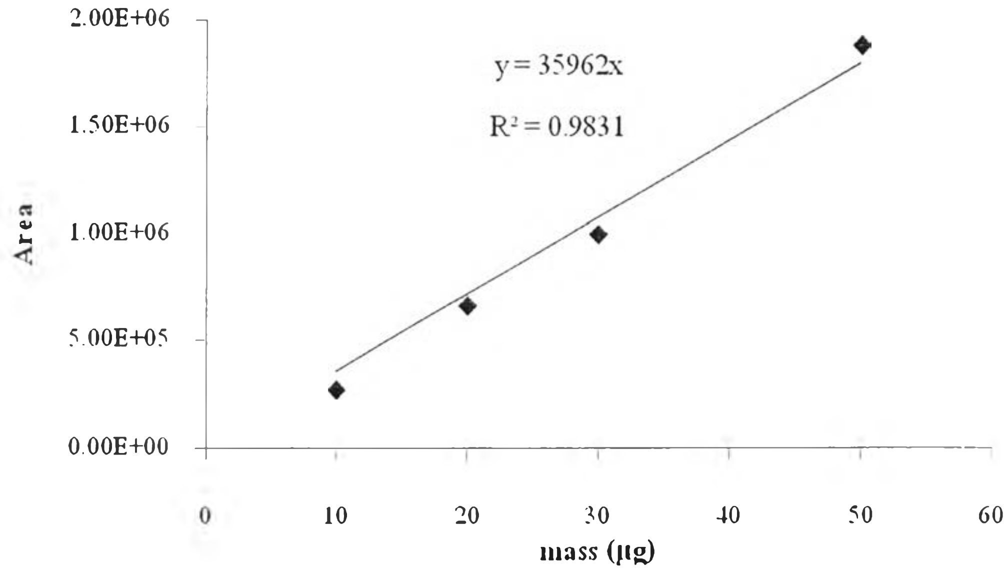

Figure D1 Standard curve of 1-monooleoly-rac-glycerol (C18:1-cis-9), Purity > 99%.

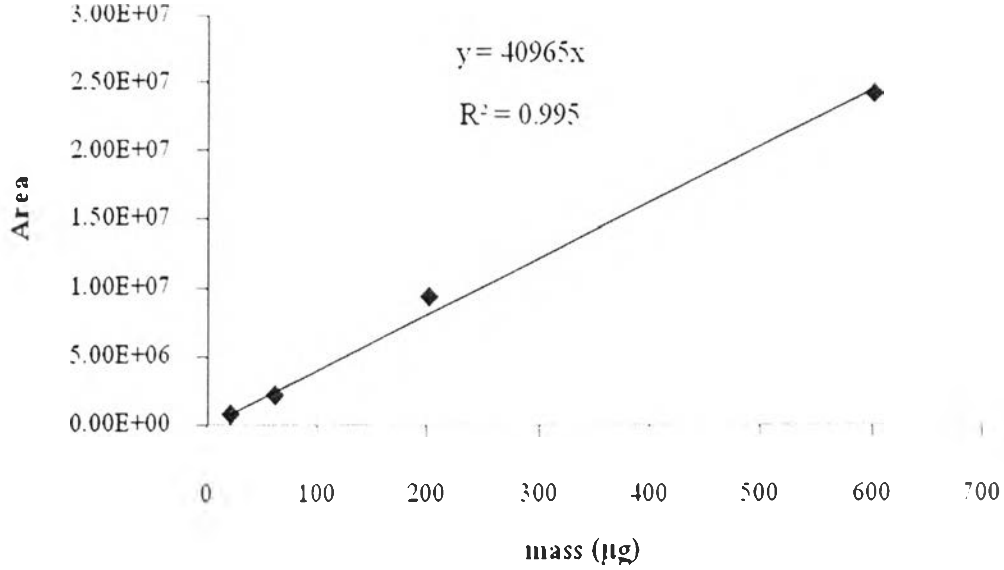

Figure D2 Standard curve of methyl ester of oleic acid (C18:1), Purity > 99%.

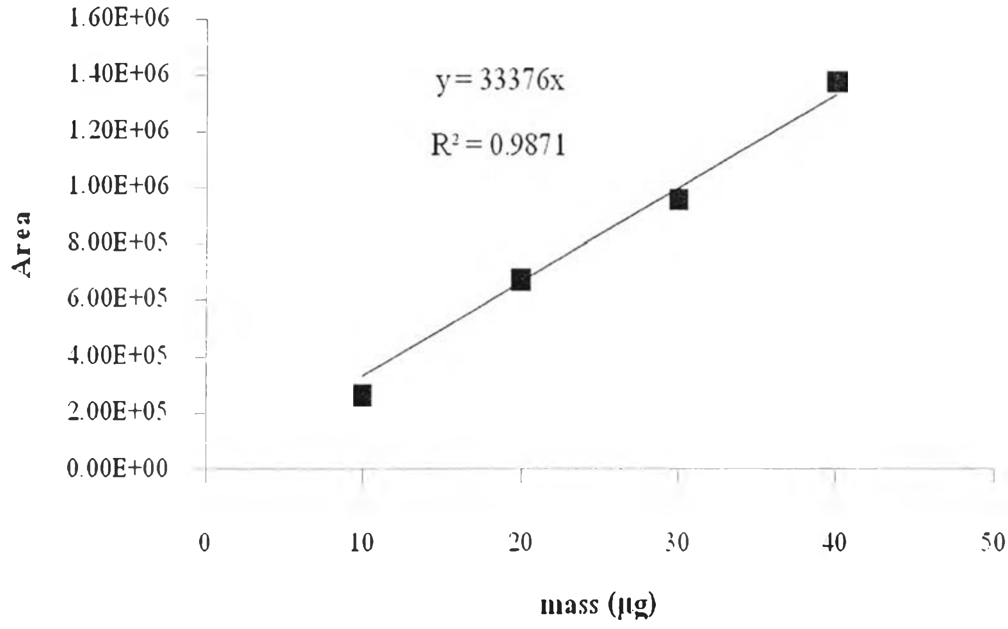

Figure D3 Standard curve of 1, 3-diolein (C18:1-cis-9), Purity > 99%.

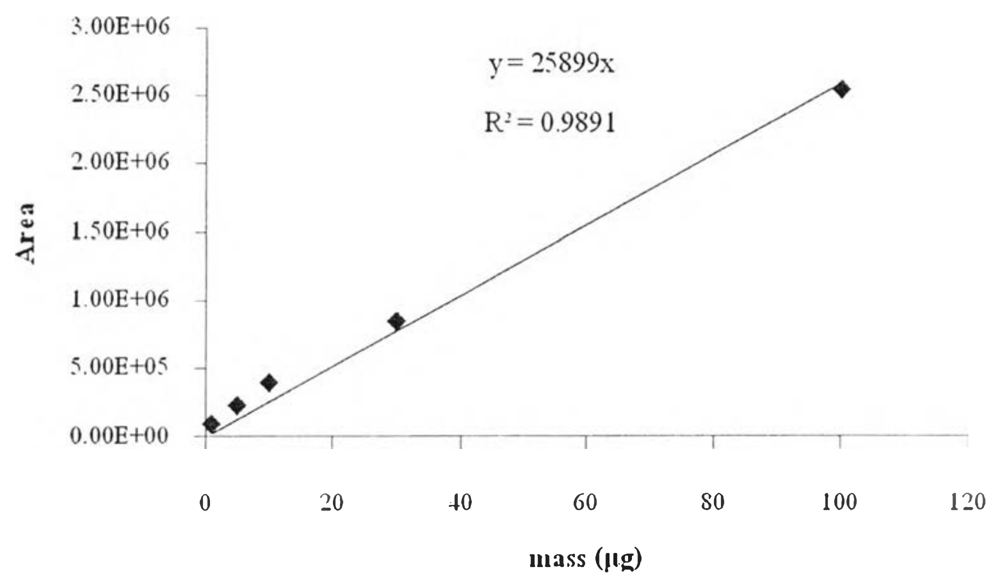

Figure D4 Standard curve of triolein (C18:1), Purity > 99%.

Table D1 Correlation coefficient of calibration curves in HPLC from standard solution

Sample	Retention time (minutes)	Slope (mV/μg)	Correlation coefficient	R_f*
1-monooleoly (C18:1-cis-9)	2-4	33965	0.983	32878.44
Methyl ester of oleic acid (C18:1)	5-10	40965	0.995	41420.50
1, 3-diolein (C18:1-cis-9)	10-15	33376	0.987	31699.30
triolein (C18:1)	16-25	25899	0.989	47849.84

*Response factor = (area of standard)/ (amount of standard)

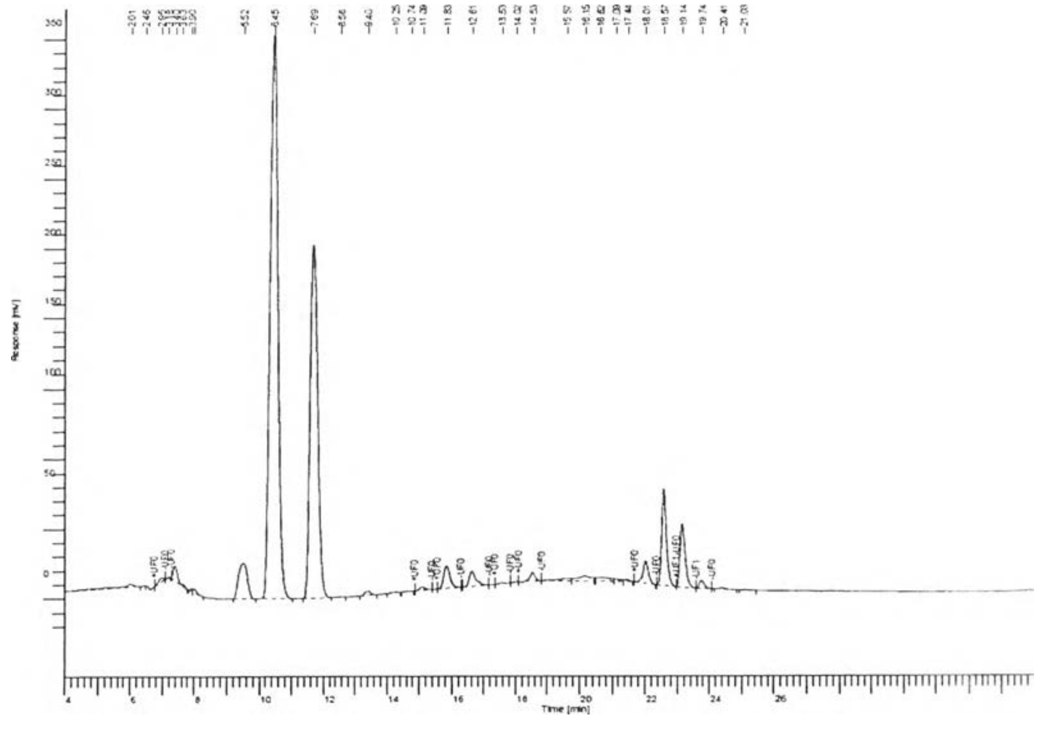

Figure D5 HPLC chromatogram of mono-, di-, tri-glycerol, and biodiesel (methyl ester 74.5 % from GC).

Table D2 Calculation of mono-, di-, tri-glyceride and methyl ester yield of biodiesel

Time	Area	Height	Area	Composition		*Sum	wt (%)
2.457	810.41	167.4	0.01	C14:0	0.022535	Mono- 4.932	1.55
2.947	31834.33	3049.31	0.23	C18:3	0.885221		
3.18	4847.54	977.64	0.03	C18:2	0.134796		
3.395	99580.8	10314.97	0.71	C18:1	2.769056		
3.626	11475.2	1192.52	0.08	C16:0	0.319092		
3.902	9316.88	1875.06	0.07	C18:0	0.259076		
3.975	20334.72	2496.97	0.14	C20:0	0.56545		
5.521	484104	25700.9	3.43	-	11.8175	FAME 233.841	73.53
6.451	5812095	403935.6	48.33	-	141.8795		
7.689	3244816	251965.4	30.11	-	79.20947		
9.398	38298	3125.81	0.27	-	0.934896		
10.247	7423.8	610.79	0.05	C14:0	0.222429	di- 12.760	4.01
10.742	2951.2	161.3	0.02	C18:3	0.088423		
11.087	28433.56	2297.14	0.2	C18:2	0.851916		
11.833	214535.5	15761.23	1.52	C18:1	6.427839		
12.613	161418.1	11047.4	1.15	C16:0	4.836353		
13.533	8142.72	936.31	0.06	C18:0	0.243969		
14.017	2983.4	382.89	0.02	C20:0	0.089388		
14.527	70286.07	6242.07	0.5	C10:0	2.713853	Tri- 63.697	20.03
15.575	53674.8	1788.61	0.38	C12:0	2.072466		
17.086	24592.58	1684.21	0.17	C14:0	0.949557		
17.444	13198.57	1296.13	0.09	C18:3	0.509617		
18.007	178985.9	15866.27	1.27	C18:2	6.91092		
18.573	717077.2	69490.66	5.09	C18:1	27.68745		
19.142	514495.8	45623.4	3.65	C16:0	19.86547		
19.74	62423.01	5838.59	0.44	C18:0	2.410248		
20.408	12478	958.99	0.09	C20:0	0.481795		
21.029	2497.2	185.39	0.02	C24:0	0.096421		

* Mono-, di-, tri-glyceride and methyl ester

CURRICULUM VITAE

Name: Mr. Pisitpong Intarapong

Date of Birth: January 4, 1984

Nationality: Thai

University Education:

2002–2006 Bachelor Degree of Petrochemical and Polymeric materials, Faculty of Engineering, Silpakorn University, Nakornphathom, Thailand

Work Experience:

2005 Position: Quality Control

Company name: Panbiotic Rubber Company

Publications:

1. Noiroj, K., Intarapong, P., Luengnaruemitchai, A. and Jai-In, S. (2009) A comparative study of KOH/Al_2O_3 and KOH/NaY catalysts for biodiesel production via transesterification from palm oil. Renewable Energy, 34(4), 1145–1150.
2. Intarapong, P., Luengnaruemitchai, A. and Jai-In, S. (2011) Transesterification of palm oil over KOH/NaY zeolite in a packed-bed reactor. Journal of Renewable Energy Research, 4, 271–280.
3. Intarapong, P., Iangthanarat, S., Luengnaruemitchai, A. and Jai-In, S. (2013) Biodiesel production from palm oil using potassium hydroxide loaded on ZrO_2 catalyst in a batch reactor. Chiang Mai Journal of Science, Accepted.
4. Intarapong, P., Iangthanarat, S., Phanthong, P., Luengnaruemitchai, A. and Jai-In, S. (2013) Activity and basic properties of KOH/mordenite for transesterification of palm oil. Journal of Energy Chemistry, in revision.
5. Intarapong, P., Luengnaruemitchai, A. and Jai-In, S. (2013) Transesterification of palm oil using KOH supported on bentonite in a continuous reactor. International Journal of Green Energy, in revision.

Proceedings:

1. Intarapong, P.; Iangthanarat S.; Luengnaruemitchai, A.; and Jai-In, S. (2010, June 27- July 3) Biodiesel production from palm oil using potassium hydroxide supported on mordenite zeolite catalyst. Proceedings of the Renewable Energy 2010 International Conference (RE2010), Yokohama, Japan.
2. Intarapong, P.; Luengnaruemitchai, A.; and Jai-In, S. (2011, March 26-31) Transesterification of palm oil using KOH loading on various type of support in a continuous flow reactor. Proceeding of the 24[1st] ACS National Meeting 2011, Anaheim, CA, USA.

Presentations:

1. Intarapong, P.; Iangthanarat S.; Luengnaruemitchai, A.; and Jai-In, S. (2010, June 27-July 3) Biodiesel production from palm oil using potassium hydroxide supported on mordenite zeolite catalyst. Paper presented at the Renewable Energy 2010 International Conference (RE2010), Yokohama, Japan.
2. Larpanum, M.; Intarapong, P.; Iangthanarat S.; Luengnaruemitchai, A.; and Jai-In, S. (2010, June 27-July 3) Transesterification of palm oil using KOH/montmorillonite clay. Paper presented at the Renewable Energy 2010 International Conference (RE2010), Yokohama, Japan.
3. Intarapong, P.; Luengnaruemitchai, A.; and Jai-In, S. (2011, March 26-31) Transesterification of palm oil using KOH loading on various type of support in a continuous flow reactor. Paper presented at the 24[1st] ACS National Meeting 2011, Anaheim, CA, USA.