REFERENCES

Ali, Y. and Hanna, M.A. (1994) Alternative diesel fuels from vegetable oils. Bioresource Technology, 50(2), 153-163.

Anantarakitti, N., Arpornpong, N., Khaodhiar, S., and Charoensaeng, A. (2014, May 9) Effect of nonionic surfactant structure on fuel properties of microemulsion-based biofuel from palm oil. Paper presented at International Conference On Advances In Civil, Structural, Environmental And Bio-Technology - CSEB 2014, Kuala Lumpur, Malaysia.

Arpornpong, N., Attaphong, C., Charoensaeng, A., Sabatini, D.A., and Khaodhiar, S. (2014) Ethanol-in-palm oil/diesel microemulsion-based biofuel: Phase behavior, viscosity, and droplet size. Fuel, 132(0), 101-106.

Atadashi, I.M., Aroua, M.K., Abdul Aziz, A.R., and Sulaiman, N.M.N. (2013) The effects of catalysts in biodiesel production: A review. Journal of Industrial and Engineering Chemistry, 19(1), 14-26.

Attaphong, C. and Sabatini, D.A. (2013) Phase Behaviors of Vegetable Oil-Based Microemulsion Fuels: The Effects of Temperatures, Surfactants, Oils, and Water in Ethanol. Energy & Fuels, 27(11), 6773-6780.

Attaphong, C., Do, L., and Sabatini, D.A. (2012) Vegetable oil-based microemulsions using carboxylate-based extended surfactants and their potential as an alternative renewable biofuel. Fuel, 94, 606-613.

Balat, M. (2008) Modeling Vegetable Oil Viscosity. Energy Sources, Part A: Recovery, Utilization, and Environmental Effects, 30(20), 1856-1869.

Balcan, M., Mihăilescu, F.-C., Anghel, D.-F., Văcăreşteanu, I.-C., Aricov, L., and Vasilescu, E.-L. (2014) Microemulsion systems containing diesel and colza oil as alternative fuels: Phase studies, interfacial tension and solubilization. Fuel, 117, Part A, 251-258.

Benjumea, P., Agudelo, J., and Agudelo, A. (2008) Basic properties of palm oil biodiesel–diesel blends. Fuel, 87(10–11), 2069-2075.

Bora, P., Konwar, L.J., Boro, J., Phukan, M.M., Deka, D., and Konwar, B.K. (2014) Hybrid biofuels from non-edible oils: A comparative standpoint with corresponding biodiesel. Applied Energy, 135, 450-460.

Che Man, Y.B., Haryati, T., Ghazali, H.M., and Asbi, B.A. (1999) Composition and thermal profile of crude palm oil and its products. Journal of the American Oil Chemists' Society, 76(2), 237-242.

Chotwichien, A., Luengnaruemitchai, A., and Jai-In, S. (2009) Utilization of palm oil alkyl esters as an additive in ethanol–diesel and butanol–diesel blends. Fuel, 88(9), 1618-1624.

Danielsson, I. and Lindman, B. (1981) The definition of microemulsion. Colloids and Surfaces, 3(4), 391-392.

Do, L.D., Singh, V., Chen, L., Kibbey, T.C.G., Gollahalli, S.R., and Sabatini, D.A. (2011) Algae, Canola, or Palm Oils—Diesel Microemulsion Fuels: Phase Behaviors, Viscosity, and Combustion Properties. International Journal of Green Energy, 8(7), 748-767.

Fletcher, P.D.I. and Morris, J.S. (1995) Turbidity of oil-in-water microemulsion droplets stabilised by nonionic surfactants. Colloids and Surfaces A: Physicochemical and Engineering Aspects, 98(1–2), 147-154.

Goddeeris, C., Cuppo, F., Reynaers, H., Bouwman, W.G., and Van den Mooter, G. (2006) Light scattering measurements on microemulsions: Estimation of droplet sizes. International Journal of Pharmaceutics, 312(1–2), 187-195.

Gunstone, F.D. (2002) Vegetable Oils in Food Technology: Composition, Properties and Uses. Australia: Blackwell Publishing.

"Introduction to Bomb Calorimetry." Scimed. 23 May 2014 <http://www.scimed.co.uk/wp-content/uploads/2013/03/Introduction-to-bomb-calorimetry.pdf>

Kibbey, T.C.G., Chen, L., Do, L.D., and Sabatini, D.A. (2014) Predicting the temperature-dependent viscosity of vegetable oil/diesel reverse microemulsion fuels. Fuel, 116, 432-437.

Klossek, M.L., Marcus, J., Touraud, D., and Kunz, W. (2013) The extension of microemulsion regions by combining ethanol with other cosurfactants. Colloids and Surfaces A: Physicochemical and Engineering Aspects, 427, 95-100.

Klossek, M.L., Marcus, J., Touraud, D., and Kunz, W. (2014) Highly water dilutable green microemulsions. Colloids and Surfaces A: Physicochemical and Engineering Aspects, 442, 105-110.

Komesvarakul, N., Sanders, M.D., Szekeres, E., Acosta, E.J., Faller, J.F., Mentlik, T., Fisher, L.B., Nicoll, G., Sabatini, D.A., and Scamehorn, J.F. (2006) Microemulsions of triglyceride-based oils: The effect of co-oil and salinity on phase diagrams. Journal of Cosmetic Science, 57(4), 309-325.

"Microemulsions." University of Bristol. 19 April 2014 <http://www.chm.bris.ac.uk/eastoe/Surf_Chem/3%20Microemulsions.pdf>

Miskandar, M.S., Man, Y.B.C., Rahman, R.A., Aini, I.N., and Yusoff, M.S.A. (2007) Effects of Emulsifiers on Crystal Behavior of Palm Oil Blends on Slow Crystallization. Journal of Food Lipids, 14(1), 1-18.

Nakkash, N.B. and Al-Karkhi, S.R. (2012) Production of Biodiesel Fuel from Oleic Acid and Comparison of its Properties with Petroleum Diesel. Iraqi Journal of Chemical and Petroleum Engineering, 13(4), 13-25.

Narváez, P.C., Rincón, S.M., Castañeda, L.Z., and Sánchez, F.J. (2008) Determination of Some Physical and Transport Properties of Palm Oil and of Its Methyl Esters. Latin American Applied Research, 38(1-6).

Neuma de Castro Dantas, T., da Silva, A.C., and Neto, A.A.D. (2001) New microemulsion systems using diesel and vegetable oils. Fuel, 80(1), 75-81.

Nguyen, T., Abraham, J., Ramallo, M., Wagner, D., and McLennan, J. (2012) Formulation of Canola-Diesel Microemulsion Fuels and Their Selective Diesel Engine Performance. Journal of the American Oil Chemists' Society, 89(10), 1905-1912.

Nguyen, T., Do, L., and Sabatini, D.A. (2010) Biodiesel production via peanut oil extraction using diesel-based reverse-micellar microemulsions. Fuel, 89(9), 2285-2291.

Normah, I., Cheow, C.S., and Chong, C.L. (2013) Crystal habit during crystallization of palm Oil: Effect of time and temperature. International Food Research Journal, 20(1), 417-422.

Normah, I., Cheow, C.S., and Chong, C.L. (2014) Crystal habit during crystallization of RBDPO with the addition of Diacylglycerol (DAG): effect of time and percentage of DAG added. International Food Research Journal, 21(5), 2045-2049.

Patidar, V., Chandra, A., Singh, M., and Kale, R.K. (2014) Physiochemical and Phase behaviour study of Jatropha curcus oil - ethanol microemulsion fuels using sorbitane fatty esters. International Journal of Renewable and Sustainable Energy, 3(1), 13-19.

Pengpreecha, S., Arpornpong, N., Khaodhiar, S., and Charoensaeng, A. (2014, May, 9-10) Microemulsion fuels from vegetable oil based renewable resource using mixed nonionic surfactant and cosurfactant systems. Paper presented at International Conference On Advances In Civil, Structural, Environmental And Bio-Technology - CSEB 2014, Kuala Lumpur, Malaysia.

Srivastava, A. and Prasad, R. (2000) Triglycerides-based diesel fuels. Renewable and Sustainable Energy Reviews, 4(2), 111-133.

Sukirno, Ludi, F, R., S.Bismo, and M.Nasikin1. (2010, March) Formulation and Performance of Palm-grease Using Calcium Soap. Paper presented at the CIGR Ejournal

"Surfactant." University of Bristol. 19 April 2014 <http://www.britannica.com/EBchecked/topic/575010/surfactant>

Tangsathitkulchai, C., Sittichaitaweekul, Y., and Tangsathitkulchai, M. (2004) Temperature effect on the viscosities of palm oil and coconut oil blended with diesel oil. Journal of the American Oil Chemists' Society, 81(4), 401-405.

"Vegetable Oils". Filter International. 19 April 2014 <http://www.filterinternational .com/index.php?lay=show&ac=article&Id=521573&Ntype=8>

Wang, F., Fang, B., Zhang, Z., Zhang, S., and Chen, Y. (2008) The effect of alkanol chain on the interfacial composition and thermodynamic properties of diesel oil microemulsion. Fuel, 87(12), 2517-2522.

Wang, X.-l., Yuan, X.-z., Huang, H.-j., Leng, L.-j., Li, H., Peng, X., Wang, H., Liu, Y., and Zeng, G.-m. (2014). Study on the solubilization capacity of bio-oil in diesel by microemulsion technology with Span80 as surfactant. Fuel Processing Technology, 118, 141-147.

Zaliha, O., Chong, C.L., Cheow, C.S., Norizzah, A.R., and Kellens, M.J. (2004) Crystallization properties of palm oil by dry fractionation. Food Chemistry, 86(2), 245-250.

APPENDICES

Appendix A Supplemental Materials for Phase Diagram

Table A1 Methyl oleate/1-octanol 1:8 mole ratio, palm oil/diesel 1:1 (v/v)

EtOH/Oil	Concentration (M)		Fraction for Phase Diagram (%)			
	MO	Oct	EtOH	MO+Oct	Oil	Total
0/5	-	-	0	0	100	100
1/5	0.8	0.1000	14.17	14.97	70.86	100
2/5	1.1	0.1375	23.00	19.49	57.51	100
3/5	1.2	0.1500	29.67	20.89	49.44	100
4/5	1.3	0.1625	34.56	22.24	43.20	100
5/5	1.4	0.1750	38.23	23.55	38.22	100
5/4	1.4	0.1750	42.47	23.55	33.98	100
5/3	1.5	0.1875	46.99	24.81	28.20	100
5/2	1.6	0.2000	52.83	26.04	21.13	100
5/1	1.6	0.2000	61.64	26.04	12.32	100
5/0	-	-	100	0	0	100

Table A2 Methyl oleate/2-ethyl-1-hexanol 1:8 mole ratio, palm oil/diesel 1:1 (v/v)

EtOH/Oil	Concentration (M)		Fraction for Phase Diagram (%)			
	MO	EH	EtOH	MO+EH	Oil	Total
0/5	-	-	0	0	100	100
1/5	0.9	0.1125	13.94	16.37	69.69	100
2/5	1.2	0.1500	22.66	20.70	56.64	100
3/5	1.4	0.1750	28.74	23.35	47.91	100
4/5	1.5	0.1875	33.51	24.60	41.89	100
5/5	1.6	0.2000	37.09	25.82	37.09	100
5/4	1.6	0.2000	41.21	25.82	32.97	100
5/3	1.8	0.2250	44.91	28.14	26.95	100
5/2	1.8	0.2250	51.33	28.14	20.53	100
5/1	1.9	0.2375	59.88	28.14	11.98	100
5/0	-	-	100	0	0	100

Table A3 Span 80/1-octanol 1:8 mole ratio, palm oil/diesel 1:1 (v/v)

EtOH/Oil	Concentration (M)		Fraction for Phase Diagram (%)			
	Span 80	Oct	EtOH	S80+Oct	Oil	Total
0/5	-	-	0	0	100	100
1/5	0.9	0.1125	13.97	16.17	69.86	100
2/5	1.1	0.1375	23.12	19.08	57.80	100
3/5	1.2	0.1500	29.83	20.46	49.71	100
4/5	1.4	0.1750	34.18	23.09	42.73	100
5/5	1.5	0.1875	37.83	24.33	37.84	100
5/4	1.6	0.2000	41.37	25.54	33.09	100
5/3	1.7	0.2125	45.81	26.71	27.48	100
5/2	1.8	0.2250	51.54	27.84	20.62	100
5/1	2.0	0.2500	58.32	30.01	11.67	100
5/0	-	-	100	0	0	100

Table A4 Span 80/2-ethyl-1-hexanol 1:8 mole ratio, palm oil/diesel 1:1 (v/v)

EtOH/Oil	Concentration (M)		Fraction for Phase Diagram (%)			
	Span 80	EH	EtOH	S80+EH	Oil	Total
0/5	-	-	0	0	100	100
1/5	1.1	0.1375	13.52	18.90	67.58	100
2/5	1.3	0.1625	22.40	21.60	56.00	100
3/5	1.4	0.1750	28.92	22.88	48.20	100
4/5	1.5	0.1875	33.72	24.12	42.16	100
5/5	1.6	0.2000	37.34	25.32	37.34	100
5/4	1.7	0.2125	40.84	26.48	32.68	100
5/3	1.8	0.2250	45.24	27.61	27.15	100
5/2	1.9	0.2375	50.93	28.70	20.37	100
5/1	2.1	0.2625	57.67	30.80	11.53	100
5/0	-	-	100	0	0	100

Table A5 Palm oil methyl ester (PME)/1-octanol 1:8 mole ratio, palm oil/diesel 1:1 (v/v)

EtOH/Oil	Concentration (M)		Fraction for Phase Diagram (%)			
	PME	Oct	EtOH	PME+Oct	Oil	
0/5	-	-	0	0	100	100
1/5	0.9	0.1125	14.12	15.30	70.58	100
2/5	1.1	0.1375	23.40	18.08	58.52	100
3/5	1.3	0.1625	30.22	19.41	50.37	100
4/5	1.4	0.1750	34.70	21.93	43.37	100
5/5	1.5	0.1875	38.43	23.14	38.43	100
5/4	1.6	0.2000	42.05	24.31	33.64	100
5/3	1.7	0.2125	46.60	25.44	27.96	100
5/2	1.8	0.2250	52.47	26.54	20.99	100
5/1	1.9	0.2375	60.33	27.61	12.06	100
5/0	-	-	100	0	0	100

Table A6 Palm oil methyl ester (PME)/2-ethyl-1-hexanol 1:8 mole ratio, palm oil/diesel 1:1 (v/v)

EtOH/Oil	Concentration (M)		Fraction for Phase Diagram (%)			
	PME	EH	EtOH	PME+EH	Oil	
0/5	-	-	0	0	100	100
1/5	1.1	0.1375	13.68	17.90	68.42	100
2/5	1.3	0.1625	22.72	20.49	56.79	100
3/5	1.5	0.1875	28.91	22.92	48.17	100
4/5	1.6	0.2000	33.74	24.08	42.18	100
5/5	1.7	0.2125	37.40	25.20	37.40	100
5/4	1.8	0.2250	40.81	26.54	32.65	100
5/3	1.9	0.2375	45.25	27.61	27.14	100
5/2	2.0	0.2500	50.97	28.64	20.39	100
5/1	2.1	0.2625	58.63	29.65	11.72	100
5/0	-	-	100	0	0	100

Appendix B Supplemental Materials for Effect of Oil Types on Amount of Surfactant to Formulate Single Phase Microemulsion Study

Table B-1 Surfactant/cosurfactant 1:8 mole ratio, palm oil/diesel 1:1 (v/v) with 20 vol.% of ethanol

Sample	Fraction of microemulsion biofuels (%)			
	EtOH	Surfactant/ cosurfactant	Palm oil/ diesel	Total
MO/Oct	20.0	18.3	61.7	100
MO/EH	20.0	19.7	60.3	100
Span 80/Oct	20.0	18.7	61.3	100
Span 80/EH	20.0	20.7	59.3	100
PME/Oct	20.0	17.7	62.3	100
PME/EH	20.0	20.0	60.0	100

Table B2 Surfactant/cosurfactant 1:8 mole ratio, RBDPO/diesel 1:1 (v/v) with 20 vol.% of ethanol

Sample	Fraction of microemulsion biofuels (%)			
	EtOH	Surfactant/ cosurfactant	RBDPO/ diesel	Total
MO/Oct	20.0	14.3	65.7	100
MO/EH	20.0	18.3	61.7	100
Span 80/Oct	20.0	15.0	65.0	100
Span 80/EH	20.0	17.0	63.0	100
PME/Oct	20.0	14.0	66.0	100
PME/EH	20.0	16.7	63.3	100

Appendix C Supplemental Materials for Viscosity Study

1. Kinematic viscosity calculation

The kinematic viscosity of the microemulsion fuel can be measured using a Canon-Fenske type viscometer (ASTM D 445). Kinematic viscosity can be calculated using Equation C.1, which is provided by the manufacturer of the viscometer:

$$\mu = Kt \qquad (C1)$$

where μ Kinematic viscosity (cSt)

K Viscosity constant (K=0.01606 cSt/s at 40°C)

t Time of sample flow in vescometer (sec)

The sample kinematic viscosity calculation of methyl oleate/1-octanol in palm oil/diesel blend with ethanol can be shown as follows;

t = 346.85 sec (average time)

K = 0.01606 cSt/s

Therefore;

μ = (0.01606 cSt/s)(346.85 sec)

= 5.57 cSt

2. Raw data of kinematic viscosity in palm oil's system

Table C1 Time for measured kinematic viscosity of microemulsion biofuels, surfactant/cosurfactant 1:8 mole ratio, palm oil/diesel 1:1 (v/v) with 20 vol.% of ethanol

Sample	Time (sec)				
	#1	#2	#3	#4	Average
MO/Oct	353.32	351.32	326.43	356.33	346.85
MO/EH	332.79	342.10	327.05	340.52	335.62
Span 80/Oct	332.79	342.10	327.05	340.52	433.14
Span 80/EH	411.35	388.96	396.11	405.23	400.41
PME/Oct	351.01	353.71	341.70	358.34	351.19
PME/EH	344.89	352.59	332.31	341.64	342.86

Table C2 Kinematic viscosity of microemulsion biofuels, surfactant/cosurfactant 1:8 mole ratio, palm oil/diesel 1:1 (v/v) with 20 vol.% of ethanol

Sample	Kinematic viscosity at 40°C (cSt)					
	#1	#2	#3	#4	Average	SD
MO/Oct	5.67	5.64	5.24	5.72	5.57	0.22
MO/EH	5.34	5.49	5.25	5.47	5.39	0.11
Span 80/Oct	7.01	6.72	7.34	6.76	6.96	0.28
Span 80/EH	6.61	6.25	6.36	6.51	6.43	0.16
PME/Oct	5.64	5.68	5.49	5.75	5.64	0.11
PME/EH	5.54	5.66	5.34	5.49	5.51	0.13

3. Raw data of kinematic viscosity in RBDPO's Ssystem

Table C3 Time for measured kinematic viscosity of microemulsion biofuels, surfactant/cosurfactant 1:8 mole ratio, RBDPO/diesel 1:1 (v/v) with 20 vol.% of ethanol

Sample	Time (sec)				
	#1	#2	#3	#4	Average
MO/Oct	381.74	377.72	374.53	391.58	381.39
MO/EH	349.10	339.39	349.11	310.62	337.06
Span 80/Oct	430.62	440.62	397.89	424.31	423.36
Span 80/EH	412.57	389.04	397.43	408.30	401.84
PME/Oct	376.89	372.82	387.09	373.18	377.50
PME/EH	354.09	351.84	346.74	351.56	351.06

Table C4 Kinematic viscosity of microemulsion biofuels, surfactant/cosurfactant 1:8 mole ratio, RBDPO/diesel 1:1 (v/v) with 20 vol.% of ethanol

Sample	Kinematic viscosity at 40°C (cSt)					
	#1	#2	#3	#4	Average	SD.
MO/Oct	6.13	6.07	6.01	6.29	6.13	0.12
MO/EH	5.61	5.45	5.61	4.99	5.41	0.29
Span 80/Oct	6.92	7.08	6.39	6.81	6.80	0.29
Span 80/EH	6.63	6.25	6.38	6.56	6.45	0.17
PME/Oct	6.05	5.99	6.22	5.99	6.06	0.11
PME/EH	5.69	5.65	5.57	5.65	5.64	0.05

Appendix D Supplemental Materials for Microemulsion Droplet Size Study

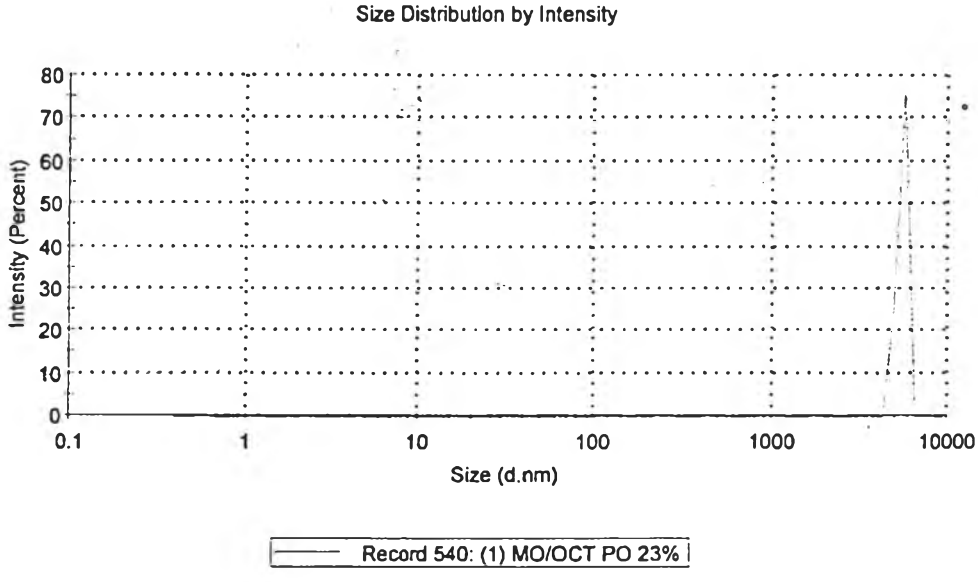

Figure D1 Droplet size and size distribution of methyl oleate/1-octanol 1:8 mole ratio, palm oil/diesel 1:1 (v/v) with 20 vol.% of ethanol.

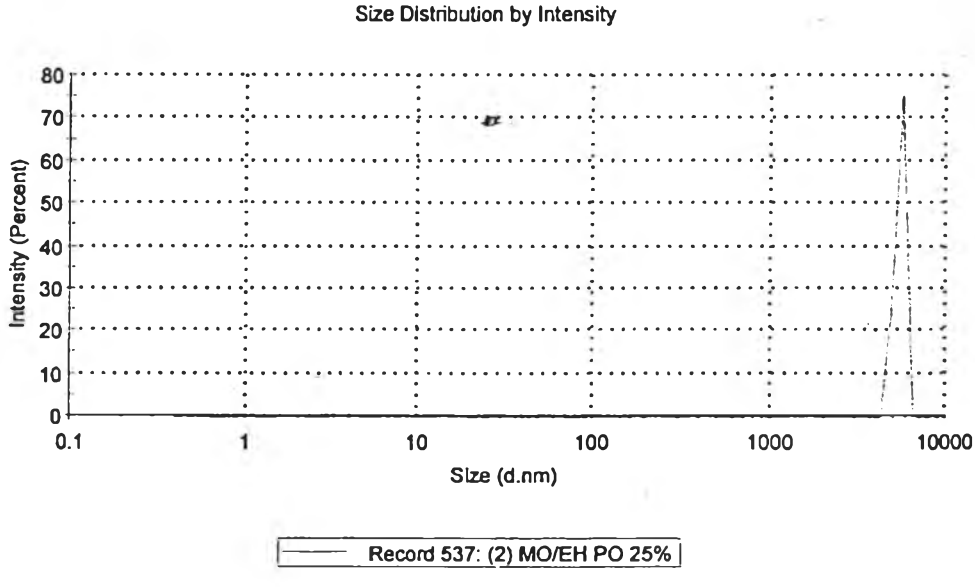

Figure D2 Droplet size and size distribution of methyl oleate/2-ethyl-1-hexanol 1:8 mole ratio, palm oil/diesel 1:1 (v/v) with 20 vol.% of ethanol.

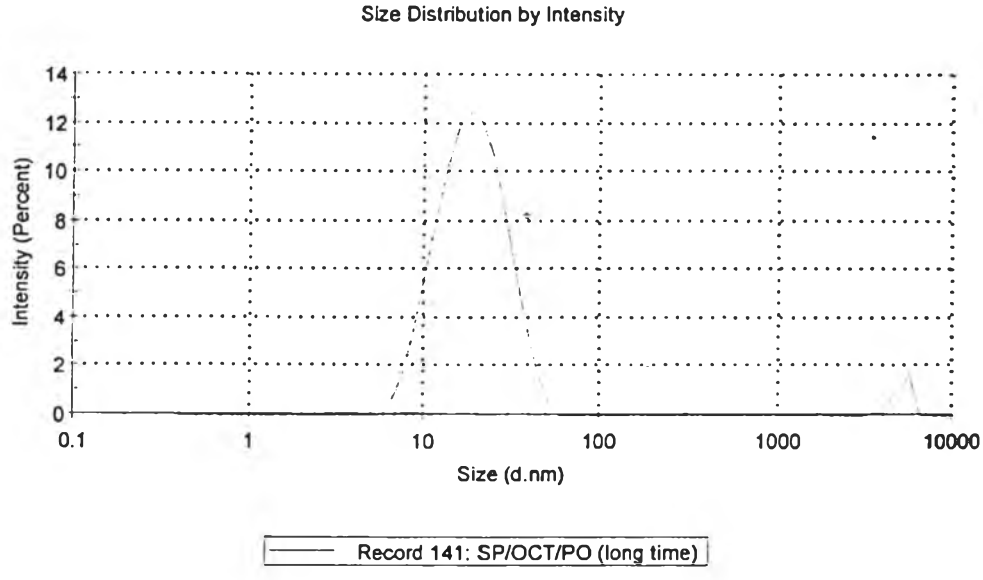

Figure D3 Droplet size and size distribution of Span 80/1-octanol 1:8 mole ratio, palm oil/diesel 1:1 (v/v) with 20 vol.% of ethanol.

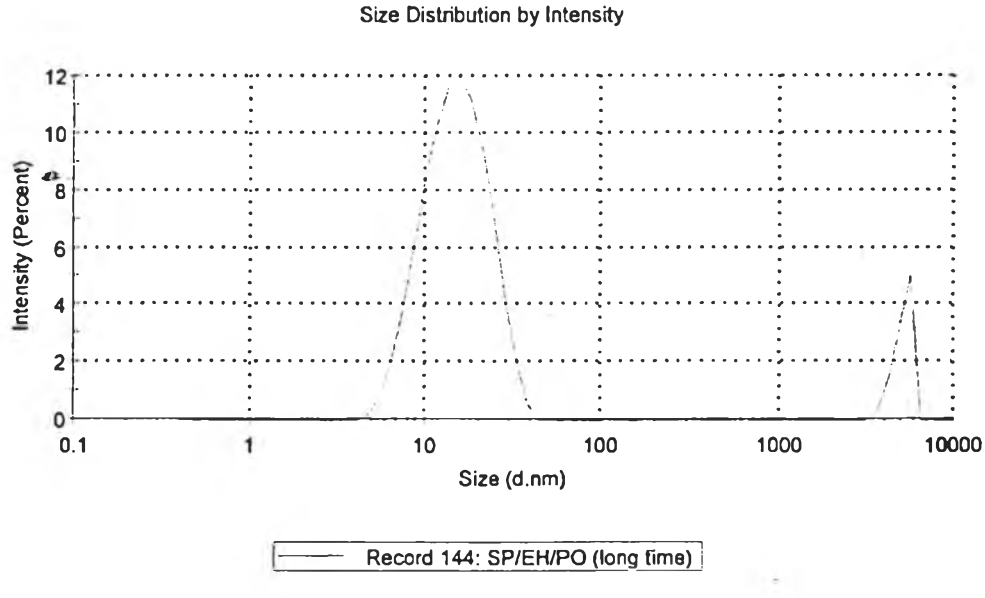

Figure D4 Droplet size and size distribution of Span 80/2-ethyl-1-hexanol 1:8 mole ratio, palm oil/diesel 1:1 (v/v) with 20 vol.% of ethanol.

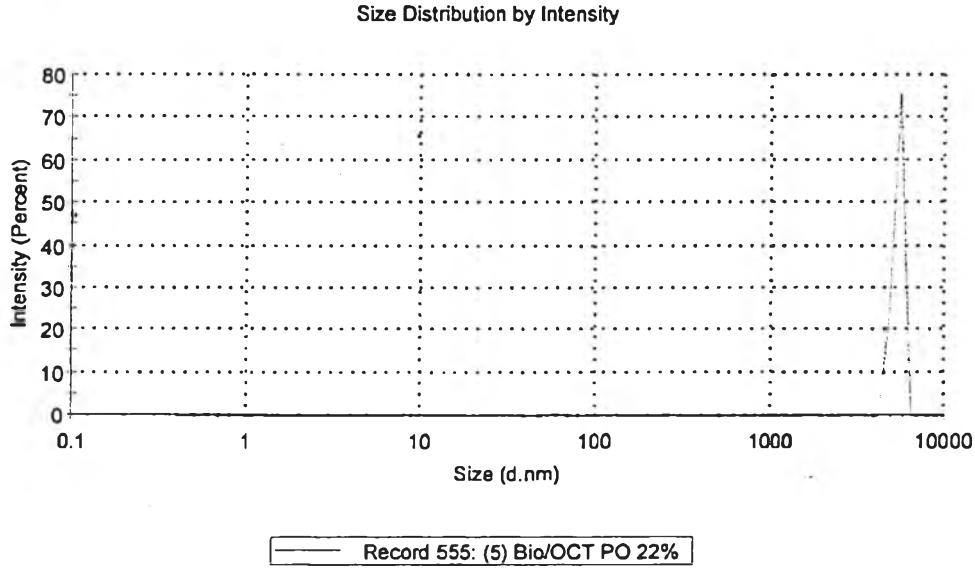

Figure D5 Droplet size and size distribution of palm oil methyl ester (PME)/1-octanol 1:8 mole ratio, palm oil/diesel 1:1 (v/v) with 20 vol.% of ethanol.

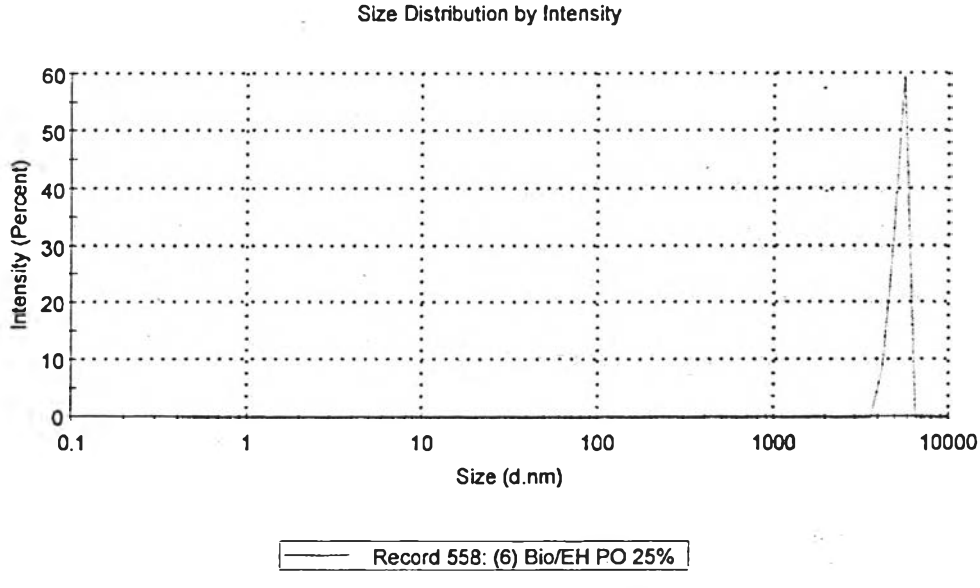

Figure D6 Droplet size and size distribution of palm oil methyl ester (PME)/2-ethyl-1-hexanol 1:8 mole ratio, palm oil/diesel 1:1 (v/v) with 20 vol.% of ethanol.

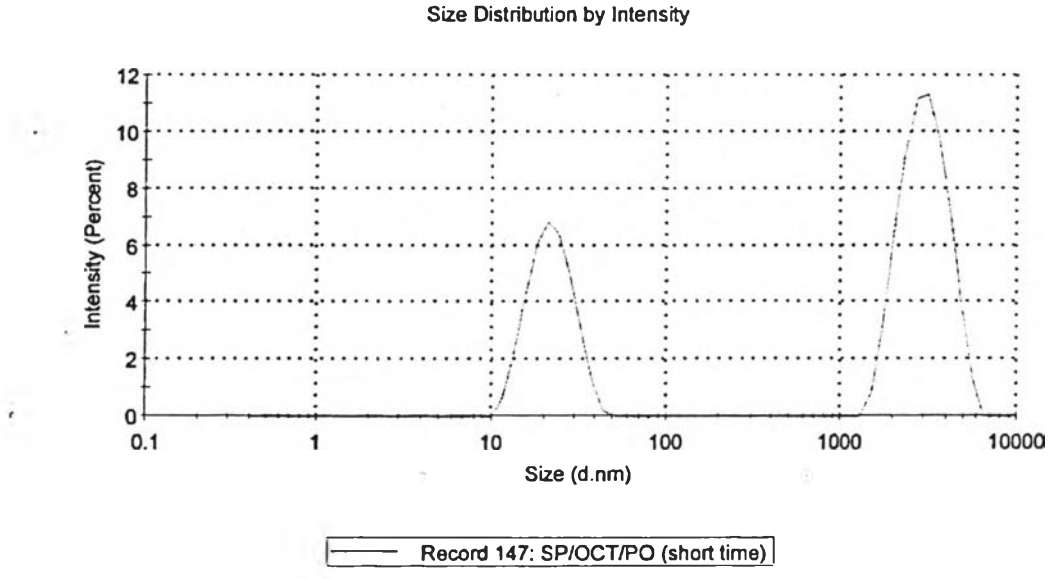

Figure D7 Droplet size and size distribution of Span 80/1-octanol 1:8 mole ratio, palm oil/diesel 1:1 (v/v) with 20 vol.% of ethanol (measured after prepared immediately).

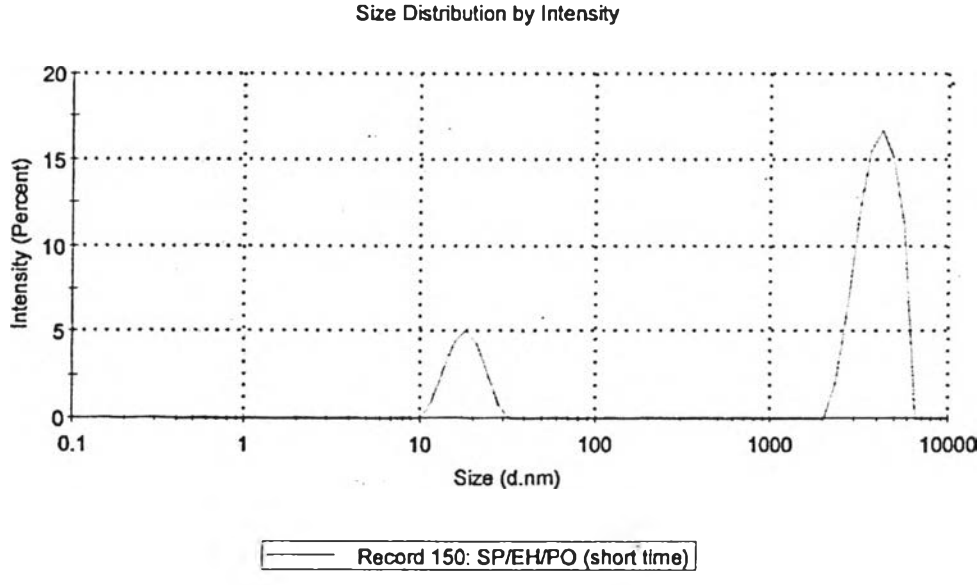

Figure D8 Droplet size and size distribution of Span 80/2-ethyl-1-hexanol 1:8 mole ratio, palm oil/diesel 1:1 (v/v) with 20 vol.% of ethanol (measured after prepared immediately).

Appendix E Supplemental Materials for Density Study

Table E1 Density of microemulsion biofuels, surfactant/cosurfactant 1:8 mole ratio, RBDPO/diesel 1:1 (v/v) with 20 vol.% of ethanol at room temperature (25°C)

Sample	Density at 25°C (g/mL)					
	#1	#2	#3	#4	Average	SD
MO/Oct	0.8863	0.8725	0.8701	0.8686	0.8743	0.0081
MO/EH	0.8240	0.8416	0.8480	0.8503	0.8410	0.0119
SSpan 80/Oct	0.8375	0.8854	0.8883	0.8999	0.8778	0.0276
Span 80/EH	0.8458	0.8550	0.8570	0.8586	0.8541	0.0058
PME/Oct	0.8500	0.8478	0.8615	0.8589	0.8545	0.0067
PME/EH	0.8268	0.8390	0.8433	0.8447	0.8384	0.0082

Appendix F HLB Calculation of Nonionic Surfactants

HLB calculation for nonionic products is obtained with the Griffin formula:

$$\mathbf{HLB} = 20 \times \frac{\mathbf{MW_H}}{\mathbf{MW_H + MW_L}} = 20 \times \frac{\mathbf{MW_H}}{\mathbf{MW}}$$

where MW_H = Molecular weight of hydrophilic part

MW_L = Molecular weight of hydrophobic part

MW = Molecular weight of surfactant

For HLB calculation of Methyl oleate

$MW_H = 59.04$

$MW = MW_H + MW_L = 296.5$

$$HLB = 20 \times \frac{MW_H}{MW}$$

$$HLB = 20 \times \frac{59.04}{296.50}$$

$$HLB = 3.98$$

For HLB calculation of Span 80

$MW_H = 91.08$

$MW = MW_H + MW_L = 428.60$

$$HLB = 20 \times \frac{MW_H}{MW}$$

$$HLB = 20 \times \frac{91.08}{428.60}$$

$$HLB = 4.25$$

For HLB calculation of Palm oil methyl ester (PME)

HLB_{AVG} calculation of mixed products is obtained with this equation:

$$\mathbf{HLB_{AVG} = \%wt._1 \times HLB_1 + \%wt._2 \times HLB_2 + \%wt._3 \times HLB_3 + \ldots}$$

Table F1 shows HLB_{AVG} calculation of mixed products

Fatty acid	Carbon number	Composition (%)	MW_H	MW	HLB	% × HLB
Lauric acid	C12:0	0.1	59.04	214.35	5.51	0.0055
Mtristic acid	C14:0	0.9	59.04	242.40	4.87	0.0438
Palmitic acid	C16:0	45.6	59.04	270.46	4.37	1.9908
Palmitoleic acid	C16:1	0.4	59.04	268.44	4.40	0.0176
Estearic acid	C18:0	3.8	59.04	298.51	3.96	0.1503
Oleic acid	C18:1	38.6	59.04	296.50	3.98	1.5372
Linoleic acid	C18.2	10.5	59.04	294.48	4.01	0.4210
Linolenic acid	C18:3	0.1	59.04	292.46	4.04	0.0040
	SUM	**1.00**	HLB Average			**4.17**

CURRICULUM VITAE

Name: Mr. Sachart Manaphati

Date of Birth: April 26, 1991

Nationality: Thai

University Education:

2009–2013 Bachelor Degree of Petrochemical Engineering, Faculty of Engineering, Silpakorn University, Nakornphathom, Thailand

Work Experience:

Mar-Jun 2012 Position: Student Internship

Company name: PTTPE Co. ltd., PTTGC Group.

Proceedings:

1. Manaphati, S.; Malakul, P.; Sabatini, D.A.; and Charoensaeng, A. (2015, April 21) Reverse Micelle Microemulsion Biofuel using Palm oil/Diesel Ethanol with Renewable Nonionic Surfactant Systems. Proceedings of The 6th Research Symposium on Petrochemical and Materials Technology and The 20th PPC Symposium on Petroleum, Petrochemicals, and Polymers, Bangkok, Thailand.

Presentations:

1. Manaphati, S.; Malakul, P.; Sabatini, D.A.; and Charoensaeng, A. (2015, April 21) Reverse Micelle Microemulsion Biofuel using Palm oil/Diesel Ethanol with Renewable Nonionic Surfactant Systems. Paper presented at The 6th Research Symposium on Petrochemical and Materials Technology and The 20th PPC Symposium on Petroleum, Petrochemicals, and Polymers, Bangkok, Thailand.
2. Manaphati, S.; Malakul, P.; Sabatini, D.A.; and Charoensaeng, A. (2015, June 11-14) Effect of Cosufactant Structure on Renewable Microemulsion Fuels Properties Using Palm Oil/Diesel Blend with Ethanol. Paper presented at The Fifth Asian Conference on Sustainability, Energy and the Environment 2015, Kobe, Japan.