REFERENCES

Chavan, S., Zubaidha, P., and Dantale, S (1995). Use of solid superacid (Sulphated SnO_2) as efficient catalyst in Facile Transesterification of Ketoesters. Tetrahedron Letters, 37(2), 233-236.

Darnoko, D., and Cheryan, M. (2000). Kinetics of palm oil transesterification in a batch reactor. Journal of American Oil Chemists Society, 77(12), 1263-1267.

De Filippis, P., Giavarini, C., Scarsella, M., and Sorrentino, M. (1995) Transesterification processes for vegetable oils: a simple control method of methyl ester content. Journal of American Oil Chemists Society, 72(11), 1399-1404.

Diasakou, M., Louloudi, A., and Papayannakos, N. (1998). Kinetics of the non-catalytic transesterification of soybean oil. Fuel, 77(12), 1297-1302.

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

Freedman, B., Pryde, E.H., and Mounts, T.L., (1984). Variables affecting the yields of fatty esters from transesterified vegetable oil. Journal of American Oil Chemists Society, 61(10), 1638-1643.

Freedman, B., Butterfield, R., and Pryde, E. (1986). Transesterification kinetics of soybean oil. Journal of American Oil Chemists Society, 63(10), 1375-1380.

Gheorghiu, M. (1996). Process for the preparation of methyl fatty acid esters starting from natural oil or fat, methyl esters obtained in this way and use thereof. U.S. Patent No. 5,532,392.

Gryglewicz, S. (1999). Rapeseed oil methyl esters preparation using heterogeneous catalysts. Bioresource Technology, 70, 249-253.

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

Kaita, J., Mimura, T., Fukuoka, N., and Hattori, Y. (2002). Catalyst for transesterification. U.S. Patent No. 6,407,269.

Karaosmanoglu, F., Cigizoglu, K.B., Tuter, M., and Ertekin, S. (1996). Investigation of the refining step of biodiesel production. Energy and Fuels, 10, 890-895.

Khan, A.K. (2002). Research into biodiesel: kinetics and catalyst development. Master's Thesis: The University of Queensland.

Knothe, G., Dunn, R.O., and Bagby, M.O. (1997). Biodiesel: the use of vegetable oils and their derivatives as alternative diesel fuels. Oil Chemical research, National Center for Agricultural Utilization Research. Illinois.

Leclercq, E., Finiels, A., and Moreau, C. (2001). Transesterification of rapeseed oil in the presence of basic zeolites and related solid catalysts. Journal of American Oil Chemists Society, 78(11), 116189-1165.

Marquardt, T., and Wilson, R. (1998). An imporved reversed-phase thin-layer chromatography method for separation of fatty acid methyl esters. Journal of American Oil Chemists Society, 75(12), 1889-1892.

Morrison, R., and Boyd, R.N. (1992). Organic Chemistry. New Jersey: Prentice Hall International, Inc.

Noureddini, H., and Zhu, D. (1997). Kinetics of transesterification of soybean oil. Journal of American Oil Chemists Society, 74(11), 1457-1463.

Peterson, G., and Scarrah, W. (1984). Rapeseed oil transesterification by heterogeneous catalysis. Journal of American Oil Chemists Society, 61(10), 1593-1597.

Plank, C., and Lorbeer, E. (1995). Simultaneous determination of glycerol, and mono-, di- and triglycerides in vegetable oil methyl esters by capillary gas chromatography. Journal of Chromatography A, 697, 461-468.

Saka, S., and Kusdiana, D. (2001). Biodiesel fuel from rapeseed oil as prepared in supercritical methanol. Fuel, 80, 225-231.

Schuchardt, U., Sercheli, R., and Vargas, R.M. (1998). Transesterification of vegetable oils: a review. Journal of Brazilian Chemical Society, 9(1), 199-210.

Siegfried, K.F., Ganswindt, R., Neuner, H.P., and Weidner, E. (2002). Alcoholysis of triacylglycerols by heterogeneous catalysis. European Journal of Lipid and Science Technology, 104, 324-330.

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

Stern, R., Hillion, G., Rouxel, J.J., and Leporq, S. (1999). Process for the production of esters from vegetable oils or animal oils alcohols. U.S. Patent No. 5,908,946.

Suppes, G.J., Bockwinkel, K., Lucas, S., Botts, J.B., Mason, M.H., and Heppert, J.A. (2001). Calcium carbonate catalyzed alcoholysis of fats and oils. Journal of American Oil Chemists Society, 78(2), 139-145.

Swern, D.(Ed). (1979). Bailey's Industrial Oil and Fat Products Vol.1 Fourth Edition. New York: John Wiley and Sons.

Weiss, T.J. (1970). Food Oils and Their Uses. Connecticut: AVI Company.

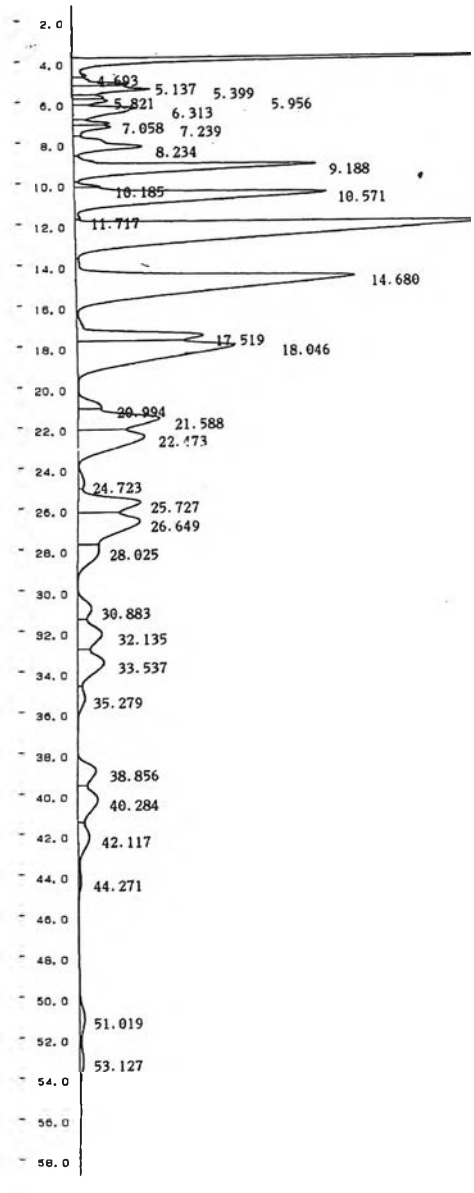
Zajdlewicz,D. (2001) Development of a continuous biodiesel process- by investigation into possible heterogeneous catalysts. Undergraduate Thesis: The University of Queensland.

APPENDICES

APPENDIX A

Sample HPLC Chromatograms

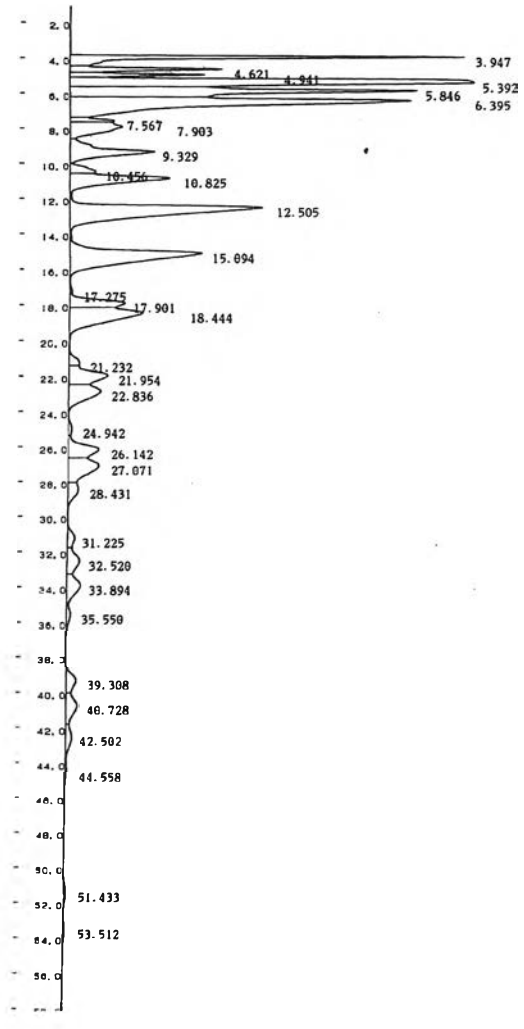
Figure A1 Crude PKO.



** CALCULATION REPORT **

CH	PKNO	TIME	AREA	HEIGHT	MK	IDNO	CONC	NAME
1	1	3.956	542044	51343	S		5.0714	
	2	4.693	3111	423	T		0.0291	
	3	5.137	83424	6062	V		0.7805	
	4	5.399	150210	8590	V		1.4054	
	5	5.821	42098	3505	V		0.3939	
	6	5.956	54747	3943	V		0.5122	
	7	6.313	185921	7014	V		1.7395	
	8	7.058	49760	4073	V		0.4656	
	9	7.239	69943	4182	V		0.6544	
	10	8.234	202530	7582	V		1.8949	
	11	9.188	637993	26838	V		5.9691	
	12	10.185	27844	2842	V		0.2605	
	13	10.571	870886	27942	SV		8.148	
	14	11.717	1149	136	T		0.0108	
	15	12.092	2053731	45676	V		19.2147	
	16	14.68	1581833	30993	V		14.7996	
	17	17.519	392169	13999	V		3.6691	
	18	18.046	942615	17403	V		8.8191	
	19	20.994	71675	2597			0.6706	
	20	21.588	400642	9056	V		3.7484	
	21	22.473	417394	7378	V		3.9051	
	22	24.723	28339	648			0.2651	
	23	25.727	300625	6948	V		2.8126	
	24	26.649	457698	6925	V		4.2822	
	25	28.025	135115	2375	V		1.2641	
	26	30.883	80248	1522			0.7508	
	27	32.135	174446	2710	V		1.6321	
	28	33.537	201792	2949	V		1.888	
	29	35.279	47639	806	V		0.4457	
	30	38.856	118035	2039			1.1043	
	31	40.284	169440	2253	V		1.5853	
	32	42.117	97284	1258	V		0.9102	
	33	44.271	18896	286	V		0.1768	
	34	51.019	44182	568			0.4134	
	35	53.127	32886	419	V		0.3077	
		TOTAL	10688334	313278			100	

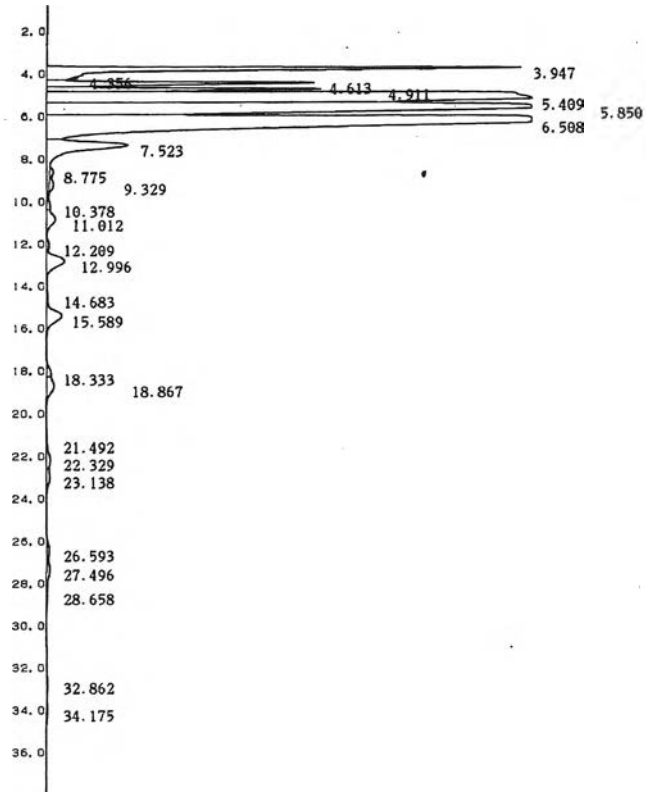
Figure A2 PKO Methyl Ester (Condition: 4:1 Methanol : Oil Ratio).



•• CALCULATION REPORT ••

CH	PEAK	TIME	AREA	HEIGHT	MK	IDNO	CONC	NAME
1	1	3.947	532965	50763			5.8103	
	2	4.621	210925	19431	V		2.2998	
	3	4.941	170747	17272	V		1.8617	
	4	5.392	1186847	52098	V		12.9404	
	5	5.846	922163	44754	V		10.0545	
	6	6.395	1303836	43924	V		14.2159	
	7	7.567	70287	5648	V		0.7665	
	8	7.903	249893	6717	V		2.7259	
	9	9.329	325755	10986	V		3.5518	
	10	10.456	74922	3298	V		0.8169	
	11	10.825	364184	12816	V		3.9699	
	12	12.505	906258	24789	V		9.8811	
	13	15.094	728666	16986	V		7.9448	
	14	17.275	6683	284			0.0729	
	15	17.901	195109	7129	V		2.1273	
	16	18.444	439634	9399	V		4.7934	
	17	21.232	40264	1305			0.439	
	18	21.954	269377	4946	V		2.2829	
	19	22.836	205256	4853	V		2.2379	
	20	24.942	18287	425			0.1994	
	21	26.142	169541	3904	V		1.8485	
	22	27.071	231923	3953	V		2.5287	
	23	28.431	71649	1346	V		0.7812	
	24	31.225	46585	916			0.5071	
	25	32.52	98733	1576	V		1.0765	
	26	33.894	189469	173[illegible]	V		1.1936	
	27	35.55	28552	47[illegible]	V		0.3113	
	28	39.388	66964	1164			0.7301	
	29	40.728	93689	132[illegible]	V		1.0215	
	30	42.502	52933	73[illegible]	V		0.5771	
	31	44.558	9836	15[illegible]	V		0.1072	
	32	51.433	18361	276			0.2002	
	33	53.512	12475	191			0.136	
		TOTAL	9171660	354685			100	

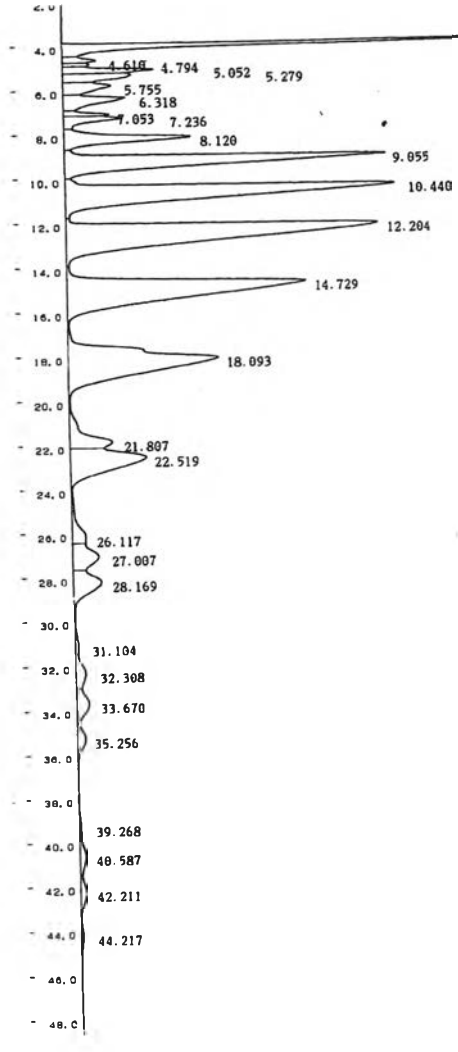
Figure A3 PKO Methyl Esters (Condition: 6:1 Methanol: Oil Ratio).



** CALCULATION REPORT **

CH	PKNO	TIME	AREA	HEIGHT	MK	IDNO	CONC	NAME
1	1	3.947	534413	50825	S		8.2947	
	2	4.356	1867	338	T		0.029	
	3	4.613	268478	28547	V		4.1671	
	4	4.911	247258	29239	V		3.8377	
	5	5.409	1469221	52055	V		22.8039	
	6	5.85	1402280	52042	V		21.7649	
	7	6.508	1914438	52036	V		29.7141	
	8	7.523	268802	8644	SV		4.1721	
	9	8.775	8785	401	T		0.1364	
	10	9.329	15400	465	TV		0.239	
	11	10.378	2009	101	T		0.0312	
	12	11.012	34863	921	V		0.5411	
	13	12.209	8213	313	V		0.1275	
	14	12.996	68334	1890	V		1.0606	
	15	14.683	4713	124	V		0.0731	
	16	15.589	62288	1622	V		0.9668	
	17	18.333	14114	492			0.2191	
	18	18.867	35219	794	V		0.5466	
	19	21.492	3590	100			0.0557	
	20	22.329	18329	406	V		0.2845	
	21	23.138	16218	358	V		0.2517	
	22	26.593	13024	293			0.2021	
	23	27.496	17837	348	V		0.2769	
	24	28.658	5033	110	V		0.0781	
	25	32.862	3454	79			0.0536	
	26	34.175	4682	106			0.0727	
		TOTAL	6442860	282651			100	

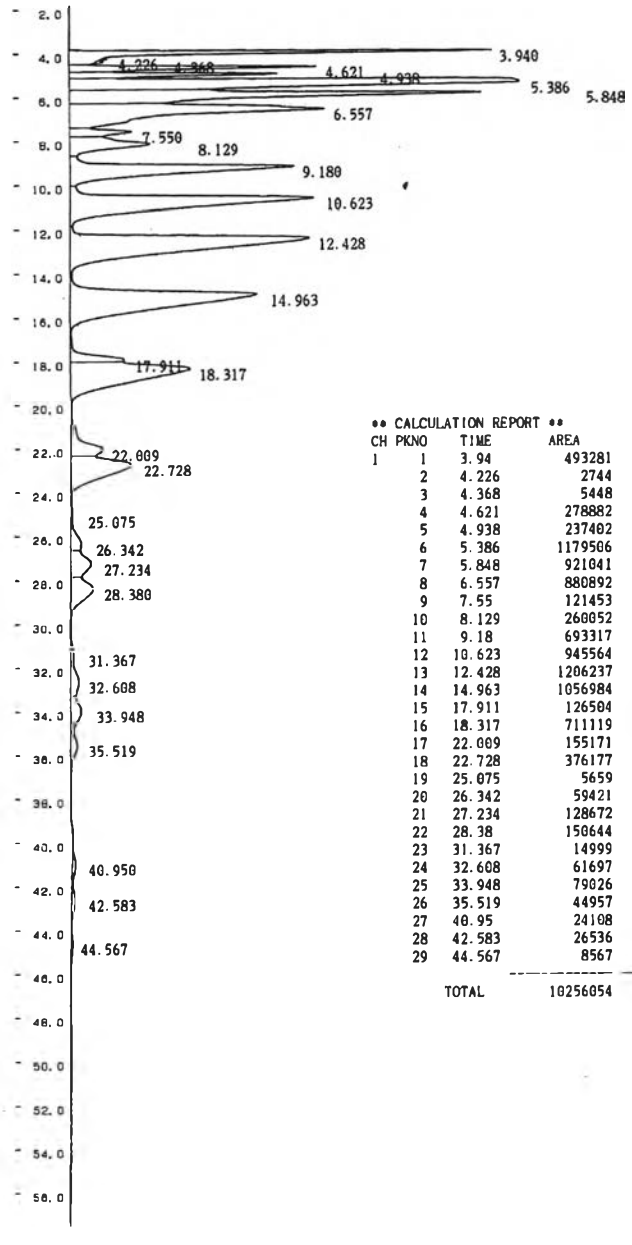
Figure A4 Crude CCO.



** CALCULATION REPORT **

CH	PKNO	TIME	AREA	HEIGHT	MK	IDNO	[illegible]	NAME
1	1	3.959	581212	59229			5.5312	
	2	4.61	56019	4143	V		0.5331	
	3	4.794	29918	3339	V		0.2847	
	4	5.052	156307	11212	V		1.4875	
	5	5.279	157445	8487	V		1.4983	
	6	5.755	140041	5986	V		1.3327	
	7	6.318	181253	7658	V		1.7249	
	8	7.053	59542	5681	V		0.5666	
	9	7.236	120325	7203	V		1.1451	
	10	8.12	353654	15581	V		3.3656	
	11	9.055	1089782	39697	V		10.3711	
	12	10.44	1464125	40881	V		13.9336	
	13	12.204	1805161	38563	V		17.1791	
	14	14.729	1534312	29367	V		14.6015	
	15	18.093	1188758	18457	V		11.313	
	16	21.807	224149	5248	V		2.1332	
	17	22.519	520166	9393	V		4.9502	
	18	26.117	97986	1692	V		0.9325	
	19	27.007	173845	3226	V		1.6544	
	20	28.169	196313	3583	V		1.8682	
	21	31.104	20323	486			0.1934	
	22	32.308	79333	1229	V		0.755	
	23	33.67	99478	1589	V		0.9467	
	24	35.256	56221	1001	V		0.535	
	25	39.268	14017	253			0.1334	
	26	40.587	47358	728	V		0.4506	
	27	42.211	44759	681	V		0.426	
	28	44.217	16100	266	V		0.1532	
		TOTAL	10507888	324622			100	

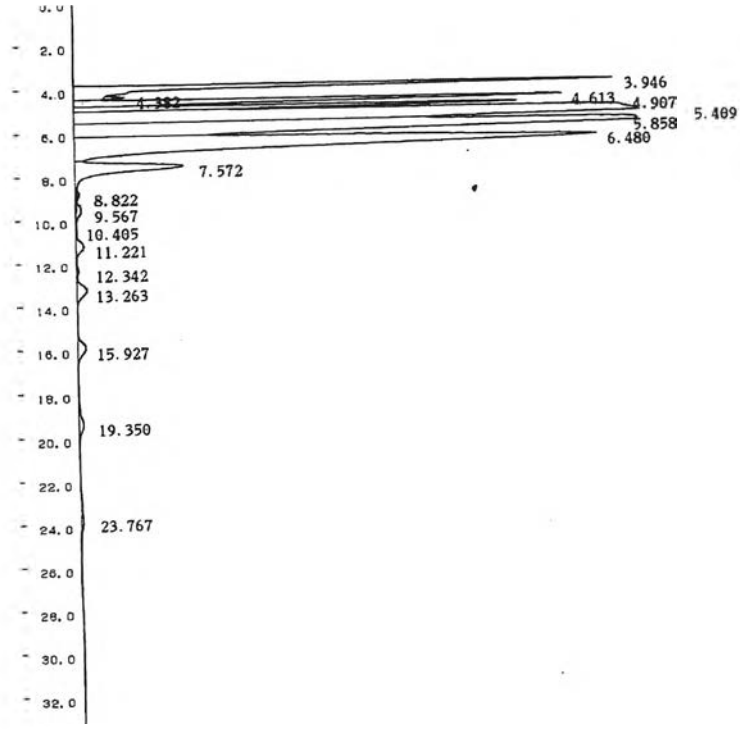
Figure A5 CCO Methyl Esters (Condition 4:1 Methanol : Oil Ratio).



** CALCULATION REPORT **

CH	PKNO	TIME	AREA	HEIGHT	MK	IDNO	CONC	NAME
1	1	3.94	493281	48741	S		4.8097	
	2	4.226	2744	454	T		0.0268	
	3	4.368	5448	907	TV		0.0531	
	4	4.621	278882	28380	V		2.7192	
	5	4.938	237402	23885	V		2.3148	
	6	5.386	1179506	51928	V		11.5006	
	7	5.848	921041	47542	V		8.9805	
	8	6.557	880892	29241	V		8.589	
	9	7.55	121453	7094	V		1.1842	
	10	8.129	260052	3186	V		2.5356	
	11	9.18	693317	25742	V		6.7601	
	12	10.623	945564	28052	V		9.2196	
	13	12.428	1206237	27500	V		11.7612	
	14	14.963	1056984	21466	V		10.3059	
	15	17.911	126504	6721	V		1.2335	
	16	18.317	711119	13752	V		6.9337	
	17	22.009	155171	3615			1.513	
	18	22.728	376177	6959	V		3.6679	
	19	25.075	5659	736			0.0552	
	20	26.342	59421	1289	V		0.5794	
	21	27.234	128672	2770	V		1.2546	
	22	28.38	150644	2561	V		1.4688	
	23	31.367	14999	306			0.1462	
	24	32.608	61697	924	V		0.6016	
	25	33.948	79026	1199	V		0.7705	
	26	35.519	44957	732	V		0.4383	
	27	40.95	24108	615			0.2351	
	28	42.583	26536	424	V		0.2587	
	29	44.567	8567	153			0.0835	
		TOTAL	10256054	391133			100	

Figure A6 CCO Methyl Esters (Condition 6:1 Methanol : Oil Ratio).



** CALCULATION REPORT **

CH	PKNO	TIME	AREA	HEIGHT	MK	IDNO	CONC	NAME
1	1	3.946	575027	56632	S		8.4059	
	2	4.382	11069	2030	T		0.1618	
	3	4.613	484149	51338	V		7.0774	
	4	4.907	408740	46519	V		5.9751	
	5	5.409	1698705	59248	V		24.8321	
	6	5.858	1588769	59235	V		23.225	
	7	6.48	1610151	54953	V		23.5376	
	8	7.572	303118	11322	SV		4.4311	
	9	8.822	5324	274	T		0.0778	
	10	9.567	16556	524	TV		0.242	
	11	10.405	1363	67	T		0.0199	
	12	11.221	26921	799	TV		0.3935	
	13	12.342	5708	230	T		0.0834	
	14	13.263	40322	1072	TV		0.5894	
	15	15.927	32770	834			0.479	
	16	19.35	24790	490			0.3624	
	17	23.767	7280	185			0.1064	
		TOTAL	6840759	345754			100	

Appendix B

Raw Data in the Characterization of Vegetable Oil

Table B1 Density measurement

	Coconut Oil			Palm Kernel Oil		
	1	2	3	1	2	3
W pycnometer, g	32.2116	32.206	32.2055	32.2157	32.5708	32.2032
W pycno + oil, g	54.5131	54.451	54.5243	54.4011	54.8303	54.4243
W oil, g	22.3015	22.245	22.3188	22.1854	22.2595	22.2211
V Pycno, ml	25	25	25	25	25	25
Density, g / ml	0.8921	0.8898	0.8928	0.8874	0.8904	0.8888
Ave. Density, g/ml			**0.8915**			**0.8889**

Table B2 Kinematic viscosity measurement

Oil	1	2	3	Average Value , mm^2/s
Coconut Oil	29.012	28.902	29.156	**29.023**
Palm Kernel Oil	28.257	28.222	28.268	**28.249**

Table B3 Free Fatty Acid Value using AOCS Cd 3a-63

	Coconut Oil		Palm Kernel Oil	
	1	2	1	2
W oil, g	5.0619	5.0368	5.0041	5.0022
V ethanol, ml	25	25	25	25
Conc KOH, N	0.10	0.10	0.10	0.10
V_{KOH} used ,ml	15.4	15.4	10.6	10.6
FFA (% Lauric Acid)	6.074	6.104	4.229	4.231
Average FFA		**6.09**		**4.23**
Amt needed to neutralize oil,				
mg NaOH/ g oil		12.2		8.475
g NaOH/100 g oil		1.22		0.8475

Formula:

FFA (% Lauric Acid) =(ml. Alkali x N x 56.1) / (weight of sample x 2.81)

Amount needed to neutralize oil = FFA, % x 2.81 x 40 / 56.1

Table B4 Moisture content determination using AOCS Aa 3-38

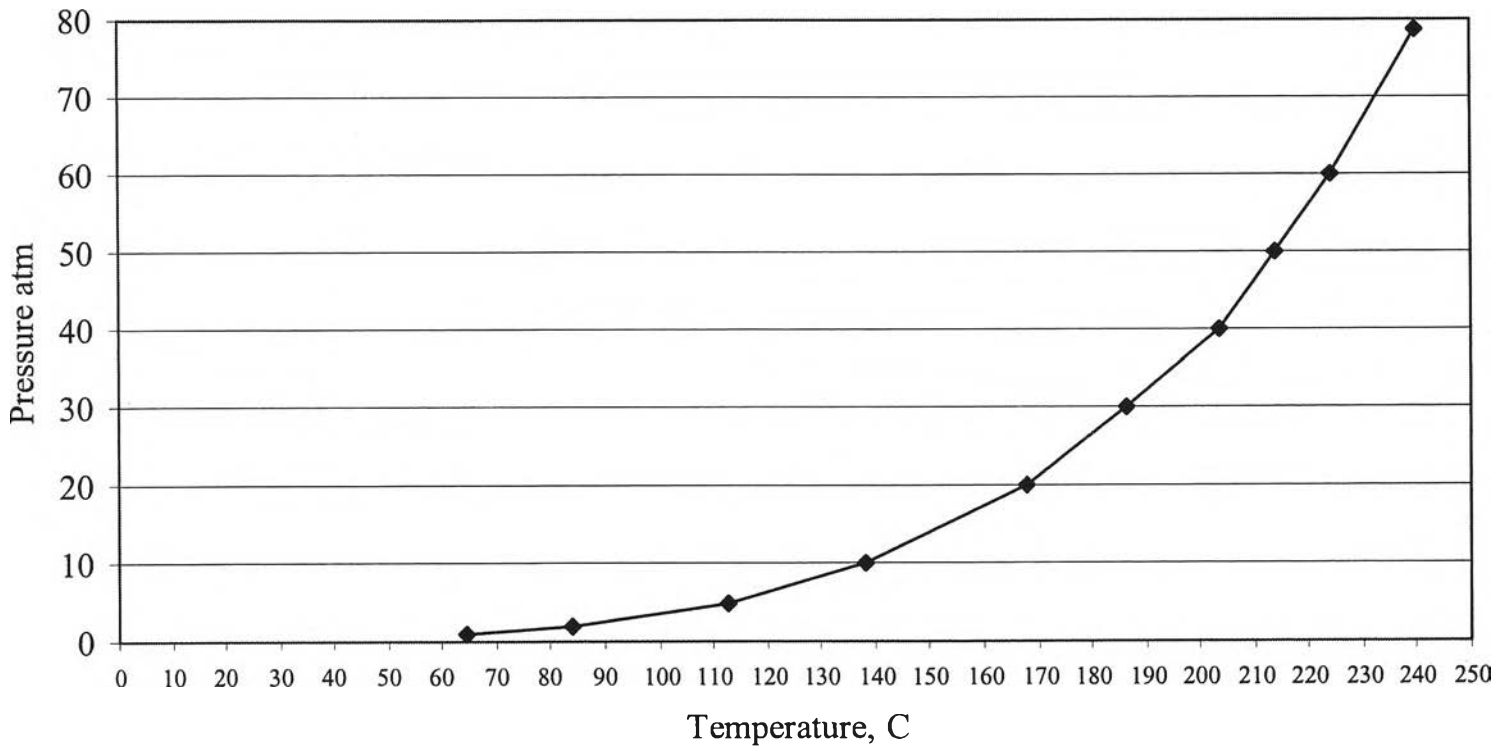
	Coconut Oil		**Palm Kernel Oil**	
	1	2	1	2
Wt. Oil, g	5.0117	5.0389	5.0435	5.0395
Initial Wt. Oil + Dish, g	26.9937	47.5784	42.7333	49.9796
Final Wt. Oil + Dish, g	26.9139	47.5003	42.673	49.9201
Moisture Content, %	1.5923	1.5499	1.1956	1.1807
Ave. MC, %		**1.57**		**1.19**

Table B5 Molecular weight determination

	FA CCO	FA PKO	MW acid	MW F.A. CCO	MW F.A. PKO
C8	0.0568	0.0287	144.21	8.19	4.14
C10	0.052	0.0311	176.26	9.17	5.48
C12	0.4623	0.4749	200.31	92.60	95.13
C14	0.1974	0.1627	228.36	45.08	37.15
C16	0.103	0.0866	256.42	26.44	22.21
C18:0	0.0277	0.0216	284.47	7.88	6.14
C18:1	0.0772	0.1625	282.5	21.81	45.91
C18:2	0.0214	0.0257	280.77	6.01	7.22
Total	0.9979	0.9938		217.17	223.37
				217.63	224.77
		MW Triglyceride		693.89	715.30

Appendix C

Temperature- Vapor Pressure Curve of Methanol



Appendix D

Raw Data for Homogeneous and Heterogeneous Transesterification

Table D1 PKO homogeneous transesterification

Expt. No.	Wt. Oil, g	Wt. MeOH, g	Wt. NaOH, g	Wt. m.e after, g	Prdn Yield, %	A m.e.	A total	M.E. Content,%	Conversion, %
1	100.12	50.16	0.9585	78.42	78.34	5715736	5767787	99.1	77.54
2	100.05	50.22	1.3524	77.95	77.87	5760278	5791377	99.46	77.41
3	100.05	50.18	1.8809	72.19	72.12	5607186	5634713	99.51	71.73
4	100.19	100.12	1.8661	72.49	74.42	5670233	5706551	99.36	73.80
5	100.08	30.04	1.8531	75.92	75.84	5596529	5908447	94.72	71.78
6	100.21	20.12	1.8432	62.21	62.15	4439573	8638755	51.39	31.87
7	100.27	15.09	1.8638						
8	100.14	15.16	1.3571	76.03	75.95	5588625	5635445	99.17	75.21
9	100.08	15.23	1.3632	75.09	75.01	5619521	5662045	99.25	74.39

Table D2 CCO homogeneous transesterification

Expt. No.	Wt. Oil, g	Wt. MeOH, g	Wt. NaOH, g	Wt. m.e after, g	Prdn Yield, %	A m.e.	A total	M.E. Content,%	Conversion, %
1	100.4	50.1	1.3762	75.84	75.82	6150797	6872616	89.56	67.63
2	100.5	50.09	1.8016	75.17	75.15	6091612	6132881	99.33	74.28
3	100.26	50.26	2.2306	73.79	73.77	6024244	6042842	99.69	73.35
4	100.13	100.15	2.2354	73.5	73.48	6088365	6127405	99.36	72.91
5	100.62	30.33	2.2397	76.05	76.03	6126581	6265732	99.78	75.40
6	100.34	20.17	2.2198	80.1	80.08	6940376	8051287	86.20	68.80
7	100.12	15.16	2.2269						
8	100.18	30.02	1.8349	75.79	75.77	6120388	6174679	99.12	74.97
9	100.22	30.05	1.7697	75.1	75.08	6080003	6138840	99.04	74.20

Table D3 CCO heterogeneous transesterification at 65-70 °C for 10 hours

Catalyst	Wt. oil, g	Wt. MeOH,g	Wt. catalyst, g	A m.e.	A total	M.E. Content, %	Observation
Na_2CO_3	30.15	30.22	1.8059	1282.44	4489.64	28.56	Dissolve in mixture
K_2CO_3	30.06	30.17	1.8023	6229836	6271314	99.34	Dissolve in mixture
$CaCO_3$	30.04	30.16	1.8004	858	8187.8	10.48	Catalyst at the bottom
ZrO_2	30.23	30.42	1.8092	4736.01	12221.57	38.75	Catalyst at the bottom
ZnO	30.16	30.16	1.8063	4295163	7913875	54.27	Catalyst at the bottom
NaY	30.14	30.17	1.8102	2228253	10173223	21.90	Catalyst at the bottom
NaX	30.29	30.53	1.8007	1479737	10146290	14.58	Catalyst at the bottom
Beta	30.17	30.24	1.8089	2177152	10116962	21.52	Catalyst at the bottom
Al_2O_3	30.1	30.19	1.8078	2350720	10343603	22.73	Catalyst at the bottom
SO_4SnO_2	30.12	30.07	1.8011	3225032	12172858	26.49	Catalyst at the bottom

Table D4 CCO heterogeneous transesterification at 30 °C for 6 hours

Catalyst	Wt. oil, g	Wt. MeOH,g	Wt. catalyst, g	A m.e.	A total	M.E. Content, %	Observation
K_2CO_3	50.12	50.03	3.01	6231769	6271314	99.37	Some of the catalyst dissolve

Table D5 CCO heterogeneous transesterification at 200 °C and 50 bar for 4 hours

Catalyst	Wt. oil, g	Wt. MeOH,g	Wt. catalyst, g	A m.e.	A total	M.E. Content, %	Observation
K_2CO_3	50.23	25.05	3.0139	6310660	6489517	97.24	Dissolve in the mixture
$CaCO_3$	50.11	25.09	3.0243	7018833	7430536	94.46	Catalyst at the bottom
ZrO_2	50.33	25.12	3.0327	6937179	7318964	94.78	Catalyst at the bottom
ZnO	50.19	25.18	3.0628	6003909	6064236	99.01	Catalyst at the bottom
NaX	50.33	25.16	3.0119	6866535	8034968	85.46	Catalyst at the bottom
NaY	50.42	25.04	3.0356	6665890	8221258	81.08	Catalyst at the bottom
Beta	50.38	25.06	3.0264	6640535	7925727	83.78	Catalyst at the bottom
Al_2O_3	50.16	25.13	3.0362	5215493	8864467	58.84	Catalyst at the bottom
$SO_4.SnO_2$	50.26	25.2	3.0233	7020175	7237050	97.00	Catalyst at the bottom
Blank	50.18	25.25	3.0322	4439573	8638755	51.39	

TableD6 Investigation of suitable heterogeneous catalyst

Catalyst	Wt. oil, g	Wt. MeOH, g	Wt. Cat., g	Temp, C	Time, hr	A m.e.	A total	M.E. Content, %
$CaCO_3$	50.1	25.12	3.0322	65	4	2315263	10055790	23.02
$CaCO_3$	50.23	25.05	3.0564	130 $^{10\ bar}$	4	3554856	9649184	36.84
$CaCO_3$	50.34	25.36	3.0891	200 $^{50\ bar}$	2	6574772	7689736	85.50
$CaCO_3$	50.11	25.09	3.0243	200 $^{50\ bar}$	4	7018833	7430536	94.46
ZrO_2	50.42	25.09	3.0547	65	4	2348801	10004807	23.48
ZrO_2	50.59	25.16	3.0636	130 $^{10\ bar}$	4	3065226	9172160	33.42
ZrO_2	50.43	25.02	3.0455	200 $^{50\ bar}$	2	6547451	8724252	75.05
ZrO_2	50.33	25.12	3.0327	200 $^{50\ bar}$	4	6937179	7318964	94.78
$SO_4.SnO_2$	50.24	25.09	3.0356	65	4	2398630	10047336	23.87
$SO_4.SnO_2$	50.36	25.11	3.0842	130 $^{10\ bar}$	4	5702441	8740265	65.24
$SO_4.SnO_2$	50.48	25.22	3.0049	200 $^{50\ bar}$	2	6697470	7217816	92.79
$SO_4.SnO_2$	50.26	25.2	3.0233	200 $^{50\ bar}$	4	7020175	7237050	97.00

TableD7 Heterogeneous catalyst versus NaOH in the transesterification of CCO

Catalyst	Wt. Oil, g	Wt. MeOH, g	Wt. Catalyst, g	Wt. m.e after, g	Prdn Yield, %	A m.e.	A total	M.E. Content, %	Conversion, %
NaOH	100.18	30.02	1.8349	75.79	75.77	6120388	6174679	99.12	74.97
$CaCO_3$	70.05	35.12	4.2083	40.45	57.74	7018833	7430536	94.46	54.55
ZrO_2	70.19	35.03	4.2157	52.25	74.44	6937179	7318964	94.78	70.56
$SO_4.SnO_2$	21.26	10.63	4.2031	15.42	72.53	7020175	7237050	97.00	70.36
ZnO	70.18	35.11	1.287	48.42	68.99	6003909	6064236	99.01	68.31

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