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APPENDICES

Appendix A Experimental data for phase behavior study.

TableA-1 Mixed Surfactant 0.1% Alfoterra145-5 PO + 3% Comperlan with Salinity Scan

No.	%NaCl	IFT (mN/m)			Average IFT (mN/m)	SD
		1	2	3		
1	0	0.6575	0.5720	0.6035	0.6111	0.0432
2	1	0.0946	0.0971	0.0998	0.0972	0.0026
3	2.5	0.0640	0.0619	0.0743	0.0668	0.0066
4	5	0.0641	0.0565	0.0654	0.0620	0.0048
5	7.5	0.0368	0.0430	0.0427	0.0408	0.0348
6	10	0.0363	0.0393	0.0369	0.0375	0.0016
7	12.5	0.0271	0.0243	0.0220	0.0245	0.0026
8	15	0.0263	0.0239	0.0263	0.0251	0.0014
9	17.5	0.0195	0.0203	0.0190	0.0196	0.0039
10	20	0.0890	0.0803	0.0861	0.0851	0.0045

TableA-2 Mixed Surfactant 0.2% Alfoterra145-5 PO + 3% Comperlan with Salinity Scan

No.	%NaCl	IFT (mN/m)			Average IFT (mN/m)	SD
		1	2	3		
1	0	0.3310	0.3222	0.3108	0.3213	0.0432
2	1	0.0799	0.0886	0.0873	0.0852	0.0026
3	2.5	0.0742	0.0726	0.0743	0.0737	0.0066
4	5	0.0385	0.0405	0.0402	0.0397	0.0048
5	7.5	0.0224	0.0024	0.0253	0.0167	0.0348
6	10	0.0203	0.0021	0.0223	0.0149	0.0016
7	12.5	0.0120	0.0114	0.0139	0.0124	0.0026
8	15	0.0226	0.0247	0.0263	0.0237	0.0014
9	17.5	0.0266	0.0244	0.0269	0.0260	0.0039
10	20	0.0520	0.0579	0.0492	0.0530	0.0045

TableA-3 Mixed Surfactant 0.3% Alfoterra145-5 PO + 3% Comperlan with Salinity Scan

No.	%NaCl	IFT (mN/m)			Average IFT (mN/m)	SD
		1	2	3		
1	0	0.3473	0.3462	0.3266	0.3400	0.0432
2	1	0.0923	0.0926	0.0978	0.0942	0.0026
3	2.5	0.0736	0.0720	0.0717	0.0725	0.0066
4	5	0.0440	0.0458	0.0480	0.0459	0.0048
5	7.5	0.0206	0.0250	0.0268	0.0241	0.0348
6	10	0.0171	0.0166	0.0205	0.0181	0.0016
7	12.5	0.0166	0.0225	0.0183	0.0191	0.0026
8	15	0.0101	0.0118	0.0153	0.0109	0.0014
9	17.5	0.0141	0.0157	0.0177	0.0158	0.0040
10	20	0.0199	0.0183	0.0200	0.0194	0.0045

Table A-4 Mixed Surfactant 0.1% Alfoterra5-8 PO + 3% Comperlan with Salinity Scan

No.	%NaCl	IFT (mN/m)			Average IFT (mN/m)	SD
		1	2	3		
1	0	0.3503	0.3552	0.3455	0.3504	0.0049
2	1	0.1086	0.1015	0.1018	0.1039	0.0040
3	2.5	0.0895	0.0743	0.0848	0.0829	0.0078
4	5	0.0543	0.0569	0.0544	0.0552	0.0014
5	7.5	0.0471	0.0457	0.0448	0.0458	0.0011
6	10	0.0316	0.03753	0.0384	0.0358	0.0037
7	12.5	0.4518	0.5526	0.4566	0.4870	0.0569
8	15	0.6413	0.6410	0.6022	0.6412	0.0224
9	17.5	0.6735	0.6797	0.6293	0.6608	0.0275
10	20	0.7649	0.8587	0.8792	0.8342	0.0610

Table A-5 Mixed Surfactant 0.2% Alfoterra5-8 PO + 3% Comperlan with Salinity Scan

No.	%NaCl	IFT (mN/m)			Average IFT (mN/m)	SD
		1	2	3		
1	0	0.2767	0.2731	0.2631	0.2701	0.0432
2	1	0.0682	0.0668	0.0609	0.0653	0.0026
3	2.5	0.0597	0.0568	0.0580	0.0582	0.0066
4	5	0.0363	0.0373	0.0334	0.0356	0.0048
5	7.5	0.0282	0.0268	0.0275	0.0275	0.0348
6	10	0.0223	0.0231	0.0215	0.0223	0.0016
7	12.5	0.0120	0.0095	0.0107	0.0107	0.0026
8	15	0.0144	0.0160	0.0133	0.0152	0.0014
9	17.5	0.0165	0.0171	0.0144	0.0160	0.0039
10	20	0.0291	0.0226	0.0210	0.0242	0.0045

Table A-6 Mixed Surfactant 0.3% Alfoterra5-8 PO + 3% Comperlan with Salinity Scan

No.	%NaCl	IFT (mN/m)			Average IFT (mN/m)	SD
		1	2	3		
1	0	0.2243	0.2262	0.2289	0.2265	0.0432
2	1	0.0710	0.0722	0.07125	0.0715	0.0026
3	2.5	0.0524	0.0534	0.05170	0.0525	0.0066
4	5	0.0419	0.0427	0.03990	0.0415	0.0048
5	7.5	0.0335	0.0341	0.0303	0.0326	0.0348
6	10	0.0181	0.0223	0.0210	0.0205	0.0016
7	12.5	0.0181	0.0166	0.0170	0.0172	0.0026
8	15	0.0098	0.0104	0.0112	0.0101	0.0014
9	17.5	0.0131	0.0109	0.0121	0.0120	0.0039
10	20	0.1185	0.1299	0.1146	0.1210	0.0045

Appendix B Experimental data for vegetable oil extraction study

The calculation for extraction efficiency

$$\% \text{ oil extraction} = V_{\text{measure}} / (\text{wt of oil in seed} / \text{density of oil}) * 100$$

For soybean oil contain oil in their seeds about 18-20%wt

For Palm kernel oil contain oil in their seeds about 48-50%wt

Table B-1 Oil extraction(%) data by using 0.1% Alfoterra145-5PO and 3% Comperlan KD with grain size 35-65 mesh contact time 30 minutes (Data from previous study)

No.	%NaCl	V(Cm ³)			Average V(Cm ³)	%Extraction	SD
		1	2	3			
1	1	0.120	0.150	0.130	0.133	61.127	0.015
2	2.5	0.140	0.150	0.160	0.150	68.295	0.010
3	5	0.170	0.160	0.180	0.170	78.115	0.010
4	7.5	0.190	0.170	0.200	0.187	85.773	0.015
5	10	0.190	0.180	0.185	0.185	85.008	0.005
6	12.5	0.180	0.190	0.190	0.187	85.773	0.006

Effect grain size

Table B-2 Oil extraction(%) data by using 0.1% Alfoterra145-5PO and 3% Comperlan KD with grain size 35-65 mesh contact time 30 minutes

No.	%NaCl	V(Cm ³)			%Extraction	SD
		1	2	3		
1	1	0.4070	0.384	0.396	76.200	4.426
2	2.5	0.430	0.396	0.418	79.899	5.443
3	5	0.452	0.452	0.441	86.402	3.471
4	7.5	0.452	0.441	0.430	84.928	4.823
5	10	0.475	0.4521	0.452	88.630	5.435
6	12.5	0.452	-	0.474	89.962	0.180
7	15	0.430	0.441	0.441	84.079	1.296
8	17.5	0.452	0.384	0.396	79.144	9.544
9	20	0.475	0.430	0.441	86.379	7.264

Table B-3 Oil extraction(%) data by using 0.1% Alfoterra145-5PO and 3% Comperlan KD with grain size more than 35 mesh contact time 30 minutes

No.	%NaCl	V(Cm ³)			%Extraction	SD
		1	2	3		
1	1	0.249	0.305	0.283	52.728	5.456
2	2.5	0.317	0.317	0.3618	62.682	5.039
3	5	0.339	0.328	0.317	61.840	2.064
4	7.5	0.3617	0.317	0.328	63.406	4.399
5	10	0.396	0.407	0.395	75.565	1.257
6	12.5	0.407	0.396	0.384	74.800	2.159
7	15	0.407	0.362	0.350	70.519	5.5198
8	17.5	0.373	0.339	0.362	67.677	3.170
9	20	0.396	0.384	0.407	74.751	2.017

Table B-4 Oil extraction(%) data by using 0.1% Alfoterra145-5PO and 3% Comperlan KD with grain size less than 65 mesh contact time 30 minutes

No.	%NaCl	V(Cm ³)			%Extraction	SD
		1	2	3		
1	1	0.430	0.407	0.407	78.312	2.927
2	2.5	0.430	0.418	0.407	79.117	3.068
3	5	0.452	0.475	0.452	86.931	0.054
4	7.5	0.441	0.430	0.430	81.953	1.424
5	10	0.463	0.452	0.463	86.821	0.012
6	12.5	0.486	0.475	0.452	88.948	4.557
7	15	0.475	0.463	0.463	88.350	1.499
8	17.5	0.452	0.452	0.452	85.514	0.085
9	20	0.463	0.509	0.486	91.838	3.017

Table B-5 Oil extraction(%) data by using 0.1% Alfoterra5-8PO and 3% Comperlan KD with grain size 35-65 mesh contact time 30 minutes

No.	%NaCl	V(Cm ³)			%Extraction	SD
		1	2	3		
1	1	0.396	0.396	0.396	74.855	0.091
2	2.5	0.418	0.407	0.396	76.929	2.152
3	5	0.441	0.475	0.452	86.059	3.312
4	7.5	0.463	0.452	0.452	86.025	1.160
5	10	0.475	0.452	0.463	87.622	2.251
6	12.5	0.407	0.429	0.452	81.186	4.396
7	15	0.430	0.463	0.452	84.865	3.229
8	17.5	0.430	0.452	0.452	83.955	2.367
9	20	0.452	0.486	0.463	88.318	3.308

Table B-6 Oil extraction(%) data by using 0.1% Alfoterra5-8PO and 3% Comperlan KD with grain size more than 35 mesh contact time 30 minutes

No.	%NaCl	V(Cm ³)			%Extraction	SD
		1	2	3		
1	1	0.226	0.317	0.271	54.170	9.075
2	2.5	0.350	0.328	0.339	67.675	2.250
3	5	0.317	0.328	0.317	63.816	1.338
4	7.5	0.339	0.317	0.350	67.035	3.453
5	10	0.362	0.384	0.362	73.760	2.663
6	12.5	0.373	0.396	0.362	75.259	3.326
7	15	0.384	0.430	-	81.176	6.526
8	17.5	0.396	0.430	0.407	81.989	3.514
9	20	0.430	0.452	0.430	87.249	2.726

Table B-7 Oil extraction(%) data by using 0.1% Alfoterra5-8PO and 3% Comperlan KD with grain size less than 65 mesh contact time 30 minutes

No.	%NaCl	V(Cm ³)			%Extraction	SD
		1	2	3		
1	1	0.452	0.452	0.430	84.079	2.497
2	2.5	0.475	0.452	0.463	87.647	2.037
3	5	0.452	0.441	0.441	83.963	1.204
4	7.5	0.452	0.475	0.463	87.579	2.167
5	10	0.430	0.475	0.452	85.504	4.176
6	12.5	0.475	0.452	0.452	86.945	2.472
7	15	0.475	0.463	-	88.607	1.622
8	17.5	0.430	0.486	0.452	86.264	5.389
9	20	0.475	0.509	0.508	93.990	3.710

Effect contact time

Table B-8 Oil extraction(%) data by using 0.1% Alfoterra145-5PO and 3% Comperlan KD with grain size 35-65 mesh contact time 15 minutes

No.	%NaCl	V(Cm ³)			%Extraction	SD
		1	2	3		
1	1	0.362	0.339	0.362	66.850	2.467
2	2.5	0.362	0.396	0.33	69.031	5.368
3	5	0.430	0.396	0.396	76.859	3.751
4	7.5	0.418	0.407	0.418	78.391	1.257
5	10	0.396	0.396	0.396	74.765	0.013
6	12.5	0.430	0.418	0.430	80.481	1.121
7	15	0.418	0.407	0.441	79.792	3.161
8	17.5	0.407	0.384	0.400	74.808	2.137
9	20	0.463	0.441	0.430	84.043	3.332

Table B-9 Oil extraction(%) data by using 0.1% Alfoterra145-5PO and 3% Comperlan KD with grain size 35-65 mesh contact time 45 minutes

No.	%NaCl	V(Cm ³)			%Extraction	SD
		1	2	3		
1	1	0.430	0.430	0.418	80.477	1.199
2	2.5	0.407	0.396	0.407	76.259	1.339
3	5	0.441	0.463	0.452	85.521	2.232
4	7.5	-	0.475	0.463	88.676	51.207
5	10	0.452	0.475	0.441	86.249	3.356
6	12.5	0.430	0.430	0.418	80.497	1.347
7	15	0.430	0.418	0.430	80.472	1.276
8	17.5	0.418	0.396	0.441	79.101	4.219
9	20	0.452	0.452	0.463	86.204	1.318

Table B-10 Oil extraction(%) data by using 0.1% Alfoterra145-5PO and 3% Comperlan KD with grain size 35-65 mesh contact time 60 minutes

No.	%NaCl	V(Cm ³)			%Extraction	SD
		1	2	3		
1	1	0.430	0.418	0.441	81.245	1.378
2	2.5	0.430	0.440	0.407	80.510	3.090
3	5	0.441	0.452	0.475	86.277	4.623
4	7.5	0.441	0.430	0.463	84.076	2.980
5	10	0.452	0.430	0.452	84.102	0.109
6	12.5	0.441	0.407	0.430	80.500	1.314
7	15	0.441	0.430	0.430	81.844	1.498
8	17.5	0.418	0.430	0.418	79.803	0.145
9	20	0.452	0.475	0.463	87.586	1.382

Table B-11 Oil extraction(%) data by using 0.1% Alfoterra5-8PO and 3% Comperlan KD with grain size 35-65 mesh contact time 15 minutes

No.	%NaCl	V(Cm ³)			%Extraction	SD
		1	2	3		
1	1	0.339	0.339	0.362	65.474	2.401
2	2.5	0.361	0.396	0.396	72.698	3.754
3	5	0.384	0.396	0.396	74.041	1.312
4	7.5	0.396	0.407	0.396	75.502	1.238
5	10	0.430	0.350	0.430	76.250	8.619
6	12.5	0.441	0.407	0.407	79.166	3.711
7	15	0.452	0.407	0.430	81.188	4.385
8	17.5	0.430	0.441	0.430	81.960	1.293
9	20	0.475	0.452	0.452	86.880	2.411

Table B-12 Oil extraction(%) data by using 0.1% Alfoterra5-8PO and 3% Comperlan KD with grain size 35-65 mesh contact time 45 minutes

No.	%NaCl	V(Cm ³)			%Extraction	SD
		1	2	3		
1	1	0.4070	0.407	0.430	78.240	2.490
2	2.5	0.43	0.430	0.430	81.243	0.048
3	5	0.441	0.430	0.452	83.273	2.107
4	7.5	0.430	0.452	0.463	84.675	3.282
5	10	0.452	0.430	0.430	82.643	2.554
6	12.5	0.441	0.430	0.452	83.303	2.099
7	15	0.452	0.441	0.430	83.333	2.112
8	17.5	0.4230	0.441	0.441	82.609	1.278
9	20	0.441	0.441	0.452	84.067	1.148

Table B-13 Oil extraction(%) data by using 0.1% Alfoterra5-8PO and 3% Comperlan KD with grain size 35-65 mesh contact time 60 minutes

No.	%NaCl	V(Cm ³)			%Extraction	SD
		1	2	3		
1	1	0.430	0.407	0.441	80.470	1.390
2	2.5	0.430	0.429552	0.452	82.634	3.127
3	5	0.441	0.441	0.418	81.859	2.889
4	7.5	0.475	0.463	0.441	86.924	4.620
5	10	0.430	0.452	0.441	83.413	1.559
6	12.5	0.430	0.430	0.430	81.271	0.012
7	15	0.452	0.441	0.452	84.877	0.024
8	17.5	0.441	0.452	0.441	84.139	1.070
9	20	0.452	0.441	0.463	85.469	1.511

Effect load

Table B-14 Oil extraction(%) data by using 0.1% Alfoterra145-5PO and 3% Comperlan KD with grain size 35-65 mesh contact time 30 minutes at 10% NaCl varied load.

No.	Load (g)	V(Cm ³)			%Extraction	SD
		1	2	3		
1	0.5	0.203	0.192	0.226	78.067	6.594
2	1.0	0.475	0.452	0.452	88.630	5.435
3	1.5	0.656	0.656	0.633	81.650	1.727
4	2.0	0.814	0.791	0.780	75.174	1.676

Table B-15 Oil extraction(%) data by using 0.1% Alfoterra145-5PO and 3% Comperlan KD with grain size 35-65 mesh contact time 30 minutes at 12.5% NaCl varied load.

No.	Load (g)	V(Cm ³)			%Extraction	SD
		1	2	3		
1	0.5	0.215	0.226	0.215	80.891	2.468
2	1.0	0.452	-	0.475	89.9620	0.181
3	1.5	0.656	0.670	0.670	83.385	1.126
4	2.0	0.836	0.878	0.859	80.257	1.525

Table B-16 Oil extraction(%) data by using 0.1% Alfoterra145-5PO and 3% Comperlan KD with grain size 35-65 mesh contact time 30 minutes at 20% NaCl varied load.

No.	Load (g)	V(Cm ³)			%Extraction	S.D.
		1	2	3		
1	0.5	0.215	0.226	0.226	83.801	2.465
2	1.0	0.475	0.430	0.441	86.380	7.264
3	1.5	0.678	0.670	-	84.830	1.020
4	2.0	0.769	0.757	0.769	71.979	0.614

Table B-17 Oil extraction(%) data by using 0.1% Alfoterra5-8PO and 3% Comperlan KD with grain size 35-65 mesh contact time 30 minutes at 7.5% NaCl varied load.

No.	Load (g)	V(Cm ³)			%Extraction	S.D.
		1	2	3		
1	0.5	0.204	0.203	0.192	75.237	2.551
2	1.0	0.463	0.452	0.452	86.025	1.1598
3	1.5	0.633	0.656	0.670	82.195	2.184
4	2.0	0.791	0.769	0.769	73.381	1.186

Table B-18 Oil extraction(%) data by using 0.1% Alfoterra5-8PO and 3% Comperlan KD with grain size 35-65 mesh contact time 30 minutes at 10% NaCl varied load.

No.	Load (g)	V(Cm ³)			%Extraction	S.D.
		1	2	3		
1	0.5	0.2148	0.226	0.215	80.077	2.680
2	1.0	0.475	0.452	0.463	87.622	2.251
3	1.5	0.644	0.656	0.656	81.975	0.915
4	2.0	0.814	0.514	0.791	75.884	1.455

Table B-19 Oil extraction(%) data by using 0.1% Alfoterra5-8PO and 3% Comperlan KD with grain size 35-65 mesh contact time 30 minutes at 20% NaCl varied load.

No.	Load (g)	V(Cm ³)			%Extraction	S.D.
		1	2	3		
1	0.5	0.215	0.226	0.226	83.957	2.464
2	1.0	0.452	0.486	0.463	88.318	3.308
3	1.5	0.690	0.712	-	88.335	2.036
4	2.0	0.881	0.859	0.882	82.618	1.261

Table B-20 Extraction Efficiency (%) data by using hexane with grain size 35-65 mesh contact time 30 minutes and 1 g palm kernel load

No.	Weight (g)	V(cm³)	%Extraction	Average % Extraction	S.D.
1	1.0008	0.480	90.824		
2	1.0021	0.490	92.596		
3	1.0026	0.480	90.661	91.361	1.073

Appendix C Experimental data for extracted oil quality study
Table C-1 The retention time and peak area of Comperlan KD

Concentration	Peak	Retention Time	Peak Area
0.05% or 50 ppm	1	17.155	46056
	2	27.284	17021
	3	36.325	19438
	4	38.327	36850
0.15% or 150 ppm	1	17.153	115641
	2	27.456	84671
	3	36.434	60833
	4	38.467	142273
0.50% or 500 ppm	1	17.119	679823
	2	27.437	399343
	3	36.444	280862
	4	38.442	663384
1% or 1000 ppm	1	16.984	1801393
	2	27.326	974458
	3	36.329	626589
	4	38.336	1417134
1.5% or 1500 ppm	1	15.171	2856110
	2	25.369	1376191
	3	34.477	857350
	4	36.421	2001590

The correlation for peak 1 $y = 182.84x$ $R^2 = 0.9836$

The correlation for peak 2 $y = 92.254x$ $R^2 = 0.9925$

The correlation for peak 3 $y = 58.529x$ $R^2 = 0.9942$

The correlation for peak 4 $y = 135.6x$ $R^2 = 0.9907$

Table C-2 The retention time and peak area of Comperlan KD in water phase for soybean extraction

% NaCl	Peak	Retention Time	Peak Area	%
5	1	15.214	1665213	2.277
		15.183	1254723	1.716
		15.157	1528530	2.090
	2	25.404	657960	1.783
		25.454	691968	1.875
		25.422	733940	1.990
	3	34.494	375764	1.605
		34.547	412041	1.760
		34.611	437213	1.868
	4	36.484	858692	1.583
		36.553	965824	1.781
		36.518	995152	1.835
Average	1.812	1.783	1.945	1.845
SD	0.323	0.673	0.117	0.1690

Table C-2(Cont.) The retention time and peak area of Comperlan KD in water phase for soybean extraction

% NaCl	Peak	Retention Time	Peak Area	%
7.5	1	15.470	1348767	1.844
		14.927	1840976	2.517
		15.242	1474000	2.015
	2	28.248	797518	2.161
		25.111	808669	2.191
		25.405	810149	2.195
	3	34.328	453469	1.937
		34.222	497689	2.126
		34.563	475906	2.033
	4	36.319	987316	1.820
		36.198	1075514	1.983
		36.495	1050096	1.936
Average	1.941	2.204	2.045	2.063
SD	0.155	0.226	0.109	0.163

Table C-2(Cont.) The retention time and peak area of Comperlan KD in water phase for soybean extraction

% NaCl	Peak	Retention Time	Peak Area	%
10	1	14.921	1131357	1.547
		15.312	1048547	1.434
		14.965	834866	1.142
	2	25.320	608108	1.648
		25.573	547240	1.482
		25.200	468175	1.268
	3	34.551	3343409	1.428
		34.670	337167	1.44
		34.309	304114	1.300
	4	36.532	812726	1.498
		36.613	872759	1.610
		36.292	826824	1.524
Average	1.530	1.491	1.308	1.443
SD	0.923	0.082	0.1593	0.111

Table C-2(Cont.) The retention time and peak area of Comperlan KD in water phase for soybean extraction

% NaCl	Peak	Retention Time	Peak Area	%
12.5	1	15.042	1061295	1.451
		15.022	1075751	1.471
		15.362	985117	1.347
	2	25.339	560058	1.518
		25.200	524809	1.422
		25.541	532418	1.423
	3	34.488	342510	1.463
		34.225	308037	1.316
		34.617	317054	1.354
	4	36.436	834217	1.538
		36.301	717781	1.318
		36.580	749608	1.382
Average	1.493	1.382	1.381	1.419
SD	0.042	0.078	0.044	0.054

Table C-3 The retention time and peak area in water phase for system 3% Comperlan KD and 0.1% Alfoterra145-5PO at 10% NaCl for palm kernel oil extraction

% NaCl	Peak	Retention Time	Peak Area	%
10	1	15.294	543356	0.934
		15.282	1040224	1.778
		14.995	639700	1.093
	2	25.378	281586	0.954
		25.387	471425	1.597
		25.046	274083	0.928
	3	34.452	170124	0.908
		34.486	247545	1.322
		34.230	148434	0.792
Average	0.931991	1.565	0.938	1.145
SD	0.022808	0.223	0.1506	0.364

Table C-4 The retention time and peak area in water phase for system 3% Comperlan KD and 0.1% Alfoterra5-8PO at 10% NaCl for kernel oil extraction

% NaCl	Peak	Retention Time	Peak Area	%
10	1	15.210	405876	0.694
		15.282	427013	0.730
		15.215	356756	0.610
	2	25.200	162353	0.550
		25.379	152896	0.518
		25.337	158968	0.538
	3	34.346	86144	0.460
		34.386	64313	0.343
		34.390	70922	0.379
Average	0.568	0.530	0.509	0.536
SD	0.118	0.412	0.118	0.309

Table C-5 Concentration of protein in water phase for soybean oil extraction

% NaCl	No.	Absorbance	Concentration (mg/L)	Average Concentration(mg/L)	SD
5	1	0.030	62.500		
	2	0.030	62.500		
	3	0.032	67.500	64.1667	2.887
7.5	1	0.032	65.000		
	2	0.026	55.000		
	3	0.029	60.000	60.000	5.000
10	1	0.026	55.000		
	2	0.031	62.500		
	3	0.026	52.500	56.667	5.204
12.5	1	0.011	22.500		
	2	0.008	17.500		
	3	0.018	37.500	25.833	10.408

Table C-6 Concentration of Alfoterra145-5PO in water phase for soybean oil extraction

% NaCl	No.	Concentration (M)	Concentration (%)	Average Concentration(%)	SD
5	1	0.00136	0.082		
	2	0.00135	0.082		
	3	0.00129	0.078	0.081	0.002
7.5	1	0.00111	0.067		
	2	0.00114	0.069		
	3	0.00106	0.064	0.067	0.002
10	1	0.00100	0.060		
	2	0.00100	0.060		
	3	0.00102	0.062	0.061	0.0006
12.5	1	0.00103	0.062		
	2	0.00102	0.061		
	3	0.00104	0.063	0.062	0.0008

Table C-7 Concentration of Alfoterra in water phase for palm kernel oil extraction at 10% NaCl

System	No.	Concentration (M)	Concentration (%)	Average Concentration(%)	SD
Alfoterra145-5PO	1	0.00165	0.099		
	2	0.00164	0.099		
	3	0.00160	0.097	0.099	0.002
Alfoterra5-8PO	1	0.00128	0.093		
	2	0.00123	0.088		
	3	0.00124	0.090	0.090	0.002

Table C-8 The Fatty acid composition of palm kernel oil from hexane extraction

----- begin report -----

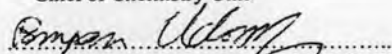
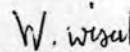
Test Report**Report No.** C 1363/07**Client Name/ Address:** Miss Apasee Naksuk 17 Mu 8 Srihaburanukit Road., Minburi., Bangkok 10510**Sampler:** Client**The below sample(s) submitted by client as :****Sample Description:** Oil

Quantity : one test tube , volume 5 ml

Laboratory Code/Number : C 1363/07**Client Reference Number :** Hexane extraction**Date of Sample Reception:** 12 March 2007**Date of Commenced:** 15 March 2007**Test Result**

State of Detection	Result (% fatty acid found)	Test Method
Methyl Dodecanoate	49.41	GC-FID
Methyl Myristate	17.56	GC-FID
Methyl Palmitate	9.24	GC-FID
Methyl Stearate	2.73	GC-FID
Methyl Oleate	18.18	GC-FID
Methyl Linoleate	2.88	GC-FID
Methyl Linolenate	ND	GC-FID

----- end report -----


(Attawiriyasuk, Kukiatt)
Chief of Chemistry Unit

(Udomkanjananan, Pornpan, Assistant Prof.)
Co-ordinator of Chemistry Advisory Committee (for)Sealed and signed for and on behalf of
Food Research and Testing Laboratory
Faculty of Science, Chulalongkorn University

(Wisutrimaneekul, Waraporn., Ph.D)
Laboratory Manager

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Table C-9 The Fatty acid composition of palm kernel oil from surfactant aqueous-based system mixed 3% Comperlan KD and 0.1% Alfoterra145-5 PO at 10% NaCl

Test Report

Report No. C 1364/07

Client Name/ Address: Miss Apasee Naksuk 17 Mu 8 Srihaburanukit Road., Minburi., Bangkok 10510

Sampler: Client

The below sample(s) submitted by client as :

Sample Description: Oil

Quantity : one test tube , volume 5 ml

Laboratory Code/Number : C 1364/07

Client Reference Number : Micro emulsion 105.5 eo

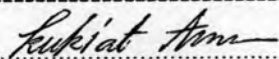
Date of Sample Reception: 12 March 2007

Date of Commenced: 15 March 200

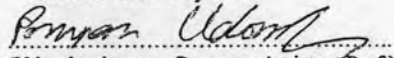
Test Result

State of Detection	Result (% fatty acid found)	Test Method
Methyl Dodecanoate	49.52	GC-FID
Methyl Myristate	17.44	GC-FID
Methyl Palmitate	9.17	GC-FID
Methyl Stearate	2.74	GC-FID
Methyl Oleate	18.21	GC-FID
Methyl Linoleate	2.92	GC-FID
Methyl Linolenate	Not detected	GC-FID

----- end report -----

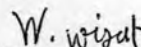


(Attawiriyasuk, Kukiat)
Chief of Chemistry Unit



(Udomkanjananan, Pompan, Assistant Prof.)
Co-ordinator of Chemistry Advisory Committee(for)

Sealed and signed for and on behalf of
Food Research and Testing Laboratory
Faculty of Science, Chulalongkorn University



(Wisutrimaneekul, Waraporn., Ph.D)
Laboratory Manager

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Table C-10 The Fatty acid composition of palm kernel oil from surfactant aqueous-based system mixed 3% Comperlan KD and 0.1% Alfoterra5-8 PO at 10% NaCl

Test Report

Report No.C 1365/07

Client Name/ Address: Miss Apasee Naksuk 17 Mu 8 Srihaburanukit Road.,Minburi.,Bangkok 10510

Sampler: Client

The below sample(s) submitted by client as :

Sample Description: Oil

Quantity : one test tube ,volume 5 ml

Laboratory Code/Number : C 1365/07

Client Reference Number : Micro emulsion 8 eo

Date of Sample Reception: 12 March 2007

Date of Commenced: 15 March 200

Test Result

State of Detection	Result (% fatty acid found)	Test Method
Methyl Dodecanoate	49.69	GC-FID
Methyl Myristate	17.47	GC-FID
Methyl Palmitate	9.15	GC-FID
Methyl Stearate	2.74	GC-FID
Methyl Oleate	18.05	GC-FID
Methyl Linoleate	2.90	GC-FID
Methyl Linolenate	Not detected	GC-FID

----- end report -----

Kukiatt Arun

(Attawiriyasuk,Kukiatt)
Chief of Chemistry Unit

Pornpan Udom

(Udomkanjananan,Pornpan, Assistant Prof.)
Co-ordinator of Chemistry Advisory Committee(for)

Sealed and signed for and on behalf of
Food Research and Testing Laboratory
Faculty of Science, Chulalongkorn University

W. wisat

(Wisutrimaneekul,Waraporn., Ph.D)
Laboratory Manager

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Table C-11 The amount of water in extracted oil from 3 systems; hexane extraction, surfactant aqueous-based system mixed 3% Comperlan KD and 0.1% Alfoterra145-5 PO and mixed 3% Comperlan KD and 0.1% Alfoterra5-8 PO respectively at 10% NaCl

Sample type : Oil
 Number of sample : 3
 Instrument used : KF Titrator
 Date of receiving : March 19, 2007
 Date of analysis : March 21, 2007

Result

Sample Name	Water Content (%)	Average
1	0.3560, 0.4173, 0.3811, 0.3886	0.3857
2	0.2030, 0.1712, 0.2249, 0.1649	0.1910
3	0.2339, 0.2134, 0.2229	0.2234

Analyzed by :

PMIRA

Approved by :

(Ms. Pastra Somboonthanate)

Researcher

(Assoc. Prof. Dr. Suwabun Chirachanchai)

Deputy Director for Research Affairs

N.B. The result is valid for sample analyzed only.

Appendix D Re-Use surfactant study

**Table D-1 Re-Use surfactant system for extraction for mixed 3% Comperlan KD and 0.1% Alfoterra145-5PO
3% Comperlan KD and 0.1% Alfoterra5-8PO at 10% NaCl**

No	Load(g)	V(cm ³)	% Extraction	Average % Extraction	SD
1	1.0038	0.400	74.638		
2	1.0034	0.418	78.935		
3	1.0012	0.407	76.970	76.848	2.151

**Table D-2 Re-Use surfactant system for extraction for mixed 3% Comperlan KD and 0.1% Alfoterra145-5PO
3% Comperlan KD and 0.1% Alfoterra5-8PO at 10% NaCl**

No	Load(g)	V(cm ³)	% Extraction	Average % Extraction	SD
1	1.0033	0.430	81.076		
2	1.0007	0.396	74.869		
3	1.0008	0.373	70.584	75.510	5.275

BIOGRAPHY

Miss Apasee Naksuk was born on October 12, 1983 in Bangkok, Thailand. She graduated her Bachelor's degree in Environmental Resource Chemistry from Faculty of Science, King Mongkut's Institute of Technology Ladkrabang in 2004. She pursued her Master's degree studies at the International Post graduated Programs in Environmental Management (Hazardous Waste Management), Inter-Department of Environmental Management, Chulalongkorn University Thailand. She finished her Master's of Science Degree in Environmental Management in May 2007.

