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APPENDICES

Appendix A Calibration curves for the extraction of aromatic with single and mixed solvents

The following calibration curves were used throughout the extractions:

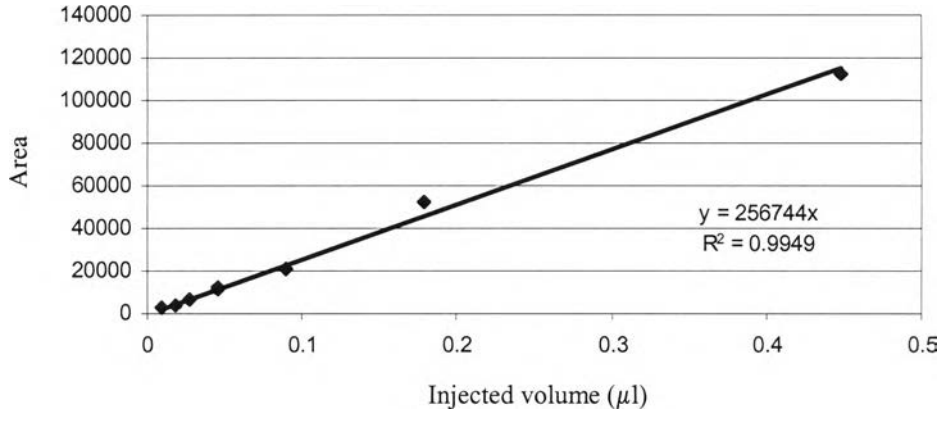

Figure A1 Calibration curve of benzene.

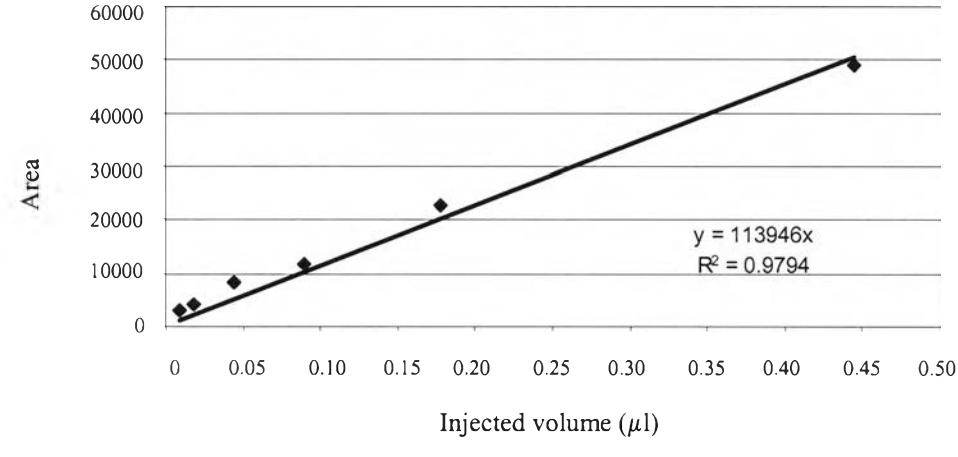

Figure A2 Calibration curve of toluene.

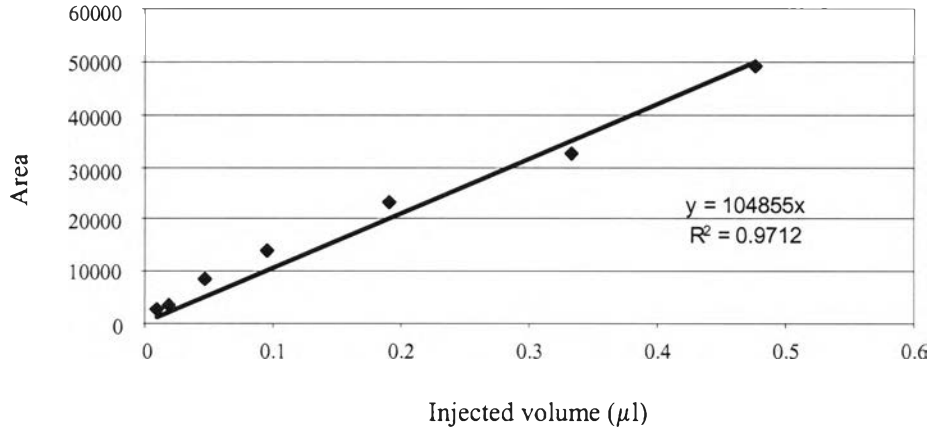

Figure A3 Calibration curve of *p*-xylene.

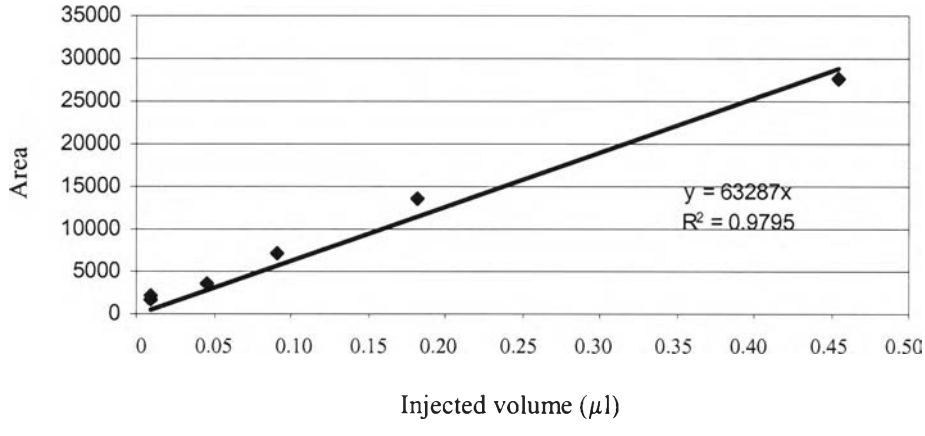

Figure A4 Calibration curve of *n*-hexane.

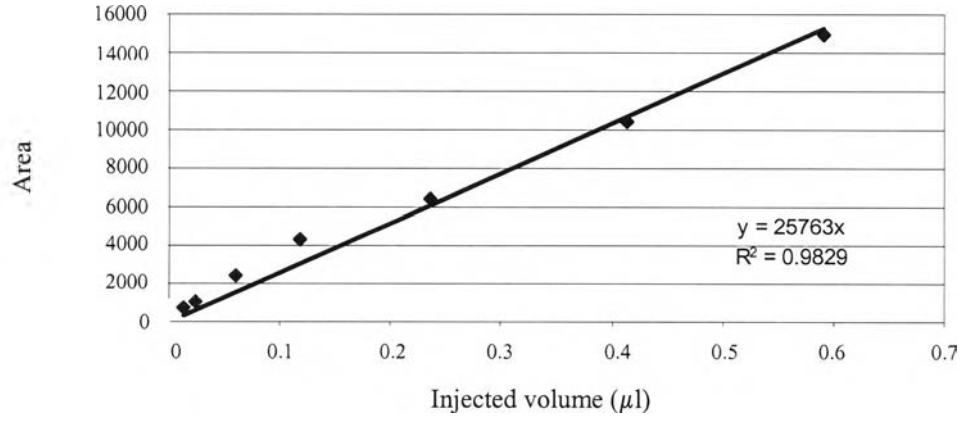

Figure A5 Calibration curve of ethylene glycol (EG).

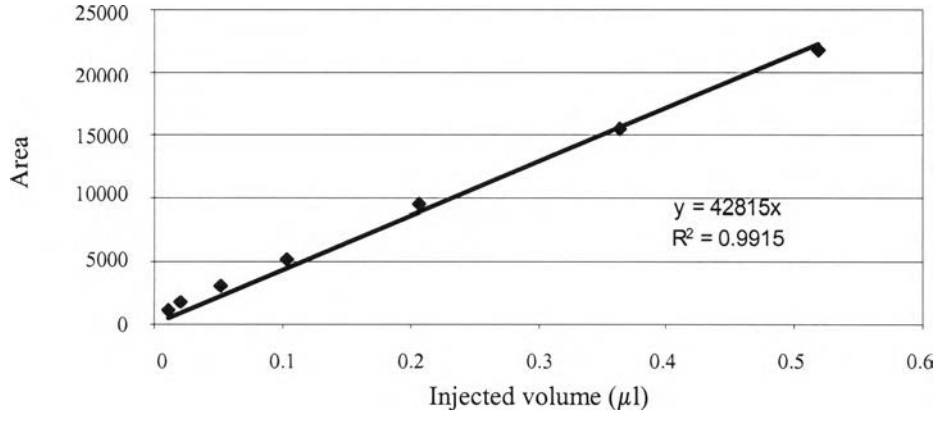

Figure A6 Calibration curve of dimethylsulfoxide (DMSO).

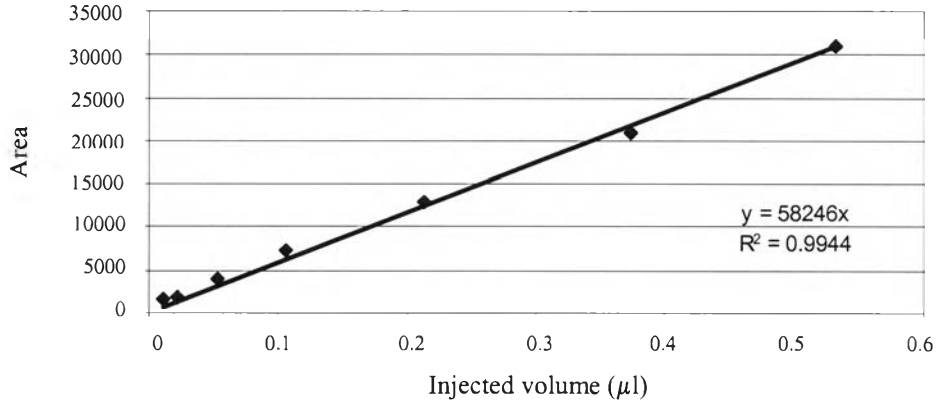

Figure A7 Calibration curve of sulfolane.

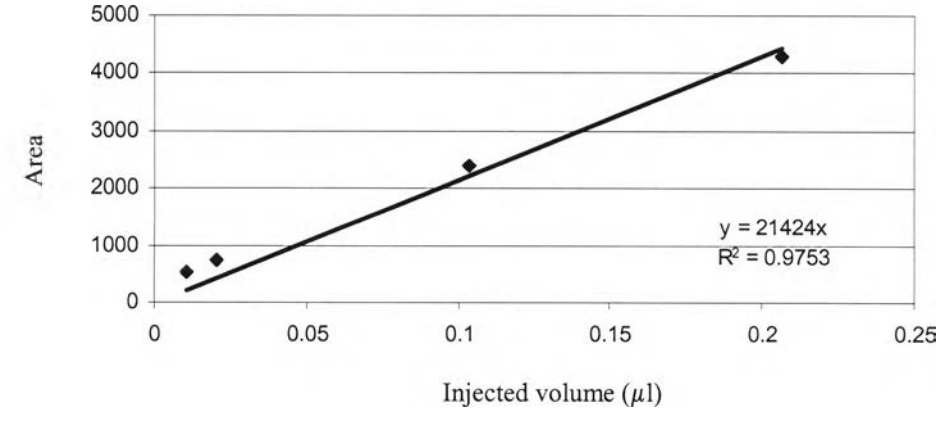

Figure A8 Calibration curve of ethylene carbonate (EC).

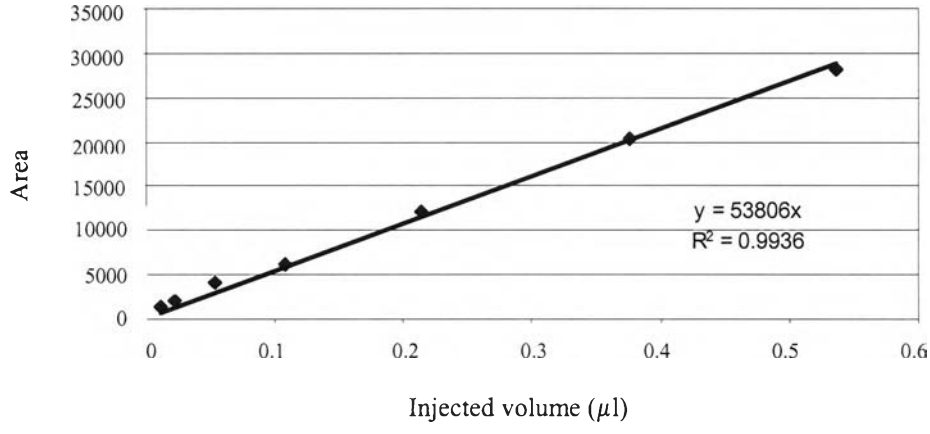

Figure A9 Calibration curve of 3-methoxypropionitrile (3MOPN).

Appendix B Sample of calculation

B1 Mass fraction

As the peak area was automatically calculated by the program accompanied with the gas chromatograph (GC), the mass fractions of the individual components were calculated by using the earlier-shown relationships as follow:

The first one is the calculation of the weight injected of the each component,

weight injected of the paraffin = (Peak area of the paraffin) (slope from the calibration curve of the paraffin)

weight injected of the aromatic = (Peak area of the aromatic) (slope from the calibration curve of the aromatic)

weight injected of the solvent = (Peak area of the solvent) (slope from the calibration curve of the solvent)

then calculate the total weight injected,

total weight injected = (weight injected of the paraffin) + (weight injected of the aromatic) + (weight injected of the solvent(s))

thus, the weight fraction of the component can be calculate,

weight fraction of the paraffin = (weight injected of the paraffin)/ (total weight injected)

weight fraction of the aromatic = (weight injected of the aromatic)/ (total weight injected)

weight fraction of the solvent = (weight injected of the solvent)/ (total weight injected)

B2 Mass balance of the extraction

The mass balance of the extraction was calculated to monitor the weight loss from the extraction system. The calculation diagram of the extraction is show in Figure B1.

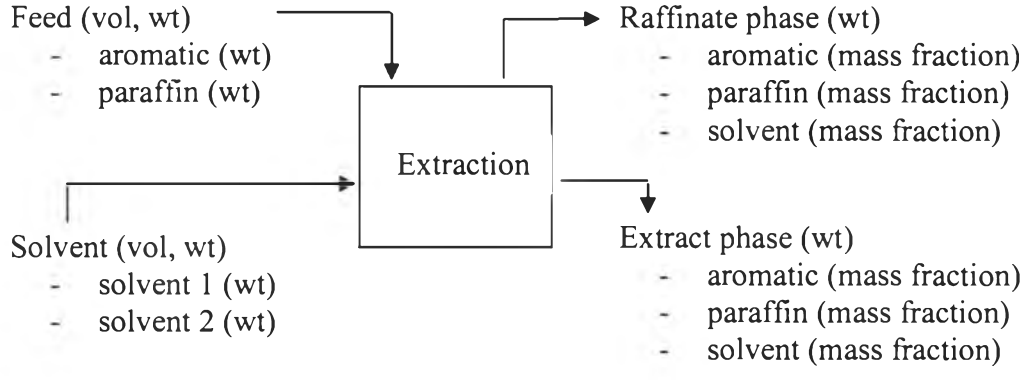

Figure B1 Numerical data of feed, solvent, raffinate phase, and extract phase of the aromatic/paraffin/solvent system.

With the calculation and diagram as mentioned above, the overall calculated weight loss was in the range of 6.5 to 6.8 %. For ease of understanding, a system of Benzene/Hexane/EG, at solvent-to-feed ratio of 3:1 and temperature of 50°C, is chosen as an example of calculation. The numerical data for calculation of the system was shown in Figure B2.

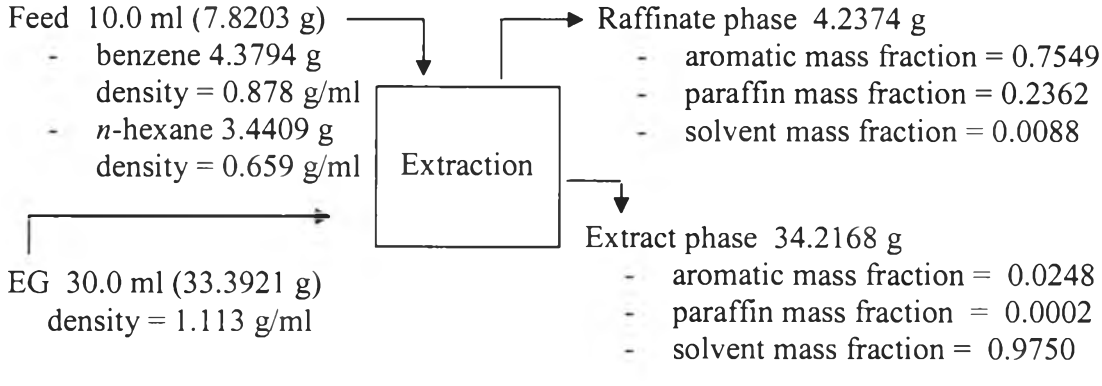

Figure B2 Numerical data of feed, solvent, raffinate phase, and extract phase of the Benzene/Hexane/EG system at 50°C and solvent-to-feed ratio of 3:1.

From the numerical data in Figure B2, the numerical data were analyzed as shown in Table B1. The weight loss calculated during the experiment of the system was around 6.70 wt%.

Table B1 Numerical and calculated data of the extraction of Benzene/Hexane/EG system at 50°C and solvent-to-feed ratio of 3:1

	Phase			
	Before extraction		After extraction	
	Solvent	Feed	Extract	Raffinate
Volume (ml)	30	10	-	-
Weight (g)	33.3921	7.8203	34.2168	4.2374
Fraction				
Hexane	0	0.44	0.0002	0.2362
Benzene	0	0.56	0.0248	0.7549
EG	1	0	0.9750	0.0088
total	1	1	1.0000	0.9998
Weight (g)				
Hexane	0	3.440932	0.0083	1.0007
Benzene	0	4.379368	0.8477	3.1987
EG	33.3921	0	33.3602	0.0372
total	33.3921	7.8203	34.2162	4.2366
Total (g)	41.2124		38.4528	
Loss (wt%)	6.70			

Appendix C Numerical data obtained from the extraction of aromatic with single solvent

Table C1 Numerical data of hexane/aromatic/EG systems

No.	Aromatic	Condition		Extract Phase				Raffinate Phase				Capacity	Selectivity
		Temp	S/F Ratio	Paraffin	Aromatic	Solvent	Total	Paraffin	Aromatic	Solvent	Total		
1			1 to 1	0.0003	0.0323	0.9674	1.0000	0.1965	0.7969	0.0033	0.9967	0.040	27.511
2	Benzene	30	2 to 1	0.0001	0.0253	0.9744	0.9998	0.2122	0.7760	0.0036	0.9919	0.033	53.499
3			3 to 1	0.0001	0.0247	0.9750	0.9998	0.2238	0.7727	0.0007	0.9972	0.032	53.596
4			1 to 1	0.0002	0.0138	0.9851	0.9991	0.2185	0.7523	0.0015	0.9723	0.018	16.967
5	Toluene	30	2 to 1	0.0002	0.0130	0.9857	0.9990	0.2211	0.7396	0.0010	0.9617	0.018	16.066
6			3 to 1	0.0003	0.0134	0.9859	0.9995	0.2091	0.7697	0.0029	0.9818	0.017	13.787
7			1 to 1	0.0002	0.0078	0.9912	0.9992	0.1782	0.7873	0.0018	0.9673	0.010	9.911
8	*p*-Xylene	30	2 to 1	0.0002	0.0079	0.9911	0.9992	0.1907	0.7627	0.0019	0.9553	0.010	11.876
9			3 to 1	0.0002	0.0075	0.9919	0.9995	0.2019	0.7734	0.0021	0.9774	0.010	10.498
10			1 to 1	0.0003	0.0359	0.9636	0.9998	0.2136	0.7790	0.0017	0.9943	0.046	31.987
11	Benzene	40	2 to 1	0.0002	0.0321	0.9675	0.9998	0.2316	0.7592	0.0021	0.9929	0.042	40.452
12			3 to 1	0.0002	0.0311	0.9686	1.0000	0.2409	0.7554	0.0017	0.9980	0.041	41.197
13			1 to 1	0.0002	0.0138	0.9857	0.9997	0.2178	0.7542	0.0015	0.9735	0.018	16.639
14	Toluene	40	2 to 1	0.0002	0.0133	0.9836	0.9971	0.2231	0.7593	0.0029	0.9854	0.017	16.052
15			3 to 1	0.0002	0.0127	0.9870	0.9999	0.2161	0.7657	0.0035	0.9853	0.017	15.600
16			1 to 1	0.0002	0.0087	0.9911	0.9999	0.1916	0.8051	0.0017	0.9983	0.011	10.702
17	*p*-Xylene	40	2 to 1	0.0003	0.0086	0.9911	0.9999	0.1756	0.8188	0.0017	0.9961	0.011	7.247
18			3 to 1	0.0002	0.0086	0.9911	1.0000	0.2047	0.7915	0.0021	0.9983	0.011	9.820
19			1 to 1	0.0003	0.0348	0.9649	1.0000	0.2130	0.7827	0.0021	0.9978	0.044	28.858
20	Benzene	50	2 to 1	0.0003	0.0321	0.9672	0.9996	0.2298	0.7523	0.0025	0.9846	0.043	32.289
21			3 to 1	0.0002	0.0248	0.9750	1.0000	0.2362	0.7549	0.0088	0.9998	0.033	32.099
22			1 to 1	0.0002	0.0123	0.9875	1.0000	0.2210	0.7766	0.0014	0.9991	0.016	21.184
23	Toluene	50	2 to 1	0.0004	0.0153	0.9839	0.9996	0.2367	0.7427	0.0025	0.9820	0.021	13.164
24			3 to 1	0.0002	0.0143	0.9854	0.9999	0.2359	0.7575	0.0016	0.9950	0.019	19.367
25			1 to 1	0.0002	0.0073	0.9958	1.0033	0.1981	0.7960	0.0033	0.9973	0.009	10.344
26	*p*-Xylene	50	2 to 1	0.0002	0.0088	0.9909	0.9999	0.1937	0.7880	0.0181	0.9998	0.011	13.104
27			3 to 1	0.0002	0.0087	0.9909	0.9998	0.2020	0.7196	0.0701	0.9917	0.012	12.062

Table C2 Numerical data of hexane/aromatic/DMSO systems

No.	Aromatic	Condition		Extract Phase				Raffinate Phase				Capacity	Selectivity
		Temp	S/F Ratio	Paraffin	Aromatic	Solvent	Total	Paraffin	Aromatic	Solvent	Total		
1			1 to 1	0.0275	0.3816	0.5904	0.9995	0.5775	0.4070	0.0139	0.9984	0.937	19.684
2	Benzene	30	2 to 1	0.0294	0.2669	0.7004	0.9967	0.7334	0.2533	0.0086	0.9952	1.054	26.245
3			3 to 1	0.0386	0.2384	0.7223	0.9994	0.7942	0.1967	0.0079	0.9988	1.212	24.936
4			1 to 1	0.0164	0.3093	0.6706	0.9963	0.5972	0.3857	0.0131	0.9959	0.802	29.262
5	Toluene	30	2 to 1	0.0242	0.2821	0.6916	0.9979	0.6627	0.3198	0.0136	0.9961	0.882	24.146
6			3 to 1	0.0283	0.2264	0.7443	0.9990	0.7075	0.2806	0.0091	0.9972	0.807	20.155
7			1 to 1	0.0123	0.1361	0.8508	0.9992	0.1966	0.7777	0.0220	0.9963	0.175	2.804
8	*p*-Xylene	30	2 to 1	0.0130	0.1591	0.8274	0.9996	0.2500	0.6765	0.0719	0.9984	0.235	4.509
9			3 to 1	0.0156	0.1999	0.7815	0.9970	0.2707	0.6665	0.0614	0.9986	0.300	5.197
10			1 to 1	0.0283	0.3307	0.6406	0.9996	0.6868	0.2990	0.0138	0.9995	1.106	26.854
11	Benzene	40	2 to 1	0.0473	0.2571	0.6953	0.9996	0.7891	0.2005	0.0104	0.9999	1.282	21.410
12			3 to 1	0.0387	0.2050	0.7559	0.9996	0.8320	0.1604	0.0072	0.9996	1.278	27.508
13			1 to 1	0.0205	0.3918	0.5866	0.9989	0.5359	0.4413	0.0216	0.9988	0.888	23.240
14	Toluene	40	2 to 1	0.0233	0.2652	0.7103	0.9989	0.6188	0.3520	0.0280	0.9987	0.753	20.018
15			3 to 1	0.0259	0.2050	0.7690	0.9998	0.5725	0.3831	0.0217	0.9772	0.535	11.849
16			1 to 1	0.0216	0.1340	0.8434	0.9990	0.4031	0.5871	0.0091	0.9993	0.228	4.265
17	*p*-Xylene	40	2 to 1	0.0228	0.2211	0.7544	0.9984	0.4953	0.4903	0.0118	0.9973	0.451	9.779
18			3 to 1	0.0249	0.1277	0.8460	0.9986	0.6254	0.3616	0.0095	0.9965	0.353	8.859
19			1 to 1	0.0408	0.3753	0.5741	0.9902	0.6076	0.3697	0.0207	0.9980	1.015	15.133
20	Benzene	50	2 to 1	0.0304	0.2808	0.6880	0.9993	0.7129	0.2724	0.0131	0.9984	1.031	24.140
21			3 to 1	0.0476	0.2271	0.7244	0.9992	0.7241	0.2490	0.0252	0.9983	0.912	13.874
22			1 to 1	0.0213	0.3366	0.6358	0.9937	0.4716	0.4957	0.0250	0.9923	0.679	15.060
23	Toluene	50	2 to 1	0.0265	0.2783	0.6935	0.9983	0.6217	0.3565	0.0195	0.9978	0.781	18.347
24			3 to 1	0.0312	0.2234	0.7440	0.9987	0.6811	0.2732	0.0441	0.9983	0.818	17.827
25			1 to 1	0.0192	0.2956	0.6796	0.9944	0.4165	0.5495	0.0269	0.9929	0.538	11.673
26	*p*-Xylene	50	2 to 1	0.0277	0.2040	0.7662	0.9979	0.4644	0.5125	0.0200	0.9969	0.398	6.666
27			3 to 1	0.0238	0.1810	0.7950	0.9998	0.4751	0.5089	0.0156	0.9996	0.356	7.103

Table C3 Numerical data of hexane/aromatic/sulfolane systems

No.	Aromatic	Condition		Extract Phase				Raffinate Phase				Capacity	Selectivity
		Temp	S/F Ratio	Paraffin	Aromatic	Solvent	Total	Paraffin	Aromatic	Solvent	Total		
1			1 to 1	0.0051	0.2801	0.7148	0.2649	0.7098	0.0253	0.3946	20.4889	0.509	20.490
2	Benzene	30	2 to 1	0.0049	0.2029	0.7935	0.4229	0.5615	0.0156	0.3614	31.4036	0.478	31.475
3			3 to 1	0.0051	0.1472	0.8466	0.5144	0.4548	0.0307	0.3236	32.6016	0.387	50.850
4			1 to 1	0.0062	0.1499	0.8381	0.3191	0.6230	0.0526	0.2407	12.2971	0.304	12.356
5	Toluene	30	2 to 1	0.0056	0.1153	0.8787	0.4139	0.5480	0.0348	0.2104	15.6615	0.271	24.813
6			3 to 1	0.0051	0.0908	0.9039	0.5124	0.4548	0.0592	0.1997	19.8712	0.260	19.865
7			1 to 1	0.0028	0.1069	0.8901	0.2539	0.7160	0.0291	0.1494	13.3773	0.176	13.377
8	*p*-Xylene	30	2 to 1	0.0045	0.1025	0.8927	0.3033	0.6661	0.0797	0.1538	10.3259	0.183	10.326
9			3 to 1	0.0045	0.0852	0.9099	0.3037	0.5505	0.1442	0.1548	10.5313	0.182	10.531
10			1 to 1	0.0065	0.2690	0.7248	0.3418	0.6035	0.0546	0.4458	23.3003	0.496	19.439
11	Benzene	40	2 to 1	0.0063	0.2095	0.7428	0.4634	0.5215	0.0148	0.4017	29.6611	0.323	33.204
12			3 to 1	0.0061	0.1335	0.8597	0.5668	0.4198	0.0117	0.3181	29.3660	0.430	39.972
13			1 to 1	0.0063	0.1474	0.8444	0.3019	0.6134	0.0662	0.2403	11.5986	0.300	11.599
14	Toluene	40	2 to 1	0.0044	0.1121	0.8819	0.3974	0.5662	0.0307	0.1981	17.7380	0.254	17.739
15			3 to 1	0.0044	0.0763	0.9186	0.3458	0.5541	0.0958	0.1377	10.7061	0.176	10.706
16			1 to 1	0.0040	0.1053	0.8889	0.2498	0.7045	0.0378	0.1495	9.4155	0.176	9.415
17	*p*-Xylene	40	2 to 1	0.0052	0.1003	0.8932	0.2809	0.6810	0.0324	0.1472	7.8992	0.174	7.899
18			3 to 1	0.0051	0.0924	0.9020	0.3237	0.6465	0.0276	0.1429	9.0283	0.171	9.028
19			1 to 1	0.0070	0.2935	0.8495	0.2757	0.6917	0.0300	0.4244	16.7599	0.542	16.760
20	Benzene	50	2 to 1	0.0066	0.2186	0.7736	0.3821	0.5857	0.0213	0.3732	21.6571	0.489	21.658
21			3 to 1	0.0065	0.1366	0.8563	0.4715	0.5084	0.0166	0.2686	19.4724	0.366	27.830
22			1 to 1	0.0064	0.1668	0.8262	0.3190	0.6428	0.0365	0.2595	13.0187	0.326	13.019
23	Toluene	50	2 to 1	0.0063	0.1239	0.8686	0.3192	0.5131	0.0359	0.2415	12.2485	0.272	12.748
24			3 to 1	0.0054	0.0854	0.9090	0.3978	0.5525	0.0473	0.1546	11.4589	0.199	11.459
25			1 to 1	0.0025	0.1450	0.8522	0.1581	0.7982	0.0434	0.1816	11.3581	0.208	11.358
26	*p*-Xylene	50	2 to 1	0.0054	0.1099	0.8831	0.2876	0.6678	0.0391	0.1645	8.7361	0.195	8.736
27			3 to 1	0.0033	0.0703	0.9262	0.3115	0.6547	0.0334	0.1074	10.1313	0.129	10.131

Table C4 Numerical data of hexane/aromatic/EC systems

No.	Aromatic	Condition		Extract Phase				Raffinate Phase				Capacity	Selectivity
		Temp	S/F Ratio	Paraffin	Aromatic	Solvent	Total	Paraffin	Aromatic	Solvent	Total		
1			1 to 1	0.0025	0.2295	0.7679	0.9998	0.2870	0.7059	0.0057	0.9986	0.325	38.067
2	Benzene	40	2 to 1	0.0021	0.1408	0.8569	0.9999	0.3909	0.6043	0.0043	0.9994	0.233	42.529
3			3 to 1	0.0017	0.1223	0.8759	1.0000	0.4478	0.5476	0.0039	0.9994	0.223	57.738
4			1 to 1	0.0022	0.1156	0.8817	0.9995	0.2778	0.7072	0.0122	0.9973	0.163	20.407
5	Toluene	40	2 to 1	0.0020	0.0839	0.9140	0.9998	0.2911	0.6738	0.0328	0.9977	0.124	18.427
6			3 to 1	0.0017	0.0656	0.9326	0.9999	0.3746	0.5600	0.0642	0.9988	0.117	25.914
7			1 to 1	0.0005	0.0250	0.9742	0.9997	0.2362	0.7527	0.0105	0.9994	0.033	14.767
8	*p*-Xylene	40	2 to 1	0.0029	0.0869	0.9102	0.9999	0.2616	0.7251	0.0086	0.9953	0.120	10.918
9			3 to 1	0.0022	0.0687	0.9289	0.9997	0.2881	0.7014	0.0078	0.9973	0.098	12.951
10			1 to 1	0.0026	0.2144	0.7827	0.9998	0.2901	0.7027	0.0061	0.9989	0.305	33.575
11	Benzene	50	2 to 1	0.0024	0.1592	0.8382	0.9998	0.3734	0.6183	0.0059	0.9977	0.257	40.037
12			3 to 1	0.0022	0.1466	0.8512	1.0000	0.3700	0.4776	0.1506	0.9981	0.307	50.644
13			1 to 1	0.0024	0.0834	0.9140	0.9998	0.2775	0.7071	0.0142	0.9988	0.118	13.869
14	Toluene	50	2 to 1	0.0023	0.0832	0.9143	0.9998	0.3303	0.6350	0.0320	0.9973	0.131	19.159
15			3 to 1	0.0015	0.0492	0.9488	0.9995	0.3626	0.6177	0.0123	0.9925	0.080	18.978
16			1 to 1	0.0024	0.0922	0.9042	0.9988	0.2186	0.7649	0.0114	0.9948	0.121	10.810
17	*p*-Xylene	50	2 to 1	0.0030	0.0826	0.9134	0.9990	0.2525	0.7325	0.0104	0.9953	0.113	9.528
18			3 to 1	0.0028	0.0718	0.9252	0.9998	0.2623	0.7236	0.0131	0.9991	0.099	9.261

Table C5 Numerical data of hexane/aromatic/3MOPN systems

No.	Aromatic	Condition		Extract Phase				Raffinate Phase				Capacity	Selectivity
		Temp	S/F Ratio	Paraffin	Aromatic	Solvent	Total	Paraffin	Aromatic	Solvent	Total		
1	Benzene	30	1 to 1	0.1017	0.3363	0.5612	0.9992	0.6658	0.2674	0.0653	0.9985	1.258	8.229
2	Benzene	40	1 to 1	0.2355	0.3207	0.4438	1.0000	0.6038	0.2886	0.1074	0.9998	1.111	2.849

Appendix D Numerical data obtained from the extraction of aromatic with mixed solvents

Table D1 Numerical data of hexane/aromatic/ EG/3MOPN (70/30) systems

No.	Aromatic	Condition		Extract Phase				Raffinate Phase				Capacity	Selectivity
		Temp	S/F Ratio	Paraffin	Aromatic	Solvents	Total	Paraffin	Aromatic	Solvents	Total		
1			1 to 1	0.0016	0.0293	0.9678	0.9987	0.5344	0.2833	0.1714	0.9891	0.103	34.863
2	Benzene	30	2 to 1	0.0019	0.0325	0.9643	0.9987	0.4566	0.2927	0.2356	0.9849	0.111	26.313
3			3 to 1	0.0013	0.0331	0.9639	0.9983	0.4704	0.3166	0.2050	0.9919	0.105	39.274
4			1 to 1	0.0009	0.0244	0.9742	0.9995	0.3411	0.5148	0.1415	0.9974	0.047	18.299
5	Toluene	30	2 to 1	0.0010	0.0275	0.9714	0.9999	0.2872	0.4424	0.2693	0.9988	0.062	17.086
6			3 to 1	0.0020	0.0384	0.9582	0.9987	0.2893	0.4338	0.2741	0.9972	0.089	12.740
7			1 to 1	0.0016	0.0227	0.9747	0.9991	0.3297	0.5205	0.1405	0.9907	0.044	9.185
8	*p*-Xylene	30	2 to 1	0.0016	0.0263	0.9711	0.9991	0.3142	0.4930	0.1850	0.9921	0.053	10.281
9			3 to 1	0.0022	0.0293	0.9666	0.9982	0.3025	0.4581	0.2249	0.9855	0.064	8.627
10			1 to 1	0.0038	0.0512	0.9446	0.9996	0.4834	0.3395	0.1753	0.9982	0.151	19.346
11	Benzene	40	2 to 1	0.0033	0.0424	0.9534	0.9991	0.4778	0.2894	0.2183	0.9855	0.147	21.534
12			3 to 1	0.0034	0.0397	0.9556	0.9987	0.6035	0.2605	0.1223	0.9863	0.152	26.875
13			1 to 1	0.0011	0.0281	0.9701	0.9993	0.3308	0.5152	0.1501	0.9961	0.055	16.553
14	Toluene	40	2 to 1	0.0015	0.0306	0.9672	0.9993	0.2715	0.4915	0.2333	0.9963	0.062	11.516
15			3 to 1	0.0043	0.0414	0.9530	0.9987	0.3052	0.4304	0.2524	0.9879	0.096	6.779
16			1 to 1	0.0015	0.0259	0.9719	0.9993	0.3950	0.4737	0.1247	0.9933	0.055	14.213
17	*p*-Xylene	40	2 to 1	0.0017	0.0273	0.9694	0.9984	0.3123	0.4744	0.1986	0.9853	0.057	10.253
18			3 to 1	0.0022	0.0316	0.9638	0.9977	0.3141	0.4655	0.2066	0.9863	0.068	9.576
19			1 to 1	0.0037	0.0434	0.9520	0.9991	0.5089	0.3696	0.1101	0.9886	0.117	16.169
20	Benzene	50	2 to 1	0.0038	0.0437	0.9517	0.9992	0.3931	0.3308	0.2625	0.9864	0.132	13.595
21			3 to 1	0.0050	0.0474	0.9465	0.9990	0.4902	0.2988	0.2002	0.9892	0.159	15.433
22			1 to 1	0.0027	0.0408	0.9561	0.9997	0.3512	0.5148	0.1286	0.9945	0.079	10.416
23	Toluene	50	2 to 1	0.0037	0.0592	0.9358	0.9987	0.2741	0.4978	0.2207	0.9926	0.119	8.879
24			3 to 1	0.0047	0.0542	0.9401	0.9990	0.3122	0.4312	0.2495	0.9929	0.126	8.342
25			1 to 1	0.0015	0.0270	0.9711	0.9997	0.2939	0.4991	0.2018	0.9949	0.054	10.418
26	*p*-Xylene	50	2 to 1	0.0017	0.0247	0.9733	0.9997	0.2559	0.5301	0.2115	0.9974	0.047	7.168
27			3 to 1	0.0024	0.0324	0.9645	0.9994	0.2814	0.5161	0.2003	0.9978	0.063	7.371

Table D2 Numerical data of hexane/aromatic/ EG/3MOPN (50/50) systems

No.	Aromatic	Condition		Extract Phase				Raffinate Phase				Capacity	Selectivity
		Temp	S/F Ratio	Paraffin	Aromatic	Solvents	Total	Paraffin	Aromatic	Solvents	Total		
1	Benzene	40	3 to 1	0.0207	0.0749	0.9040	0.9996	0.6903	0.2054	0.1022	0.9979	0.365	12.180
2	Toluene	40	3 to 1	0.0045	0.0440	0.9508	0.9993	0.1123	0.2568	0.6273	0.9963	0.171	4.320
3			1 to 1	0.0078	0.0564	0.9356	0.9998	0.3585	0.2799	0.3600	0.9984	0.201	9.208
4	Benzene	50	2 to 1	0.0228	0.0902	0.8870	1.0000	0.5642	0.2595	0.1763	0.9999	0.348	8.599
5			1 to 1	0.0113	0.0588	0.9296	0.9997	0.1241	0.3467	0.5273	0.9981	0.170	1.857
6	Toluene	50	2 to 1	0.0117	0.0846	0.9021	0.9984	0.0681	0.2371	0.6894	0.9946	0.357	2.084
7			3 to 1	0.0060	0.0620	0.9312	0.9992	0.2588	0.4333	0.3040	0.9962	0.143	6.143
8			1 to 1	0.0032	0.0416	0.9551	0.9999	0.2362	0.4642	0.2990	0.9994	0.090	6.614
9	*p*-Xylene	50	2 to 1	0.0056	0.0545	0.9399	1.0000	0.2042	0.3788	0.4169	0.9998	0.144	5.266
10			3 to 1	0.0125	0.0564	0.9312	1.0000	0.1019	0.2750	0.6229	0.9998	0.205	1.678

Table D3 Numerical data of hexane/aromatic/ EG/3MOPN (30/70) systems

No.	Aromatic	Condition		Extract Phase				Raffinate Phase				Capacity	Selectivity
		Temp	S/F Ratio	Paraffin	Aromatic	Solvents	Total	Paraffin	Aromatic	Solvents	Total		
1	Benzene	40	1 to 1	0.1304	0.2079	0.6611	0.9994	0.5701	0.2603	0.1681	0.9985	0.798	3.490
2			2 to 1	0.0523	0.1114	0.8358	0.9996	0.6898	0.1940	0.1151	0.9990	0.574	7.572
3	Toluene	40	1 to 1	0.0049	0.1280	0.8667	0.9998	0.1897	0.3669	0.4426	0.9993	0.349	13.35
4	*p*-Xylene	50	1 to 1	0.0133	0.0704	0.9158	0.9998	0.0928	0.2478	0.6590	0.9997	0.284	1.946
5			2 to 1	0.0155	0.0758	0.9077	0.9993	0.0845	0.2157	0.6981	0.9984	0.351	1.885

Table D4 Numerical data of hexane/aromatic/ EC/DMSO (50/50) systems

No.	Aromatic	Condition		Extract Phase				Raffinate Phase				Capacity	Selectivity
		Temp	S/F Ratio	Paraffin	Aromatic	Solvents	Total	Paraffin	Aromatic	Solvents	Total		
1			1 to 1	0.0044	0.1050	0.8897	0.9991	0.4947	0.4965	0.0077	0.9989	0.212	23.976
2	Benzene	30	2 to 1	0.0040	0.0751	0.9208	0.9999	0.5656	0.4259	0.0069	0.9984	0.176	25.137
3			3 to 1	0.0038	0.0601	0.9361	0.9999	0.6645	0.3264	0.0069	0.9977	0.184	32.236
4			1 to 1	0.0045	0.0983	0.8938	0.9966	0.4782	0.5027	0.0052	0.9862	0.195	20.989
5	Toluene	30	2 to 1	0.0049	0.0757	0.9170	0.9976	0.4222	0.5651	0.0057	0.9930	0.134	11.445
6			3 to 1	0.0049	0.0585	0.9358	0.9992	0.4052	0.5727	0.0081	0.9860	0.102	8.427
7			1 to 1	0.0038	0.0644	0.9314	0.9995	0.4034	0.5523	0.0378	0.9936	0.117	12.387
8	*p*-Xylene	30	2 to 1	0.0037	0.0747	0.9201	0.9984	0.4449	0.5350	0.0123	0.9923	0.140	16.831
9			3 to 1	0.0027	0.0687	0.9281	0.9995	0.4857	0.5010	0.0096	0.9964	0.137	25.101
10			1 to 1	0.0050	0.1824	0.8112	0.9986	0.3806	0.6109	0.0083	0.9999	0.299	22.568
11	Benzene	40	2 to 1	0.0052	0.1615	0.8309	0.9976	0.4554	0.5285	0.0033	0.9872	0.306	26.542
12			3 to 1	0.0047	0.1470	0.8459	0.9976	0.4831	0.5061	0.0036	0.9928	0.290	29.702
13			1 to 1	0.0047	0.1716	0.8232	0.9995	0.3395	0.6266	0.0213	0.9873	0.274	19.981
14	Toluene	40	2 to 1	0.0050	0.1509	0.8426	0.9985	0.4027	0.5802	0.0135	0.9964	0.260	20.871
15			3 to 1	0.0056	0.1408	0.8527	0.9991	0.4497	0.5368	0.0124	0.9990	0.262	20.914
16			1 to 1	0.0033	0.0985	0.8960	0.9978	0.4116	0.5717	0.0086	0.9918	0.172	21.626
17	*p*-Xylene	40	2 to 1	0.0034	0.0863	0.9095	0.9992	0.2898	0.6968	0.0072	0.9939	0.124	10.482
18			3 to 1	0.0031	0.0622	0.9341	0.9994	0.2782	0.7082	0.0068	0.9933	0.088	7.792
19			1 to 1	0.0051	0.1593	0.8342	0.9986	0.4440	0.5489	0.0036	0.9965	0.290	25.174
20	Benzene	50	2 to 1	0.0049	0.1254	0.8685	0.9988	0.5408	0.4528	0.0015	0.9952	0.277	30.553
21			3 to 1	0.0053	0.0925	0.9015	0.9993	0.5793	0.4134	0.0029	0.9956	0.224	24.218
22			1 to 1	0.0060	0.1580	0.8335	0.9975	0.3728	0.5769	0.0217	0.9714	0.274	16.948
23	Toluene	50	2 to 1	0.0065	0.1499	0.8417	0.9981	0.4294	0.5533	0.0063	0.9891	0.271	17.910
24			3 to 1	0.0062	0.1054	0.8874	0.9990	0.6021	0.3890	0.0042	0.9954	0.271	26.102
25			1 to 1	0.0028	0.0650	0.9252	0.9930	0.4075	0.5622	0.0059	0.9756	0.116	16.881
26	*p*-Xylene	50	2 to 1	0.0024	0.0426	0.9535	0.9984	0.4686	0.5115	0.0044	0.9845	0.083	16.279
27			3 to 1	0.0020	0.0485	0.9448	0.9953	0.4947	0.4850	0.0035	0.9832	0.100	24.154

Table D5 Numerical data of hexane/aromatic/ EC/DMSO (10/90) systems

No.	Aromatic	Condition		Extract Phase				Raffinate Phase				Capacity	Selectivity
		Temp	S/F Ratio	Paraffin	Aromatic	Solvents	Total	Paraffin	Aromatic	Solvents	Total		
1			1 to 1	0.0136	0.1092	0.8735	0.9964	0.7464	0.2185	0.0199	0.9848	0.500	27.462
2	Benzene	30	2 to 1	0.0120	0.1027	0.8818	0.9965	0.7389	0.2200	0.0198	0.9787	0.467	28.861
3			3 to 1	0.0152	0.0854	0.8967	0.9973	0.7328	0.1586	0.0946	0.9861	0.538	25.868
4			1 to 1	0.0021	0.0681	0.9285	0.9986	0.4563	0.5229	0.0093	0.9884	0.130	28.357
5	Toluene	30	2 to 1	0.0026	0.0617	0.9349	0.9993	0.4604	0.5242	0.0097	0.9942	0.118	20.941
6			3 to 1	0.0024	0.0419	0.9550	0.9993	0.4988	0.4884	0.0071	0.9943	0.086	17.665
7			1 to 1	0.0032	0.0569	0.9364	0.9965	0.4708	0.4790	0.0484	0.9981	0.119	17.229
8	*p*-Xylene	30	2 to 1	0.0033	0.0614	0.9345	0.9993	0.4799	0.4991	0.0190	0.9981	0.123	17.725
9			3 to 1	0.0038	0.0679	0.9279	0.9996	0.4633	0.5246	0.0091	0.9970	0.129	15.707
10			1 to 1	0.0356	0.1851	0.7768	0.9976	0.6827	0.2793	0.0295	0.9915	0.663	12.698
11	Benzene	40	2 to 1	0.0288	0.1783	0.7901	0.9972	0.6726	0.2837	0.0314	0.9877	0.629	14.704
12			3 to 1	0.0242	0.1671	0.8063	0.9976	0.6925	0.2796	0.0184	0.9905	0.598	17.071
13			1 to 1	0.0068	0.1526	0.8392	0.9986	0.4577	0.5098	0.0264	0.9939	0.299	20.242
14	Toluene	40	2 to 1	0.0093	0.1440	0.8456	0.9990	0.5136	0.4629	0.0191	0.9956	0.311	17.097
15			3 to 1	0.0046	0.0924	0.9015	0.9984	0.5573	0.4191	0.0143	0.9907	0.220	26.756
16			1 to 1	0.0056	0.0703	0.9201	0.9960	0.5042	0.4490	0.0308	0.9840	0.157	14.150
17	*p*-Xylene	40	2 to 1	0.0102	0.0882	0.8814	0.9798	0.5339	0.4221	0.0418	0.9978	0.209	10.955
18			3 to 1	0.0153	0.1082	0.8755	0.9990	0.5861	0.3801	0.0315	0.9977	0.285	10.935
19			1 to 1	0.0184	0.1737	0.8060	0.9981	0.7657	0.2095	0.0190	0.9941	0.829	34.470
20	Benzene	50	2 to 1	0.0271	0.1222	0.8499	0.9992	0.8129	0.1731	0.0106	0.9967	0.706	21.152
21			3 to 1	0.0107	0.0710	0.9175	0.9992	0.8596	0.1307	0.0068	0.9971	0.543	43.713
22			1 to 1	0.0093	0.1481	0.8382	0.9956	0.4664	0.4906	0.0294	0.9863	0.302	15.060
23	Toluene	50	2 to 1	0.0065	0.1022	0.8891	0.9978	0.4955	0.4767	0.0214	0.9935	0.214	16.342
24			3 to 1	0.0116	0.1081	0.8768	0.9965	0.4456	0.3794	0.1645	0.9895	0.285	10.985
25			1 to 1	0.0076	0.0797	0.9115	0.9988	0.5016	0.4770	0.0188	0.9975	0.167	11.042
26	*p*-Xylene	50	2 to 1	0.0126	0.1054	0.8814	0.9994	0.4995	0.4661	0.0324	0.9980	0.226	8.972
27			3 to 1	0.0103	0.0921	0.8969	0.9994	0.5357	0.4308	0.0319	0.9985	0.214	11.072

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