Supporting Information

Liquid-Liquid Phase Equilibrium for Quaternary Systems (n-Decane + 1-Tetradecene + 1-Methylnaphthalene + Sulfolane / Dimethyl Sulfoxide) for Separation of 1-Methylnaphthalene from FCC Diesel

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Table S1. Experimental Tie-Line Data (Mass Fraction) for *n*-Decane (1) + 1-Tetradecene (2) + 1-Methylnaphthalene (3) + Sulfolane (4) at Different Temperatures under 0.1 MPa[a]

T/K	Raffinate phase				Solvent phase				*D*	*S*
	w_1^{I}	w_2^{I}	w_3^{I}	w_4^{I}	w_1^{II}	w_2^{II}	w_3^{II}	w_4^{II}		
303.15	0.6783	0.3147	-	0.0070	0.0081	0.0034	-	0.9885	-	-
	0.5821	0.2725	0.1370	0.0084	0.0099	0.0038	0.1650	0.8213	1.20	75.07
	0.5101	0.2460	0.2306	0.0133	0.0139	0.0064	0.2737	0.7060	1.19	44.29
	0.4604	0.2143	0.3058	0.0195	0.0210	0.0092	0.3716	0.5982	1.21	27.13
	0.4124	0.1915	0.3666	0.0295	0.0270	0.0118	0.4426	0.5186	1.21	18.82
	0.3935	0.1832	0.3898	0.0335	0.0354	0.0155	0.4763	0.4728	1.22	13.83
	0.3726	0.1735	0.4160	0.0379	0.0421	0.0188	0.5039	0.4352	1.21	10.84
	0.3504	0.1639	0.4369	0.0488	0.0470	0.0207	0.5233	0.4090	1.20	9.11
	0.3307	0.1539	0.4574	0.0580	0.0511	0.0235	0.5473	0.3781	1.20	7.78
323.15	0.6778	0.3144	-	0.0078	0.0099	0.0042	-	0.9859	-	-
	0.5742	0.2688	0.1445	0.0125	0.0123	0.0048	0.1572	0.8257	1.09	53.68
	0.5044	0.2432	0.2427	0.0096	0.0174	0.0080	0.2608	0.7138	1.07	31.70
	0.4504	0.2097	0.3222	0.0177	0.0264	0.0115	0.3542	0.6079	1.10	19.16
	0.3988	0.1851	0.3867	0.0294	0.0338	0.0148	0.4220	0.5294	1.09	13.11
	0.3731	0.1737	0.4120	0.0412	0.0443	0.0195	0.4539	0.4823	1.10	9.44
	0.3554	0.1654	0.4391	0.0401	0.0526	0.0236	0.4800	0.4438	1.09	7.47
	0.3285	0.1536	0.4620	0.0559	0.0587	0.0258	0.4986	0.4169	1.08	6.15
	0.3030	0.1410	0.4845	0.0715	0.0646	0.0298	0.5210	0.3846	1.08	5.06
343.15	0.6721	0.3117	-	0.0162	0.0117	0.0049	-	0.9834	-	-
	0.5589	0.2617	0.1615	0.0179	0.0136	0.0052	0.1563	0.8249	0.97	42.18
	0.4824	0.2325	0.2566	0.0285	0.0191	0.0087	0.2481	0.7240	0.97	24.81
	0.4210	0.1960	0.3412	0.0418	0.0291	0.0127	0.3371	0.6211	0.99	14.57
	0.3591	0.1666	0.4109	0.0634	0.0373	0.0163	0.4018	0.5446	0.98	9.59
	0.3345	0.1557	0.4375	0.0723	0.0489	0.0214	0.4321	0.4976	0.99	6.89
	0.3073	0.1430	0.4677	0.0820	0.0580	0.0259	0.4570	0.4591	0.98	5.25
	0.2733	0.1279	0.4932	0.1056	0.0647	0.0286	0.4745	0.4322	0.96	4.14
	0.2495	0.1160	0.5168	0.1177	0.0703	0.0323	0.4961	0.4012	0.96	3.42

[a] Standard uncertainties of u are $u(T)$= 0.1 K, $u(p)$=1 kPa, $u(w)$= 0.0018.

Table S2. Experimental Tie-Line Data (Mass Fraction) for *n*-Decane (1) + 1-Tetradecene (2) + 1-Methylnaphthalene (3) + DMSO (4) System at Different Temperatures under 0.1 MPa[a]

T/K	Raffinate phase				Solvent phase				*D*	*S*
	w_1^{I}	w_2^{I}	w_3^{I}	w_4^{I}	w_1^{II}	w_2^{II}	w_3^{II}	w_4^{II}		
303.15	0.6785	0.3147	-	0.0069	0.0158	0.0067	-	0.9774	-	-
	0.5787	0.2709	0.1421	0.0082	0.0179	0.0069	0.2246	0.7506	1.58	54.10
	0.5040	0.2430	0.2398	0.0132	0.0240	0.0110	0.3529	0.6122	1.47	31.43
	0.4512	0.2101	0.3194	0.0193	0.0348	0.0151	0.4560	0.4941	1.43	18.94
	0.3995	0.1855	0.3857	0.0293	0.0429	0.0188	0.5246	0.4138	1.36	12.91
	0.3789	0.1764	0.4113	0.0335	0.0551	0.0241	0.5528	0.3679	1.34	9.42
	0.3560	0.1657	0.4403	0.0380	0.0644	0.0288	0.5750	0.3318	1.31	7.31
	0.3304	0.1545	0.4659	0.0492	0.0710	0.0312	0.5904	0.3074	1.27	6.01
	0.3072	0.1429	0.4910	0.0590	0.0761	0.0350	0.6093	0.2795	1.24	5.02
323.15	0.6775	0.3142	-	0.0083	0.0187	0.0079	-	0.9734	-	-
	0.5735	0.2686	0.1480	0.0099	0.0212	0.0083	0.2141	0.7565	1.45	41.32
	0.4951	0.2387	0.2503	0.0158	0.0285	0.0131	0.3368	0.6216	1.35	23.74
	0.4387	0.2043	0.3339	0.0232	0.0412	0.0179	0.4358	0.5052	1.31	14.20
	0.3828	0.1777	0.4041	0.0355	0.0509	0.0222	0.5016	0.4253	1.24	9.51
	0.3604	0.1679	0.4313	0.0405	0.0654	0.0288	0.5279	0.3779	1.22	6.87
	0.3355	0.1563	0.4622	0.0460	0.0764	0.0342	0.5487	0.3407	1.19	5.28
	0.3067	0.1434	0.4903	0.0597	0.0842	0.0371	0.5632	0.3155	1.15	4.26
	0.2802	0.1304	0.5177	0.0718	0.0902	0.0414	0.5810	0.2874	1.12	3.50
343.15	0.6751	0.3132	-	0.0116	0.0221	0.0094	-	0.9685	-	-
	0.5663	0.2651	0.1547	0.0139	0.0252	0.0096	0.2038	0.7614	1.32	31.51
	0.4827	0.2327	0.2623	0.0223	0.0337	0.0155	0.3212	0.6296	1.22	17.81
	0.4205	0.1957	0.3509	0.0329	0.0489	0.0213	0.4159	0.5139	1.19	10.41
	0.3571	0.1656	0.4269	0.0504	0.0603	0.0265	0.4787	0.4345	1.12	6.75
	0.3313	0.1543	0.4567	0.0577	0.0774	0.0339	0.5033	0.3854	1.10	4.81
	0.3028	0.1410	0.4905	0.0657	0.0903	0.0404	0.5226	0.3467	1.07	3.62
	0.2663	0.1246	0.5234	0.0857	0.0995	0.0437	0.5360	0.3208	1.02	2.80
	0.2327	0.1083	0.5554	0.1036	0.1065	0.0496	0.5525	0.2914	0.99	2.17

[a] Standard uncertainties of u are $u(T)$= 0.1 K, $u(p)$=1 kPa, $u(w)$= 0.0020.

Table S3. The standard deviations of the model parameters for *n*-Decane (1) + 1-Tetradecene (2) + 1-Methylnaphthalene (3) + Solvent (4)

i-j	NRTL parameters[a]		Std Devs.		UNIQUAC parameters[a]		Std Devs.	
	b_{ij} / K	b_{ji} / K	$\sigma(b_{ij})$	$\sigma(b_{ji})$	b_{ij} / K	b_{ji} / K	$\sigma(b_{ij})$	$\sigma(b_{ji})$
	n-decane (1) + 1-tetradecene (2) + 1-methylnaphthalene (3) + sulfolane (4)							
1-2	-2938.98	191.42	25.98	8.54	-407.64	1341.81	11.27	47.27
1-3	-524.57	513.11	12.41	3.47	390.07	-549.45	6.14	6.61
1-4	1080.29	1266.74	13.52	4.59	-445.92	42.47	5.62	1.68
2-3	-1846.11	686.75	6.40	25.99	-587.14	865.63	9.66	10.91
2-4	3417.74	754.87	68.23	23.93	-441.58	185.37	6.17	2.07
3-4	1561.53	-881.79	3.51	2.12	-519.37	578.24	17.12	29.50
	n-decane (1) + 1-tetradecene (2) + 1-methylnaphthalene (3) + DMSO (4)							
1-2	-2938.98	191.42	25.98	8.54	-407.64	1341.81	11.27	47.27
1-3	-524.57	513.11	12.41	3.47	390.07	-549.45	6.14	6.61
1-4	-6910.78	-77.01	31.39	2.25	-364.86	-44.73	5.21	1.36
2-3	-1846.11	686.75	6.40	25.99	-587.14	865.63	9.66	10.91
2-4	2908.89	-8734.34	15.38	61.34	-789.31	79.90	11.25	1.87
3-4	567.39	68.03	10.87	2.47	-758.21	619.19	9.86	7.21