Table 1
Densities and refractive indices of pure components

Chemicals	GC analysis (wt.%)	ρ at 298.15 K (g cm^{-3})		n_D at 298.15 K	
		Present study	Literature value	Present study	Literature value
PVE	99.99	0.76269	–	1.39793	–
1-propanol	99.98	0.80061	0.79970[a]	1.38312	1.38307[b]
Benzene	99.99	0.87360	0.87370[a]	1.49785	1.49780[c]

[a] Ref. [18].
[b] Ref. [19].
[c] Ref. [20].

Table 2
Isothermal VLE for the binary systems PVE (1) + 1-propanol (2), PVE (1) + benzene (2) and 1-propanol (1) + benzene (2) at 323.15 K

x_1	y_1	P_{cal} (kPa)	x_1	y_1	P_{cal} (kPa)	x_1	y_1	P_{cal} (kPa)
PVE (1) + benzene (2)			PVE (1) + benzene (2)			1-propanol (1) + benzene (2)		
0.0207	0.2958	16.86	0.0201	0.0372	36.84	0.0062	0.0151	38.52
0.0395	0.4249	20.31	0.0395	0.0703	37.42	0.0107	0.0248	38.73
0.0594	0.5155	23.68	0.0597	0.1033	38.00	0.0391	0.0688	39.59
0.0798	0.5562	25.56	0.0800	0.1368	38.61	0.0586	0.0883	39.89
0.1185	0.6514	31.28	0.1203	0.1976	39.77	0.1205	0.1271	39.56
0.1685	0.7109	36.29	0.1700	0.2676	41.16	0.1702	0.1470	38.95
0.2288	0.7576	41.28	0.2298	0.3434	42.76	0.2296	0.1666	38.72
0.2890	0.7875	45.06	0.2898	0.4169	44.40	0.2900	0.1865	38.31
0.3491	0.8151	49.00	0.3496	0.4809	45.91	0.3495	0.1972	37.79
0.4088	0.8312	51.48	0.4096	0.5451	47.52	0.4097	0.2126	37.20
0.4685	0.8415	53.05	0.4702	0.5991	48.93	0.4709	0.2271	36.15
0.5298	0.8504	54.32	0.5297	0.6544	50.42	0.5307	0.2462	35.29
0.5895	0.8566	55.12	0.5898	0.7052	51.86	0.5899	0.2599	34.06
0.6490	0.8698	56.58	0.6498	0.7524	53.23	0.6509	0.2866	32.92
0.7092	0.8962	59.68	0.7099	0.7979	54.57	0.7112	0.3206	31.09
0.7689	0.8869	58.84	0.7697	0.8421	55.90	0.7711	0.3480	28.71
0.8277	0.9027	59.72	0.8292	0.8857	57.24	0.8306	0.4192	25.16
0.8790	0.9198	60.44	0.8799	0.9210	58.41	0.8801	0.4854	22.31
0.9184	0.9382	60.94	0.9199	0.9467	59.19	0.9201	0.5734	19.56
0.9396	0.9487	61.11	0.9395	0.9628	59.77	0.9398	0.6355	17.98
0.9593	0.9609	61.19	0.9601	0.9731	60.13			
0.9794	0.9751	61.13						

Table 4
Isothermal VLE for the ternary system PVE (1) + 1-propanol (2) + benzene (3) at 323.15 K

x_1	x_2	y_1	y_2	P_{cal} (kPa)	x_1	x_2	y_1	y_2	P_{cal} (kPa)
0.0600	0.5400	0.1535	0.2230	37.08	0.3507	0.4995	0.6368	0.1854	45.41
0.0503	0.4496	0.1057	0.2290	37.65	0.2798	0.5994	0.6161	0.2167	43.03
0.0405	0.3596	0.0782	0.1937	37.96	0.2098	0.6994	0.5901	0.2489	39.58
0.0200	0.1804	0.0335	0.1515	38.16	0.0697	0.9004	0.4490	0.4360	25.72
0.1801	0.4198	0.3367	0.1853	41.51	0.5400	0.4004	0.7827	0.1602	50.20
0.1198	0.2802	0.2017	0.1660	40.47	0.4501	0.5002	0.7619	0.1821	47.95
0.0898	0.2096	0.1438	0.1529	39.93	0.3612	0.5993	0.7310	0.2178	45.22
0.0311	0.0697	0.0494	0.0983	38.29	0.2700	0.7001	0.7104	0.2395	41.39
0.2497	0.2506	0.3702	0.1498	43.45	0.1799	0.8006	0.6535	0.3025	35.75
0.1999	0.1990	0.2961	0.1397	42.45	0.3994	0.0601	0.5040	0.0715	46.21
0.1502	0.1496	0.2229	0.1288	41.40	0.5004	0.0492	0.5994	0.0603	48.26
0.1007	0.0911	0.1511	0.1070	40.15	0.6001	0.0401	0.6788	0.0493	50.44
0.3506	0.1501	0.4582	0.1162	45.57	0.6996	0.0295	0.7621	0.0384	52.75
0.2793	0.1197	0.3741	0.1090	44.06	0.8000	0.0192	0.8439	0.0275	55.27
0.2097	0.0893	0.2906	0.0984	42.52	0.3995	0.1795	0.5231	0.1206	46.60
0.0695	0.0297	0.1068	0.0545	38.75	0.4997	0.1507	0.6123	0.1081	48.71
0.3601	0.0407	0.4543	0.0563	45.19	0.5998	0.1199	0.6892	0.0949	50.90
0.2700	0.0298	0.3578	0.0465	43.17	0.7004	0.0891	0.7665	0.0784	53.21
0.1807	0.0192	0.2547	0.0359	41.09	0.8997	0.0297	0.9145	0.0363	58.11
0.0395	0.6000	0.1127	0.2542	35.38	0.3997	0.3001	0.5711	0.1479	46.64
0.0296	0.6983	0.1059	0.3067	32.63	0.4995	0.2498	0.6483	0.1347	48.85
0.0194	0.8007	0.0970	0.3674	28.19	0.5999	0.1998	0.7159	0.1212	51.12
0.1497	0.5008	0.3118	0.2200	40.29	0.6996	0.1499	0.7812	0.1033	53.45
0.1200	0.5991	0.3095	0.2354	38.39	0.8002	0.1000	0.8460	0.0814	55.87
0.0899	0.6995	0.2896	0.2886	35.35	0.5000	0.3501	0.7038	0.1548	49.04
0.0298	0.8998	0.2104	0.4975	23.19	0.5993	0.2800	0.7555	0.1400	51.33
0.2997	0.3999	0.5015	0.1722	44.37	0.7004	0.2098	0.8087	0.1198	53.70
0.2494	0.4997	0.4890	0.1946	42.90	0.9004	0.0694	0.9144	0.0639	58.44
0.2000	0.6003	0.4766	0.2218	40.82	0.6005	0.3602	0.8135	0.1504	51.68
0.1496	0.7010	0.4549	0.2613	37.56	0.7004	0.2700	0.8390	0.1362	53.99
0.0996	0.8002	0.4240	0.3169	32.49	0.8010	0.1792	0.8736	0.1112	56.31
0.4194	0.3999	0.6421	0.1725	47.16					

Table 6
Densities, excess molar volumes, refractive indices and deviations in molar refractivity for the binary systems PVE (1) + 1-propanol (2), PVE (1) + benzene (2) and 1-propanol (1) + benzene (2) at 298.15 K

x_1	ρ (g cm^{-3})	V^E (cm^3 mol^{-1})	n_D	ΔR (cm^3 mol^{-1})
PVE (1) + 1-propanol (2)				
0.0496	0.79801	−0.0153	1.38365	−0.2790
0.1006	0.79553	−0.0376	1.38393	−0.5364
0.1996	0.79099	−0.0758	1.38470	−0.9040
0.2999	0.78662	−0.0951	1.38529	−1.1378
0.3997	0.78247	−0.0968	1.38545	−1.2656
0.4996	0.77859	−0.0902	1.38538	−1.2973
0.6001	0.77495	−0.0781	1.38531	−1.2325
0.7002	0.77151	−0.0553	1.38567	−1.0521
0.8007	0.76832	−0.0337	1.38691	−0.7342
0.8999	0.76542	−0.0173	1.38766	−0.3829
0.9487	0.76405	−0.0066	1.38786	−0.1979
PVE (1) + benzene (2)				
0.0500	0.86674	−0.0057	1.49122	0.0139
0.0997	0.86011	−0.0133	1.48479	0.0264
0.1996	0.84744	−0.0444	1.47256	0.0558
0.2997	0.83539	−0.0819	1.46103	0.0904
0.3998	0.82385	−0.1112	1.44997	0.1222
0.4998	0.81272	−0.1240	1.43933	0.1532
0.6002	0.80209	−0.1420	1.42889	0.1657
0.7004	0.79187	−0.1501	1.41850	0.1520
0.7998	0.78199	−0.1334	1.40801	0.1011
0.8995	0.77241	−0.1016	1.39779	0.0413
0.9506	0.76752	−0.0658	1.39281	0.0221
1-Propanol (1) + benzene (2)				
0.0495	0.86979	0.0769	1.49257	−0.0601
0.1012	0.86616	0.1152	1.48690	−0.1365
0.1997	0.85949	0.1474	1.47608	−0.2682
0.3007	0.85280	0.1445	1.46534	−0.3556
0.4002	0.84608	0.1299	1.45464	−0.4067
0.4999	0.83922	0.1056	1.44370	−0.4252
0.6002	0.83214	0.0745	1.43238	−0.4124
0.7000	0.82483	0.0433	1.42061	−0.3726
0.8004	0.81726	0.0061	1.40860	−0.2874
0.8999	0.80929	−0.0136	1.39601	−0.1741
0.9496	0.80503	−0.0073	1.38970	−0.0910

Table 7
Densities, excess molar volumes, refractive indices and deviations in molar refractivity for the ternary systems PVE (1) + 1-propanol (2) + benzene (3) at 298.15 K

x_1	x_2	ρ (g cm^{-3})	V^E (cm^3 mol^{-1})	n_D	ΔR (cm^3 mol^{-1})
0.0495	0.4496	0.83573	0.1225	1.44235	−0.5235
0.0401	0.3597	0.84308	0.1514	1.45374	−0.4365
0.0291	0.2701	0.85054	0.1691	1.46417	−0.3811
0.0191	0.1796	0.85815	0.1462	1.47587	−0.2469
0.1795	0.4200	0.82132	0.0370	1.42760	−0.8105
0.1503	0.3501	0.82969	0.0724	1.43967	−0.6364
0.1209	0.2797	0.83813	0.1002	1.45223	−0.4418
0.0896	0.2120	0.84665	0.1191	1.46313	−0.3386
0.0298	0.0698	0.86425	0.0906	1.48619	−0.1016
0.2999	0.3006	0.81493	0.0048	1.42816	−0.6714
0.2502	0.2498	0.82430	0.0239	1.43935	−0.5314
0.2000	0.2000	0.83361	0.0583	1.45074	−0.3913
0.1499	0.1512	0.84309	0.0753	1.46215	−0.2695
0.1000	0.1006	0.85291	0.0755	1.47371	−0.1694
0.3497	0.1500	0.81925	−0.0159	1.44013	−0.2670
0.2800	0.1199	0.82939	0.0053	1.44931	−0.2831
0.2092	0.0897	0.83989	0.0295	1.46185	−0.1410
0.0703	0.0289	0.86175	0.0416	1.48554	−0.0217
0.3611	0.0387	0.82546	−0.0589	1.45026	0.0132
0.2702	0.0296	0.83676	−0.0400	1.46215	0.0591
0.1800	0.0196	0.84838	−0.0089	1.47313	0.0276
0.0402	0.6005	0.82633	0.0859	1.42688	−0.5206
0.0299	0.7004	0.82032	0.0660	1.41661	−0.4631
0.0193	0.7998	0.81408	0.0516	1.40617	−0.3522
0.1497	0.4999	0.81954	0.0280	1.42353	−0.7777
0.0900	0.7008	0.81259	0.0053	1.40742	−0.7230
0.0297	0.9010	0.80459	0.0219	1.39226	−0.2829
0.3013	0.3998	0.80816	−0.0302	1.41692	−0.8836
0.2492	0.5010	0.80725	−0.0277	1.41235	−0.9174
0.1995	0.6008	0.80614	−0.0298	1.40688	−0.9152
0.4204	0.3997	0.79468	−0.0898	1.40429	−1.0118
0.3504	0.5003	0.79564	−0.0969	1.40132	−1.0789