

Supporting Information

Characterization of Aqueous Biphasic Systems Composed of Ionic Liquids and a Citrate-Based Biodegradable Salt

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Table S1. Weight fraction data for the system composed of IL (1) + C₆H₅K₃O₇ (2) + H₂O (3) at 25 °C.

[C ₄ mim]Cl		[C ₄ mim]Br		[C ₄ mim][SCN]	
100 w ₁	100 w ₂	100 w ₁	100 w ₂	100 w ₁	100 w ₂
68.640	1.600	66.625	1.978	68.822	1.592
62.787	2.900	60.731	3.387	52.817	2.690
59.000	4.413	57.156	4.645	46.887	3.764
54.537	6.500	53.597	5.749	42.895	4.814
49.469	9.417	48.945	7.697	36.831	6.376
43.003	13.735	46.546	8.486	34.198	6.976
23.776	31.460	43.039	10.365	30.769	8.039
21.874	33.600	37.247	14.297	28.980	8.359
20.279	35.497	34.419	16.068	26.125	9.166
18.395	37.603	31.342	18.068	23.497	10.079
16.299	39.897	28.108	20.440	22.085	10.452
		25.239	22.470	20.634	11.180
		22.755	24.360	20.101	11.467
		20.806	25.918	19.465	11.763
		19.278	27.144	18.609	12.082
		17.375	28.796	18.205	12.316
		15.665	30.410	17.797	12.398
		14.056	31.978	14.635	13.826
				14.309	14.104

Table S2. Weight fraction data for the system composed of IL (1) + C₆H₅K₃O₇ (2) + H₂O (3) at 25 °C.

[C ₄ mim][CF ₃ CO ₂]		[C ₄ mim][CF ₃ SO ₃]			
100 w ₁	100 w ₂	100 w ₁	100 w ₂	100 w ₁	100 w ₂
67.014	1.745	68.129	1.839	12.205	11.709
62.327	3.932	48.631	3.192	11.912	12.364
57.309	6.131	42.434	3.789	11.683	12.405
43.435	10.783	37.824	4.369	11.333	12.893
41.599	11.329	33.839	4.732	11.186	13.006
38.836	12.922	31.666	5.115	10.919	13.256
35.143	14.900	29.577	5.405	10.655	13.462
34.052	15.291	27.890	5.727	10.505	13.527
32.219	16.362	26.419	6.195	10.380	13.635
30.428	17.522	24.369	6.360	10.140	13.838
29.436	17.898	23.618	6.750	9.991	14.106
27.975	18.931	22.614	7.007		
26.334	19.855	21.656	7.266		
25.033	20.610	20.722	7.393		
23.931	21.325	20.168	7.611		
22.782	21.981	19.765	7.853		
21.714	22.665	19.120	8.151		
20.266	23.563	18.475	8.361		
19.320	24.146	17.832	8.561		
18.553	24.725	17.280	8.799		
17.797	25.202	16.905	9.093		
17.141	25.615	16.356	9.260		
16.326	26.200	16.031	9.583		
15.650	26.685	15.537	9.766		
15.190	26.945	15.117	9.929		
14.794	27.096	14.873	10.101		
14.017	27.858	14.510	10.279		
13.723	28.011	14.196	10.412		
13.187	28.627	13.875	10.552		
12.730	28.968	13.464	10.991		
12.345	29.303	13.111	11.314		
12.083	29.423	12.864	11.411		
11.565	30.039	12.614	11.525		
10.928	30.516	12.450	11.661		

Table S3. Weight fraction data for the system composed of IL (1) + C₆H₅K₃O₇ (2) + H₂O (3) at 25 °C.

[C ₄ mim][N(CN) ₂]					
100 w ₁	100 w ₂	100 w ₁	100 w ₂	100 w ₁	100 w ₂
67.802	1.905	16.725	15.356	10.444	19.241
54.433	2.898	16.429	15.538	10.332	19.406
48.910	4.026	16.071	15.706	10.229	19.557
44.529	4.917	15.865	15.812	10.035	19.728
41.224	5.736	15.555	15.919	9.839	19.932
38.737	6.495	15.245	16.039	9.653	20.021
36.848	7.164	15.010	16.251	9.547	20.122
34.973	7.800	14.691	16.356	9.415	20.348
33.335	8.221	14.474	16.554	9.320	20.442
31.963	8.691	14.182	16.595	9.236	20.515
30.685	9.137	13.978	16.788	9.142	20.621
29.487	9.582	13.802	16.932	9.017	20.828
28.609	10.142	13.628	17.084	8.943	20.930
27.520	10.506	13.363	17.155	8.856	20.990
26.555	10.953	13.174	17.314	8.765	21.080
25.572	11.309	13.011	17.471	8.691	21.147
24.755	11.708	12.859	17.590	8.575	21.387
23.881	12.038	12.685	17.768	8.431	21.533
23.058	12.334	12.482	17.850	8.338	21.579
22.532	12.736	12.380	17.689	8.231	21.810
21.774	13.013	12.160	17.698	8.123	22.037
21.074	13.210	12.023	17.846	7.993	22.160
20.644	13.542	11.893	17.980	7.895	22.309
20.069	13.734	11.651	18.256	7.744	22.522
19.607	13.898	11.488	18.261	7.567	22.810
19.182	14.249	11.271	18.557	7.423	23.035
18.656	14.414	11.031	18.797	7.312	23.137
18.161	14.568	10.874	18.845	7.137	23.457
17.826	14.816	10.758	18.939	7.010	23.654
17.354	14.892	10.655	19.034	6.867	23.930
17.066	15.186	10.559	19.120	6.714	24.195

Table S4. Weight fraction data for the system composed of IL (1) + C₆H₅K₃O₇ (2) + H₂O (3) at 25 °C.

[C ₄ mim][PO ₄ (CH ₃) ₂]		[C ₄ mim][CH ₃ SO ₃]	
100 w ₁	100 w ₂	100 w ₁	100 w ₂
59.812	11.891	57.496	9.381
58.622	12.673	55.050	11.664
56.744	13.949	52.977	13.539
55.598	14.823	49.263	16.366
54.202	15.778	47.595	17.725
50.972	17.787	44.390	20.420
49.948	18.601	41.940	22.596
47.972	20.192	40.074	24.385
46.027	21.712		
42.157	25.014		
40.216	26.722		
37.679	28.836		

Table S5. Weight fraction data for the system composed of IL (1) + C₆H₅K₃O₇ (2) + H₂O (3) at 25 °C.

[C ₄ mim][CH ₃ CO ₂]		[C ₆ mim]Cl	
100 w ₁	100 w ₂	100 w ₁	100 w ₂
52.647	13.214	69.004	1.408
51.116	14.824	63.451	3.048
48.295	17.427	60.865	4.153
43.981	21.106	58.119	5.411
42.403	22.498	55.576	6.465
40.801	23.963	53.213	7.495
39.247	25.430	49.909	9.395
		46.825	11.107
		42.778	13.693
		38.176	17.016
		30.372	23.272
		24.096	28.319

Table S6. Weight fraction data for the system composed of IL (1) + C₆H₅K₃O₇ (2) + H₂O (3) at 25 °C.

[C ₄ mpyr]Cl					
100 w ₁	100 w ₂	100 w ₁	100 w ₂	100 w ₁	100 w ₂
65.681	2.063	41.083	12.124	30.793	21.097
50.882	6.008	40.639	12.496	29.661	22.131
46.435	8.525	40.059	12.933	28.914	23.012
46.113	8.735	39.663	13.213	27.755	24.131
45.644	8.976	39.243	13.478	26.752	25.344
45.624	9.118	38.693	13.964	25.061	26.853
45.362	9.195	38.125	14.448	23.918	28.144
45.012	9.429	37.519	14.960	22.801	29.608
44.627	9.682	36.902	15.487	20.619	31.882
44.133	9.947	36.163	16.111	19.108	33.819
43.755	10.214	35.810	16.548	16.286	36.595
43.132	10.582	35.109	17.179	15.362	38.125
42.747	10.850	34.197	17.888	13.203	40.753
42.482	11.096	33.620	18.511	12.070	42.632
42.028	11.462	32.581	19.391		
41.572	11.776	31.397	20.316		

Table S7. Weight fraction data for the system composed of IL (1) + C₆H₅K₃O₇ (2) + H₂O (3) at 25 °C.

[C ₄ mpy]Cl					
100 w ₁	100 w ₂	100 w ₁	100 w ₂	100 w ₁	100 w ₂
66.913	2.320	34.202	17.582	24.068	27.126
50.603	6.941	33.820	17.897	23.734	27.680
47.681	8.207	33.458	18.293	22.777	28.596
39.828	13.070	32.705	18.858	21.387	30.025
39.601	13.248	32.331	19.264	20.322	31.068
39.298	13.512	31.894	19.709	19.919	31.826
38.883	13.794	31.042	20.328	19.307	32.418
38.681	13.994	30.742	20.625	18.075	33.471
38.223	14.292	30.206	21.167	17.515	34.338
37.567	14.825	29.621	21.685	16.286	35.736
37.294	15.092	29.155	22.256	14.785	37.204
36.744	15.428	28.557	22.814	14.127	38.257
36.485	15.715	27.950	23.448	13.428	39.142
35.959	16.086	27.283	24.081	12.699	40.250
35.672	16.385	26.512	24.800	11.291	42.535
35.077	16.813	25.733	25.496	10.505	43.823
34.758	17.147	24.932	26.314		

Table S8. Weight fraction data for the system composed of IL (1) + C₆H₅K₃O₇ (2) + H₂O (3) at 25 °C.

[C ₄ mpip]Cl					
100 w ₁	100 w ₂	100 w ₁	100 w ₂	100 w ₁	100 w ₂
67.511	1.560	36.908	15.535	27.919	23.904
60.511	3.048	36.529	15.898	26.983	24.819
55.603	4.194	36.050	16.301	26.033	25.760
51.288	6.576	35.544	16.689	25.090	26.738
48.392	7.634	35.045	17.137	24.154	27.693
44.293	10.138	34.778	17.370	23.175	28.768
41.028	12.437	34.127	17.948	21.964	29.940
40.470	12.828	33.462	18.561	21.253	30.862
40.074	13.140	32.825	19.136	19.969	32.201
39.886	13.236	32.783	19.038	19.095	33.251
39.553	13.462	32.039	19.799	17.452	34.864
39.135	13.781	31.513	20.353	16.381	36.255
38.888	13.973	30.866	20.970	15.259	37.672
38.375	14.382	30.213	21.636	13.892	39.389
37.994	14.701	29.457	22.358	13.236	40.261
37.475	15.100	28.428	23.272	11.830	42.027

Table S9. Weight fraction data for the system composed of IL (1) + C₆H₅K₃O₇ (2) + H₂O (3) at 25 °C.

[P ₄₄₄₄]Cl					
100 w ₁	100 w ₂	100 w ₁	100 w ₂	100 w ₁	100 w ₂
58.615	5.560	16.018	21.566	9.040	28.109
48.752	6.944	15.632	21.918	8.898	28.217
44.978	7.422	15.301	22.229	8.713	28.453
41.690	8.008	15.083	22.318	8.567	28.587
39.230	8.576	14.701	22.663	8.426	28.738
37.264	9.152	14.377	23.025	8.278	28.912
35.572	9.565	14.133	23.141	8.134	29.082
34.403	10.185	13.756	23.523	7.987	29.293
32.774	10.653	13.550	23.612	7.890	29.370
30.815	11.472	13.266	23.904	7.739	29.576
29.945	11.865	13.097	23.985	7.596	29.753
29.106	12.239	12.960	24.121	7.456	29.932
28.391	12.628	12.663	24.457	7.285	30.149
27.604	13.153	12.491	24.567	7.162	30.303
26.488	14.022	12.249	24.805	7.025	30.471
25.787	14.359	12.092	24.899	6.946	30.530
24.266	15.595	11.802	25.295	6.797	30.736
23.756	15.842	11.647	25.370	6.663	30.921
23.301	16.071	11.505	25.479	6.540	31.089
22.823	16.325	11.235	25.812	6.432	31.234
22.317	16.602	11.015	26.031	6.318	31.384
21.646	17.189	10.880	26.113	6.202	31.544
21.036	17.666	10.676	26.345	6.089	31.692
20.328	18.224	10.458	26.604	5.976	31.870
19.959	18.434	10.339	26.662	5.862	32.033
19.044	19.115	10.072	27.038	5.774	32.132
18.453	19.702	9.919	27.175	5.693	32.228
17.747	20.163	9.750	27.313	5.592	32.387
17.163	20.506	9.529	27.564	5.497	32.531
16.763	20.881	9.339	27.805	5.394	32.675
16.383	21.245	9.222	27.872		

Table S10. Weight fraction data for the system composed of IL (1) + C₆H₅K₃O₇ (2) + H₂O (3) at 25 °C.

[N ₄₄₄₄]Cl					
100 w ₁	100 w ₂	100 w ₁	100 w ₂	100 w ₁	100 w ₂
65.990	1.832	25.606	16.428	13.484	26.668
51.102	4.182	24.666	17.106	12.975	27.226
47.501	5.309	23.475	18.135	12.599	27.663
44.345	6.288	22.703	18.635	12.105	28.202
41.938	6.891	21.704	19.547	11.663	28.693
40.414	7.574	20.785	20.377	11.210	29.189
38.715	8.274	19.913	21.053	10.723	29.777
37.262	8.962	19.090	21.823	10.324	30.241
36.035	9.521	18.396	22.481	9.950	30.660
34.211	10.776	17.825	22.918	9.474	31.259
32.973	11.369	16.509	24.126	9.095	31.749
31.370	12.510	15.784	24.843	8.774	32.143
30.391	12.948	15.064	25.599	8.461	32.540
29.070	13.829	14.514	26.080	8.171	32.912
27.632	14.947	14.245	26.156	7.936	33.185
26.587	15.748	13.859	26.408		

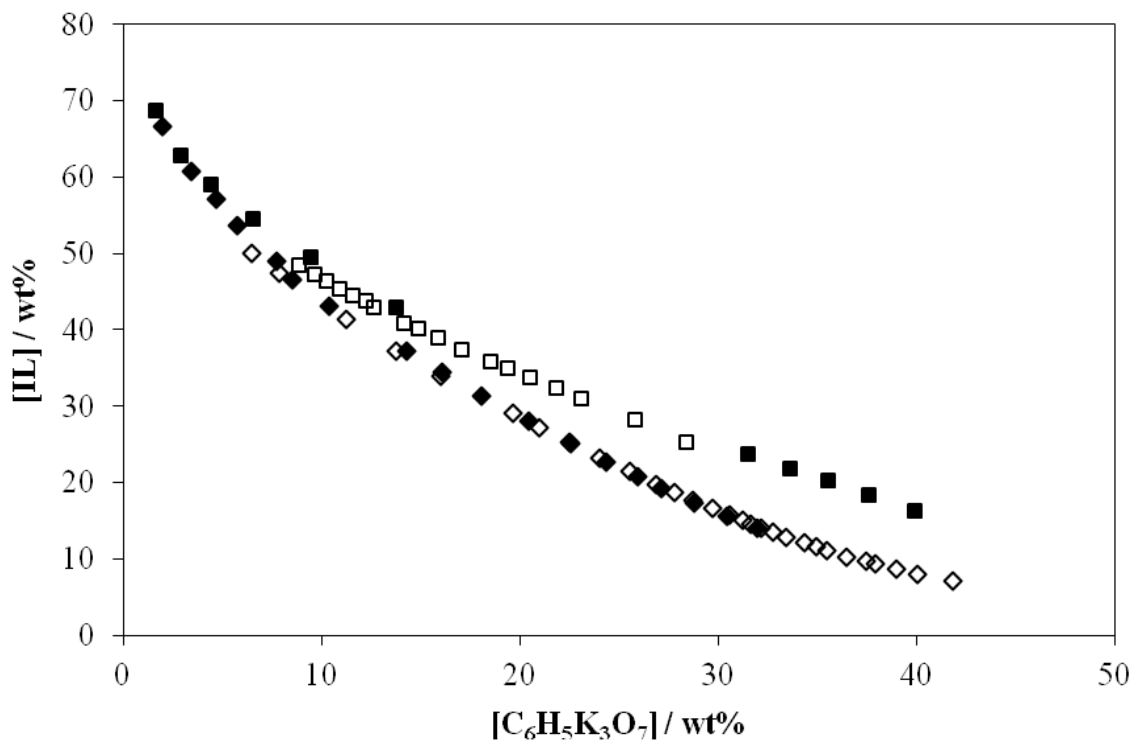


Fig. S1. Phase diagram for the ternary system composed of $C_6H_5K_3O_7 + H_2O + [C_4mim]Cl$ (■) and $C_6H_5K_3O_7 + H_2O + [C_4mim]Br$ (◆) at 298 K. The full symbols represent the data obtained in this work while the empty symbols correspond to literature data [34-35].