

Supporting Information

Evaluation of Anion Influence on the Formation and Extraction Capacity of Ionic-Liquid-Based Aqueous Biphase Systems

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Table S1 Experimental binodal curve mass fraction data for the system IL (1) + K₃PO₄ (2) + H₂O (3) at 298 K

[C ₂ mim][CF ₃ SO ₃]					
100 w ₁	100 w ₂	100 w ₁	100 w ₂	100 w ₁	100 w ₂
0.640	32.889	6.059	19.653	15.680	12.845
0.706	32.187	6.298	19.209	16.338	12.598
0.759	31.842	6.598	18.855	16.958	12.292
0.824	31.222	6.884	18.346	17.732	12.020
0.874	30.710	7.336	18.157	18.556	11.689
0.911	30.427	7.779	17.753	19.564	11.401
1.366	29.666	8.256	17.280	20.642	11.047
1.585	28.734	8.800	16.756	27.650	8.822
1.818	27.850	9.290	16.356	29.869	8.056
1.986	27.356	9.752	15.767	32.628	7.300
2.171	26.649	10.237	15.531	36.122	6.409
2.427	25.953	10.746	15.217	39.539	5.379
2.626	25.418	11.204	15.051	45.772	3.912
2.820	24.927	11.427	14.807		
3.025	24.424	11.782	14.696		
3.234	24.024	12.068	14.488		
3.538	23.388	12.429	14.344		
3.794	22.840	12.842	14.214		
4.252	21.948	13.599	13.745		
4.525	21.349	13.982	13.468		
5.081	20.898	14.509	13.299		
5.492	20.198	15.069	13.085		

Table S2 Experimental binodal curve mass fraction data for the system IL (1) + K₃PO₄ (2) + H₂O (3) at 298 K

[C ₂ mim][MeSO ₄]				[C ₂ mim][Cl]	
100 w ₁	100 w ₂	100 w ₁	100 w ₂	100 w ₁	100 w ₂
3.081	30.379	14.055	20.794	5.602	30.035
4.885	29.296	14.630	20.368	6.541	28.651
5.044	29.302	14.954	20.134	7.369	27.499
5.740	28.389	15.301	19.933	8.230	26.413
6.245	27.772	15.984	19.432	9.164	25.244
6.718	27.145	16.324	19.164	10.061	24.238
7.173	26.708	14.751	18.945	10.781	23.435
7.673	26.150	17.137	18.638	11.823	22.341
8.000	25.824	17.555	18.345	12.685	21.426
8.348	25.423	18.081	18.052	13.550	20.571
8.740	25.047	18.603	17.774	14.579	19.557
9.199	24.723	19.064	17.398	15.757	18.396
9.690	24.326	19.604	17.050	17.045	17.150
10.212	23.741	20.123	16.628	18.419	15.884
10.669	23.358	20.748	16.244	20.019	14.420
11.180	22.975	21.454	15.851	21.547	13.050
11.534	22.648	22.076	15.371	23.370	11.511
11.915	22.346	22.835	14.924	25.026	10.285
12.352	22.105	23.640	14.474	26.796	8.785
12.782	21.748	44.344	5.625	31.369	7.142
13.244	21.370			34.749	6.366
13.760	20.956			38.727	4.175

Table S3 Experimental binodal curve mass fraction data for the system IL (1) + K₃PO₄ (2) + H₂O (3) at 298 K

[C ₂ mim][EtSO ₄]					
100 w ₁	100 w ₂	100 w ₁	100 w ₂	100 w ₁	100 w ₂
2.174	32.594	8.426	23.591	15.752	18.367
2.520	31.653	8.656	23.414	16.656	17.830
2.768	31.166	8.915	23.246	17.511	17.059
3.046	30.530	9.154	23.018	18.193	16.865
3.276	30.106	9.414	22.776	19.227	16.021
3.584	29.514	9.570	22.697	16.656	17.830
4.162	28.666	9.740	22.606	17.511	17.059
4.573	27.973	10.017	22.223	18.193	16.865
4.982	27.525	10.188	22.124	19.227	16.021
5.413	26.820	10.369	22.037	19.853	15.674
5.793	26.455	10.892	21.628	20.556	15.238
6.020	26.047	11.264	21.303	21.236	14.792
6.321	25.791	11.562	21.320	22.034	14.321
6.649	25.464	12.162	20.615	22.899	13.830
6.937	25.230	12.460	20.534	23.745	13.264
7.207	24.829	12.929	20.096	24.964	12.692
7.466	24.636	13.224	19.933	26.127	12.058
7.731	24.266	13.546	19.753	27.508	11.463
7.916	24.074	13.865	19.552	28.858	10.669
8.110	23.879	14.224	19.374		
8.223	23.810	14.954	18.857		

Table S4 Experimental binodal curve mass fraction data for the system IL (1) + K₃PO₄ (2) + H₂O (3) at 298 K

[C ₂ mim][Br]					
100 w ₁	100 w ₂	100 w ₁	100 w ₂	100 w ₁	100 w ₂
3.539	31.888	9.951	23.604	16.297	18.728
3.967	31.092	10.252	23.397	16.647	18.333
4.455	30.218	10.545	23.121	17.133	18.104
4.810	29.628	10.685	22.966	17.571	17.808
5.231	28.987	10.865	22.867	18.041	17.437
5.613	28.446	11.011	22.667	18.572	17.117
5.788	28.181	11.197	22.549	19.155	16.809
6.062	27.775	11.539	22.191	19.760	16.447
6.270	27.539	11.743	22.044	20.268	15.902
6.481	27.226	11.958	21.919	20.968	15.429
6.735	27.008	12.170	21.759	21.733	14.992
6.991	26.712	12.384	21.526	22.508	14.481
7.204	26.481	12.661	21.415	23.306	13.901
7.498	26.179	13.100	20.990	24.295	13.450
7.810	25.801	13.335	20.769	25.385	12.843
7.986	25.605	13.600	20.579	26.527	12.124
8.269	25.350	13.897	20.396	27.529	11.324
8.554	25.005	14.162	20.157	28.861	10.624
8.863	24.687	14.519	20.018	30.493	9.859
9.078	24.445	14.832	19.816	32.428	8.909
9.197	24.349	15.137	19.516	34.568	7.917
9.440	24.132	15.490	19.271	38.250	7.012
9.833	23.771	15.817	18.961	45.588	3.823

Table S5 Experimental binodal curve mass fraction data for the system IL (1) + K₃PO₄ (2) + H₂O (3) at 298 K

[C ₂ mim][CH ₃ SO ₃]		[C ₂ mim][CH ₃ CO ₂]	
100 w ₁	100 w ₂	100 w ₁	100 w ₂
3.856	38.047	6.423	30.522
4.249	37.579	7.743	28.763
4.922	36.154	7.796	28.737
5.699	34.734	8.354	28.058
6.210	34.120	8.784	27.468
6.978	33.159	9.007	27.275
8.377	30.896	9.728	26.433
18.685	22.738	9.751	26.368
29.150	18.249	10.626	25.417
32.063	18.140	10.944	24.967
		11.421	24.514
		12.063	23.788
		12.142	23.746
		13.451	22.231
		15.024	20.521
		16.772	18.645
		18.455	16.958
		20.381	15.098
		22.064	13.611
		24.161	11.716
		26.443	9.744

Table S6 Experimental binodal curve mass fraction data for the system IL (1) + K₃PO₄ (2) + H₂O (3) at 298 K

[C ₄ mim][N(CN) ₂]					
100 w ₁	100 w ₂	100 w ₁	100 w ₂	100 w ₁	100 w ₂
0.420	30.198	4.258	17.790	13.571	10.814
0.443	29.800	4.297	17.707	13.816	10.636
0.466	29.373	4.353	17.668	14.176	10.542
0.488	28.998	4.399	17.603	14.537	10.459
0.500	28.761	4.450	17.552	14.798	10.282
0.510	28.584	4.490	17.429	15.243	10.163
0.519	28.487	4.549	17.369	15.674	10.068
0.656	28.314	4.590	17.280	15.981	9.880
0.688	27.925	4.656	17.218	16.444	9.743
0.706	27.753	4.706	17.106	16.963	9.609
0.731	27.530	4.764	17.075	17.340	9.361
0.755	27.243	4.827	17.016	17.912	9.234
0.789	26.973	4.896	16.975	18.315	9.032
0.806	26.813	4.964	16.914	18.998	8.834
0.828	26.620	5.018	16.793	19.475	8.564
0.845	26.472	5.067	16.698	20.117	8.436
0.861	26.317	5.140	16.623	20.916	8.206
0.882	26.108	5.215	16.552	21.524	7.896
0.907	25.898	5.271	16.429	22.433	7.608
0.925	25.765	5.344	16.372	23.442	7.359
0.946	25.581	5.398	16.270	24.523	7.058
0.968	25.381	5.462	16.223	25.703	6.749
0.989	25.220	5.542	16.153	27.067	6.330
1.004	25.091	5.627	16.071	28.629	5.987

1.023	24.921	5.694	15.918	30.291	5.498
1.041	24.782	5.785	15.833	32.306	4.814
1.067	24.554	5.876	15.743	35.263	4.361
1.582	23.919	5.957	15.667	38.085	3.443
1.658	23.681	6.016	15.547	42.279	2.846
1.722	23.489	6.108	15.457	47.148	2.129
1.758	23.359	6.178	15.331		
1.804	23.203	6.224	15.302		
1.839	23.068	6.272	15.264		
1.876	22.956	6.322	15.227		
1.912	22.799	6.391	15.221		
1.955	22.716	6.434	15.126		
1.992	22.580	6.486	15.100		
2.032	22.432	6.538	15.051		
2.072	22.301	6.591	15.011		
2.117	22.181	6.645	14.973		
2.159	22.093	6.704	14.895		
2.203	21.946	6.757	14.855		
2.256	21.815	6.812	14.820		
2.313	21.674	6.867	14.760		
2.373	21.430	6.930	14.720		
2.414	21.343	7.021	14.699		
2.458	21.269	7.115	14.545		
2.496	21.147	7.180	14.462		
2.536	21.097	7.254	14.401		
2.576	20.977	7.320	14.350		
2.618	20.844	7.392	14.292		
2.662	20.712	7.451	14.223		
2.700	20.613	7.520	14.155		

2.739	20.519	7.639	14.155
2.779	20.424	7.714	14.089
2.822	20.319	7.789	14.020
2.872	20.244	7.873	13.962
2.921	20.117	7.977	13.940
2.963	20.033	8.057	13.863
2.999	19.926	8.133	13.797
3.030	19.865	8.220	13.714
3.063	19.787	8.359	13.698
3.098	19.715	8.455	13.610
3.135	19.650	8.649	13.422
3.173	19.576	8.751	13.324
3.210	19.503	8.849	13.240
3.248	19.439	8.994	13.230
3.288	19.360	9.101	13.119
3.326	19.296	9.209	13.044
3.368	19.220	9.321	12.948
3.411	19.129	9.485	12.920
3.454	19.042	9.638	12.849
3.498	18.969	9.812	12.615
3.544	18.888	9.976	12.612
3.592	18.797	10.101	12.502
3.622	18.727	10.209	12.415
3.660	18.694	10.370	12.404
3.689	18.626	10.496	12.312
3.730	18.588	10.638	12.184
3.762	18.506	10.822	12.184
3.787	18.456	10.976	12.048
3.829	18.421	11.197	11.992

3.860	18.350	11.363	11.853
3.902	18.299	11.528	11.750
3.947	18.265	11.812	11.708
3.982	18.178	12.016	11.533
4.028	18.122	12.299	11.457
4.100	17.965	12.495	11.300
4.153	17.918	12.710	11.136
4.215	17.907	13.027	11.076
4.258	17.790	13.248	10.918

Table S7 Experimental binodal curve mass fraction data for the system IL (1) + K₃PO₄ (2) + H₂O (3) at 298 K

[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
4.768	14.548	7.707	10.925	11.304	8.071
4.919	14.300	7.949	10.470	11.782	7.878
5.090	14.096	8.164	10.361	12.171	7.534
5.283	13.890	8.333	10.185	12.690	7.279
5.525	13.391	8.516	10.019	13.380	7.058
5.692	13.027	8.743	9.866	14.091	6.785
5.888	12.897	8.938	9.679	14.810	6.479
6.059	12.683	9.215	9.567	15.872	6.205
6.235	12.448	9.392	9.338	17.078	5.935
6.414	12.200	9.614	9.119	18.371	5.573
6.640	11.983	9.919	8.951	20.300	5.277
6.834	11.698	10.215	8.721	22.880	4.846
7.081	11.433	10.554	8.502	26.880	4.485
7.346	11.158	10.935	8.322	32.603	4.052
				47.969	1.923

Table S8 Experimental binodal curve mass fraction data for the system IL (1) + K₃PO₄ (2) + H₂O (3) at 298 K

[C ₄ mim][Br]					
100 w ₁	100 w ₂	100 w ₁	100 w ₂	100 w ₁	100 w ₂
1.540	33.627	5.320	26.149	13.552	17.794
1.715	33.048	5.429	26.003	13.817	17.633
1.881	32.545	5.548	25.872	14.155	17.513
2.069	32.012	5.613	25.247	14.474	17.296
2.196	31.676	5.838	24.923	14.816	17.088
2.277	31.472	6.019	24.684	15.155	16.850
2.369	31.243	6.166	24.489	15.867	16.433
2.457	31.027	6.379	24.242	16.787	15.694
2.575	30.758	6.556	24.065	17.224	15.396
2.765	30.358	6.800	23.768	17.613	15.002
2.943	29.930	6.980	23.541	18.242	14.802
3.050	29.808	7.198	23.329	18.730	14.435
3.160	29.574	7.336	23.181	19.238	14.049
3.242	29.406	7.582	22.942	19.851	13.708
3.305	29.304	7.826	22.674	20.484	13.307
3.392	29.153	8.203	22.312	21.072	12.900
3.484	28.970	8.377	22.052	21.491	12.856
3.584	28.805	8.625	21.937	23.028	11.867
3.689	28.628	8.833	21.705	23.797	11.331
3.771	28.500	9.047	21.452	24.663	10.781
3.858	28.343	9.182	21.378	26.007	10.340
3.949	28.193	9.546	21.021	27.047	9.841
4.026	28.070	9.825	20.875	28.311	9.123
4.085	27.963	10.101	20.549	30.077	8.456

4.232	27.783	10.480	20.444	31.559	7.575
4.304	27.693	10.959	19.939	33.640	6.686
4.401	27.540	11.283	19.586	35.872	5.766
4.621	27.078	11.692	19.306	41.914	5.021
4.795	26.839	12.132	18.996	53.044	2.210
4.916	26.676	12.587	18.649		
5.079	26.480	13.088	18.289		

Table S9 Experimental binodal curve mass fraction data for the system IL (1) + K₃PO₄ (2) + H₂O (3) at 298 K

[C ₄ mim][TFA]					
100 w ₁	100 w ₂	100 w ₁	100 w ₂	100 w ₁	100 w ₂
0.403	34.326	7.554	19.942	16.071	14.517
0.473	33.706	7.785	19.727	16.439	14.351
0.634	32.860	8.062	19.629	16.844	14.191
0.806	31.291	8.323	19.389	17.271	14.028
1.925	28.011	8.622	19.110	17.775	13.755
2.297	27.055	8.964	18.752	18.245	13.542
2.603	26.416	9.218	18.650	19.285	13.079
2.999	25.600	9.416	18.435	19.829	12.829
3.230	25.070	9.717	18.297	20.439	12.526
3.412	24.702	10.023	18.174	21.114	12.194
3.623	24.478	10.284	17.902	21.765	11.824
3.838	24.077	10.632	17.773	22.432	11.565
4.122	23.829	10.995	17.541	23.189	11.235
4.409	23.303	11.389	17.342	23.929	10.828
4.637	22.944	11.732	16.997	24.600	10.317
4.884	22.846	12.060	16.689	25.363	9.928
5.248	22.284	12.283	16.568	26.242	9.566
5.515	21.832	12.510	16.445	27.243	9.120
5.691	21.719	12.756	16.313	28.379	8.596
5.860	21.475	13.042	16.158	29.557	8.122
6.040	21.258	13.324	16.063	30.787	7.579
6.227	21.004	13.692	15.759	32.432	6.935
6.484	20.868	14.008	15.550	33.860	6.280
6.748	20.662	14.476	15.523	35.545	5.421

6.936	20.484	15.006	15.013	40.969	4.631
7.138	20.307	15.358	14.849	44.506	3.982
7.351	20.124	15.703	14.682		

Table S10 Experimental binodal curve mass fraction data for the system IL (1) + K₃PO₄ (2) + H₂O (3) at 298 K

[C ₄ mim][HSO ₄]		[C ₄ mim][Cl]			
100 w ₁	100 w ₂	100 w ₁	100 w ₂	100 w ₁	100 w ₂
4.087	24.013	2.912	32.157	14.343	18.403
8.873	15.736	3.804	30.521	14.940	17.860
11.279	12.682	4.507	29.347	15.409	17.485
16.720	8.001	4.977	28.610	16.057	16.865
18.339	6.562	5.313	28.106	16.646	16.394
22.740	5.568	5.635	27.668	17.261	15.895
25.738	4.786	5.986	27.218	17.904	15.373
35.884	2.598	6.329	26.814	18.632	14.786
48.248	1.324	6.735	26.319	19.298	14.297
59.383	0.551	7.152	25.841	20.128	13.628
		7.648	25.267	20.954	13.008
		8.024	24.887	21.686	12.518
		8.530	24.407	22.512	11.946
		9.113	23.803	23.517	11.175
		9.792	23.113	24.369	10.655
		10.426	22.560	25.291	10.051
		11.083	22.019	27.447	8.731
		12.304	20.154	30.179	7.539
		12.675	19.829	32.269	6.533
		13.021	19.561	33.876	5.683
		13.531	19.054	37.151	4.566
		13.932	18.714	39.321	3.478

Table S11 Experimental binodal curve mass fraction data for the system IL (1) + K₃PO₄ (2) + H₂O (3) at 298 K

[C ₄ mim][CH ₃ CO ₂]		[C ₄ mim][CH ₃ SO ₃]			
100 w ₁	100 w ₂	100 w ₁	100 w ₂	100 w ₁	100 w ₂
6.423	30.522	2.498	34.378	14.238	21.258
7.743	28.763	3.432	32.625	14.978	20.554
7.797	28.737	4.069	31.597	15.909	19.886
8.354	28.058	4.530	30.869	16.655	19.356
8.784	27.468	4.851	30.609	17.456	18.658
9.007	27.275	5.404	29.871	18.505	17.779
9.728	26.433	6.113	28.860	19.542	17.082
9.751	26.368	6.723	28.126	20.233	16.498
10.626	25.417	7.445	27.352	21.437	15.702
10.944	24.967	7.933	26.853	22.165	15.097
11.421	24.515	8.340	26.409	23.719	14.090
12.064	23.788	8.789	25.941	24.187	13.785
12.142	23.746	9.276	25.503	25.800	12.670
13.452	22.231	9.814	24.954	27.278	11.755
15.024	20.521	10.265	24.593	27.992	11.255
16.772	18.645	10.781	24.161	29.685	10.314
18.455	16.958	11.316	23.720	31.842	9.092
20.381	15.098	11.794	23.284	34.326	7.760
22.064	13.611	12.360	22.857	37.061	6.348
24.161	11.716	12.890	22.363	40.190	4.949
26.443	9.744	13.534	21.842	46.003	2.594