Supporting information

Liquid - liquid equilibria data for ethylbenzene or *p*-xylene with alkane and 1-butylpyridinium nitrate ionic liquid at 298.15 K

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Table S1. The Othmer–Tobias parameters and the regression coefficients (R^2) for ternary systems containing [BPy][NO_3] (1) + alkane (2) + aromatic (3) at T = 298.15 K.

a	b	R^2
[BPy][NO_3] (1) + heptane (2) + ethylbenzene (3)		
7.567	2.652	0.994
[BPy][NO_3] (1) + octane (2) + ethylbenzene (3)		
6.106	2.402	0.995
[BPy][NO_3] (1) + decane (2) + ethylbenzene (3)		
4.609	2.141	0.996
[BPy][NO_3] (1) + heptane (2) + *p*-xylene (3)		
6.407	2.440	0.994
[BPy][NO_3] (1) + octane (2) + *p*-xylene (3)		
5.404	2.296	0.994
[BPy][NO_3] (1) + decane (2) + *p*-xylene (3)		
4.253	2.168	0.997

Table S2. The Hand parameters and the regression coefficients (R^2) for ternary systems containing [BPy][NO_3] (1) + alkane (2) + aromatic (3) at T = 298.15 K.

c	d	R^2
[BPy][NO_3] (1) + heptane (2) + ethylbenzene (3)		
6.568	2.224	0.984
[BPy][NO_3] (1) + octane (2) + ethylbenzene (3)		
5.410	2.065	0.985
[BPy][NO_3] (1) + decane (2) + ethylbenzene (3)		
4.111	1.866	0.987
[BPy][NO_3] (1) + heptane (2) + *p*-xylene (3)		
5.695	2.108	0.982
[BPy][NO_3] (1) + octane (2) + *p*-xylene (3)		
4.854	2.005	0.984
[BPy][NO_3] (1) + decane (2) + *p*-xylene (3)		
3.861	1.925	0.994

Table S3 The separation factor ($\alpha_{3,2}$) and mole fraction of aromatic in the alkane rich phase (X_3^I) for the ternary systems of the experimental and literature data at T = 298.15 K.

System	X_3^I	$\alpha_{3,2}$	Reference
[BPy][NO_3] (1) + heptane (2) + ethylbenzene (3)	0.0416	42.9327	this work
	0.0867	34.1125	
	0.1802	26.3889	
	0.2806	21.4368	
	0.3793	17.6912	
	0.4787	14.4241	
	0.5806	11.8476	
	0.6814	9.4684	
	0.7859	6.9893	
	0.8906	4.3422	
[BPy][NO_3] (1) + heptane (2) + *p*-xylene (3)	0.0407	50.9050	this work
	0.0848	42.9772	
	0.1771	36.1794	
	0.2732	31.0585	
	0.3719	26.0835	
	0.4722	22.8222	
	0.5731	18.1428	
	0.6744	13.5260	
	0.7806	9.3058	
	0.8888	5.5457	
[BPy][NO_3] (1) + heptane (2) + benzene (3)	0.0348	101.4533	37
	0.0771	74.4795	
	0.1617	66.5066	
	0.2557	58.8502	
	0.3556	48.7762	
	0.4519	40.7509	
	0.5498	33.0038	
	0.6559	24.7746	
	0.7633	19.6960	
	0.8752	12.5373	
[Bmim][NO_3] (1) + heptane (2) + *p*-xylene (3)	0.1530	32.8910	35
	0.1760	32.2530	
	0.3080	22.0030	
	0.3660	18.8990	
	0.4640	14.3780	
	0.4710	14.0080	
	0.5500	11.2440	
	0.6440	8.0540	
sulfolane (1) + heptane (2) + *p*-xylene (3)	0.1050	17.3399	44
	0.3220	10.9490	
	0.4770	7.7631	
	0.5480	6.6740	
	0.6200	4.6707	
	0.7010	3.0488	
	0.7030	2.5493	

NMR spectroscopy of synthesized ionic liquid

^{1}H NMR (500 MHz) spectra was obtained on a FT-NMR Bruker Ultra Shield TM instrument as $CDCl_3$ –DMSO-d6 solutions, and the chemical shifts are expressed as δ units. The ^{1}H resonance of $CDCl_3$ residual in respect to the methyl resonance of TMS at 0.0 ppm was used to reference the 1H spectra.

The "unidentified" peaks relate to the residuals from the solvents used for the analysis, which from left to right show $CHCl_3$ as the impurity of $CDCl_3$ at ~7.3 ppm and H_2O & DMSO at ~2.9 & 2.2 ppm as the impurity of DMSO-d6, respectively.

[BPy][NO_3]

^{1}H NMR (500 MHz, $CDCl_3$): δ (ppm) 8.91 (2H, *J* = 5.1 Hz, d), 8.18 (1H, *J* = 6.5 Hz, t), 7.72 (2H, *J* = 5.3 Hz, t), 4.36 (2H, *J* = 7.6 Hz, t), 1.61-1.55 (2H, m), 0.99-0.94 (2H, m), 0.52 (3H, *J* = 7.3, t).

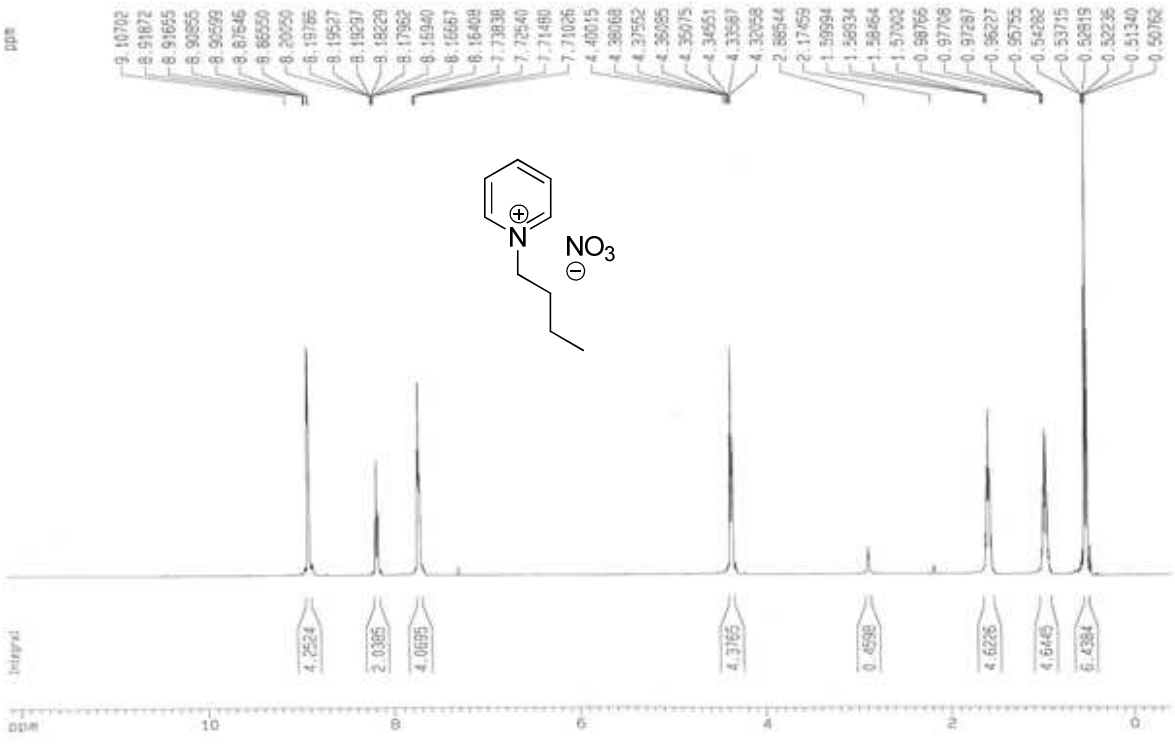

Figure S1. [BPy][NO_3] ^{1}H NMR spectrum

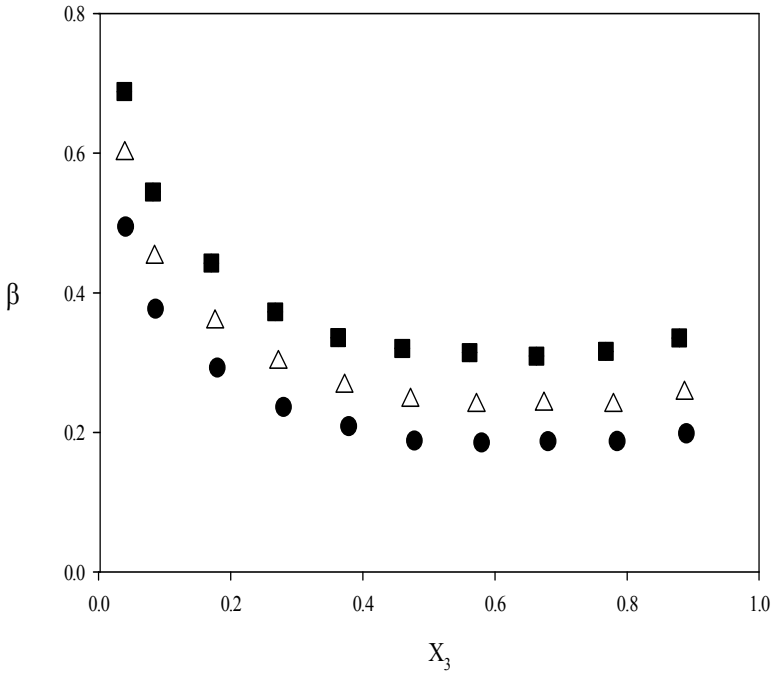

Figure S2. Solute distribution ratio versus mole fraction of ethylbenzene in the alkane rich phase, for the ternary systems including {[BPy][NO_3] (1) + alkane (2) + ethylbenzene (3)} at T = 298.15 K: (●) heptane, (Δ) octane, (■) decane