

Probing the absence of third phase formation during the extraction of trivalent metal ions in ionic liquid medium

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Measurement of Viscosity and Refractive index

Viscosities of ionic liquid phases were measured using Lovis 2000 ME; a rolling ball viscometer (supplied by Anton Paar), which measures the rolling time of a ball through transparent and opaque liquids according to Höppler's principle. The uncertainty in the values of viscosity was about 2×10^{-3} mPa.s. Similarly, the refractive index of the organic phase sample was measured using a Anton Parr refractometer (Model: Abbemat 200) which can measure the refractive index in the temperature range of 283K to 333K with an accuracy of ± 0.0001 nD.

Table S1. Viscosity and refractive index of ionic liquid phases measured after equilibration with nitric acid.

[HNO₃]/ M	Viscosity/ mPa.s		
	[N₁₈₈₈][NO₃]	0.1M T2EHDGA/[N₁₈₈₈][NO₃]	0.1M CMPO/[N₁₈₈₈][NO₃]
0.5	128	141	131
1	118	123	120
3	104	111	108
5	90	98	94
8	71	75	72

[HNO₃]/ M	Refractive Index		
	[N₁₈₈₈][NO₃]	0.1M T2EHDGA/[N₁₈₈₈][NO₃]	0.1M CMPO/[N₁₈₈₈][NO₃]
0.5	1.4642	1.4646	1.4667
1	1.4621	1.4622	1.4622
3	1.4588	1.4591	1.4589
5	1.4577	1.4579	1.4583
8	1.4574	1.4576	1.4578

Table S2. Viscosity and refractive index of different ionic liquid phases after Nd(III) loading from 3 M nitric acid.

[Nd(III)]_{aq. ,ini}/ M	Viscosity/ mPa.s	
	0.1M T2EHDGA/[N₁₈₈₈][NO₃]	0.1M CMPO/[N₁₈₈₈][NO₃]
0	111	108
0.5	125	115
1	128	118
3	135	127
5	138	134

[Nd(III)]_{aq. ,ini}/ M	Refractive Index	
	0.1M T2EHDGA/[N₁₈₈₈][NO₃]	0.1M CMPO/[N₁₈₈₈][NO₃]
0	1.4591	1.4589
0.5	1.4582	1.4591
1	1.4583	1.4594
3	1.4585	1.4598
5	1.4588	1.4599

Table S3. Viscosity and refractive index of ionic liquid phase at different concentrations of T2EHDGA (or CMPO).

[Extractant]/ M in [N₁₈₈₈][NO₃]	Viscosity/ mPa.s	
	T2EHDGA/[N₁₈₈₈][NO₃]	CMPO/[N₁₈₈₈][NO₃]
0	104	104
0.1	111	108
0.2	113	114
0.3	125	123

[Extractant]/ M in [N₁₈₈₈][NO₃]	Refractive Index	
	T2EHDGA/[N₁₈₈₈][NO₃]	CMPO/[N₁₈₈₈][NO₃]
0	1.4588	1.4588
0.1	1.4591	1.4589
0.2	1.4592	1.4602
0.3	1.4594	1.4630

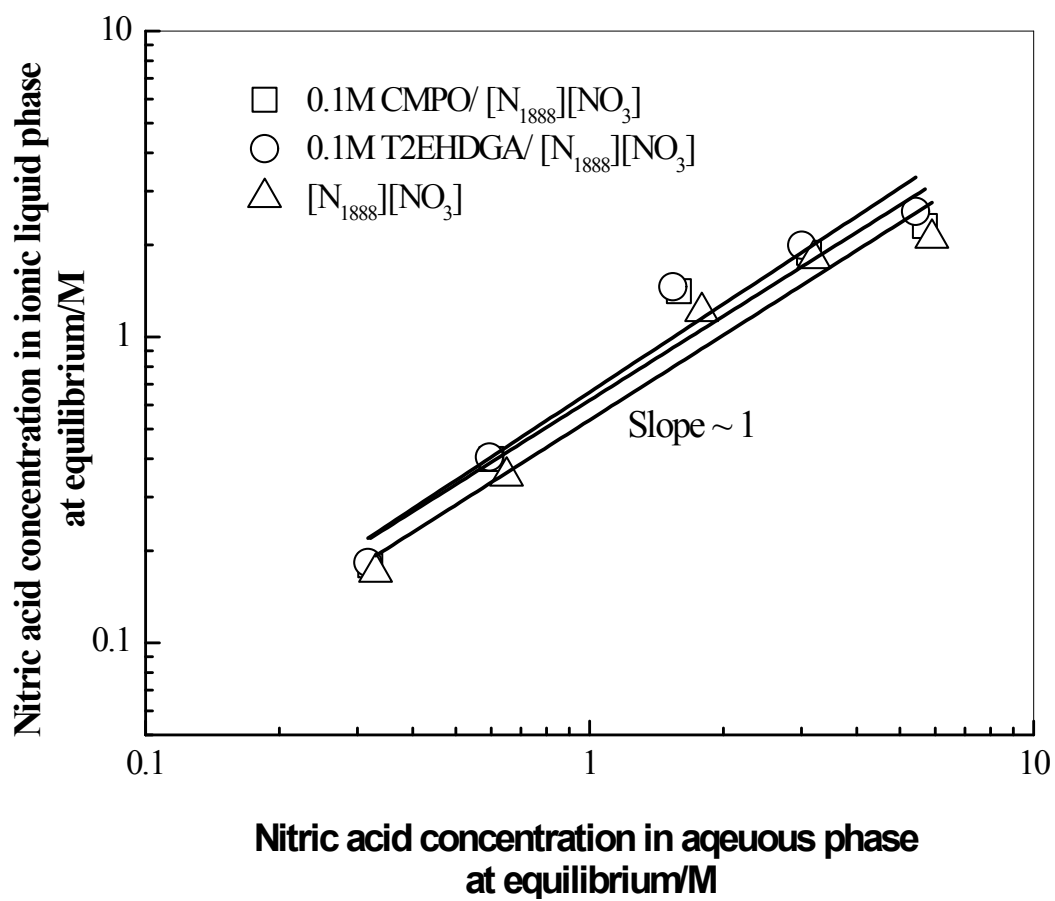


Figure S1. Nitric acid extraction isotherm in various ionic liquid systems.

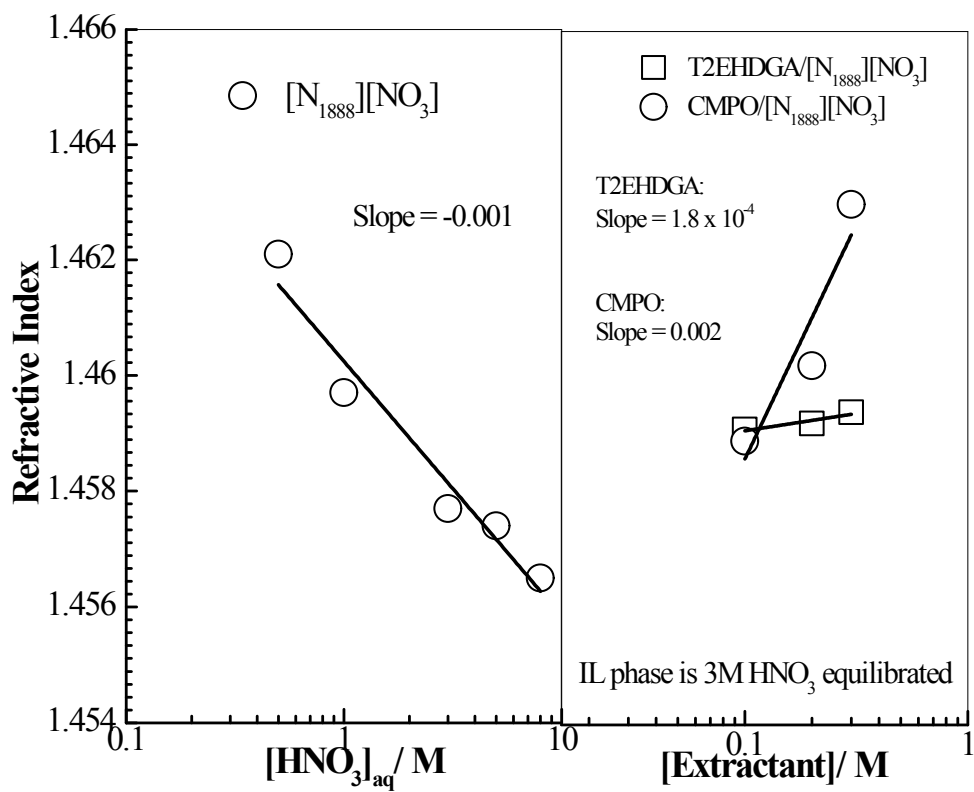


Figure S2. Variation of refractive indices of the ionic liquid phase $[N_{1888}][NO_3]$ as a function of nitric acid and extractants.