Supporting Information

LIQUID DENSITIES AND SPEED OF SOUND FOR IONIC LIQUID (2-HEAA AND 2-HDEAA) + ALCOHOL (1-PROPANOL AND 2-PROPANOL) MIXTURES FOR T = (293.15-323.15 K) AND ATMOSPHERIC PRESSURE

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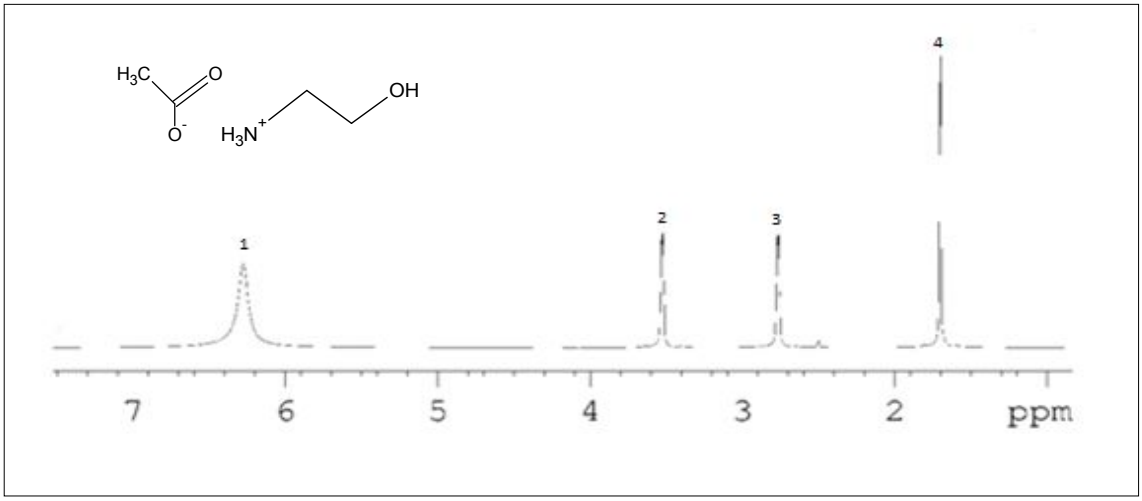

Figure S1. ^{1}H NMR spectrum for ionic liquid protic 2-HEAA. Experimental relative peak areas (peak 1 =36.72 %, peak 2= 5.80 %, peak 3= 14.51 %, peak 4= 42.97 %)

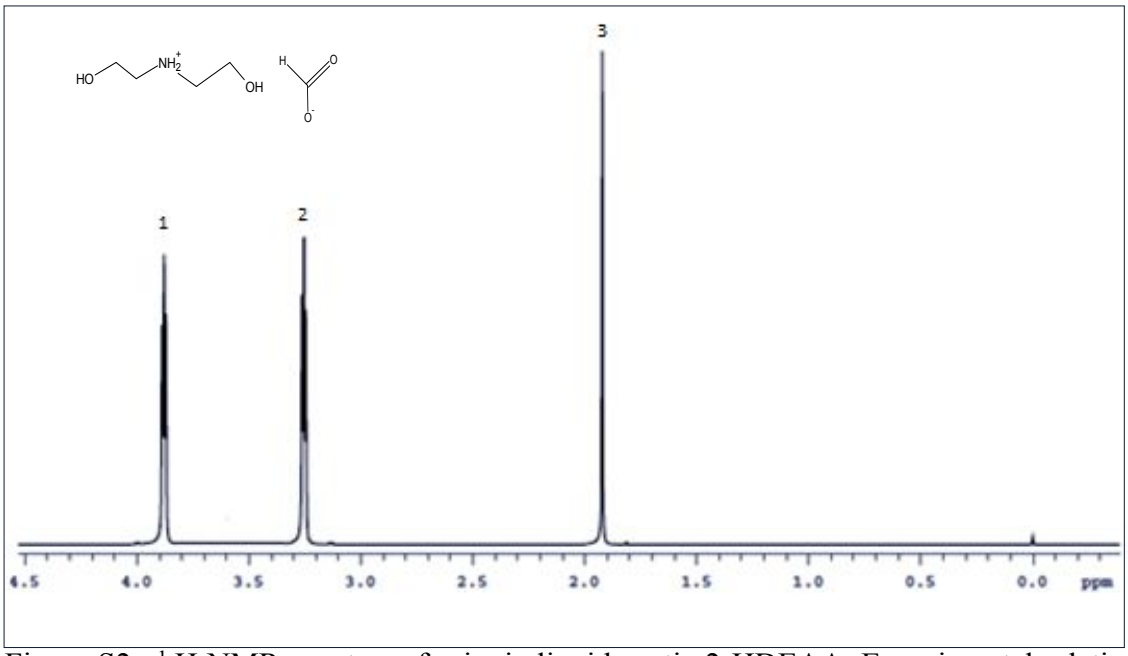

Figure S2. ^{1}H NMR spectrum for ionic liquid protic 2-HDEAA. Experimental relative peak areas (peak 1 =32.05 %, peak 2= 33.75%, peak 3= 34.22 %)

Table S1. Estimated parameters for excess molar volume, V^E, of the binary mixtures at different temperatures, along with standard deviation, σ.

	T/K = 293.15	T/K = 303.15	T/K = 313.15	T/K = 323.15
2-HDEAA + 1- propanol				
A_0	-2.1393	-2.3414	-2.5687	-2.7799
A_1	-1.0190	-1.1953	-1.1415	-0.7473
A_2	-2.2692	-2.0400	-1.8869	-2.3714
A_3	-1.3967	-0.8795	-1.0611	-1.8989
A_4	2.8744	2.8117	2.7253	3.2757
σ	0.23	0.23	0.23	0.22
2-HDEAA + 2- propanol				
A_0	-1.5932	-2.9823	-3.1736	-3.7034
A_1	-1.0337	-1.9307	-1.7084	-1.8132
A_2	-0.7999	-1.5363	-1.9339	-2.8143
A_3	7.9339	4.5699	3.9708	3.8172
A_4	-1.0018	-4.9913	-4.7854	-3.2280
σ	0.34	0.16	0.14	0.14
2-HEAA + 1- propanol				
A_0	-3.5829	-3.7450	-3.9918	-4.2128
A_1	0.2250	0.2550	0.2321	0.2061
A_2	-0.3542	-0.3902	-0.4642	0.0148
A_3	1.7288	1.7924	1.9715	1.8952
A_4	-5.0062	-5.0004	-4.9616	-5.6921
σ	0.14	0.15	0.15	0.14
2-HEAA + 2-propanol				
A_0	-3.2248	-4.7943	-5.14162	-5.2499
A_1	0.3822	-0.3053	-0.44008	-1.0984
A_2	-0.7303	-0.5649	-0.76766	-1.6417
A_3	5.4261	1.5809	1.6910	2.5734
A_4	-0.8545	-5.9578	-5.9578	-5.2079
σ	0.38	0.06	0.06	0.09

Table S2. Derivated properties molality (m), isentropic compressibility (κ_s), deviations in isentropic compressibility ($\Delta\kappa_s$), apparent molar volume ($V_Ø$), apparent molar isentropic compressibility ($\kappa_ø$) and, excess molar volume, V^E, for the pure components and binary mixtures (2-HDEAA + 1-propanol, or + 2-propanol, 2-HEAA + 1-propanol, or + 2-propanol) at T = (293.15 to 323.15) K.

2-HDEAA + 1-propanol						
x_1	m (mol kg^{-1})	10^{10} x κ_s (Pa^{-1})	10^{10} x $\Delta\kappa_s$ (Pa^{-1})	$V_Ø$ (cm^3.mol^{-1})	10^{10} x $\kappa_Ø$ (Pa^{-1})	V^E (cm^3.mol^{-1})
293.15 K						
0.000	0.00	8.31	0.00	-	-	0
0.096	1.76	6.95	-0.79	136.38	-1.27	-0.34
0.199	4.14	5.88	-1.25	137.10	7.65	-0.56
0.295	6.96	5.12	-1.45	137.79	13.43	-0.62
0.400	11.10	4.43	-1.51	138.45	17.91	-0.58
0.501	16.71	3.92	-1.43	138.86	21.63	-0.53
0.599	24.89	3.48	-1.28	139.09	24.32	-0.48
0.697	38.24	3.11	-1.08	139.26	26.31	-0.44
0.801	66.76	2.85	-7.19	139.62	29.61	-0.22
0.901	151.94	2.61	-0.36	139.79	31.81	-0.10
1.000	-	2.39	0.00	-	-	0
303.15 K						
0	0	8.8835	0	-	-	0
0.0959	1.76	7.3873	-0.8889	137.09	-5.2709	-0.35
0.1994	4.14	6.2203	-1.4004	137.81	4.962	-0.57
0.2948	6.96	5.3945	-1.6221	138.45	11.651	-0.65
0.4002	11.1	4.656	-1.6931	138.98	16.856	-0.68
0.501	16.71	4.1092	-1.6016	139.57	21.434	-0.56
0.5994	24.89	3.6652	-1.4224	139.79	24.893	-0.53
0.6968	38.24	3.292	-1.1788	139.99	27.709	-0.47
0.8005	66.76	2.9889	-0.8251	140.34	30.851	-0.26
0.9013	151.94	2.7594	-0.4163	140.54	33.715	-0.11
1	-	2.5506	0	-	-	0
313.15 K						
0.000	0.00	9.51	0.00	-	-	0
0.096	1.76	7.86	-1.00	137.67	-10.84	-0.36
0.199	4.14	6.58	-1.57	138.42	1.35	-0.60
0.295	6.96	5.69	-1.81	139.08	9.25	-0.69
0.400	11.10	4.89	-1.89	139.65	15.41	-0.71
0.501	16.71	4.30	-1.78	140.21	20.78	-0.62
0.599	24.89	3.84	-1.58	140.48	25.00	-0.58
0.697	38.24	3.45	-1.30	140.7	28.47	-0.52
0.801	66.76	3.12	-0.92	141.08	31.84	-0.29
0.901	151.94	2.89	-0.47	141.31	35.27	-0.11

1.000	-	2.68	0.00	-	-	0
			323.15 K			
0.000	0.00	10.20	0.00	-	-	0
0.096	1.76	8.37	-1.12	138.19	-17.07	-0.38
0.199	4.14	6.97	-1.75	138.92	-3.13	-0.66
0.295	6.96	6.00	-2.01	139.83	6.50	-0.71
0.400	11.10	5.14	-2.10	140.34	13.65	-0.76
0.501	16.71	4.51	-1.98	140.91	19.85	-0.66
0.599	24.89	4.02	-1.74	141.15	24.85	-0.65
0.697	38.24	3.61	-1.43	141.4	28.95	-0.58
0.801	66.76	3.25	-1.02	141.8	32.74	-0.35
0.901	151.94	3.01	-0.52	142.09	36.69	-0.14
1.000	-	2.80	0.00	-	-	0

2-HDEAA + 2-propanol

x_1	m (mol kg^{-1})	10^{10} x κ_s (Pa^{-1})	10^{10} x $\Delta\kappa_s$ (Pa^{-1})	$V_Ø$ (cm^3.mol^{-1})	10^{10} x $\kappa_Ø$ (Pa^{-1})	V^E (cm^3.mol^{-1})
			293.15 K			
0.000	0.00	9.16	0.00	-	-	0
0.040	1.88	7.66	-0.81	140.57	7.18	-3.55
0.083	4.16	6.45	-1.36	139.08	7.21	-6.05
0.134	7.09	5.50	-1.64	138.82	11.07	-7.67
0.194	11.01	4.73	-1.74	138.85	14.71	-8.58
0.268	16.75	4.07	-1.69	138.99	18.23	-8.89
0.344	23.90	3.65	-1.52	139.39	21.68	-8.55
0.455	38.13	3.21	-1.23	139.32	25.06	-7.79
0.592	66.18	2.85	-0.90	139.27	27.65	-6.36
0.766	149.75	2.57	-0.49	139.33	30.32	-4.03
1.000	-	2.39	0.00	-	-	0
			303.15 K			
0.000	0.00	10.22	0.00	-	-	0
0.040	1.88	8.17	-1.27	135.86	-28.75	-4.22
0.083	4.16	6.84	-1.85	137.24	-10.82	-6.77
0.134	7.09	5.80	-2.12	138.01	0.01	-8.39
0.194	11.01	4.98	-2.19	138.59	7.68	-9.28
0.268	16.75	4.28	-2.09	139.04	13.88	-9.55
0.344	23.90	3.84	-1.86	139.7	19.25	-9.14
0.455	38.13	3.38	-1.50	139.75	24.14	-8.32
0.592	66.18	3.00	-1.09	139.83	27.88	-6.78
0.766	149.75	2.73	-0.59	140	31.72	-4.27
1.000		2.55	0.00	-	-	0
			313.15 K			
0.000	0.00	11.01	0.00	-	-	0
0.040	1.88	8.73	-1.43	136.22	-38.76	-4.34
0.083	4.16	7.26	-2.09	137.78	-17.50	-6.96

0.134	7.09	6.13	-2.39	138.59	-4.54	-8.61
0.194	11.01	5.24	-2.45	139.33	4.73	-9.49
0.268	16.75	4.49	-2.34	139.69	11.99	-9.81
0.344	23.90	4.02	-2.08	140.39	18.42	-9.38
0.455	38.13	3.54	-1.68	140.43	24.12	-8.55
0.592	66.18	3.13	-1.22	140.56	28.56	-6.95
0.766	149.75	2.85	-6.60	140.75	33.06	-4.38
1.000	-	2.68	0.00	-	-	0
			323.15 K			
0.000	0.00	11.91	0.00	-	-	0
0.040	1.88	9.35	-1.64	136.46	-51.94	-4.50
0.083	4.16	7.72	-2.38	138.01	-26.59	-7.20
0.134	7.09	6.49	-2.70	138.95	-10.80	-8.92
0.194	11.01	5.52	-2.77	139.61	0.48	-9.87
0.268	16.75	4.71	-2.63	140.5	9.55	-10.0
0.344	23.90	4.22	-2.32	140.76	16.91	-9.79
0.455	38.13	3.70	-1.87	141.11	23.74	-8.82
0.592	66.18	3.27	-1.36	141.26	29.01	-7.17
0.766	149.75	2.98	-0.73	141.51	34.29	-4.51
1.000	-	2.80	0.00	-	-	0

2-HEAA+ 1-propanol

x_1	m (mol kg^{-1})	10^{10} x κ_s (Pa^{-1})	10^{10} x $\Delta\kappa_s$ (Pa^{-1})	$V_Ø$ (cm^3.mol^{-1})	10^{10} x $\kappa_Ø$ (Pa^{-1})	V^E (cm^3.mol^{-1})
			293.15 K			
0.000	0.00	8.31	0.00	-	-	0
0.101	1.87	7.19	-0.55	100.99	-1.85	-0.43
0.199	4.13	6.34	-0.85	102.14	5.34	-0.61
0.298	7.06	5.60	-1.03	102.64	9.57	-0.77
0.401	11.15	4.93	-1.11	103.13	13.10	-0.84
0.502	16.74	4.36	-1.11	103.5	15.75	-0.87
0.592	24.12	3.92	-1.04	103.72	18.03	-0.90
0.681	35.46	3.53	-0.93	103.9	19.90	-0.90
0.795	64.33	3.09	-0.72	104.33	22.16	-0.71
0.890	135.04	2.80	-0.47	104.45	24.18	-0.69
1.000	-	2.65	0.00	-	-	0
			303.15 K			
0.000	0.00	8.88	0.00	-	-	0
0.101	1.87	7.65	-0.61	101.4	-5.29	-0.44
0.199	4.13	6.72	-0.95	102.54	2.81	-0.64
0.298	7.06	5.90	-1.16	103.04	7.76	-0.81
0.401	11.15	5.18	-1.24	103.57	11.90	-0.87
0.502	16.74	4.57	-1.24	103.93	15.02	-0.91
0.592	24.12	4.10	-1.16	104.17	17.75	-0.93

0.681	35.46	3.68	-1.03	104.36	20.00	-0.94
0.795	64.33	3.23	-0.78	104.81	22.84	-0.74
0.890	135.04	2.93	-0.50	104.94	25.17	-0.71
1.000	-	2.75	0.00	-	-	0
			313.15 K			
0.000	0.00	9.51	0.00	-	-	0
0.101	1.87	8.15	-0.69	101.69	-9.73	-0.46
0.199	4.13	7.12	-1.07	102.93	-0.42	-0.67
0.298	7.06	6.23	-1.30	103.40	5.34	-0.86
0.401	11.15	5.44	-1.40	103.93	10.23	-0.95
0.502	16.74	4.78	-1.39	104.36	13.98	-0.96
0.592	24.12	4.28	-1.29	104.61	17.20	-0.99
0.681	35.46	3.83	-1.14	104.81	19.87	-1.00
0.795	64.33	3.36	-0.86	105.28	23.23	-0.80
0.890	135.04	3.04	-0.54	105.44	25.95	-0.75
1.000	-	2.85	0.00	-	-	0
			323.15 K			
0.000	0.00	10.20	0.00	-	-	0
0.101	1.87	8.69	-0.78	101.97	-14.95	-0.49
0.199	4.13	7.55	-1.20	103.25	-4.24	-0.70
0.298	7.06	6.58	-1.46	103.81	2.56	-0.88
0.401	11.15	5.72	-1.56	104.3	8.21	-1.00
0.502	16.74	5.00	-1.56	104.73	12.59	-1.02
0.592	24.12	4.46	-1.44	105.04	16.41	-1.03
0.681	35.46	3.99	-1.27	105.27	19.56	-1.03
0.795	64.33	3.49	-0.94	105.75	23.54	-0.82
0.890	135.04	3.15	-0.59	105.93	26.64	-0.75
1.000	-	2.95	0.00	-	-	0
			2-HEAA + 2-propanol			
x_1	m (mol kg^{-1})	10^{10} x κ_s (Pa^{-1})	10^{10} x $\Delta\kappa_s$ (Pa^{-1})	$V_Ø$ (cm^3.mol^{-1})	10^{10} x $\kappa_Ø$ (Pa^{-1})	V^E (cm^3.mol^{-1})
			293.15 K			
0.000	0.00	9.16	0.00	-	-	0
0.102	1.89	8.01	-0.49	104.7	6.79	-0.05
0.200	4.17	6.92	-0.94	103.12	3.47	-0.42
0.299	7.10	6.04	-1.18	103.35	6.77	-0.56
0.397	10.94	5.28	-1.30	103.40	9.67	-0.73
0.493	16.17	4.63	-1.32	103.53	12.49	-0.84
0.600	24.92	3.99	-1.26	103.90	15.30	-0.80
0.692	37.45	3.55	-1.10	104.01	18.03	-0.84
0.798	65.90	3.13	-0.83	104.28	21.08	-0.75
0.894	140.93	2.80	-0.54	104.46	23.52	-0.70
1.000	-	2.65	0.00	-	-	0
			303.15 K			

0.000	0.00	10.22	0.00	-	-	0
0.102	1.89	8.55	-0.90	99.72	-27.88	-0.61
0.200	4.17	7.35	-1.37	101.01	-14.21	-0.95
0.299	7.10	6.38	-1.60	102.27	-4.24	-1.04
0.397	10.94	5.56	-1.69	102.84	2.43	-1.15
0.493	16.17	4.86	-1.68	103.3	7.52	-1.20
0.600	24.92	4.19	-1.55	103.79	12.42	-1.17
0.692	37.45	3.72	-1.33	104.21	16.41	-1.06
0.798	65.90	3.28	-0.98	104.59	20.77	-0.92
0.894	140.93	2.93	-0.61	104.87	24.08	-0.78
1.000	-	2.75	0.00	-	-	0
			313.15 K			
0.000	0.00	11.01	0.00	-	-	0
0.102	1.89	9.16	-1.02	99.84	-36.17	-0.66
0.200	4.17	7.82	-1.56	101.17	-20.49	-1.02
0.299	7.10	6.75	-1.82	102.52	-8.81	-1.13
0.397	10.94	5.86	-1.91	103.15	-0.84	-1.25
0.493	16.17	5.10	-1.89	103.65	5.22	-1.29
0.600	24.92	4.39	-1.73	104.2	11.09	-1.25
0.692	37.45	3.88	-1.48	104.65	15.84	-1.13
0.798	65.90	3.42	-1.08	105.05	20.87	-0.98
0.894	140.93	3.05	-0.67	105.37	24.74	-0.81
1.000	-	2.85	0.00	-	-	0
			323.15 K			
0.000	0.00	11.91	0.00	-	-	0
0.102	1.89	9.83	-1.17	99.86	-47.28	-0.70
0.200	4.17	8.34	-1.78	101.26	-28.67	-1.10
0.299	7.10	7.16	-2.07	102.71	-14.70	-1.21
0.397	10.94	6.18	-2.17	103.5	-5.01	-1.30
0.493	16.17	5.36	-2.14	104.06	2.27	-1.34
0.600	24.92	4.59	-1.95	104.71	9.28	-1.24
0.692	37.45	4.05	-1.66	105.17	14.89	-1.11
0.798	65.90	3.55	-1.21	105.49	20.68	-1.03
0.894	140.93	3.16	-0.74	105.86	25.23	-0.82
1.000	-	2.95	0.00	-	-	0

Standard combined uncertainties: u(m) = 0.003; u(κ_s) = 0.02 x10^{-10}; u($\Delta\kappa_s$) = 0.004 x10^{-10}; u($V_{\varnothing}$) = 0.20; u($\kappa_{\varnothing}$) = 0.02 x10^{-10}; and, u(V^E) = 0.05.