

基于离子交换跃迁模型和实验法对离子液体 Walden 乘积的研究

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Evaluation of the Walden Product of Ionic Liquids Using Experiments and a New Theory: An Ion Exchange Transition Model

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表 S1 离子液体[C_npy][DCA] (*n* = 2-6)和[C_nmim][Ser] (*n* = 2-4)在 298.15 -338.15 K 范围内的不同含水量的电导率值

Table S1 At 298.15 -338.15 K, values of conductivity, σ , for [C_npy][DCA] (*n* = 2-6) and [C_nmim][Ser] (*n* = 2-4) contained various amount of water

[C ₂ py][DCA] ($\sigma/\text{mS cm}^{-1}$)							
<i>T</i> /K	10 ³ <i>w</i> ₂					<i>r</i>	<i>s</i> × 10 ²
	1.93	3.44	4.94	6.43	7.93		
298.15	18.60	19.44	20.60	21.55	22.70	0.999	2.91
303.15	20.80	21.80	22.70	23.70	24.60	0.999	3.02
308.15	23.90	24.80	25.80	26.60	27.50	0.999	3.02
313.15	27.40	28.20	29.00	29.80	30.50	0.999	3.29
318.15	31.00	31.80	32.50	33.30	33.90	0.999	3.49
323.15	35.40	36.10	37.00	37.80	38.50	0.999	3.07
328.15	40.10	40.80	41.80	42.60	43.40	0.999	2.45
333.15	44.80	46.10	47.00	48.10	49.10	0.999	3.10
338.15	50.10	51.10	52.40	53.40	54.70	0.999	3.54
[C ₃ py][DCA] ($\sigma/\text{mS cm}^{-1}$)							
<i>T</i> /K	10 ³ <i>w</i> ₂					<i>r</i>	<i>s</i> × 10 ²
	1.14	2.64	4.14	5.63	7.12		
298.15	13.40	13.73	14.05	14.40	14.90	0.995	6.54
303.15	15.34	15.74	16.10	16.44	16.81	0.999	1.71
308.15	18.15	18.58	19.08	19.70	20.30	0.997	7.57
313.15	21.20	21.73	22.34	22.98	23.50	0.999	3.74
318.15	24.67	25.20	25.68	26.00	26.40	0.996	7.18
323.15	28.37	28.70	29.18	29.50	29.81	0.997	5.22
328.15	32.50	32.90	33.30	33.80	34.20	0.999	3.26
333.15	36.80	37.20	37.70	38.10	38.80	0.994	9.59
338.15	41.10	41.68	42.20	42.70	43.10	0.998	5.82

[C ₄ py][DCA] ($\sigma/\text{mS cm}^{-1}$)							
<i>T/K</i>	$10^3 w_2$					<i>r</i>	<i>s</i> × 10 ²
	1.76	3.30	4.78	6.28	7.80		
298.15	9.030	9.310	9.680	9.970	10.29	0.999	2.40
303.15	10.59	10.85	11.16	11.44	11.71	0.999	1.47
308.15	12.59	12.94	13.36	13.76	14.06	0.999	3.49
313.15	14.95	15.36	15.71	16.05	16.47	0.999	2.54
318.15	17.62	18.14	18.53	18.90	19.34	0.999	3.99
323.15	20.46	21.13	21.80	22.60	23.20	0.999	5.19
328.15	23.04	23.58	24.20	24.70	25.10	0.998	6.48
333.15	26.45	26.97	27.45	28.09	28.50	0.998	5.48
338.15	29.92	30.51	31.03	31.64	32.21	0.999	2.69

[C ₃ py][DCA] ($\sigma/\text{mS cm}^{-1}$)							
<i>T/K</i>	$10^3 w_2$					<i>r</i>	<i>s</i> × 10 ²
	1.23	2.74	4.23	5.72	7.21		
298.15	6.110	6.300	6.480	6.670	6.870	0.999	0.64
303.15	7.190	7.610	7.980	8.330	8.650	0.999	3.27
308.15	8.730	9.260	9.790	10.32	10.80	0.999	1.71
313.15	10.27	10.91	11.34	11.91	12.28	0.997	7.60
318.15	12.29	12.74	13.29	13.86	14.24	0.998	5.73
323.15	14.34	15.01	15.53	16.05	16.66	0.999	4.56
328.15	16.53	17.02	17.62	18.16	18.57	0.998	5.57
333.15	18.83	19.22	19.73	20.30	20.80	0.998	5.80
338.15	21.20	21.70	22.30	22.90	23.40	0.999	3.80

[C ₆ py][DCA] ($\sigma/\text{mS cm}^{-1}$)							
<i>T/K</i>	$10^3 w_2$					<i>r</i>	<i>s</i> × 10 ²
	1.90	3.40	4.89	6.39	7.91		
298.15	4.770	4.940	5.120	5.320	5.540	0.999	1.80
303.15	5.880	6.150	6.420	6.600	6.820	0.997	3.42

308.15	7.110	7.390	7.690	7.960	8.170	0.998	3.09
313.15	8.390	8.890	9.270	9.580	9.970	0.997	5.87
318.15	10.03	10.51	10.90	11.24	11.66	0.998	4.14
323.15	11.73	12.22	12.60	12.95	13.39	0.998	4.19
328.15	13.53	13.87	14.22	14.69	15.17	0.997	6.26
333.15	15.49	15.93	16.4	16.82	17.25	0.999	1.55
338.15	17.51	18.01	18.54	18.97	19.41	0.999	3.89

[C₂mim][Ser] ($\sigma/\text{mS cm}^{-1}$)

<i>T</i> /K	$10^3 w_2$					<i>r</i>	<i>s</i> × 10 ³
	6.49	7.88	9.38	10.87	12.37		
303.15	0.944	0.964	0.982	1.00	1.02	0.999	1.30
308.15	1.30	1.32	1.35	1.38	1.40	0.998	2.87
313.15	1.66	1.69	1.72	1.74	1.76	0.995	4.82
318.15	2.13	2.16	2.18	2.21	2.23	0.998	3.12
323.15	2.66	2.69	2.71	2.73	2.76	0.995	4.38
328.15	3.38	3.41	3.43	3.46	3.48	0.998	3.12
333.15	4.23	4.26	4.29	4.32	4.36	0.997	4.34
338.15	5.11	5.15	5.18	5.22	5.26	0.999	3.90

[C₃mim][Ser] ($\sigma/\text{mS cm}^{-1}$)

<i>T</i> /K	$10^3 w_2$					<i>r</i>	<i>s</i> × 10 ³
	6.06	7.57	9.08	10.51	12.06		
298.15	0.191	0.204	0.219	0.231	0.244	0.999	0.731
303.15	0.301	0.321	0.339	0.356	0.369	0.997	2.26
308.15	0.469	0.497	0.521	0.538	0.559	0.996	3.55
313.15	0.685	0.721	0.751	0.775	0.804	0.998	3.60
318.15	0.979	1.02	1.06	1.09	1.12	0.997	4.89
323.15	1.35	1.40	1.45	1.50	1.54	0.999	3.42
328.15	1.82	1.87	1.94	1.99	2.04	0.998	6.09
333.15	2.41	2.48	2.56	2.61	2.68	0.998	7.63

338.15	3.12	3.19	3.27	3.33	3.42	0.999	7.41
[C ₄ mim][Ser] ($\sigma/\mu\text{S cm}^{-1}$)							
T/K	$10^3 w_2$					<i>r</i>	<i>s</i> × 10 ³
	8.94	10.40	11.99	13.55	15.14		
298.15	60.9	64.6	67.5	71.1	76.1	0.996	0.62
303.15	97.3	101.3	107.1	111.4	118.2	0.997	0.71
308.15	150.7	159.5	169.8	183.3	196.3	0.997	1.61
313.15	237	247	261	280	293	0.996	2.36
318.15	341	357	375	402	423	0.996	3.24
323.15	488	511	534	565	597	0.997	3.67
328.15	679	703	738	780	817	0.997	5.05
333.15	921	958	1001	1057	1103	0.998	5.09
338.15	1221	1265	1321	1401	1459	0.996	9.76

表 S2 离子液体[C_{*n*}py][DCA] (*n* = 2-6)和[C_{*n*}mim][Ser] (*n* = 3,4)在
298.15-338.15 K 范围内的不同含水量的粘度(η)值

Table S2 At 298.15-338.15 K^a, values of dynamic viscosity (η) for [C_{*n*}py][DCA]
(*n* = 2-6) and [C_{*n*}mim][Ser] (*n* = 3,4) contained various amount of water

[C ₂ py][DCA] ($\eta/\text{mPa s}$)							
T/K	$10^3 w_2$					<i>r</i>	
	1.09	2.58	4.08	5.58	7.08		
298.15	16.52	16.02	15.62	15.27	14.98	0.999	
303.15	14.38	13.97	13.58	13.23	12.98	0.997	
308.15	12.55	12.17	11.87	11.59	11.41	0.998	
313.15	11.02	10.73	10.49	10.26	10.08	0.999	
318.15	9.75	9.52	9.32	9.11	8.95	0.996	
323.15	8.44	8.27	8.08	7.9	7.77	0.998	
328.15	7.61	7.44	7.28	7.13	7.01	0.999	
333.15	6.88	6.73	6.58	6.45	6.35	0.999	

338.15	6.22	6.1	5.98	5.86	5.76	0.999
[C ₃ py][DCA] (η /mPa s)						
<i>T</i> /K			$10^3 w_2$			<i>r</i>
	1.37	2.87	4.37	5.89	7.41	
298.15	24.55	23.39	22.43	21.6	20.93	0.999
303.15	20.53	19.65	18.78	18.05	17.56	0.998
308.15	17.49	16.69	15.97	15.43	15.11	0.999
313.15	14.87	14.28	13.71	13.31	13.05	0.999
318.15	12.93	12.47	11.99	11.63	11.38	0.999
323.15	11.07	10.68	10.29	9.95	9.72	0.999
328.15	9.66	9.21	8.88	8.63	8.53	0.999
333.15	8.57	8.23	7.97	7.77	7.65	0.999
338.15	7.68	7.41	7.17	7.01	6.91	0.999
[C ₄ py][DCA] (η /mPa s)						
<i>T</i> /K			$10^3 w_2$			<i>r</i>
	1.04	2.54	4.05	5.54	7.07	
298.15	32.25	31.13	30.06	29.04	28.23	0.999
303.15	26.58	25.61	24.67	24.03	23.59	0.999
308.15	22.17	21.47	20.75	20.18	19.79	0.997
313.15	18.73	18.19	17.57	17.11	16.69	0.999
318.15	16.14	15.54	15.00	14.67	14.38	0.999
323.15	13.56	13.13	12.69	12.4	12.11	0.999
328.15	11.84	11.44	11.08	10.83	10.62	0.999
333.15	10.43	10.10	9.77	9.57	9.38	0.999
338.15	9.19	8.93	8.65	8.47	8.34	0.999
[C ₅ py][DCA] (η /mPa s)						
<i>T</i> /K			$10^3 w_2$			<i>r</i>
	1.26	2.75	4.24	5.75	7.23	
298.15	45.94	44.66	43.37	42.09	40.99	0.996

303.15	37	36.03	35.1	34.15	33.27	0.997
308.15	30.4	29.57	28.82	28.11	27.41	0.997
313.15	25.39	24.65	24.01	23.49	22.92	0.996
318.15	21.39	20.87	20.32	19.85	19.45	0.999
323.15	17.54	16.91	16.27	15.64	15.16	0.999
328.15	15.11	14.81	14.48	14.21	13.96	0.998
333.15	13.26	12.99	12.69	12.43	12.2	0.996
338.15	11.64	11.32	11.11	10.9	10.78	0.999

[C₆py][DCA] (η /mPa s)

<i>T</i> /K	$10^3 w_2$					<i>r</i>
	1.16	2.72	4.21	5.78	7.25	
298.15	56.35	53.7	51.83	50.41	49.31	0.996
303.15	45.48	43.33	41.67	40.28	39.19	0.997
308.15	37.16	35.44	34.12	33.01	32.18	0.997
313.15	30.51	29.09	28.15	27.39	26.76	0.996
318.15	25.35	24.43	23.8	23.12	22.52	0.999
323.15	21.03	20.12	19.48	19.06	18.75	0.999
328.15	18.12	17.36	16.85	16.38	15.96	0.998
333.15	15.67	14.95	14.44	14.07	13.84	0.996
338.15	13.8	13.17	12.75	12.38	12.16	0.999

[C₃mim][Ser] (η /Pa s)

<i>T</i> /K	$10^3 w_2$					<i>r</i>
	4.76	6.27	7.77	9.27	10.78	
298.15	2.4955	2.3908	2.3142	2.2590	2.2150	0.996
303.15	1.5466	1.4769	1.4389	1.4136	1.3991	0.997
308.15	0.9965	0.9662	0.9417	0.9226	0.9117	0.997
313.15	0.6700	0.6496	0.6329	0.6239	0.6169	0.996
318.15	0.4623	0.4470	0.4376	0.4316	0.4278	0.999
323.15	0.3368	0.3219	0.3119	0.3060	0.2999	0.999

328.15	0.2447	0.2382	0.2335	0.2309	0.2286	0.998
333.15	0.1830	0.1784	0.1746	0.1723	0.1710	0.996
338.15	0.1372	0.1348	0.1324	0.1311	0.1305	0.999
[C ₄ mim][Ser] (η /Pa s)						
<i>T</i> /K	$10^3 w_2$					<i>r</i>
	4.79	6.72	8.71	10.62	12.69	
298.15	5.2697	5.2207	5.1801	5.1353	5.1067	0.996
303.15	3.1467	3.0729	3.0311	3.0000	2.9752	0.997
308.15	1.9519	1.8974	1.8680	1.8432	1.8283	0.997
313.15	1.2899	1.2308	1.1791	1.1595	1.1348	0.996
318.15	0.8704	0.8217	0.7901	0.7679	0.7535	0.999
323.15	0.5967	0.5662	0.5445	0.5325	0.5229	0.999
328.15	0.4221	0.3882	0.3671	0.3520	0.3375	0.998
333.15	0.3043	0.2792	0.2662	0.2552	0.2468	0.996
338.15	0.2290	0.2121	0.1966	0.1874	0.1799	0.999

^a $u(T) = \pm 0.05$ K, w_2 is water content in mass fraction and r is correlation coefficient.

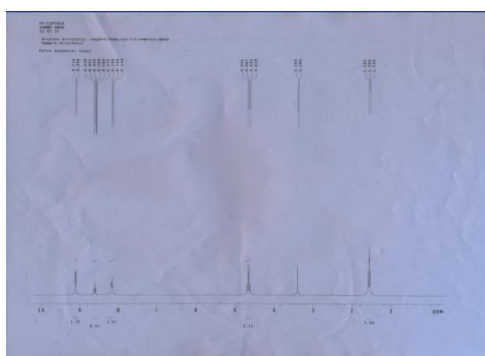


图 S1 离子液体[C₂py][DCA]的¹H NMR 谱

Fig.S1 ¹H NMR of IL [C₂py][DCA]

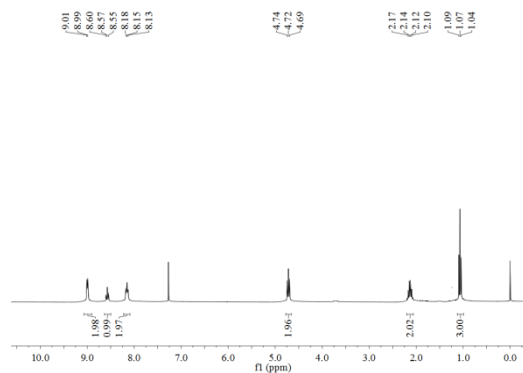


图 S2 离子液体[C₃py][DCA]的¹H NMR 谱

Fig.S2 ¹H NMR of IL [C₃py][DCA]

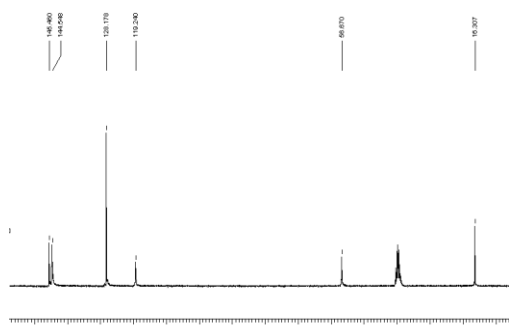


图 S9 离子液体[C₂py][DCA]的¹³C NMR 谱

Fig.S9 ¹³C NMR of IL [C₂py][DCA]

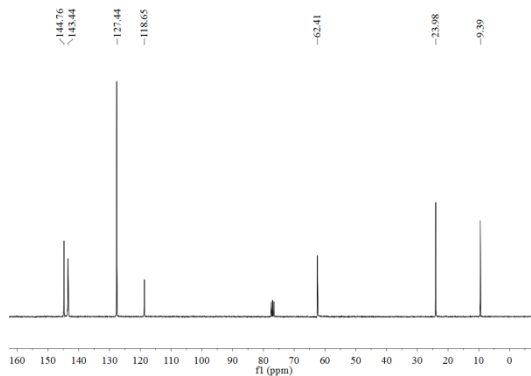


图 S10 离子液体[C₃py][DCA]的¹³C NMR 谱

Fig.S10 ¹³C NMR of IL [C₃py][DCA]

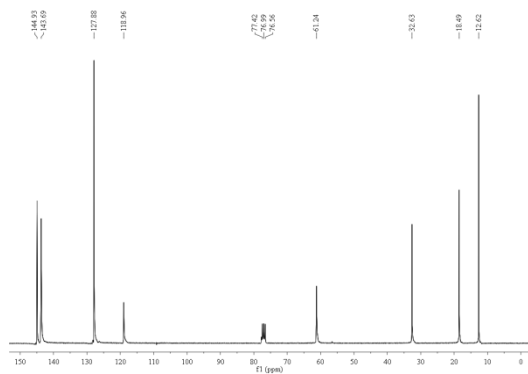


图 S11 离子液体[C₄py][DCA]的¹³C NMR 谱

Fig.S11 ¹³C NMR of IL [C₄py][DCA]

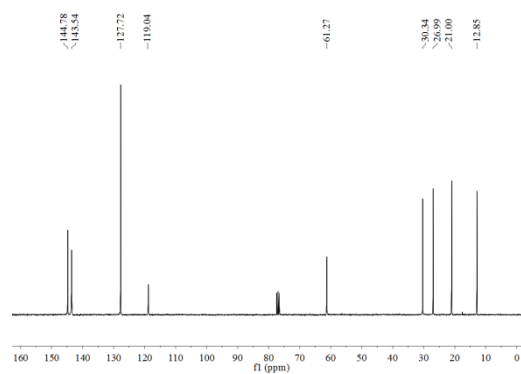


图 S12 离子液体[C₅py][DCA]的¹³C NMR 谱

Fig.S12 ¹³C NMR of IL [C₅py][DCA]

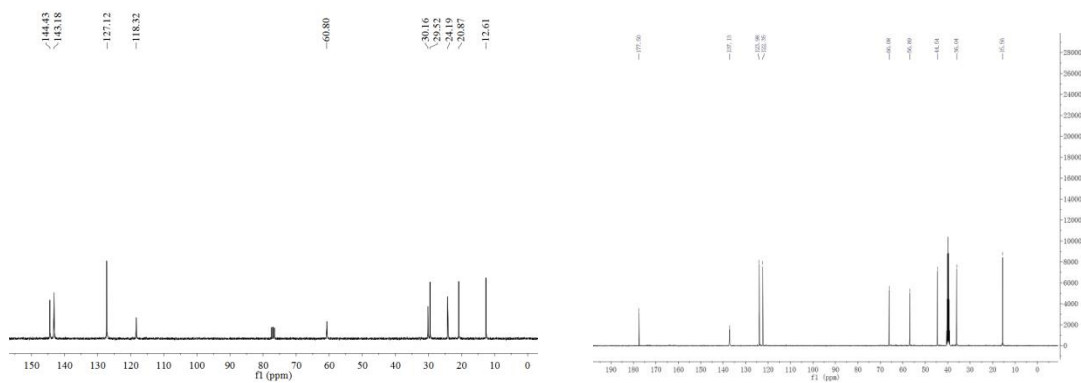


图 S13 离子液体[C₆py][DCA]的 ¹³C NMR 谱 图 S14 离子液体[C₂mim][Ser]的 ¹³C NMR 谱

Fig.S13 ¹³C NMR of IL [C₆py][DCA]

Fig.S14 ¹³C NMR of IL [C₂mim][Ser]

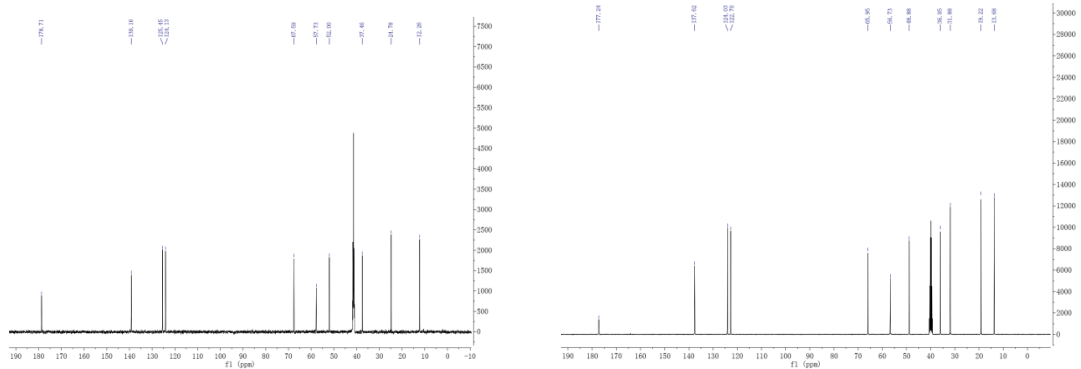


图 S15 离子液体[C₃mim][Ser]的 ¹³C NMR 谱 图 S16 离子液体[C₄mim][Ser]的 ¹³C NMR 谱

Fig.S15 ¹³C NMR of IL [C₃mim][Ser]

Fig.S16 ¹³C NMR of IL [C₄mim][Ser]

The ¹H chemical ¹³C chemical shifts (δ) are reported in parts per million (ppm) (TMS as an internal standard). Multiplicities are abbreviated as s = singlet, d = doublet, t = triplet, and m = multiplet. The NMR of the [C_npy][DCA] ($n = 2-6$) and [C_nmim][Ser] ($n = 2-4$) are as follows:

[C₂py][DCA]: ¹H NMR (300 MHz, DMSO): δ 9.118 [d, 2H (py)], 8.636 [t, 1H (py)], 8.190 [t, 2H (py)], 4.692 [t, 2H, N-CH₂], 1.593 [t, 3H, CH₃]; ¹³C NMR (70 MHz, DMSO): δ 145.460, 144.548, 128.178, 119.240, 56.670, 16.307.

[C₃py][DCA]: ¹H NMR (300 MHz, CDCl₃): δ 9.01 [d, 2H (py)], 8.60 [t, 1H (py)], 8.18 [t, 2H (py)], 4.74 [t, 2H, N-CH₂], 2.17-2.10 [m, 2H, CH₂], 1.09 [t, 3H, CH₃]; ¹³C NMR (70 MHz, CDCl₃): δ 144.76, 143.44, 127.44, 118.65, 62.41, 23.98, 9.29.

[C₄py][DCA]: ¹H NMR (300 MHz, CDCl₃): δ 8.99 [d, 2H (py)], 8.55 [t, 1H (py)], 8.15 [t, 2H (py)], 4.73 [t, 2H, N-CH₂], 2.08-1.98 [m, 2H, CH₂], 1.44-1.41 [m, 2H, CH₂], 1.01 [t, 3H, CH₃]; ¹³C NMR (70 MHz, CDCl₃): δ 144.93, 143.69, 127.88, 118.96, 61.24, 32.63, 18.49, 12.62.

[C₅py][DCA]: ¹H NMR (300 MHz, CDCl₃): δ 9.01 [d, 2H (py)], 8.60 [t, 1H (py)], 8.18 [t, 2H (py)], 4.76 [t, 2H, N-CH₂], 2.10-2.05 [m, 2H, CH₂], 1.42-1.39 [m, 4H, CH₂CH₂], 0.95 [t, 3H, CH₃]; ¹³C NMR (70 MHz, CDCl₃): δ 144.78, 143.54, 127.72, 119.04, 61.27, 30.34, 26.99, 21.00, 12.

[C₆py][DCA]: ¹H NMR (300 MHz, CDCl₃): δ 9.55 [d, 2H (py)], 8.51 [t, 1H (py)], 8.12 [t, 2H (py)], 4.95 [t, 2H, N-CH₂], 1.98-1.96 [m, 2H, CH₂], 1.28-1.22 [m, 6H, CH₂CH₂CH₂], 0.78 [t, 3H, CH₃]; ¹³C NMR (70 MHz, CDCl₃): δ 144.43, 143.18, 127.12, 118.32, 60.80, 30.16, 29.52, 24.19, 10.87, 12.61.

[C₂mim][Ser]: ¹H NMR (300 MHz, DMSO): δ_H 9.42 [s, 1H, C(2)H], 7.88 [d, 1H, C(5)H], 7.78 [d, 1H, C(4)H], 4.25 [q, 2H, NCH₂], 3.86 [s, 3H, NCH₃], 3.24 [m, 2H, NH₂CH₂], 2.83 [t, 1H, NH₂CH], 1.41 [t, 3H, NCH₂CH₃]. ¹³C NMR (70 MHz, DMSO): δ 177.50, 137.13, 123.98, 122.35, 66.08, 56.89, 44.54, 36.04, 15.56. ESI-MS *m/z* (%): 111.0 [C₂mim]⁺, 104.1 [Ser]⁻.

[C₃mim][Ser]: ¹H NMR (600 MHz, DMSO): δ_H 9.297 [s, 1H, C(2)H], 7.786 [d, 1H, C(5)H], 7.719 [d, 1H, C(4)H], 4.156~4.280 [m, 2H, NCH₂], 3.855 [s, 3H, NCH₃], 2.833~2.834 [t, 1H, NH₂CH], 1.750~1.775 [m, 2H, NH₂CHCH₂], 1.237~1.275 [m, 2H, NCH₂CH₂CH₃], 0.888~0.913 [t, 3H, NCH₂CH₂CH₃]. ¹³C NMR (70 MHz, DMSO): δ 178.71, 139.16, 125.45, 124.13, 67.59, 57.73, 52.00, 37.46, 24.78, 12.26. ESI-MS *m/z* (%): 125.1 [C₃mim]⁺, 104.1 [Ser]⁻.

[C₄mim][Ser]: ¹H NMR (600 MHz, DMSO): δ_H 9.630 [s, 1H, C(2)H], 7.845 [d, 1H, C(5)H], 7.778 [d, 1H, C(4)H], 4.188~4.212 [t, 2H, NCH₂], 3.887 [s, 3H, NCH₃], 3.296~3.307 [d, 2H, NH₂CHCH₂], 2.894~2.917 [t, 1H, NH₂CH], 1.746~1.783 [m, 2H, NCH₂CH₂CH₂CH₃], 1.237~1.275 [m, 2H, NCH₂CH₂CH₂CH₃], 0.882~0.907 [t, 3H, NCH₂CH₂CH₂CH₃]. ¹³C NMR (70 MHz, DMSO): δ 177.24, 137.62, 124.03, 122.70, 65.95, 56.73, 48.88, 36.05, 31.88, 19.22, 13.68. ESI-MS *m/z* (%): 139.0 [C₄mim]⁺, 104.0 [Ser]⁻.

Calorimetric data were obtained with a differential scanning calorimeter DSC1 (Mettler-Toledo Co., Switzerland). The temperature was -130 to 100 $^{\circ}\text{C}$ with heating rate of 10 $^{\circ}\text{C min}^{-1}$. Then samples were incubated at -130 $^{\circ}\text{C}$ for 5 min and were then heated to 100 $^{\circ}\text{C}$.

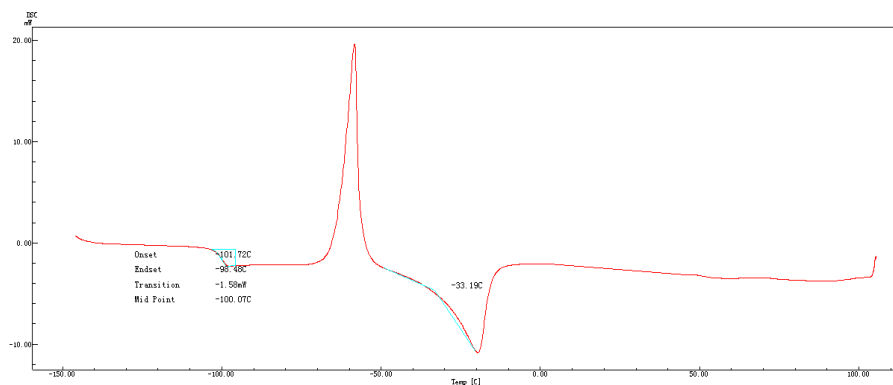


图 S17 离子液体 $[\text{C}_2\text{py}][\text{DCA}]$ 的差示扫描量热分析谱图

Fig.S17 DSC trace of IL $[\text{C}_2\text{py}][\text{DCA}]$

The temperature was -130 to 80 $^{\circ}\text{C}$ with heating rate of 10 $^{\circ}\text{C min}^{-1}$. Then samples were incubated at -130 $^{\circ}\text{C}$ for 5 min and were then heated to 80 $^{\circ}\text{C}$.

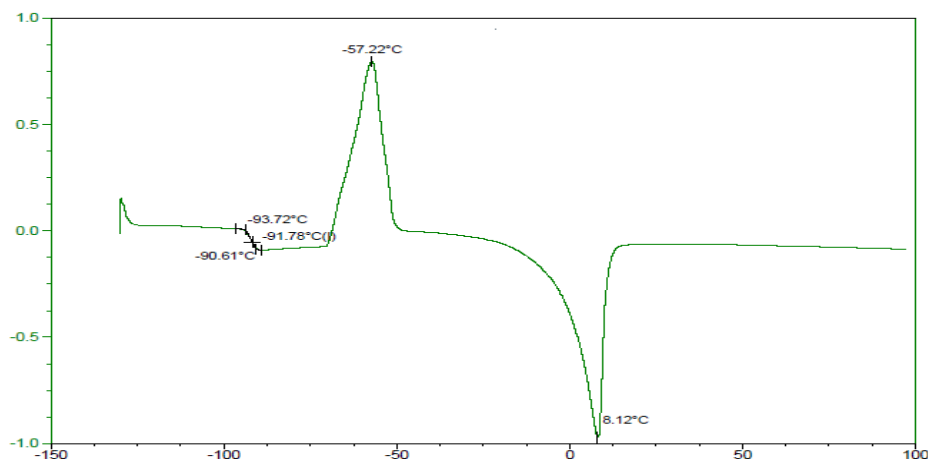


图 S18 离子液体 $[\text{C}_3\text{py}][\text{DCA}]$ 的差示扫描量热分析谱图

Fig.S18 DSC trace of IL $[\text{C}_3\text{py}][\text{DCA}]$

The temperature was -100 to 80 $^{\circ}\text{C}$ with heating rate of 10 $^{\circ}\text{C min}^{-1}$. Then samples were incubated at -100 $^{\circ}\text{C}$ for 5 min and were then heated to 80 $^{\circ}\text{C}$.

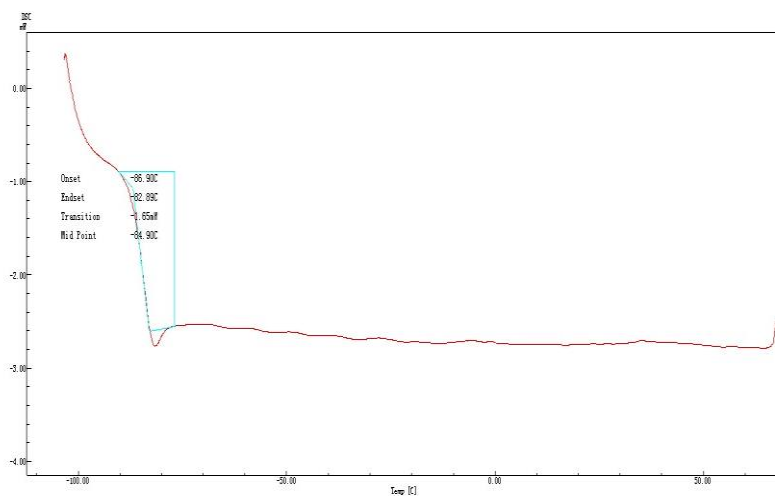


图 S19 离子液体[C₄py][DCA]的差示扫描量热分析谱图

Fig.S19 DSC trace of IL [C₄py][DCA]

The temperature was -120 to 80 °C with heating rate of 10 °C min^{-1} . Then samples were incubated at -120 °C for 5 min and were then heated to 80 °C.

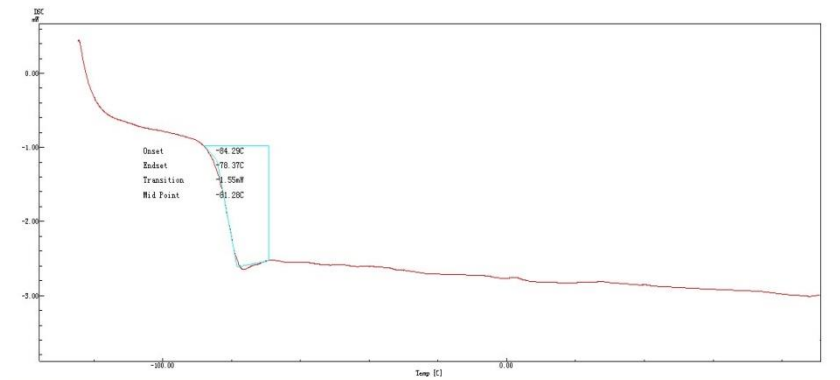


图 S20 离子液体[C₅py][DCA]的差示扫描量热分析谱图

Fig.S20 DSC trace of IL [C₅py][DCA]

The temperature was -100 to 80 °C with heating rate of 10 °C min^{-1} . Then samples were incubated at -100 °C for 5 min and were then heated to 80 °C.

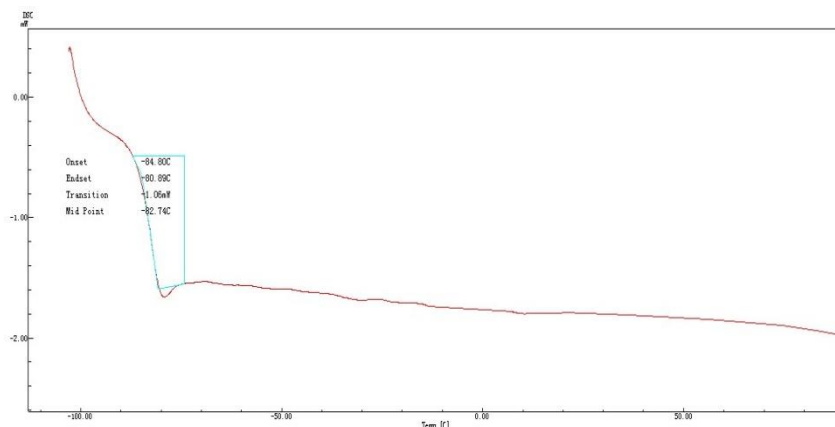


图 S21 离子液体[C₆py][DCA]的差示扫描量热分析谱图

Fig.S21 DSC trace of IL [C₆py][DCA]

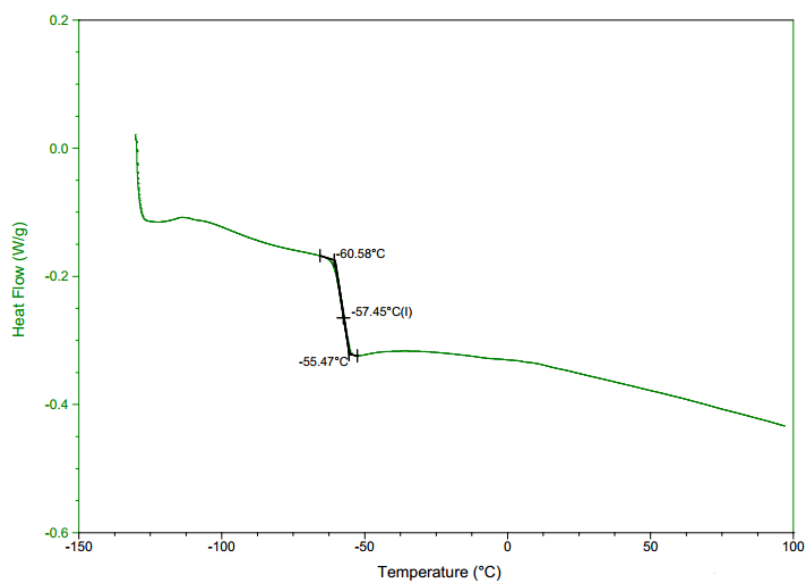


图 S22 离子液体[C₂mim][Ser]的差示扫描量热分析谱图

Fig.S22 DSC trace of IL [C₂mim][Ser]

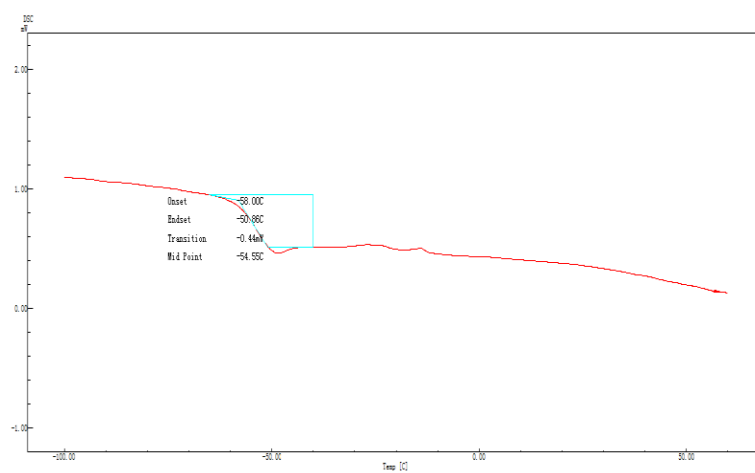


图 S23 离子液体[C₃mim][Ser]的差示扫描量热分析谱图

Fig.S23 DSC trace of IL [C₃mim][Ser]

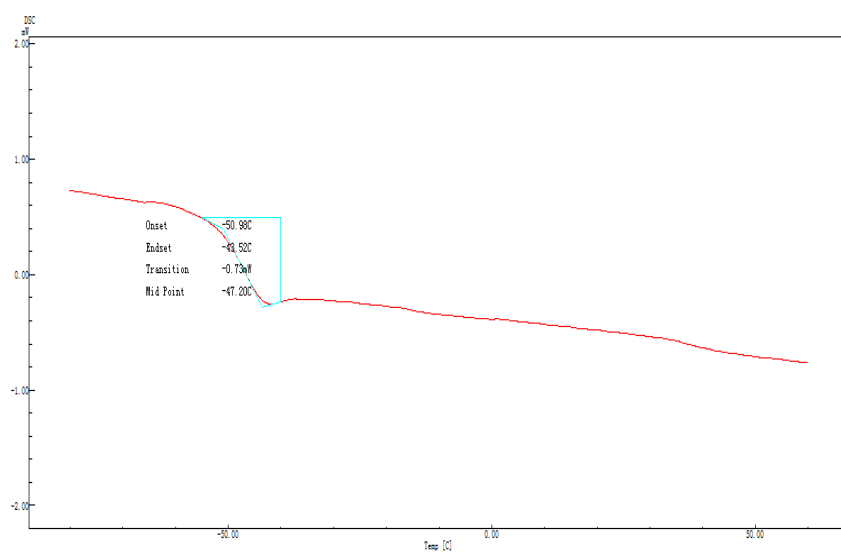


图 S24 离子液体[C₄mim][Ser]的差示扫描量热分析谱图

Fig.S24 DSC trace of IL [C₄mim][Ser]

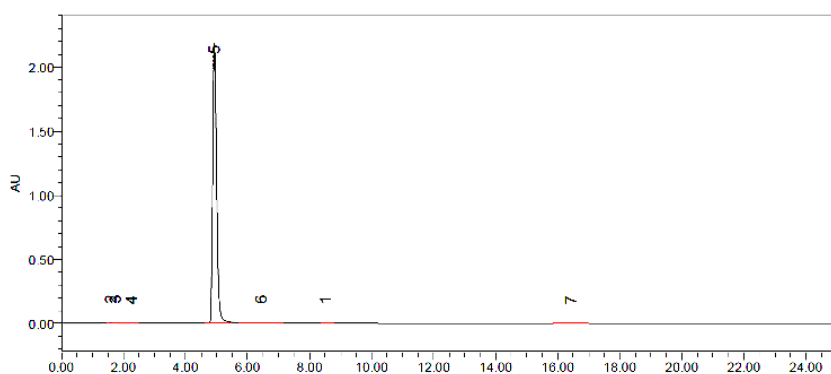


图 S25 离子液体[C₂py][DCA]的高效液相色谱图

Fig.S25 HPLC of IL [C₂py][DCA]

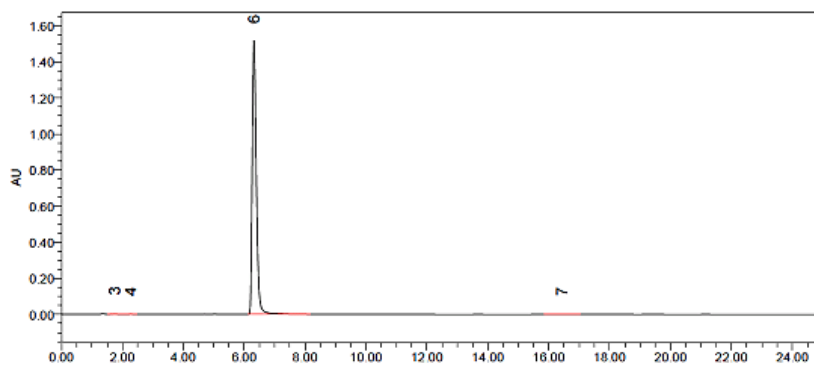


图 S26 离子液体[C₃py][DCA]的高效液相色谱图

Fig.S26 HPLC of IL [C₃py][DCA]

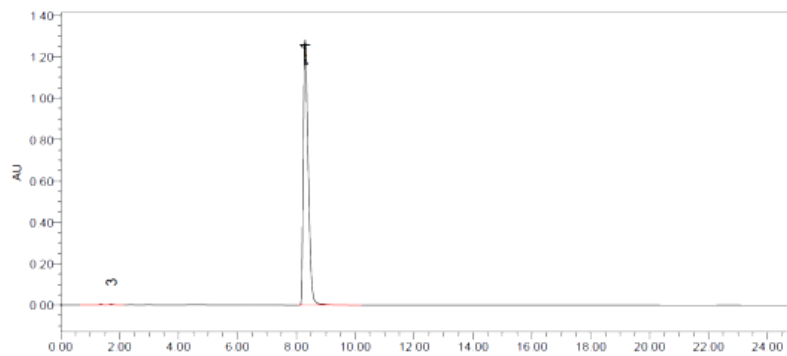


图 S27 离子液体[C₄py][DCA]的高效液相色谱图

Fig.S27 HPLC of IL [C₄py][DCA]

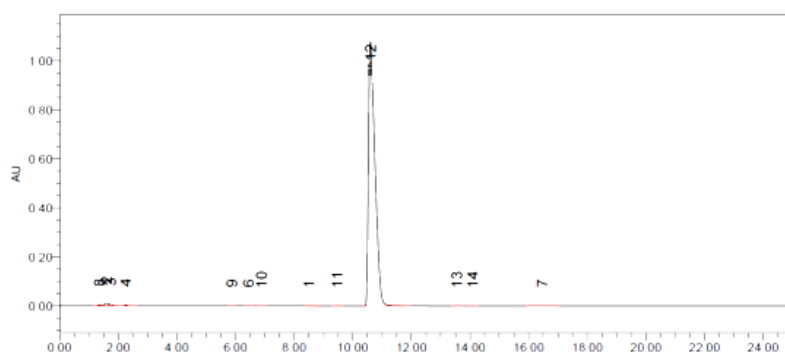


图 S28 离子液体[C₅py][DCA]的高效液相色谱图

Fig.S28 HPLC of IL [C₅py][DCA]

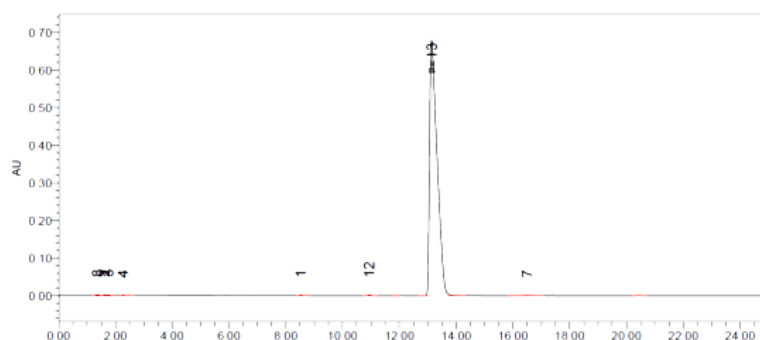


图 S29 离子液体[C₆py][DCA]的高效液相色谱图

Fig.S29 HPLC of IL [C₆py][DCA]

Chromatographic analysis was performed on a unitary C18 column (150 mm × 4.60 mm, 5 μm) (A China Chromatography Co., Ltd., Zhejiang, China). The mobile phase was a mixture of acetonitrile and 0.15% sodium hexanesulfonate at a flow rate of 1.0 mL min⁻¹. The injection volume of [C_npy][DCA] (n = 2-6) were 5 μL and [C₄py][DCA] was 10 μL, respectively. Column temperature was kept at 303K. The monitoring wavelength was 258 nm. HPLC peak area fraction of [C_npy][DCA] (n = 2-6) is 0.9932, 0.9971, 0.9967, 0.9849, and 0.9902, respectively.