

## 四种深共融溶剂的性质：密度、电导率、动力粘度及折光率

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### Properties of Four Deep Eutectic Solvents: Density, Electrical Conductivity, Dynamic Viscosity and Refractive Index

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**Table S1**  $^1\text{H}$  NMR spectrum  $\delta_{\text{H}}$  (500MHz) in  $\text{CDCl}_3$  of [TBAC:2PA] [TBAC:2EG] [TBAC:2PEG] and [TBAC:2PAA]

Radical	[TBAC:2PA]		[TBAC:2EG]		[TBAC:2PEG]		[TBAC:2PAA]	
	Chemical shift	$n_{\text{H}}$	Chemical shift	$n_{\text{H}}$	Chemical shift	$n_{\text{H}}$	Chemical shift	$n_{\text{H}}$
-CH <sub>3</sub>	0.777-0.885(t)	12	0.949-1.058(t)	12	0.809-0.870(t)	12	0.720-0.819(t)	12
-CH <sub>2</sub> -CH <sub>3</sub>	0.918-1.003(t)	6						
-CH <sub>2</sub> -CH <sub>3</sub>	1.218-1.349(m)	8	1.410-1.493(m)	8	1.250-1.333(m)	8	1.111-1.208(m)	8
N-CH <sub>2</sub> -CH <sub>2</sub> -	1.446-1.585(m)	8	1.627-1.710(dt)	8	1.476-1.562(dt)	8	1.296-1.424(dt)	8
-CH <sub>2</sub> -CH <sub>3</sub>	2.179-2.300(q)	4						
N-CH <sub>2</sub> -	3.048-3.265(m)	8	3.259-3.331(m)	8	3.176-3.221(m)	8	2.931-2.994(m)	8
-CH <sub>2</sub> -OH					3.418-3.447(m)	8		
-CH <sub>2</sub> -COOH							3.458-3.518(s)	4
-O-(CH <sub>2</sub> ) <sub>2</sub> -O-					3.469-3.508(m)	57		
-OH								
-CH <sub>2</sub> -CH <sub>2</sub> -OH					3.529-3.560(m)	8		
-CH <sub>2</sub> -OH			3.586-3.702(s)	8				
-CH <sub>2</sub> -OH			4.295-4.509(s)	4				
C(4)H							7.042-7.091(dd)	2
C(2,,3, 5,6)H							7.092-7.150(m)	8
-COOH							9.011-9.238(s)	2
-COOH	9.021-10.304(s)	2						

 $n_{\text{H}}$ : the number of the H

**Table S2** Values of density,  $\rho/\text{kg m}^{-3}$ , for four DESs at atmospheric pressure

<i>T</i> /K	[TBAC:2PA]	[TBAC:2EG]	[TBAC:2PEG]	[TBAC:2PAA]
288.15	972.38	995.35	1084.62	1046.76
293.15	969.18	992.32	1081.04	1043.55
298.15	965.91	989.34	1077.45	1040.39
303.15	962.67	986.27	1073.82	1037.14
308.15	959.38	983.21	1070.23	1033.88
313.15	956.11	980.13	1066.61	1030.59
318.15	952.83	977.03	1062.94	1027.34
323.15	949.51	973.91	1059.34	1023.99
328.15	946.26	970.85	1055.74	1020.74
333.15	943.01	967.84	1052.12	1017.56
338.15	939.73	964.78	1048.51	1014.31

The uncertainty is  $0.05 \text{ kg m}^{-3}$  for density. The uncertainty is  $0.05 \text{ K}$  for temperature.

**Table S3 Electrical conductivity values ( $\sigma/(\text{mS cm}^{-1})$ ) for four DESs at atmospheric pressure**

<i>T</i> /K	[TBAC:2PA]	[TBAC:2EG]	[TBAC:2PEG]	[TBAC:2PAA]
288.15	0.276	0.964	0.1247	0.0907
293.15	0.343	1.128	0.148	0.1214
298.15	0.420	1.314	0.178	0.1587
303.15	0.512	1.532	0.211	0.205
308.15	0.609	1.763	0.245	0.257
313.15	0.725	2.02	0.283	0.319
318.15	0.847	2.29	0.321	0.386
323.15	0.975	2.57	0.362	0.461
328.15	1.120	2.87	0.408	0.547
333.15	1.270	3.19	0.453	0.635
338.15	1.434	3.54	0.502	0.730

The uncertainty is 1% for electrical conductivity. The uncertainty is 0.05 K for temperature.

**Table S4 Values of dynamic viscosity ( $\eta$ /(mPa s)) for four DESs  
at atmospheric pressure**

<i>T</i> /K	[TBAC:2PA]	[TBAC:2EG]	[TBAC:2PEG]	[TBAC:2PAA]
288.15	301.2	216.7	315.5	677.0
293.15	213.0	160.6	232.8	430.6
298.15	155.0	121.2	177.1	286.8
303.15	114.9	92.8	133.4	205.5
308.15	87.3	71.6	104.1	134.9
313.15	67.2	56.1	82.0	109.2
318.15	52.3	44.7	65.9	83.3
323.15	41.5	35.9	53.4	64.7
328.15	33.6	29.5	44.9	51.2
333.15	27.6	24.4	37.5	40.4
338.15	22.8	20.4	31.6	33.2

The uncertainty is 1% for dynamic viscosity. The uncertainty is 0.05 K for temperature.

**Table S5** Values of refractive index,  $n_D$ , for four DESs at atmospheric pressure

$T/K$	[TBAC:2PA]	[TBAC:2EG]	[TBAC:2PEG]	[TBAC:2PAA]
288.15	1.4580	1.4686	1.4740	1.5115
293.15	1.4567	1.4674	1.4724	1.5099
298.15	1.4553	1.4661	1.4708	1.5083
303.15	1.4538	1.4648	1.4692	1.5067
308.15	1.4523	1.4635	1.4676	1.5051
313.15	1.4509	1.4622	1.4661	1.5035
318.15	1.4494	1.4608	1.4646	1.5020
323.15	1.4479	1.4594	1.4632	1.5004
328.15	1.4464	1.4580	1.4618	1.4988
333.15	1.4449	1.4566	1.4603	1.4973
338.15	1.4433	1.4551	1.4586	1.4958

The uncertainty is 0.0002 for refractive index. The uncertainty is 0.05 K for temperature.