

Supporting Information

Table 1. The vapor pressure P^* used in calculation of γ_i^∞ at $T=(303.15$ to $363.16)$

K.

solutes	P^*/kPa						
	$T/\text{K}=303.15\text{K}$	$T/\text{K}=313.15\text{K}$	$T/\text{K}=323.15\text{K}$	$T/\text{K}=333.15\text{K}$	$T/\text{K}=343.15\text{K}$	$T/\text{K}=353.15\text{K}$	$T/\text{K}=363.15\text{K}$
nonane	0.782	1.407	2.414	4.027	6.310	9.807	14.470
methylcyclohexane	7.830	12.210	18.434	27.031	38.619	53.893	73.627
2,2,4-trimethylpentane	8.326	12.966	19.471	28.603	43.510	56.796	77.427
cyclohexene	16.000	22.600	35.400	48.100	70.400	92.700	129.000
styrene	1.077	1.891	3.178	5.136	8.018	12.133	17.836
ethylbenzene	1.681	2.866	4.689	7.401	11.310	16.790	24.282
o-xylene	1.781	2.043	3.398	5.443	8.432	12.677	18.552
m-xylene	1.490	2.547	4.183	6.629	10.170	15.160	22.014
p-xylene	1.551	2.265	4.340	6.936	10.512	15.639	22.668
1-propanol	3.836	6.997	12.177	20.325	32.689	50.855	76.788
1-butanol	1.458	2.359	5.103	7.846	14.753	21.660	36.695
1-pentanol	0.481	0.971	2.222	3.473	6.979	10.120	17.625
2-propanol	9.329	14.240	26.530	38.820	65.700	92.580	145.290
2-methylpropanol	2.405	3.858	8.084	12.310	22.495	32.680	53.945
2-butanol	3.993	6.267	12.399	18.530	32.545	46.560	74.680
3-methylbutanol	0.617	1.316	3.047	4.778	9.364	13.950	24.220
acetonitrile	15.467	23.803	35.521	51.566	73.020	101.106	137.175
ethyl acetate	16.142	25.298	38.337	56.377	80.707	112.781	154.202
acetone	38.010	56.617	81.950	108.126	159.366	213.937	283.083
tetrahydrofuran	28.749	40.214	61.684	83.154	119.767	156.380	214.620
1,4-dioxane	7.117	10.380	17.360	24.340	37.715	51.090	74.470
dichloromethane	70.809	102.210	144.542	198.727	267.360	352.721	457.178
trichloromethane	32.344	48.050	72.810	97.570	139.135	180.700	245.600
tetrachloromethane	18.902	29.577	41.567	51.196	82.351	121.166	149.872

Table 2. The molar volumes V^* used in calculation of γ_i^∞ at $T=(303.15$ to $363.16)$ **K.**

solutes	$V^*/\text{cm}^3\text{mol}^{-1}$						
	$T/\text{K}=303.15\text{K}$	$T/\text{K}=313.15\text{K}$	$T/\text{K}=323.15\text{K}$	$T/\text{K}=333.15\text{K}$	$T/\text{K}=343.15\text{K}$	$T/\text{K}=353.15\text{K}$	$T/\text{K}=363.15\text{K}$
nonane	180.332	182.388	184.544	186.725	188.986	191.330	193.763
methylcyclohexane	128.609	130.146	131.632	133.152	134.801	136.490	138.320
2,2,4-trimethylpentane	166.642	168.664	170.812	173.147	175.520	178.125	180.723
cyclohexene	102.308	103.535	104.792	106.080	107.471	108.898	110.363
styrene	115.813	116.854	117.914	119.129	120.231	121.495	122.786
ethylbenzene	123.428	124.735	126.070	127.434	128.844	130.285	131.775
o-xylene	120.977	122.162	123.399	124.662	125.981	127.327	128.750
m-xylene	123.213	124.472	125.786	127.144	128.532	129.950	131.563
p-xylene	123.904	125.177	126.507	127.880	129.300	130.767	132.318
1-propanol	74.963	75.892	76.884	77.902	78.999	80.139	81.367
1-butanol	90.720	91.789	92.918	94.076	95.312	96.593	97.961
1-pentanol	108.254	109.453	110.720	112.031	113.402	114.808	116.294
2-propanol	76.453	77.509	78.647	79.830	81.114	82.452	83.916
2-methylpropanol	93.647	94.762	95.954	97.177	98.483	99.825	101.273
2-butanol	91.652	92.790	94.004	95.250	96.593	97.987	99.489
3-methylbutanol	109.890	111.097	112.374	113.695	115.093	116.525	118.057
acetonitrile	53.074	53.735	54.449	55.182	55.973	56.787	57.625
ethyl acetate	98.988	100.342	101.852	103.408	105.012	106.667	108.508
acetone	74.426	75.511	76.679	77.884	79.181	80.533	82.014
tetrahydrofuran	82.005	83.045	84.112	85.207	86.331	87.591	88.889
1,4-dioxane	86.106	87.043	88.053	89.078	90.136	91.239	92.379
dichloromethane	65.010	65.943	66.903	67.891	68.994	70.132	71.369
trichloromethane	81.182	82.244	83.333	84.452	85.663	86.909	88.257
tetrachloromethane	99.048	100.257	101.496	102.835	104.139	105.548	107.069

**Table 3. The time t_r - t_G used in calculation of γ_i^∞ at T =(303.15 to 363.16) K
when IL is hmim PF₆.**

solutes	t/min						
	$T/\text{K}=303.15\text{K}$	$T/\text{K}=313.15\text{K}$	$T/\text{K}=323.15\text{K}$	$T/\text{K}=333.15\text{K}$	$T/\text{K}=343.15\text{K}$	$T/\text{K}=353.15\text{K}$	$T/\text{K}=363.15\text{K}$
nonane	15.5	10.4	7.6	5.4	3.8	2.8	2.1
cyclohexane	5.9	4.6	3.7	3.0	2.5	2.1	1.8
methylcyclohexane	3.3	3.0	2.8	2.3	2.0	1.7	1.5
styrene	486.3	285.8	174.5	111.1	73.2	49.5	34.4
ethylbenzene	152.5	94.1	61.5	40.8	28.0	19.7	14.3
o-xylene	154.7	143.4	91.1	60.0	40.6	28.4	20.3
m-xylene	148.6	92.7	61.7	41.5	28.9	20.5	14.8
p-xylene	155.3	113.3	63.1	42.0	29.4	20.7	15.1
1-propanol	118.4	67.2	40.0	24.9	15.9	10.5	7.2
1-pentanol	659.8	333.3	134.4	92.4	48.7	36.0	21.8
2-methylpropanol	137.2	89.4	44.6	30.7	17.6	12.5	7.9
2-butanol	68.1	44.8	23.4	16.2	9.4	6.8	4.3
acetonitrile	37.4	24.3	16.3	11.2	7.9	5.7	4.2
ethyl acetate	40.3	25.8	14.6	10.1	6.1	4.2	2.7
tetrahydrofuran	14.7	10.0	6.3	4.5	3.0	2.1	1.5
1,4-dioxane	13.2	8.6	5.8	4.3	2.8	2.0	1.5
dichloromethane	20.3	13.9	9.6	6.9	5.0	3.8	2.9
trichloromethane	66.1	41.7	25.3	17.6	11.7	8.3	5.7
tetrachloromethane	13.0	7.8	5.2	3.9	2.2	1.4	1.0

**Table 4. The time t_I - t_G used in calculation of γ_i^∞ at T =(303.15 to 363.16) K
when IL is omim PF₆.**

solutes	t/min						
	$T/\text{K}=303.15\text{K}$	$T/\text{K}=313.15\text{K}$	$T/\text{K}=323.15\text{K}$	$T/\text{K}=333.15\text{K}$	$T/\text{K}=343.15\text{K}$	$T/\text{K}=353.15\text{K}$	$T/\text{K}=363.15\text{K}$
methylcyclohexane	17.2	11.5	8.0	5.6	4.0	3.0	2.3
2,2,4-trimethylpentane	7.7	5.3	3.9	2.9	2.0	1.7	1.3
cyclohexene	16.0	11.7	7.7	5.8	4.1	3.2	2.4
styrene	622.6	355.1	210.0	129.6	82.3	54.7	37.1
o-xylene	238.2	212.9	130.6	83.3	54.7	37.2	25.9
m-xylene	239.2	144.2	90.5	58.7	39.0	27.0	19.1
p-xylene	215.9	151.7	81.5	52.3	35.4	24.4	17.2
1-propanol	201.1	119.8	74.0	48.5	33.5	23.1	16.6
1-butanol	537.2	354.4	173.0	120.0	67.9	49.4	30.9
1-pentanol			405.5	268.0	137.5	97.9	57.9
2-propanol	69.4	49.1	28.1	20.5	12.8	9.8	6.5
2-methylpropanol	340.1	220.7	110.1	75.4	42.8	30.6	19.2
2-butanol	182.2	120.6	63.3	43.9	25.8	18.6	12.0
3-methylbutanol		583.0	267.6	180.4	97.5	68.9	41.5
acetonitrile	103.6	67.0	44.5	30.4	21.1	15.2	11.0
ethyl acetate	91.1	62.1	36.9	26.1	16.5	12.0	8.1
acetone	67.9	42.9	28.2	19.0	13.2	9.4	6.9
tetrahydrofuran	23.1	16.1	10.1	7.2	4.7	3.5	2.5
1,4-dioxane	9.8	6.2	4.0	2.8	1.8	1.2	0.9
dichloromethane	26.0	17.6	12.1	8.7	6.3	4.7	3.6
trichloromethane	80.8	50.5	30.7	21.1	13.8	10.0	6.9
tetrachloromethane	27.6	17.0	11.5	9.0	5.4	3.5	2.8

**Table 5. The input pressure of the GC column used in calculation of γ_i^∞ at T
=(303.15 to 363.16) K.**

Solutes	P_i/kPa						
	$T/\text{K}=303.15\text{K}$	$T/\text{K}=313.15\text{K}$	$T/\text{K}=323.15\text{K}$	$T/\text{K}=333.15\text{K}$	$T/\text{K}=343.15\text{K}$	$T/\text{K}=353.15\text{K}$	$T/\text{K}=363.15\text{K}$
hmim PF ₆	131.6	133.0	134.4	136.4	137.8	139.2	140.6
omim PF ₆	149.5	151.6	153.7	155.7	157.1	159.9	162.0