

Comprehensive study on the impact of chemical structures of ionic liquids on the solubility of ethane

Kiki Adi Kurnia,^{1,*} Pranesh Matheswaran,² Choo Jia How,² Mohd. Hilmi Noh,^{2,3*}
Yuly Kusumawati,⁴

¹Department of Marine, Faculty of Fisheries and Marine, Universitas Airlangga, Jalan Mulyorejo
Kampus C, Surabaya 60115 Indonesia.

²Chemical Engineering Department, Faculty of Engineering, Universiti Teknologi PETRONAS,
Bandar Seri Iskandar, Perak 32610 Malaysia.

³Center of Research in ILs, Universiti Teknologi PETRONAS, Bandar Seri Iskandar, Perak 32610
Malaysia.

⁴Department of Chemistry, Faculty of Science, Institut Teknologi Sepuluh Nopember, Kampus ITS
Sukolilo, Surabaya 60111 Indonesia.

*Corresponding author: K.A. Kurnia (Email: kiki.adi@fpk.unair.ac.id), M.H. Noh
(hilmi.noh@utp.edu.my)

Electronic Supplementary Information

Table S1. Experimental and predicted mole fraction solubility, $x_{C_2H_6}$, of ethane in ionic liquids at different temperatures and pressure, P .

| No | T/K | P/Mpa | $x_{C_2H_6}$ | | ARD |
|--|--------|---------|--------------|----------|--------|
| | | | Exp. | COSMO-RS | |
| [C ₄ C ₁ im][Ac] | | | | | |
| 1 | 298.15 | 0.04 | 0.0037 | 0.0014 | 0.0024 |
| 2 | 298.15 | 0.11 | 0.0095 | 0.0037 | 0.0058 |
| 3 | 298.15 | 0.16 | 0.0134 | 0.0052 | 0.0081 |
| 4 | 298.15 | 0.32 | 0.0269 | 0.0105 | 0.0163 |
| 5 | 298.15 | 0.58 | 0.0480 | 0.0188 | 0.0293 |
| 6 | 298.15 | 0.83 | 0.0726 | 0.0268 | 0.0459 |
| 7 | 298.15 | 1.07 | 0.0939 | 0.0346 | 0.0593 |
| 8 | 298.15 | 1.40 | 0.1141 | 0.0447 | 0.0693 |
| 9 | 298.15 | 1.61 | 0.1395 | 0.0515 | 0.0879 |
| 10 | 298.15 | 1.87 | 0.1616 | 0.0598 | 0.1017 |
| 11 | 313.15 | 0.05 | 0.0032 | 0.0012 | 0.0020 |
| 12 | 313.15 | 0.08 | 0.0054 | 0.0020 | 0.0034 |
| 13 | 313.15 | 0.19 | 0.0118 | 0.0046 | 0.0072 |
| 14 | 313.15 | 0.39 | 0.0240 | 0.0093 | 0.0146 |
| 15 | 313.15 | 0.62 | 0.0403 | 0.0148 | 0.0255 |
| 16 | 313.15 | 0.82 | 0.0536 | 0.0197 | 0.0339 |
| 17 | 313.15 | 1.13 | 0.0690 | 0.0269 | 0.0421 |
| 18 | 313.15 | 1.35 | 0.0823 | 0.0322 | 0.0501 |
| 19 | 313.15 | 1.50 | 0.0973 | 0.0358 | 0.0615 |
| 20 | 313.15 | 1.86 | 0.1203 | 0.0444 | 0.0760 |
| 21 | 328.15 | 0.05 | 0.0028 | 0.0010 | 0.0018 |
| 22 | 328.15 | 0.10 | 0.0048 | 0.0019 | 0.0030 |
| 23 | 328.15 | 0.21 | 0.0109 | 0.0040 | 0.0069 |
| 24 | 328.15 | 0.40 | 0.0192 | 0.0074 | 0.0117 |
| 25 | 328.15 | 0.59 | 0.0284 | 0.0111 | 0.0174 |
| 26 | 328.15 | 0.80 | 0.0408 | 0.0149 | 0.0258 |
| 27 | 328.15 | 1.11 | 0.0530 | 0.0206 | 0.0324 |
| 28 | 328.15 | 1.27 | 0.0641 | 0.0235 | 0.0406 |
| 29 | 328.15 | 1.61 | 0.0812 | 0.0298 | 0.0514 |
| 30 | 328.15 | 1.85 | 0.0932 | 0.0343 | 0.0590 |
| 31 | 343.15 | 0.04 | 0.0014 | 0.0005 | 0.0009 |
| 32 | 343.15 | 0.11 | 0.0042 | 0.0016 | 0.0026 |
| 33 | 343.15 | 0.20 | 0.0081 | 0.0030 | 0.0052 |
| 34 | 343.15 | 0.35 | 0.0132 | 0.0051 | 0.0081 |
| 35 | 343.15 | 0.62 | 0.0251 | 0.0091 | 0.0159 |
| 36 | 343.15 | 0.78 | 0.0297 | 0.0115 | 0.0182 |
| 37 | 343.15 | 1.02 | 0.0413 | 0.0151 | 0.0262 |
| 38 | 343.15 | 1.30 | 0.0522 | 0.0191 | 0.0331 |
| 39 | 343.15 | 1.50 | 0.0570 | 0.0221 | 0.0348 |
| 40 | 343.15 | 1.83 | 0.0734 | 0.0269 | 0.0465 |

| [C ₄ C ₁ im][DMP] | | | | | |
|---|--------|------|--------|--------|--------|
| 1 | 298.15 | 0.06 | 0.0046 | 0.0016 | 0.0030 |
| 2 | 298.15 | 0.10 | 0.0077 | 0.0029 | 0.0048 |
| 3 | 298.15 | 0.28 | 0.0221 | 0.0078 | 0.0143 |
| 4 | 298.15 | 0.50 | 0.0378 | 0.0143 | 0.0235 |
| 5 | 298.15 | 0.73 | 0.0545 | 0.0206 | 0.0339 |
| 6 | 298.15 | 0.94 | 0.0706 | 0.0268 | 0.0438 |
| 7 | 298.15 | 1.24 | 0.0987 | 0.0354 | 0.0633 |
| 8 | 298.15 | 1.42 | 0.1127 | 0.0405 | 0.0722 |
| 9 | 298.15 | 1.64 | 0.1300 | 0.0469 | 0.0832 |
| 10 | 298.15 | 1.82 | 0.1440 | 0.0521 | 0.0919 |
| 11 | 313.15 | 0.04 | 0.0026 | 0.0009 | 0.0017 |
| 12 | 313.15 | 0.15 | 0.0088 | 0.0033 | 0.0055 |
| 13 | 313.15 | 0.33 | 0.0186 | 0.0070 | 0.0116 |
| 14 | 313.15 | 0.52 | 0.0298 | 0.0112 | 0.0186 |
| 15 | 313.15 | 0.68 | 0.0414 | 0.0147 | 0.0267 |
| 16 | 313.15 | 0.96 | 0.0547 | 0.0207 | 0.0341 |
| 17 | 313.15 | 1.15 | 0.0658 | 0.0249 | 0.0409 |
| 18 | 313.15 | 1.30 | 0.0785 | 0.0280 | 0.0505 |
| 19 | 313.15 | 1.59 | 0.0905 | 0.0344 | 0.0561 |
| 20 | 313.15 | 1.82 | 0.1102 | 0.0395 | 0.0707 |
| 21 | 328.15 | 0.05 | 0.0025 | 0.0009 | 0.0016 |
| 22 | 328.15 | 0.20 | 0.0090 | 0.0033 | 0.0056 |
| 23 | 328.15 | 0.35 | 0.0158 | 0.0059 | 0.0099 |
| 24 | 328.15 | 0.51 | 0.0231 | 0.0087 | 0.0144 |
| 25 | 328.15 | 0.70 | 0.0317 | 0.0119 | 0.0198 |
| 26 | 328.15 | 0.95 | 0.0431 | 0.0162 | 0.0269 |
| 27 | 328.15 | 1.09 | 0.0521 | 0.0185 | 0.0336 |
| 28 | 328.15 | 1.40 | 0.0631 | 0.0238 | 0.0393 |
| 29 | 328.15 | 1.62 | 0.0775 | 0.0276 | 0.0499 |
| 30 | 328.15 | 1.83 | 0.0877 | 0.0313 | 0.0564 |
| 31 | 343.15 | 0.04 | 0.0014 | 0.0005 | 0.0009 |
| 32 | 343.15 | 0.20 | 0.0079 | 0.0028 | 0.0051 |
| 33 | 343.15 | 0.34 | 0.0125 | 0.0047 | 0.0078 |
| 34 | 343.15 | 0.60 | 0.0234 | 0.0082 | 0.0151 |
| 35 | 343.15 | 0.72 | 0.0264 | 0.0099 | 0.0165 |
| 36 | 343.15 | 0.94 | 0.0343 | 0.0129 | 0.0215 |
| 37 | 343.15 | 1.17 | 0.0429 | 0.0161 | 0.0268 |
| 38 | 343.15 | 1.34 | 0.0492 | 0.0185 | 0.0307 |
| 39 | 343.15 | 1.56 | 0.0572 | 0.0215 | 0.0357 |
| 40 | 343.15 | 1.82 | 0.0709 | 0.0252 | 0.0457 |
| [C ₄ C ₁ im][DBP] | | | | | |
| 1 | 298.15 | 0.05 | 0.0059 | 0.0019 | 0.0039 |
| 2 | 298.15 | 0.12 | 0.0150 | 0.0053 | 0.0097 |
| 3 | 298.15 | 0.16 | 0.0193 | 0.0068 | 0.0125 |
| 4 | 298.15 | 0.34 | 0.0403 | 0.0142 | 0.0261 |
| 5 | 298.15 | 0.62 | 0.0779 | 0.0261 | 0.0519 |
| 6 | 298.15 | 0.89 | 0.1128 | 0.0380 | 0.0747 |

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|---|--------|------|--------|--------|--------|
| 7 | 298.15 | 1.15 | 0.1370 | 0.0495 | 0.0875 |
| 8 | 298.15 | 1.53 | 0.1809 | 0.0661 | 0.1148 |
| 9 | 298.15 | 1.74 | 0.2060 | 0.0758 | 0.1302 |
| 10 | 298.15 | 2.01 | 0.2523 | 0.0882 | 0.1642 |
| 11 | 313.15 | 0.05 | 0.0051 | 0.0017 | 0.0034 |
| 12 | 313.15 | 0.09 | 0.0086 | 0.0028 | 0.0057 |
| 13 | 313.15 | 0.19 | 0.0172 | 0.0060 | 0.0112 |
| 14 | 313.15 | 0.40 | 0.0367 | 0.0129 | 0.0238 |
| 15 | 313.15 | 0.64 | 0.0624 | 0.0208 | 0.0416 |
| 16 | 313.15 | 0.83 | 0.0813 | 0.0272 | 0.0541 |
| 17 | 313.15 | 1.18 | 0.1079 | 0.0387 | 0.0693 |
| 18 | 313.15 | 1.41 | 0.1376 | 0.0467 | 0.0910 |
| 19 | 313.15 | 1.59 | 0.1453 | 0.0525 | 0.0927 |
| 20 | 313.15 | 1.95 | 0.1783 | 0.0651 | 0.1132 |
| 21 | 328.15 | 0.06 | 0.0050 | 0.0017 | 0.0034 |
| 22 | 328.15 | 0.10 | 0.0078 | 0.0026 | 0.0052 |
| 23 | 328.15 | 0.24 | 0.0192 | 0.0063 | 0.0128 |
| 24 | 328.15 | 0.43 | 0.0336 | 0.0111 | 0.0225 |
| 25 | 328.15 | 0.62 | 0.0488 | 0.0162 | 0.0326 |
| 26 | 328.15 | 0.86 | 0.0673 | 0.0224 | 0.0449 |
| 27 | 328.15 | 1.17 | 0.0859 | 0.0306 | 0.0553 |
| 28 | 328.15 | 1.33 | 0.0974 | 0.0348 | 0.0626 |
| 29 | 328.15 | 1.72 | 0.1262 | 0.0454 | 0.0808 |
| 30 | 328.15 | 1.99 | 0.1455 | 0.0526 | 0.0929 |
| 31 | 343.15 | 0.05 | 0.0030 | 0.0010 | 0.0020 |
| 32 | 343.15 | 0.14 | 0.0086 | 0.0030 | 0.0056 |
| 33 | 343.15 | 0.25 | 0.0164 | 0.0054 | 0.0110 |
| 34 | 343.15 | 0.42 | 0.0273 | 0.0090 | 0.0183 |
| 35 | 343.15 | 0.75 | 0.0451 | 0.0159 | 0.0292 |
| 36 | 343.15 | 0.89 | 0.0570 | 0.0190 | 0.0381 |
| 37 | 343.15 | 1.16 | 0.0697 | 0.0247 | 0.0450 |
| 38 | 343.15 | 1.45 | 0.0926 | 0.0310 | 0.0616 |
| 39 | 343.15 | 1.66 | 0.1059 | 0.0356 | 0.0703 |
| 40 | 343.15 | 1.97 | 0.1187 | 0.0426 | 0.0761 |
| [C ₄ C _{1im} [EtSO ₄] | | | | | |
| 1 | 298.15 | 0.06 | 0.0030 | 0.0011 | 0.0019 |
| 2 | 298.15 | 0.14 | 0.0072 | 0.0028 | 0.0045 |
| 3 | 298.15 | 0.20 | 0.0112 | 0.0040 | 0.0072 |
| 4 | 298.15 | 0.42 | 0.0232 | 0.0084 | 0.0148 |
| 5 | 298.15 | 0.73 | 0.0376 | 0.0145 | 0.0231 |
| 6 | 298.15 | 1.02 | 0.0561 | 0.0205 | 0.0356 |
| 7 | 298.15 | 1.35 | 0.0701 | 0.0273 | 0.0428 |
| 8 | 298.15 | 1.52 | 0.0790 | 0.0308 | 0.0481 |
| 9 | 298.15 | 1.80 | 0.0936 | 0.0367 | 0.0569 |
| 10 | 298.15 | 1.90 | 0.0995 | 0.0391 | 0.0604 |
| 11 | 313.15 | 0.06 | 0.0027 | 0.0010 | 0.0017 |
| 12 | 313.15 | 0.11 | 0.0044 | 0.0017 | 0.0027 |
| 13 | 313.15 | 0.23 | 0.0101 | 0.0036 | 0.0065 |

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|--|--------|------|--------|--------|--------|
| 14 | 313.15 | 0.47 | 0.0203 | 0.0073 | 0.0130 |
| 15 | 313.15 | 0.73 | 0.0298 | 0.0114 | 0.0184 |
| 16 | 313.15 | 0.97 | 0.0394 | 0.0151 | 0.0243 |
| 17 | 313.15 | 1.26 | 0.0545 | 0.0198 | 0.0347 |
| 18 | 313.15 | 1.42 | 0.0615 | 0.0224 | 0.0392 |
| 19 | 313.15 | 1.63 | 0.0709 | 0.0259 | 0.0450 |
| 20 | 313.15 | 1.86 | 0.0808 | 0.0296 | 0.0512 |
| 21 | 328.15 | 0.06 | 0.0022 | 0.0008 | 0.0014 |
| 22 | 328.15 | 0.12 | 0.0041 | 0.0016 | 0.0025 |
| 23 | 328.15 | 0.27 | 0.0094 | 0.0034 | 0.0060 |
| 24 | 328.15 | 0.47 | 0.0164 | 0.0059 | 0.0105 |
| 25 | 328.15 | 0.73 | 0.0243 | 0.0093 | 0.0150 |
| 26 | 328.15 | 0.98 | 0.0324 | 0.0124 | 0.0200 |
| 27 | 328.15 | 1.21 | 0.0426 | 0.0154 | 0.0273 |
| 28 | 328.15 | 1.45 | 0.0512 | 0.0185 | 0.0327 |
| 29 | 328.15 | 1.63 | 0.0574 | 0.0208 | 0.0366 |
| 30 | 328.15 | 1.82 | 0.0644 | 0.0234 | 0.0410 |
| 31 | 343.15 | 0.03 | 0.0009 | 0.0003 | 0.0006 |
| 32 | 343.15 | 0.18 | 0.0049 | 0.0018 | 0.0030 |
| 33 | 343.15 | 0.30 | 0.0086 | 0.0031 | 0.0056 |
| 34 | 343.15 | 0.62 | 0.0181 | 0.0065 | 0.0117 |
| 35 | 343.15 | 0.80 | 0.0236 | 0.0084 | 0.0152 |
| 36 | 343.15 | 1.01 | 0.0296 | 0.0106 | 0.0190 |
| 37 | 343.15 | 1.25 | 0.0368 | 0.0132 | 0.0236 |
| 38 | 343.15 | 1.57 | 0.0435 | 0.0166 | 0.0269 |
| 39 | 343.15 | 1.75 | 0.0484 | 0.0185 | 0.0299 |
| 40 | 343.15 | 1.94 | 0.0538 | 0.0206 | 0.0332 |
| [C ₄ C _{1im}][OcSO ₄] | | | | | |
| 1 | 298.15 | 0.07 | 0.0066 | 0.0023 | 0.0043 |
| 2 | 298.15 | 0.18 | 0.0179 | 0.0063 | 0.0115 |
| 3 | 298.15 | 0.24 | 0.0260 | 0.0087 | 0.0173 |
| 4 | 298.15 | 0.49 | 0.0500 | 0.0179 | 0.0321 |
| 5 | 298.15 | 0.88 | 0.0890 | 0.0321 | 0.0568 |
| 6 | 298.15 | 1.05 | 0.1127 | 0.0385 | 0.0742 |
| 7 | 298.15 | 1.23 | 0.1328 | 0.0456 | 0.0872 |
| 8 | 298.15 | 1.51 | 0.1534 | 0.0565 | 0.0969 |
| 9 | 298.15 | 1.74 | 0.1773 | 0.0658 | 0.1115 |
| 10 | 298.15 | 1.93 | 0.1964 | 0.0733 | 0.1231 |
| 11 | 313.15 | 0.07 | 0.0056 | 0.0019 | 0.0037 |
| 12 | 313.15 | 0.13 | 0.0107 | 0.0036 | 0.0071 |
| 13 | 313.15 | 0.27 | 0.0219 | 0.0078 | 0.0141 |
| 14 | 313.15 | 0.47 | 0.0397 | 0.0133 | 0.0264 |
| 15 | 313.15 | 0.81 | 0.0651 | 0.0233 | 0.0418 |
| 16 | 313.15 | 1.02 | 0.0863 | 0.0292 | 0.0571 |
| 17 | 313.15 | 1.26 | 0.1069 | 0.0364 | 0.0705 |
| 18 | 313.15 | 1.50 | 0.1270 | 0.0435 | 0.0835 |
| 19 | 313.15 | 1.67 | 0.1417 | 0.0487 | 0.0929 |
| 20 | 313.15 | 1.93 | 0.1543 | 0.0567 | 0.0976 |

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|---|--------|------|--------|--------|--------|
| 21 | 328.15 | 0.08 | 0.0057 | 0.0019 | 0.0038 |
| 22 | 328.15 | 0.15 | 0.0101 | 0.0034 | 0.0067 |
| 23 | 328.15 | 0.33 | 0.0217 | 0.0077 | 0.0140 |
| 24 | 328.15 | 0.60 | 0.0418 | 0.0140 | 0.0278 |
| 25 | 328.15 | 0.81 | 0.0529 | 0.0189 | 0.0340 |
| 26 | 328.15 | 1.12 | 0.0728 | 0.0261 | 0.0467 |
| 27 | 328.15 | 1.37 | 0.0892 | 0.0321 | 0.0570 |
| 28 | 328.15 | 1.52 | 0.0991 | 0.0358 | 0.0633 |
| 29 | 328.15 | 1.78 | 0.1158 | 0.0420 | 0.0738 |
| 30 | 328.15 | 1.93 | 0.1254 | 0.0456 | 0.0797 |
| 31 | 343.15 | 0.06 | 0.0034 | 0.0012 | 0.0022 |
| 32 | 343.15 | 0.18 | 0.0107 | 0.0033 | 0.0074 |
| 33 | 343.15 | 0.34 | 0.0176 | 0.0062 | 0.0114 |
| 34 | 343.15 | 0.56 | 0.0302 | 0.0107 | 0.0195 |
| 35 | 343.15 | 0.95 | 0.0535 | 0.0179 | 0.0355 |
| 36 | 343.15 | 1.14 | 0.0623 | 0.0223 | 0.0400 |
| 37 | 343.15 | 1.33 | 0.0744 | 0.0258 | 0.0486 |
| 38 | 343.15 | 1.52 | 0.0810 | 0.0295 | 0.0515 |
| 39 | 343.15 | 1.73 | 0.0950 | 0.0338 | 0.0612 |
| 40 | 343.15 | 1.95 | 0.1055 | 0.0382 | 0.0674 |
| [C ₄ C ₁ im][TFA] | | | | | |
| 1 | 298.15 | 0.04 | 0.0018 | 0.0006 | 0.0012 |
| 2 | 298.15 | 0.11 | 0.0050 | 0.0018 | 0.0032 |
| 3 | 298.15 | 0.16 | 0.0072 | 0.0026 | 0.0046 |
| 4 | 298.15 | 0.32 | 0.0151 | 0.0054 | 0.0096 |
| 5 | 298.15 | 0.56 | 0.0262 | 0.0095 | 0.0167 |
| 6 | 298.15 | 0.79 | 0.0369 | 0.0135 | 0.0235 |
| 7 | 298.15 | 1.04 | 0.0521 | 0.0180 | 0.0341 |
| 8 | 298.15 | 1.33 | 0.0630 | 0.0233 | 0.0397 |
| 9 | 298.15 | 1.54 | 0.0733 | 0.0273 | 0.0461 |
| 10 | 298.15 | 1.78 | 0.0850 | 0.0318 | 0.0532 |
| 11 | 313.15 | 0.05 | 0.0019 | 0.0006 | 0.0012 |
| 12 | 313.15 | 0.08 | 0.0033 | 0.0011 | 0.0022 |
| 13 | 313.15 | 0.18 | 0.0066 | 0.0024 | 0.0042 |
| 14 | 313.15 | 0.36 | 0.0134 | 0.0049 | 0.0086 |
| 15 | 313.15 | 0.56 | 0.0210 | 0.0076 | 0.0134 |
| 16 | 313.15 | 0.75 | 0.0278 | 0.0101 | 0.0177 |
| 17 | 313.15 | 1.05 | 0.0416 | 0.0143 | 0.0273 |
| 18 | 313.15 | 1.24 | 0.0492 | 0.0170 | 0.0323 |
| 19 | 313.15 | 1.41 | 0.0564 | 0.0195 | 0.0369 |
| 20 | 313.15 | 1.74 | 0.0656 | 0.0243 | 0.0414 |
| 21 | 328.15 | 0.05 | 0.0016 | 0.0005 | 0.0010 |
| 22 | 328.15 | 0.09 | 0.0030 | 0.0010 | 0.0020 |
| 23 | 328.15 | 0.21 | 0.0067 | 0.0023 | 0.0044 |
| 24 | 328.15 | 0.36 | 0.0111 | 0.0040 | 0.0071 |
| 25 | 328.15 | 0.56 | 0.0173 | 0.0062 | 0.0110 |
| 26 | 328.15 | 0.75 | 0.0231 | 0.0084 | 0.0148 |
| 27 | 328.15 | 1.01 | 0.0331 | 0.0113 | 0.0217 |

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|--|--------|------|--------|--------|--------|
| 28 | 328.15 | 1.19 | 0.0367 | 0.0134 | 0.0233 |
| 29 | 328.15 | 1.59 | 0.0491 | 0.0180 | 0.0311 |
| 30 | 328.15 | 1.82 | 0.0598 | 0.0207 | 0.0391 |
| 31 | 343.15 | 0.04 | 0.0010 | 0.0003 | 0.0007 |
| 32 | 343.15 | 0.08 | 0.0023 | 0.0008 | 0.0015 |
| 33 | 343.15 | 0.15 | 0.0038 | 0.0014 | 0.0024 |
| 34 | 343.15 | 0.25 | 0.0067 | 0.0023 | 0.0045 |
| 35 | 343.15 | 0.52 | 0.0133 | 0.0048 | 0.0085 |
| 36 | 343.15 | 0.84 | 0.0231 | 0.0079 | 0.0152 |
| 37 | 343.15 | 1.09 | 0.0300 | 0.0102 | 0.0197 |
| 38 | 343.15 | 1.35 | 0.0348 | 0.0127 | 0.0222 |
| 39 | 343.15 | 1.54 | 0.0400 | 0.0146 | 0.0254 |
| 40 | 343.15 | 1.89 | 0.0522 | 0.0180 | 0.0342 |
| [C ₄ C _{1im}][PF ₆] | | | | | |
| 1 | 298.15 | 0.04 | 0.0012 | 0.0004 | 0.0008 |
| 2 | 298.15 | 0.13 | 0.0036 | 0.0013 | 0.0023 |
| 3 | 298.15 | 0.27 | 0.0080 | 0.0026 | 0.0053 |
| 4 | 298.15 | 0.49 | 0.0145 | 0.0048 | 0.0097 |
| 5 | 298.15 | 0.70 | 0.0198 | 0.0070 | 0.0128 |
| 6 | 298.15 | 0.92 | 0.0258 | 0.0092 | 0.0166 |
| 7 | 298.15 | 1.21 | 0.0363 | 0.0123 | 0.0241 |
| 8 | 298.15 | 1.38 | 0.0393 | 0.0142 | 0.0251 |
| 9 | 298.15 | 1.59 | 0.0456 | 0.0165 | 0.0291 |
| 10 | 298.15 | 1.89 | 0.0580 | 0.0200 | 0.0380 |
| 11 | 313.15 | 0.04 | 0.0010 | 0.0003 | 0.0007 |
| 12 | 313.15 | 0.15 | 0.0035 | 0.0012 | 0.0023 |
| 13 | 313.15 | 0.32 | 0.0075 | 0.0026 | 0.0049 |
| 14 | 313.15 | 0.50 | 0.0120 | 0.0042 | 0.0078 |
| 15 | 313.15 | 0.66 | 0.0168 | 0.0056 | 0.0112 |
| 16 | 313.15 | 0.93 | 0.0224 | 0.0080 | 0.0144 |
| 17 | 313.15 | 1.12 | 0.0269 | 0.0096 | 0.0173 |
| 18 | 313.15 | 1.26 | 0.0323 | 0.0109 | 0.0214 |
| 19 | 313.15 | 1.55 | 0.0376 | 0.0135 | 0.0241 |
| 20 | 313.15 | 1.85 | 0.0480 | 0.0164 | 0.0316 |
| 21 | 328.15 | 0.05 | 0.0011 | 0.0004 | 0.0007 |
| 22 | 328.15 | 0.19 | 0.0040 | 0.0014 | 0.0026 |
| 23 | 328.15 | 0.34 | 0.0070 | 0.0025 | 0.0046 |
| 24 | 328.15 | 0.49 | 0.0110 | 0.0037 | 0.0074 |
| 25 | 328.15 | 0.68 | 0.0152 | 0.0050 | 0.0101 |
| 26 | 328.15 | 0.92 | 0.0194 | 0.0069 | 0.0125 |
| 27 | 328.15 | 1.05 | 0.0236 | 0.0079 | 0.0157 |
| 28 | 328.15 | 1.36 | 0.0288 | 0.0103 | 0.0185 |
| 29 | 328.15 | 1.57 | 0.0334 | 0.0120 | 0.0214 |
| 30 | 328.15 | 1.85 | 0.0420 | 0.0144 | 0.0276 |
| 31 | 343.15 | 0.03 | 0.0007 | 0.0002 | 0.0005 |
| 32 | 343.15 | 0.19 | 0.0035 | 0.0012 | 0.0023 |
| 33 | 343.15 | 0.32 | 0.0059 | 0.0021 | 0.0038 |
| 34 | 343.15 | 0.56 | 0.0105 | 0.0037 | 0.0068 |

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|---|--------|------|--------|--------|--------|
| 35 | 343.15 | 0.67 | 0.0133 | 0.0044 | 0.0089 |
| 36 | 343.15 | 0.87 | 0.0173 | 0.0058 | 0.0115 |
| 37 | 343.15 | 1.08 | 0.0217 | 0.0073 | 0.0145 |
| 38 | 343.15 | 1.24 | 0.0249 | 0.0083 | 0.0166 |
| 39 | 343.15 | 1.41 | 0.0283 | 0.0095 | 0.0188 |
| 40 | 343.15 | 1.81 | 0.0365 | 0.0123 | 0.0242 |
| [C ₄ C _{1im}][BF ₄] | | | | | |
| 1 | 298.15 | 0.05 | 0.0015 | 0.0005 | 0.0010 |
| 2 | 298.15 | 0.14 | 0.0037 | 0.0013 | 0.0024 |
| 3 | 298.15 | 0.19 | 0.0051 | 0.0018 | 0.0033 |
| 4 | 298.15 | 0.38 | 0.0104 | 0.0037 | 0.0067 |
| 5 | 298.15 | 0.68 | 0.0198 | 0.0067 | 0.0132 |
| 6 | 298.15 | 0.97 | 0.0266 | 0.0096 | 0.0171 |
| 7 | 298.15 | 1.26 | 0.0371 | 0.0126 | 0.0245 |
| 8 | 298.15 | 1.44 | 0.0423 | 0.0144 | 0.0279 |
| 9 | 298.15 | 1.70 | 0.0500 | 0.0171 | 0.0329 |
| 10 | 298.15 | 1.89 | 0.0560 | 0.0192 | 0.0368 |
| 11 | 313.15 | 0.05 | 0.0012 | 0.0004 | 0.0008 |
| 12 | 313.15 | 0.10 | 0.0023 | 0.0008 | 0.0015 |
| 13 | 313.15 | 0.21 | 0.0050 | 0.0017 | 0.0033 |
| 14 | 313.15 | 0.44 | 0.0104 | 0.0035 | 0.0069 |
| 15 | 313.15 | 0.71 | 0.0158 | 0.0056 | 0.0102 |
| 16 | 313.15 | 0.94 | 0.0210 | 0.0075 | 0.0135 |
| 17 | 313.15 | 1.29 | 0.0306 | 0.0104 | 0.0203 |
| 18 | 313.15 | 1.45 | 0.0345 | 0.0117 | 0.0228 |
| 19 | 313.15 | 1.66 | 0.0396 | 0.0135 | 0.0261 |
| 20 | 313.15 | 1.82 | 0.0435 | 0.0148 | 0.0287 |
| 21 | 328.15 | 0.06 | 0.0013 | 0.0004 | 0.0008 |
| 22 | 328.15 | 0.11 | 0.0021 | 0.0007 | 0.0014 |
| 23 | 328.15 | 0.26 | 0.0051 | 0.0017 | 0.0034 |
| 24 | 328.15 | 0.47 | 0.0093 | 0.0031 | 0.0062 |
| 25 | 328.15 | 0.71 | 0.0132 | 0.0047 | 0.0085 |
| 26 | 328.15 | 0.94 | 0.0177 | 0.0063 | 0.0114 |
| 27 | 328.15 | 1.29 | 0.0259 | 0.0087 | 0.0171 |
| 28 | 328.15 | 1.49 | 0.0298 | 0.0101 | 0.0197 |
| 29 | 328.15 | 1.65 | 0.0330 | 0.0112 | 0.0218 |
| 30 | 328.15 | 1.86 | 0.0374 | 0.0127 | 0.0247 |
| 31 | 343.15 | 0.05 | 0.0008 | 0.0003 | 0.0006 |
| 32 | 343.15 | 0.14 | 0.0022 | 0.0008 | 0.0014 |
| 33 | 343.15 | 0.25 | 0.0043 | 0.0014 | 0.0029 |
| 34 | 343.15 | 0.43 | 0.0074 | 0.0025 | 0.0049 |
| 35 | 343.15 | 0.78 | 0.0125 | 0.0045 | 0.0081 |
| 36 | 343.15 | 0.96 | 0.0155 | 0.0055 | 0.0100 |
| 37 | 343.15 | 1.25 | 0.0215 | 0.0073 | 0.0143 |
| 38 | 343.15 | 1.47 | 0.0254 | 0.0086 | 0.0168 |
| 39 | 343.15 | 1.62 | 0.0279 | 0.0094 | 0.0184 |
| 40 | 343.15 | 1.88 | 0.0324 | 0.0110 | 0.0214 |
| [C ₄ C _{1im}][Tf ₂ N] | | | | | |

| | | | | | |
|---|--------|------|--------|--------|--------|
| 1 | 298.15 | 0.05 | 0.0037 | 0.0011 | 0.0026 |
| 2 | 298.15 | 0.12 | 0.0100 | 0.0031 | 0.0069 |
| 3 | 298.15 | 0.16 | 0.0128 | 0.0040 | 0.0088 |
| 4 | 298.15 | 0.33 | 0.0240 | 0.0084 | 0.0156 |
| 5 | 298.15 | 0.60 | 0.0466 | 0.0156 | 0.0310 |
| 6 | 298.15 | 0.87 | 0.0680 | 0.0230 | 0.0451 |
| 7 | 298.15 | 1.13 | 0.0906 | 0.0302 | 0.0604 |
| 8 | 298.15 | 1.49 | 0.1182 | 0.0409 | 0.0773 |
| 9 | 298.15 | 1.71 | 0.1260 | 0.0473 | 0.0787 |
| 10 | 298.15 | 1.97 | 0.1489 | 0.0556 | 0.0933 |
| 11 | 313.15 | 0.05 | 0.0032 | 0.0011 | 0.0021 |
| 12 | 313.15 | 0.09 | 0.0057 | 0.0018 | 0.0039 |
| 13 | 313.15 | 0.18 | 0.0122 | 0.0038 | 0.0083 |
| 14 | 313.15 | 0.39 | 0.0234 | 0.0082 | 0.0152 |
| 15 | 313.15 | 0.62 | 0.0434 | 0.0133 | 0.0301 |
| 16 | 313.15 | 0.81 | 0.0582 | 0.0175 | 0.0407 |
| 17 | 313.15 | 1.15 | 0.0699 | 0.0251 | 0.0448 |
| 18 | 313.15 | 1.38 | 0.0842 | 0.0305 | 0.0537 |
| 19 | 313.15 | 1.55 | 0.0937 | 0.0345 | 0.0592 |
| 20 | 313.15 | 1.91 | 0.1176 | 0.0431 | 0.0745 |
| 21 | 328.15 | 0.06 | 0.0040 | 0.0011 | 0.0029 |
| 22 | 328.15 | 0.10 | 0.0050 | 0.0017 | 0.0033 |
| 23 | 328.15 | 0.24 | 0.0130 | 0.0042 | 0.0087 |
| 24 | 328.15 | 0.42 | 0.0264 | 0.0075 | 0.0189 |
| 25 | 328.15 | 0.61 | 0.0331 | 0.0110 | 0.0221 |
| 26 | 328.15 | 0.84 | 0.0457 | 0.0153 | 0.0304 |
| 27 | 328.15 | 1.14 | 0.0609 | 0.0209 | 0.0400 |
| 28 | 328.15 | 1.30 | 0.0711 | 0.0239 | 0.0472 |
| 29 | 328.15 | 1.68 | 0.0886 | 0.0315 | 0.0572 |
| 30 | 328.15 | 1.94 | 0.1007 | 0.0367 | 0.0640 |
| 31 | 343.15 | 0.05 | 0.0028 | 0.0007 | 0.0021 |
| 32 | 343.15 | 0.14 | 0.0050 | 0.0021 | 0.0029 |
| 33 | 343.15 | 0.25 | 0.0104 | 0.0038 | 0.0066 |
| 34 | 343.15 | 0.41 | 0.0204 | 0.0063 | 0.0140 |
| 35 | 343.15 | 0.72 | 0.0317 | 0.0113 | 0.0205 |
| 36 | 343.15 | 0.86 | 0.0415 | 0.0135 | 0.0281 |
| 37 | 343.15 | 1.12 | 0.0507 | 0.0177 | 0.0330 |
| 38 | 343.15 | 1.40 | 0.0660 | 0.0222 | 0.0437 |
| 39 | 343.15 | 1.61 | 0.0748 | 0.0256 | 0.0491 |
| 40 | 343.15 | 1.92 | 0.0879 | 0.0309 | 0.0570 |
| [C ₂ C ₁ im][Tf ₂ N] | | | | | |
| 1 | 298.15 | 0.04 | 0.0017 | 0.0006 | 0.0011 |
| 2 | 298.15 | 0.12 | 0.0059 | 0.0019 | 0.0039 |
| 3 | 298.15 | 0.17 | 0.0079 | 0.0028 | 0.0051 |
| 4 | 298.15 | 0.30 | 0.0136 | 0.0048 | 0.0088 |
| 5 | 298.15 | 0.65 | 0.0315 | 0.0106 | 0.0209 |
| 6 | 298.15 | 0.90 | 0.0441 | 0.0149 | 0.0292 |
| 7 | 298.15 | 1.15 | 0.0533 | 0.0193 | 0.0340 |

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|---|--------|------|--------|--------|--------|
| 8 | 298.15 | 1.41 | 0.0701 | 0.0241 | 0.0460 |
| 9 | 298.15 | 1.66 | 0.0830 | 0.0288 | 0.0542 |
| 10 | 298.15 | 1.97 | 0.0935 | 0.0348 | 0.0587 |
| 11 | 313.15 | 0.04 | 0.0016 | 0.0006 | 0.0010 |
| 12 | 313.15 | 0.08 | 0.0030 | 0.0010 | 0.0019 |
| 13 | 313.15 | 0.20 | 0.0082 | 0.0027 | 0.0055 |
| 14 | 313.15 | 0.36 | 0.0137 | 0.0048 | 0.0088 |
| 15 | 313.15 | 0.65 | 0.0265 | 0.0089 | 0.0176 |
| 16 | 313.15 | 0.92 | 0.0380 | 0.0128 | 0.0252 |
| 17 | 313.15 | 1.16 | 0.0453 | 0.0163 | 0.0290 |
| 18 | 313.15 | 1.47 | 0.0610 | 0.0209 | 0.0402 |
| 19 | 313.15 | 1.79 | 0.0705 | 0.0258 | 0.0447 |
| 20 | 313.15 | 1.98 | 0.0784 | 0.0288 | 0.0495 |
| 21 | 328.15 | 0.03 | 0.0009 | 0.0003 | 0.0006 |
| 22 | 328.15 | 0.09 | 0.0031 | 0.0010 | 0.0021 |
| 23 | 328.15 | 0.22 | 0.0078 | 0.0026 | 0.0052 |
| 24 | 328.15 | 0.45 | 0.0151 | 0.0054 | 0.0098 |
| 25 | 328.15 | 0.76 | 0.0272 | 0.0091 | 0.0181 |
| 26 | 328.15 | 1.06 | 0.0378 | 0.0128 | 0.0250 |
| 27 | 328.15 | 1.30 | 0.0441 | 0.0159 | 0.0282 |
| 28 | 328.15 | 1.50 | 0.0510 | 0.0184 | 0.0325 |
| 29 | 328.15 | 1.73 | 0.0589 | 0.0214 | 0.0375 |
| 30 | 328.15 | 2.06 | 0.0747 | 0.0257 | 0.0490 |
| 31 | 343.15 | 0.05 | 0.0014 | 0.0005 | 0.0009 |
| 32 | 343.15 | 0.19 | 0.0056 | 0.0020 | 0.0036 |
| 33 | 343.15 | 0.47 | 0.0146 | 0.0049 | 0.0097 |
| 34 | 343.15 | 0.60 | 0.0188 | 0.0063 | 0.0125 |
| 35 | 343.15 | 0.83 | 0.0245 | 0.0087 | 0.0158 |
| 36 | 343.15 | 1.06 | 0.0334 | 0.0113 | 0.0222 |
| 37 | 343.15 | 1.20 | 0.0378 | 0.0128 | 0.0250 |
| 38 | 343.15 | 1.46 | 0.0462 | 0.0157 | 0.0305 |
| 39 | 343.15 | 1.69 | 0.0537 | 0.0183 | 0.0354 |
| 40 | 343.15 | 1.90 | 0.0569 | 0.0207 | 0.0363 |
| [C ₆ C _{1im}][Tf ₂ N] | | | | | |
| 1 | 298.15 | 0.04 | 0.0040 | 0.0013 | 0.0027 |
| 2 | 298.15 | 0.14 | 0.0146 | 0.0048 | 0.0098 |
| 3 | 298.15 | 0.29 | 0.0288 | 0.0101 | 0.0187 |
| 4 | 298.15 | 0.50 | 0.0527 | 0.0175 | 0.0352 |
| 5 | 298.15 | 0.71 | 0.0741 | 0.0248 | 0.0493 |
| 6 | 298.15 | 0.94 | 0.0928 | 0.0333 | 0.0594 |
| 7 | 298.15 | 1.19 | 0.1188 | 0.0431 | 0.0757 |
| 8 | 298.15 | 1.38 | 0.1382 | 0.0506 | 0.0876 |
| 9 | 298.15 | 1.60 | 0.1601 | 0.0591 | 0.1009 |
| 10 | 298.15 | 1.90 | 0.2032 | 0.0717 | 0.1316 |
| 11 | 313.15 | 0.08 | 0.0061 | 0.0021 | 0.0040 |
| 12 | 313.15 | 0.16 | 0.0137 | 0.0045 | 0.0092 |
| 13 | 313.15 | 0.33 | 0.0277 | 0.0091 | 0.0186 |
| 14 | 313.15 | 0.50 | 0.0428 | 0.0142 | 0.0286 |

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|---|--------|------|--------|--------|--------|
| 15 | 313.15 | 0.66 | 0.0566 | 0.0188 | 0.0377 |
| 16 | 313.15 | 0.94 | 0.0804 | 0.0270 | 0.0534 |
| 17 | 313.15 | 1.10 | 0.0889 | 0.0319 | 0.0570 |
| 18 | 313.15 | 1.26 | 0.1084 | 0.0368 | 0.0716 |
| 19 | 313.15 | 1.57 | 0.1270 | 0.0462 | 0.0808 |
| 20 | 313.15 | 1.85 | 0.1593 | 0.0551 | 0.1042 |
| 21 | 328.15 | 0.09 | 0.0057 | 0.0020 | 0.0037 |
| 22 | 328.15 | 0.19 | 0.0132 | 0.0043 | 0.0089 |
| 23 | 328.15 | 0.32 | 0.0214 | 0.0075 | 0.0139 |
| 24 | 328.15 | 0.50 | 0.0358 | 0.0119 | 0.0240 |
| 25 | 328.15 | 0.67 | 0.0452 | 0.0160 | 0.0293 |
| 26 | 328.15 | 0.90 | 0.0603 | 0.0214 | 0.0389 |
| 27 | 328.15 | 1.07 | 0.0762 | 0.0256 | 0.0507 |
| 28 | 328.15 | 1.33 | 0.0900 | 0.0323 | 0.0577 |
| 29 | 328.15 | 1.53 | 0.1035 | 0.0373 | 0.0662 |
| 30 | 328.15 | 1.82 | 0.1307 | 0.0447 | 0.0860 |
| 31 | 343.15 | 0.02 | 0.0011 | 0.0004 | 0.0007 |
| 32 | 343.15 | 0.27 | 0.0165 | 0.0053 | 0.0112 |
| 33 | 343.15 | 0.42 | 0.0267 | 0.0083 | 0.0183 |
| 34 | 343.15 | 0.69 | 0.0387 | 0.0139 | 0.0248 |
| 35 | 343.15 | 0.83 | 0.0534 | 0.0168 | 0.0366 |
| 36 | 343.15 | 1.19 | 0.0752 | 0.0242 | 0.0511 |
| 37 | 343.15 | 1.30 | 0.0787 | 0.0266 | 0.0522 |
| 38 | 343.15 | 1.53 | 0.0938 | 0.0313 | 0.0625 |
| 39 | 343.15 | 1.71 | 0.1077 | 0.0353 | 0.0724 |
| 40 | 343.15 | 1.91 | 0.1177 | 0.0396 | 0.0781 |
| [C ₈ C _{1im}][Tf ₂ N] | | | | | |
| 1 | 298.15 | 0.05 | 0.0067 | 0.0023 | 0.0044 |
| 2 | 298.15 | 0.14 | 0.0185 | 0.0060 | 0.0125 |
| 3 | 298.15 | 0.29 | 0.0362 | 0.0126 | 0.0236 |
| 4 | 298.15 | 0.40 | 0.0532 | 0.0175 | 0.0357 |
| 5 | 298.15 | 0.69 | 0.0865 | 0.0306 | 0.0559 |
| 6 | 298.15 | 0.99 | 0.1316 | 0.0443 | 0.0873 |
| 7 | 298.15 | 1.30 | 0.1732 | 0.0591 | 0.1141 |
| 8 | 298.15 | 1.48 | 0.1974 | 0.0680 | 0.1295 |
| 9 | 298.15 | 1.64 | 0.2193 | 0.0761 | 0.1433 |
| 10 | 298.15 | 1.94 | 0.2452 | 0.0917 | 0.1535 |
| 11 | 313.15 | 0.05 | 0.0054 | 0.0019 | 0.0036 |
| 12 | 313.15 | 0.10 | 0.0109 | 0.0035 | 0.0073 |
| 13 | 313.15 | 0.22 | 0.0217 | 0.0075 | 0.0142 |
| 14 | 313.15 | 0.46 | 0.0492 | 0.0162 | 0.0330 |
| 15 | 313.15 | 0.73 | 0.0776 | 0.0257 | 0.0519 |
| 16 | 313.15 | 0.95 | 0.0958 | 0.0339 | 0.0618 |
| 17 | 313.15 | 1.32 | 0.1330 | 0.0477 | 0.0853 |
| 18 | 313.15 | 1.58 | 0.1591 | 0.0576 | 0.1015 |
| 19 | 313.15 | 1.77 | 0.1784 | 0.0650 | 0.1134 |
| 20 | 313.15 | 1.95 | 0.1965 | 0.0720 | 0.1244 |
| 21 | 328.15 | 0.07 | 0.0060 | 0.0021 | 0.0039 |

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|--|--------|------|--------|--------|--------|
| 22 | 328.15 | 0.12 | 0.0099 | 0.0034 | 0.0065 |
| 23 | 328.15 | 0.27 | 0.0237 | 0.0077 | 0.0160 |
| 24 | 328.15 | 0.48 | 0.0395 | 0.0138 | 0.0257 |
| 25 | 328.15 | 0.60 | 0.0531 | 0.0175 | 0.0356 |
| 26 | 328.15 | 0.83 | 0.0693 | 0.0244 | 0.0449 |
| 27 | 328.15 | 1.10 | 0.0918 | 0.0325 | 0.0593 |
| 28 | 328.15 | 1.38 | 0.1149 | 0.0410 | 0.0739 |
| 29 | 328.15 | 1.69 | 0.1493 | 0.0505 | 0.0987 |
| 30 | 328.15 | 1.90 | 0.1585 | 0.0573 | 0.1012 |
| 31 | 343.15 | 0.05 | 0.0035 | 0.0012 | 0.0023 |
| 32 | 343.15 | 0.14 | 0.0107 | 0.0035 | 0.0072 |
| 33 | 343.15 | 0.27 | 0.0200 | 0.0065 | 0.0135 |
| 34 | 343.15 | 0.43 | 0.0303 | 0.0106 | 0.0198 |
| 35 | 343.15 | 0.80 | 0.0560 | 0.0196 | 0.0364 |
| 36 | 343.15 | 0.98 | 0.0685 | 0.0241 | 0.0444 |
| 37 | 343.15 | 1.24 | 0.0923 | 0.0307 | 0.0616 |
| 38 | 343.15 | 1.49 | 0.1112 | 0.0372 | 0.0740 |
| 39 | 343.15 | 1.74 | 0.1222 | 0.0437 | 0.0785 |
| 40 | 343.15 | 1.98 | 0.1387 | 0.0498 | 0.0889 |
| [C ₁₀ Cl _{im}][Tf ₂ N] | | | | | |
| 1 | 298.15 | 0.04 | 0.0059 | 0.0020 | 0.0039 |
| 2 | 298.15 | 0.14 | 0.0207 | 0.0072 | 0.0135 |
| 3 | 298.15 | 0.29 | 0.0460 | 0.0151 | 0.0309 |
| 4 | 298.15 | 0.53 | 0.0846 | 0.0281 | 0.0565 |
| 5 | 298.15 | 0.77 | 0.1229 | 0.0412 | 0.0817 |
| 6 | 298.15 | 0.99 | 0.1494 | 0.0537 | 0.0957 |
| 7 | 298.15 | 1.32 | 0.1984 | 0.0724 | 0.1260 |
| 8 | 298.15 | 1.50 | 0.2259 | 0.0832 | 0.1427 |
| 9 | 298.15 | 1.73 | 0.2611 | 0.0973 | 0.1638 |
| 10 | 298.15 | 1.94 | 0.2928 | 0.1103 | 0.1825 |
| 11 | 313.15 | 0.04 | 0.0053 | 0.0018 | 0.0035 |
| 12 | 313.15 | 0.16 | 0.0192 | 0.0067 | 0.0125 |
| 13 | 313.15 | 0.34 | 0.0437 | 0.0143 | 0.0293 |
| 14 | 313.15 | 0.55 | 0.0702 | 0.0232 | 0.0470 |
| 15 | 313.15 | 0.72 | 0.0863 | 0.0305 | 0.0558 |
| 16 | 313.15 | 1.01 | 0.1291 | 0.0433 | 0.0857 |
| 17 | 313.15 | 1.22 | 0.1556 | 0.0526 | 0.1030 |
| 18 | 313.15 | 1.37 | 0.1639 | 0.0592 | 0.1047 |
| 19 | 313.15 | 1.68 | 0.2135 | 0.0733 | 0.1401 |
| 20 | 313.15 | 1.92 | 0.2296 | 0.0845 | 0.1450 |
| 21 | 328.15 | 0.06 | 0.0059 | 0.0019 | 0.0040 |
| 22 | 328.15 | 0.21 | 0.0209 | 0.0073 | 0.0137 |
| 23 | 328.15 | 0.37 | 0.0369 | 0.0129 | 0.0240 |
| 24 | 328.15 | 0.54 | 0.0531 | 0.0186 | 0.0345 |
| 25 | 328.15 | 0.74 | 0.0779 | 0.0258 | 0.0521 |
| 26 | 328.15 | 1.01 | 0.1060 | 0.0354 | 0.0706 |
| 27 | 328.15 | 1.14 | 0.1126 | 0.0400 | 0.0725 |
| 28 | 328.15 | 1.49 | 0.1553 | 0.0525 | 0.1028 |

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|--|--------|------|--------|--------|--------|
| 29 | 328.15 | 1.72 | 0.1690 | 0.0611 | 0.1080 |
| 30 | 328.15 | 1.93 | 0.1899 | 0.0690 | 0.1209 |
| 31 | 343.15 | 0.04 | 0.0037 | 0.0012 | 0.0025 |
| 32 | 343.15 | 0.23 | 0.0192 | 0.0067 | 0.0125 |
| 33 | 343.15 | 0.39 | 0.0341 | 0.0112 | 0.0229 |
| 34 | 343.15 | 0.68 | 0.0599 | 0.0198 | 0.0401 |
| 35 | 343.15 | 0.81 | 0.0674 | 0.0237 | 0.0437 |
| 36 | 343.15 | 1.06 | 0.0930 | 0.0309 | 0.0620 |
| 37 | 343.15 | 1.32 | 0.1094 | 0.0389 | 0.0705 |
| 38 | 343.15 | 1.52 | 0.1252 | 0.0447 | 0.0805 |
| 39 | 343.15 | 1.72 | 0.1417 | 0.0508 | 0.0909 |
| 40 | 343.15 | 1.95 | 0.1604 | 0.0578 | 0.1026 |
| [C ₄ C ₁ pip][Tf ₂ N] | | | | | |
| 1 | 298.15 | 0.04 | 0.0028 | 0.0012 | 0.0016 |
| 2 | 298.15 | 0.12 | 0.0115 | 0.0038 | 0.0076 |
| 3 | 298.15 | 0.17 | 0.0209 | 0.0055 | 0.0154 |
| 4 | 298.15 | 0.29 | 0.0418 | 0.0097 | 0.0321 |
| 5 | 298.15 | 0.61 | 0.0624 | 0.0209 | 0.0415 |
| 6 | 298.15 | 0.85 | 0.0871 | 0.0294 | 0.0577 |
| 7 | 298.15 | 1.09 | 0.1173 | 0.0383 | 0.0790 |
| 8 | 298.15 | 1.43 | 0.1485 | 0.0513 | 0.0972 |
| 9 | 298.15 | 1.67 | 0.1744 | 0.0607 | 0.1137 |
| 10 | 298.15 | 1.96 | 0.1941 | 0.0728 | 0.1213 |
| 11 | 313.15 | 0.04 | 0.0033 | 0.0011 | 0.0022 |
| 12 | 313.15 | 0.08 | 0.0066 | 0.0021 | 0.0046 |
| 13 | 313.15 | 0.19 | 0.0148 | 0.0052 | 0.0097 |
| 14 | 313.15 | 0.34 | 0.0266 | 0.0094 | 0.0172 |
| 15 | 313.15 | 0.61 | 0.0508 | 0.0169 | 0.0340 |
| 16 | 313.15 | 0.87 | 0.0727 | 0.0242 | 0.0486 |
| 17 | 313.15 | 1.11 | 0.0876 | 0.0312 | 0.0564 |
| 18 | 313.15 | 1.38 | 0.1094 | 0.0395 | 0.0699 |
| 19 | 313.15 | 1.67 | 0.1412 | 0.0485 | 0.0927 |
| 20 | 313.15 | 1.96 | 0.1567 | 0.0576 | 0.0991 |
| 21 | 328.15 | 0.03 | 0.0021 | 0.0007 | 0.0014 |
| 22 | 328.15 | 0.09 | 0.0063 | 0.0020 | 0.0043 |
| 23 | 328.15 | 0.21 | 0.0146 | 0.0048 | 0.0099 |
| 24 | 328.15 | 0.42 | 0.0293 | 0.0097 | 0.0196 |
| 25 | 328.15 | 0.71 | 0.0468 | 0.0165 | 0.0303 |
| 26 | 328.15 | 0.98 | 0.0647 | 0.0229 | 0.0418 |
| 27 | 328.15 | 1.22 | 0.0858 | 0.0287 | 0.0571 |
| 28 | 328.15 | 1.49 | 0.1051 | 0.0355 | 0.0695 |
| 29 | 328.15 | 1.64 | 0.1158 | 0.0392 | 0.0766 |
| 30 | 328.15 | 1.94 | 0.1294 | 0.0469 | 0.0825 |
| 31 | 343.15 | 0.04 | 0.0024 | 0.0009 | 0.0015 |
| 32 | 343.15 | 0.10 | 0.0045 | 0.0020 | 0.0024 |
| 33 | 343.15 | 0.18 | 0.0101 | 0.0035 | 0.0066 |
| 34 | 343.15 | 0.42 | 0.0238 | 0.0082 | 0.0156 |
| 35 | 343.15 | 0.64 | 0.0432 | 0.0126 | 0.0306 |

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|---|--------|------|--------|--------|--------|
| 36 | 343.15 | 0.84 | 0.0502 | 0.0166 | 0.0337 |
| 37 | 343.15 | 1.25 | 0.0786 | 0.0250 | 0.0537 |
| 38 | 343.15 | 1.40 | 0.0840 | 0.0282 | 0.0558 |
| 39 | 343.15 | 1.61 | 0.1005 | 0.0326 | 0.0679 |
| 40 | 343.15 | 1.97 | 0.1118 | 0.0402 | 0.0716 |
| [C ₄ C ₁ py][Tf ₂ N] | | | | | |
| 1 | 298.15 | 0.04 | 0.0039 | 0.0013 | 0.0026 |
| 2 | 298.15 | 0.11 | 0.0100 | 0.0033 | 0.0067 |
| 3 | 298.15 | 0.18 | 0.0164 | 0.0057 | 0.0107 |
| 4 | 298.15 | 0.34 | 0.0310 | 0.0107 | 0.0203 |
| 5 | 298.15 | 0.58 | 0.0530 | 0.0188 | 0.0343 |
| 6 | 298.15 | 0.81 | 0.0790 | 0.0265 | 0.0526 |
| 7 | 298.15 | 1.06 | 0.1039 | 0.0350 | 0.0689 |
| 8 | 298.15 | 1.31 | 0.1215 | 0.0441 | 0.0774 |
| 9 | 298.15 | 1.56 | 0.1455 | 0.0534 | 0.0921 |
| 10 | 298.15 | 1.85 | 0.1745 | 0.0644 | 0.1101 |
| 11 | 313.15 | 0.05 | 0.0039 | 0.0012 | 0.0028 |
| 12 | 313.15 | 0.08 | 0.0063 | 0.0021 | 0.0041 |
| 13 | 313.15 | 0.22 | 0.0173 | 0.0058 | 0.0116 |
| 14 | 313.15 | 0.42 | 0.0332 | 0.0109 | 0.0222 |
| 15 | 313.15 | 0.66 | 0.0523 | 0.0173 | 0.0350 |
| 16 | 313.15 | 0.91 | 0.0680 | 0.0241 | 0.0440 |
| 17 | 313.15 | 1.18 | 0.0885 | 0.0316 | 0.0570 |
| 18 | 313.15 | 1.39 | 0.1046 | 0.0377 | 0.0669 |
| 19 | 313.15 | 1.53 | 0.1154 | 0.0416 | 0.0738 |
| 20 | 313.15 | 1.94 | 0.1472 | 0.0538 | 0.0934 |
| 21 | 328.15 | 0.04 | 0.0026 | 0.0009 | 0.0017 |
| 22 | 328.15 | 0.12 | 0.0075 | 0.0026 | 0.0049 |
| 23 | 328.15 | 0.18 | 0.0112 | 0.0039 | 0.0073 |
| 24 | 328.15 | 0.40 | 0.0249 | 0.0086 | 0.0163 |
| 25 | 328.15 | 0.62 | 0.0411 | 0.0136 | 0.0275 |
| 26 | 328.15 | 0.80 | 0.0532 | 0.0176 | 0.0356 |
| 27 | 328.15 | 1.16 | 0.0728 | 0.0258 | 0.0470 |
| 28 | 328.15 | 1.33 | 0.0836 | 0.0298 | 0.0538 |
| 29 | 328.15 | 1.61 | 0.1079 | 0.0365 | 0.0714 |
| 30 | 328.15 | 1.84 | 0.1236 | 0.0419 | 0.0817 |
| 31 | 343.15 | 0.02 | 0.0011 | 0.0003 | 0.0008 |
| 32 | 343.15 | 0.06 | 0.0034 | 0.0011 | 0.0023 |
| 33 | 343.15 | 0.12 | 0.0064 | 0.0022 | 0.0042 |
| 34 | 343.15 | 0.23 | 0.0130 | 0.0043 | 0.0087 |
| 35 | 343.15 | 0.45 | 0.0255 | 0.0083 | 0.0172 |
| 36 | 343.15 | 0.68 | 0.0385 | 0.0126 | 0.0259 |
| 37 | 343.15 | 0.91 | 0.0486 | 0.0170 | 0.0316 |
| 38 | 343.15 | 1.18 | 0.0632 | 0.0224 | 0.0408 |
| 39 | 343.15 | 1.43 | 0.0814 | 0.0271 | 0.0543 |
| 40 | 343.15 | 1.69 | 0.0964 | 0.0324 | 0.0640 |
| [C ₄ C ₁ pyrr][Tf ₂ N] | | | | | |
| 1 | 298.15 | 0.05 | 0.0040 | 0.0013 | 0.0027 |

| | | | | | |
|----|--------|------|--------|--------|--------|
| 2 | 298.15 | 0.12 | 0.0100 | 0.0035 | 0.0065 |
| 3 | 298.15 | 0.19 | 0.0154 | 0.0054 | 0.0101 |
| 4 | 298.15 | 0.37 | 0.0304 | 0.0107 | 0.0197 |
| 5 | 298.15 | 0.62 | 0.0545 | 0.0182 | 0.0364 |
| 6 | 298.15 | 0.84 | 0.0746 | 0.0251 | 0.0495 |
| 7 | 298.15 | 1.13 | 0.0950 | 0.0343 | 0.0607 |
| 8 | 298.15 | 1.38 | 0.1170 | 0.0427 | 0.0743 |
| 9 | 298.15 | 1.66 | 0.1503 | 0.0523 | 0.0980 |
| 10 | 298.15 | 1.93 | 0.1660 | 0.0621 | 0.1039 |
| 11 | 313.15 | 0.03 | 0.0025 | 0.0008 | 0.0016 |
| 12 | 313.15 | 0.09 | 0.0066 | 0.0022 | 0.0045 |
| 13 | 313.15 | 0.21 | 0.0148 | 0.0049 | 0.0099 |
| 14 | 313.15 | 0.40 | 0.0291 | 0.0096 | 0.0195 |
| 15 | 313.15 | 0.65 | 0.0476 | 0.0158 | 0.0318 |
| 16 | 313.15 | 0.90 | 0.0620 | 0.0221 | 0.0400 |
| 17 | 313.15 | 1.14 | 0.0787 | 0.0282 | 0.0505 |
| 18 | 313.15 | 1.38 | 0.0954 | 0.0344 | 0.0610 |
| 19 | 313.15 | 1.61 | 0.1187 | 0.0406 | 0.0781 |
| 20 | 313.15 | 1.84 | 0.1364 | 0.0470 | 0.0894 |
| 21 | 328.15 | 0.04 | 0.0027 | 0.0009 | 0.0018 |
| 22 | 328.15 | 0.11 | 0.0064 | 0.0022 | 0.0042 |
| 23 | 328.15 | 0.21 | 0.0130 | 0.0043 | 0.0087 |
| 24 | 328.15 | 0.42 | 0.0255 | 0.0084 | 0.0171 |
| 25 | 328.15 | 0.68 | 0.0419 | 0.0139 | 0.0280 |
| 26 | 328.15 | 0.85 | 0.0523 | 0.0174 | 0.0349 |
| 27 | 328.15 | 1.19 | 0.0690 | 0.0246 | 0.0444 |
| 28 | 328.15 | 1.40 | 0.0869 | 0.0293 | 0.0576 |
| 29 | 328.15 | 1.56 | 0.0915 | 0.0329 | 0.0586 |
| 30 | 328.15 | 1.89 | 0.1180 | 0.0403 | 0.0777 |
| 31 | 343.15 | 0.04 | 0.0022 | 0.0007 | 0.0015 |
| 32 | 343.15 | 0.08 | 0.0044 | 0.0014 | 0.0030 |
| 33 | 343.15 | 0.18 | 0.0087 | 0.0030 | 0.0057 |
| 34 | 343.15 | 0.33 | 0.0163 | 0.0057 | 0.0106 |
| 35 | 343.15 | 0.62 | 0.0325 | 0.0107 | 0.0217 |
| 36 | 343.15 | 0.85 | 0.0448 | 0.0149 | 0.0299 |
| 37 | 343.15 | 1.11 | 0.0555 | 0.0197 | 0.0358 |
| 38 | 343.15 | 1.41 | 0.0748 | 0.0251 | 0.0497 |
| 39 | 343.15 | 1.66 | 0.0886 | 0.0299 | 0.0587 |
| 40 | 343.15 | 1.95 | 0.0978 | 0.0353 | 0.0626 |

Table S2. Excess enthalpy of (ionic liquids + ethane) binary system at different temperatures predicted using COSMO-RS. The value is at $x_{C_2H_6} = 0.2$ and is given in $J \cdot mol^{-1}$

| Ionic liquid + ethane | T/K | Ethane | | | | Cation | | | | Cation | | | |
|-----------------------|--------|-------------|------------|------------|-------------|-------------|------------|------------|-------------|-------------|------------|------------|-------------|
| | | $H_{E,INT}$ | $H_{E,MF}$ | $H_{E,HB}$ | $H_{E,vdW}$ | $H_{E,INT}$ | $H_{E,MF}$ | $H_{E,HB}$ | $H_{E,vdW}$ | $H_{E,INT}$ | $H_{E,MF}$ | $H_{E,HB}$ | $H_{E,vdW}$ |
| [C4C1im][Ac] | 298.15 | 864.51 | 854.87 | 0.00 | 9.64 | -1004.23 | -1045.86 | 44.36 | -7.99 | 107.49 | 62.46 | 43.94 | 1.10 |
| [C4C1im][Ac] | 313.15 | 905.90 | 894.38 | 0.00 | 11.52 | -1009.39 | -1056.98 | 50.68 | -9.23 | 131.26 | 80.05 | 50.18 | 1.04 |
| [C4C1im][Ac] | 328.15 | 949.07 | 935.72 | 0.00 | 13.35 | -1016.06 | -1069.24 | 56.74 | -10.51 | 155.23 | 98.11 | 56.15 | 0.97 |
| [C4C1im][Ac] | 343.15 | 993.65 | 978.52 | 0.00 | 15.13 | -1024.37 | -1082.45 | 62.22 | -11.82 | 178.96 | 116.49 | 61.57 | 0.90 |
| [C4C1im][BF4] | 298.15 | 1315.41 | 1207.37 | 0.00 | 108.04 | -919.70 | -886.90 | 69.47 | -111.16 | 504.22 | 439.73 | 69.20 | -4.70 |
| [C4C1im][BF4] | 313.15 | 1369.20 | 1254.90 | 0.00 | 114.30 | -923.10 | -888.36 | 73.03 | -116.84 | 531.64 | 463.50 | 72.75 | -4.62 |
| [C4C1im][BF4] | 328.15 | 1420.11 | 1300.10 | 0.00 | 120.01 | -927.09 | -889.70 | 75.52 | -122.06 | 556.68 | 485.96 | 75.25 | -4.52 |
| [C4C1im][BF4] | 343.15 | 1468.12 | 1342.95 | 0.00 | 125.17 | -931.74 | -890.94 | 76.88 | -126.78 | 579.19 | 506.98 | 76.62 | -4.42 |
| [C4C1im][DBP] | 298.15 | 678.91 | 658.71 | 0.00 | 20.19 | -288.34 | -303.78 | 32.97 | -19.85 | -56.76 | -87.52 | 32.92 | -0.96 |
| [C4C1im][DBP] | 313.15 | 720.92 | 698.61 | 0.00 | 22.32 | -293.18 | -313.24 | 38.05 | -20.70 | -47.71 | -82.88 | 37.97 | -1.68 |
| [C4C1im][DBP] | 328.15 | 762.92 | 738.59 | 0.00 | 24.32 | -298.46 | -322.74 | 42.73 | -21.52 | -39.49 | -78.71 | 42.63 | -2.38 |
| [C4C1im][DBP] | 343.15 | 804.58 | 778.37 | 0.00 | 26.21 | -304.40 | -332.26 | 46.76 | -22.28 | -32.42 | -75.05 | 46.64 | -3.06 |
| [C4C1im][DMP] | 298.15 | 891.71 | 872.50 | 0.00 | 19.20 | -719.91 | -756.73 | 47.92 | -16.25 | 23.20 | -21.54 | 47.51 | 0.46 |
| [C4C1im][DMP] | 313.15 | 939.34 | 917.75 | 0.00 | 21.59 | -725.49 | -767.69 | 54.08 | -17.72 | 45.94 | -4.76 | 53.61 | 0.09 |
| [C4C1im][DMP] | 328.15 | 987.37 | 963.49 | 0.00 | 23.88 | -732.08 | -779.02 | 59.68 | -19.18 | 67.90 | 11.77 | 59.16 | -0.28 |
| [C4C1im][DMP] | 343.15 | 1035.43 | 1009.38 | 0.00 | 26.05 | -739.83 | -790.62 | 64.42 | -20.61 | 88.67 | 27.97 | 63.88 | -0.66 |
| [C4C1im][EtSO4] | 298.15 | 1014.07 | 979.82 | 0.00 | 34.25 | -658.56 | -694.84 | 58.20 | -28.34 | 149.80 | 91.12 | 57.90 | 0.79 |
| [C4C1im][EtSO4] | 313.15 | 1065.86 | 1028.52 | 0.00 | 37.34 | -664.36 | -703.96 | 63.12 | -30.44 | 171.80 | 108.73 | 62.80 | 0.26 |
| [C4C1im][EtSO4] | 328.15 | 1116.25 | 1076.04 | 0.00 | 40.21 | -671.03 | -713.00 | 67.11 | -32.42 | 192.15 | 125.63 | 66.77 | -0.25 |
| [C4C1im][EtSO4] | 343.15 | 1165.01 | 1122.14 | 0.00 | 42.88 | -678.68 | -721.92 | 69.98 | -34.29 | 210.65 | 141.75 | 69.65 | -0.76 |
| [C4C1im][OcSO4] | 298.15 | 792.11 | 759.88 | 0.00 | 32.23 | -255.46 | -271.58 | 40.62 | -27.42 | -0.76 | -40.83 | 40.62 | -0.38 |
| [C4C1im][OcSO4] | 313.15 | 835.25 | 800.56 | 0.00 | 34.69 | -259.60 | -278.76 | 44.44 | -28.50 | 4.34 | -38.39 | 44.41 | -1.50 |
| [C4C1im][OcSO4] | 328.15 | 876.87 | 839.93 | 0.00 | 36.94 | -264.37 | -285.89 | 47.52 | -29.48 | 8.12 | -36.59 | 47.48 | -2.56 |
| [C4C1im][OcSO4] | 343.15 | 916.81 | 877.81 | 0.00 | 39.00 | -269.92 | -292.99 | 49.73 | -30.35 | 10.44 | -35.44 | 49.67 | -3.60 |
| [C4C1im][PF6] | 298.15 | 1433.29 | 1214.49 | 0.00 | 218.80 | -613.92 | -418.75 | 28.24 | -225.84 | 491.84 | 472.08 | 28.21 | -8.45 |
| [C4C1im][PF6] | 313.15 | 1472.07 | 1247.95 | 0.00 | 224.12 | -615.13 | -417.21 | 28.96 | -229.36 | 498.50 | 477.58 | 28.94 | -8.02 |

| | | | | | | | | | | | | | |
|-----------------|--------|---------|---------|------|--------|---------|---------|-------|---------|--------|--------|-------|-------|
| [C4C1im][PF6] | 328.15 | 1507.42 | 1278.84 | 0.00 | 228.58 | -616.62 | -416.41 | 29.29 | -231.98 | 502.21 | 480.54 | 29.26 | -7.60 |
| [C4C1im][PF6] | 343.15 | 1539.57 | 1307.37 | 0.00 | 232.20 | -618.42 | -416.37 | 29.22 | -233.77 | 503.20 | 481.17 | 29.20 | -7.17 |
| [C4C1im][Tf2N] | 298.15 | 1231.23 | 871.43 | 0.00 | 359.80 | -322.11 | -125.62 | 28.83 | -226.49 | 84.96 | 52.02 | 29.00 | -0.56 |
| [C4C1im][Tf2N] | 313.15 | 1258.86 | 900.23 | 0.00 | 358.64 | -322.31 | -129.31 | 30.09 | -224.44 | 81.35 | 48.29 | 30.25 | -2.01 |
| [C4C1im][Tf2N] | 328.15 | 1283.87 | 926.91 | 0.00 | 356.96 | -323.31 | -133.43 | 30.80 | -222.15 | 76.29 | 43.76 | 30.94 | -3.45 |
| [C4C1im][Tf2N] | 343.15 | 1306.38 | 951.59 | 0.00 | 354.78 | -325.05 | -137.96 | 30.97 | -219.64 | 69.92 | 38.52 | 31.08 | -4.88 |
| [C4C1im][TFA] | 298.15 | 1121.72 | 942.62 | 0.00 | 179.09 | -740.10 | -602.69 | 29.92 | -171.18 | 239.64 | 211.31 | 29.61 | -1.28 |
| [C4C1im][TFA] | 313.15 | 1166.13 | 984.70 | 0.00 | 181.43 | -745.18 | -613.59 | 35.55 | -171.44 | 259.14 | 225.06 | 35.22 | -1.14 |
| [C4C1im][TFA] | 328.15 | 1209.94 | 1026.61 | 0.00 | 183.32 | -750.63 | -624.66 | 40.79 | -171.44 | 278.08 | 238.66 | 40.45 | -1.03 |
| [C4C1im][TFA] | 343.15 | 1252.84 | 1068.06 | 0.00 | 184.77 | -756.65 | -635.84 | 45.36 | -171.17 | 296.02 | 251.94 | 45.03 | -0.95 |
| [C2C1im][Tf2N] | 298.15 | 1377.79 | 975.28 | 0.00 | 402.51 | -240.68 | -42.18 | 31.70 | -231.68 | 78.08 | 41.55 | 31.92 | -0.02 |
| [C2C1im][Tf2N] | 313.15 | 1407.53 | 1006.84 | 0.00 | 400.69 | -237.70 | -43.67 | 33.33 | -229.04 | 74.76 | 37.80 | 33.52 | -1.65 |
| [C2C1im][Tf2N] | 328.15 | 1434.45 | 1036.10 | 0.00 | 398.35 | -235.90 | -45.84 | 34.32 | -226.23 | 69.67 | 33.04 | 34.48 | -3.30 |
| [C2C1im][Tf2N] | 343.15 | 1458.67 | 1063.18 | 0.00 | 395.49 | -235.23 | -48.66 | 34.70 | -223.24 | 62.97 | 27.38 | 34.84 | -4.95 |
| [C6C1im][Tf2N] | 298.15 | 1127.80 | 800.23 | 0.00 | 327.57 | -348.81 | -156.01 | 26.53 | -218.46 | 81.16 | 50.81 | 26.63 | -0.67 |
| [C6C1im][Tf2N] | 313.15 | 1153.88 | 827.09 | 0.00 | 326.78 | -351.59 | -161.52 | 27.56 | -216.91 | 77.65 | 47.35 | 27.65 | -1.96 |
| [C6C1im][Tf2N] | 328.15 | 1177.47 | 851.97 | 0.00 | 325.51 | -354.89 | -167.31 | 28.09 | -215.08 | 72.89 | 43.20 | 28.16 | -3.24 |
| [C6C1im][Tf2N] | 343.15 | 1198.71 | 874.96 | 0.00 | 323.75 | -358.67 | -173.36 | 28.13 | -212.98 | 67.00 | 38.44 | 28.19 | -4.48 |
| [C8C1im][Tf2N] | 298.15 | 1044.20 | 742.98 | 0.00 | 301.22 | -358.70 | -176.30 | 24.48 | -208.06 | 76.98 | 48.84 | 24.60 | -0.68 |
| [C8C1im][Tf2N] | 313.15 | 1068.54 | 767.93 | 0.00 | 300.61 | -363.17 | -183.14 | 25.34 | -206.77 | 73.58 | 45.60 | 25.44 | -1.83 |
| [C8C1im][Tf2N] | 328.15 | 1090.54 | 791.00 | 0.00 | 299.54 | -368.04 | -190.16 | 25.73 | -205.20 | 69.07 | 41.75 | 25.82 | -2.97 |
| [C8C1im][Tf2N] | 343.15 | 1110.30 | 812.29 | 0.00 | 298.01 | -373.25 | -197.30 | 25.68 | -203.36 | 63.58 | 37.38 | 25.75 | -4.07 |
| [C10C1im][Tf2N] | 298.15 | 970.26 | 692.22 | 0.00 | 278.04 | -364.16 | -191.72 | 22.55 | -196.81 | 73.49 | 47.50 | 22.66 | -0.66 |
| [C10C1im][Tf2N] | 313.15 | 992.92 | 715.35 | 0.00 | 277.57 | -370.24 | -199.61 | 23.21 | -195.82 | 70.24 | 44.52 | 23.30 | -1.69 |
| [C10C1im][Tf2N] | 328.15 | 1013.36 | 736.68 | 0.00 | 276.68 | -376.56 | -207.56 | 23.44 | -194.55 | 66.01 | 41.02 | 23.52 | -2.69 |
| [C10C1im][Tf2N] | 343.15 | 1031.69 | 756.34 | 0.00 | 275.36 | -383.06 | -215.54 | 23.28 | -193.00 | 60.92 | 37.06 | 23.35 | -3.66 |
| [C4C1pip][Tf2N] | 298.15 | 1212.48 | 863.38 | 0.00 | 349.11 | -419.80 | -211.35 | 18.40 | -226.84 | 109.88 | 89.52 | 18.46 | -1.91 |
| [C4C1pip][Tf2N] | 313.15 | 1233.65 | 885.72 | 0.00 | 347.93 | -422.82 | -216.62 | 18.59 | -224.79 | 105.17 | 85.88 | 18.65 | -3.40 |
| [C4C1pip][Tf2N] | 328.15 | 1252.51 | 906.25 | 0.00 | 346.26 | -426.03 | -222.07 | 18.53 | -222.49 | 99.28 | 81.40 | 18.57 | -4.87 |
| [C4C1pip][Tf2N] | 343.15 | 1269.22 | 925.13 | 0.00 | 344.10 | -429.37 | -227.64 | 18.22 | -219.94 | 92.39 | 76.16 | 18.25 | -6.31 |
| [C4C1py][Tf2N] | 298.15 | 1180.15 | 836.85 | 0.00 | 343.30 | -393.15 | -187.64 | 24.44 | -227.38 | 99.12 | 71.98 | 24.59 | -1.45 |
| [C4C1py][Tf2N] | 313.15 | 1205.42 | 862.99 | 0.00 | 342.43 | -393.91 | -191.23 | 25.24 | -225.32 | 95.19 | 68.29 | 25.37 | -2.75 |

| | | | | | | | | | | | | | |
|------------------|--------|---------|--------|------|--------|---------|---------|-------|---------|--------|-------|-------|-------|
| [C4C1py][Tf2N] | 328.15 | 1228.20 | 887.16 | 0.00 | 341.05 | -395.27 | -195.20 | 25.61 | -223.03 | 89.94 | 63.80 | 25.72 | -4.05 |
| [C4C1py][Tf2N] | 343.15 | 1248.64 | 909.48 | 0.00 | 339.16 | -397.15 | -199.50 | 25.56 | -220.50 | 83.51 | 58.62 | 25.65 | -5.35 |
| [C4C1pyrr][Tf2N] | 298.15 | 1260.54 | 899.89 | 0.00 | 360.65 | -385.33 | -175.64 | 19.40 | -229.53 | 104.60 | 82.86 | 19.42 | -1.70 |
| [C4C1pyrr][Tf2N] | 313.15 | 1282.45 | 923.20 | 0.00 | 359.25 | -388.49 | -181.16 | 19.62 | -227.38 | 99.98 | 79.34 | 19.63 | -3.27 |
| [C4C1pyrr][Tf2N] | 328.15 | 1301.98 | 944.61 | 0.00 | 357.36 | -391.89 | -186.90 | 19.56 | -225.00 | 94.09 | 74.90 | 19.57 | -4.82 |
| [C4C1pyrr][Tf2N] | 343.15 | 1319.28 | 964.30 | 0.00 | 354.99 | -395.48 | -192.79 | 19.23 | -222.37 | 87.10 | 69.66 | 19.24 | -6.35 |

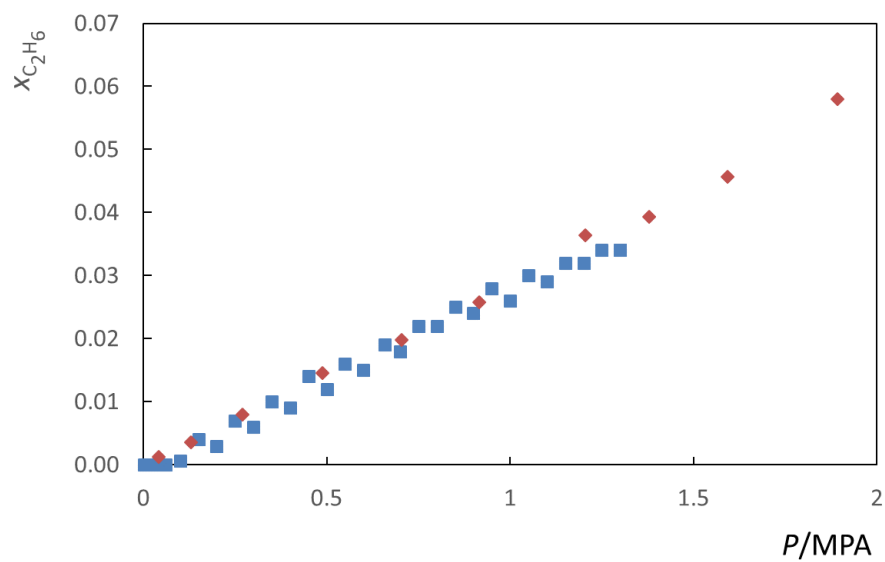


Figure S1. Solubility of ethane, $x_{C_2H_6}$, in ILs $[C_4C_{1im}][PF_6]$ at 298.15 K and as function of pressure, P . Symbols: (■), The data from reference¹; (◆), the data from this work.

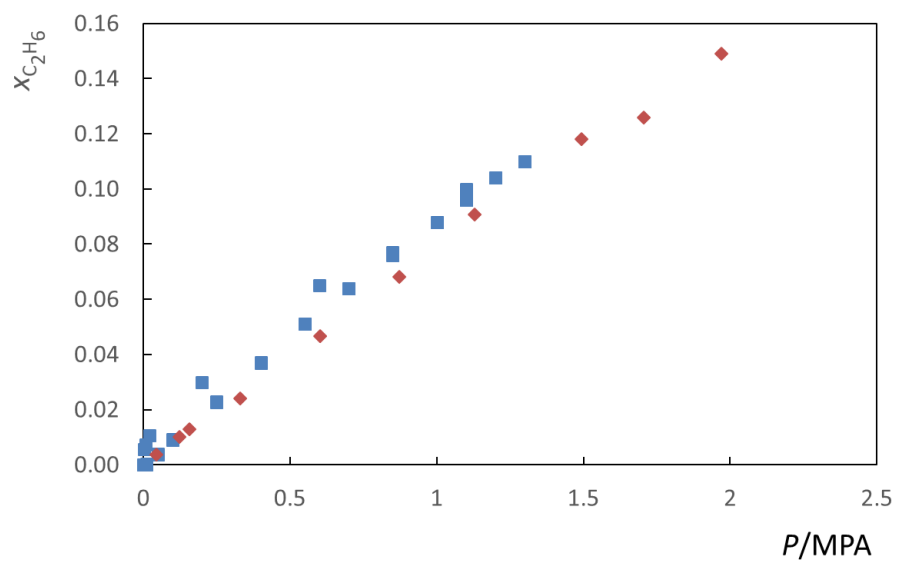


Figure S2. Solubility of ethane, $x_{C_2H_6}$, in ILs $[C_4C_{1im}][Tf_2N]$ at 298.15 K and as function of pressure, P . Symbols: (■), The data from reference²; (◆), the data from this work.

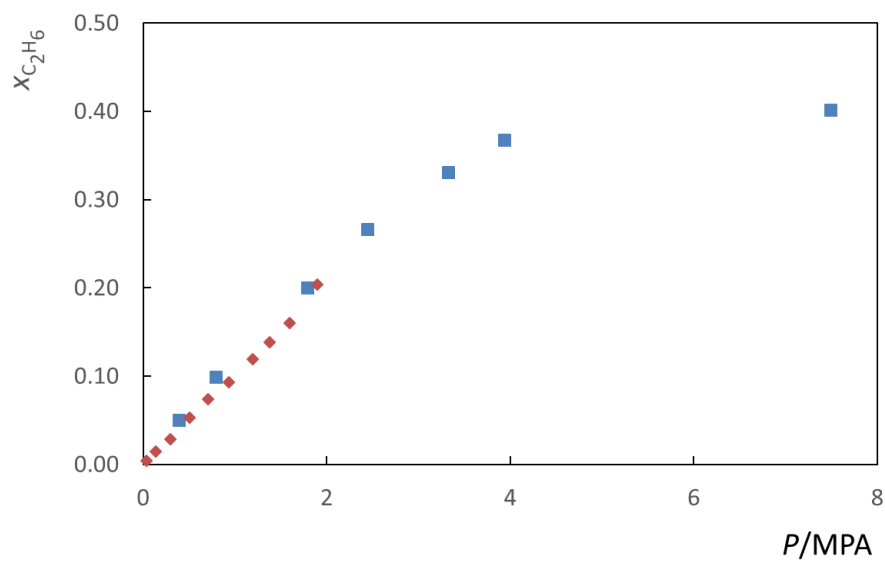


Figure S3. Solubility of ethane, $x_{C_2H_6}$, in ILs $[C_6C_{1im}][Tf_2N]$ at 298.15 K and as function of pressure, P . Symbols: (■), The data from reference³; (◆), the data from this work.

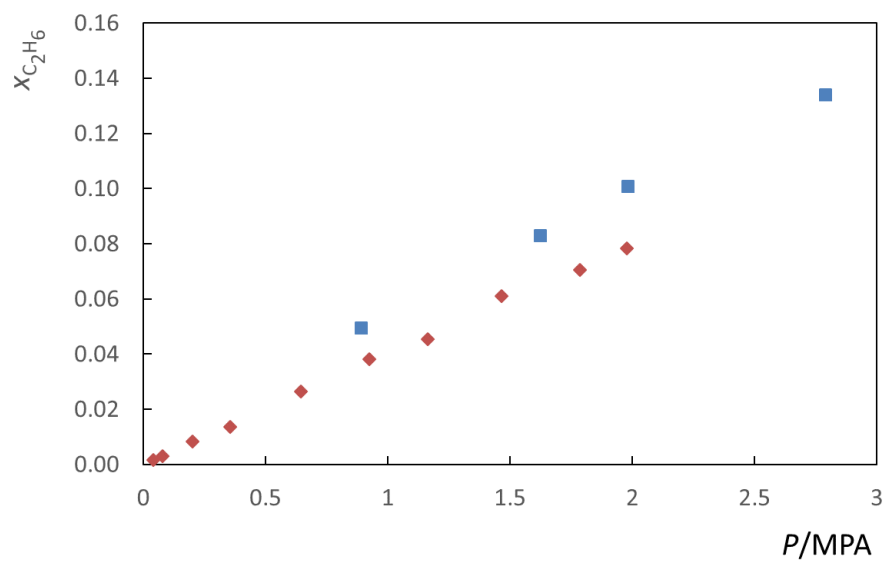


Figure S4. Solubility of ethane, $x_{C_2H_6}$, in ILs $[C_2C_{1im}][Tf_2N]$ at 298.15 K and as function of pressure, P . Symbols: (■), The data from reference⁴; (◆), the data from this work.

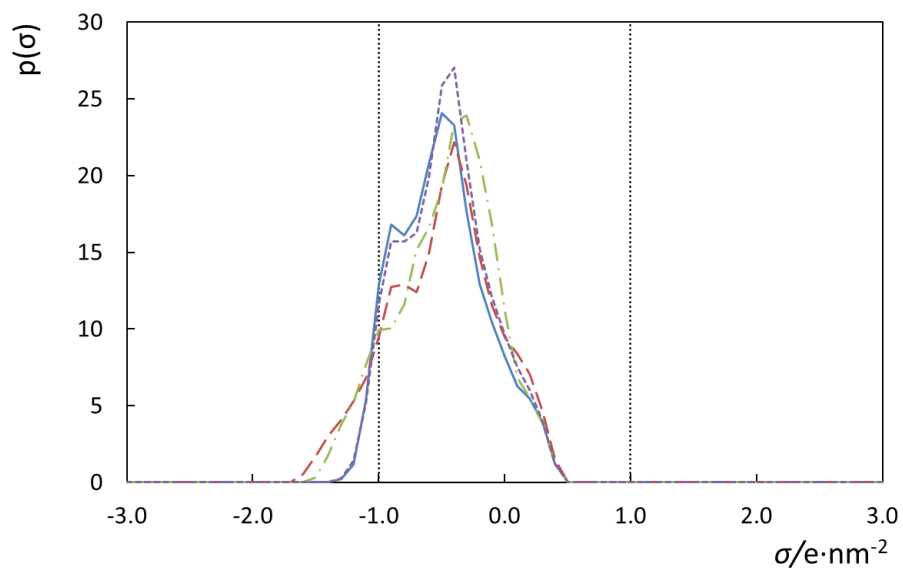


Figure S5. The σ -profile of cation head group calculated using COSMO-RS. Full line, $[\text{C}_4\text{C}_1\text{pyrr}]^+$; Dashed line, $[\text{C}_4\text{C}_1\text{im}]^+$; Dashed-dotted line, $[\text{C}_4\text{C}_1\text{py}]^+$; and dotted line, $[\text{C}_4\text{C}_1\text{pip}]^+$.

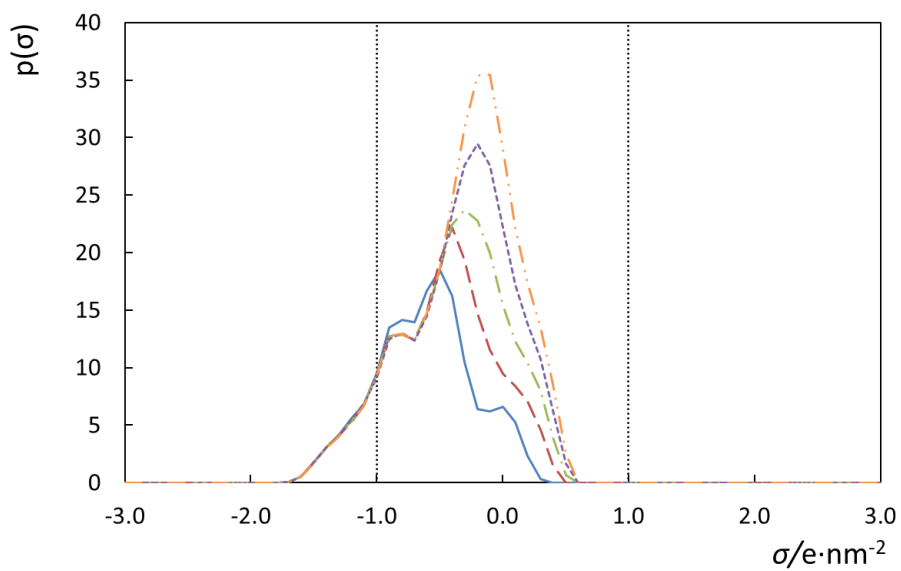


Figure S6. The σ -profile of $[\text{C}_n\text{C}_{1\text{im}}][\text{Tf}_2\text{N}]$ calculated using COSMO-RS. Full line, $[\text{C}_2\text{C}_{1\text{im}}]^+$; Dashed line, $[\text{C}_4\text{C}_{1\text{im}}]^+$; Dashed-dotted line, $[\text{C}_6\text{C}_{1\text{im}}]^+$; dotted line, $[\text{C}_2\text{C}_{1\text{im}}]^+$; and Dashed-dotted-dotted line, $[\text{C}_{10}\text{C}_{1\text{im}}]^+$.

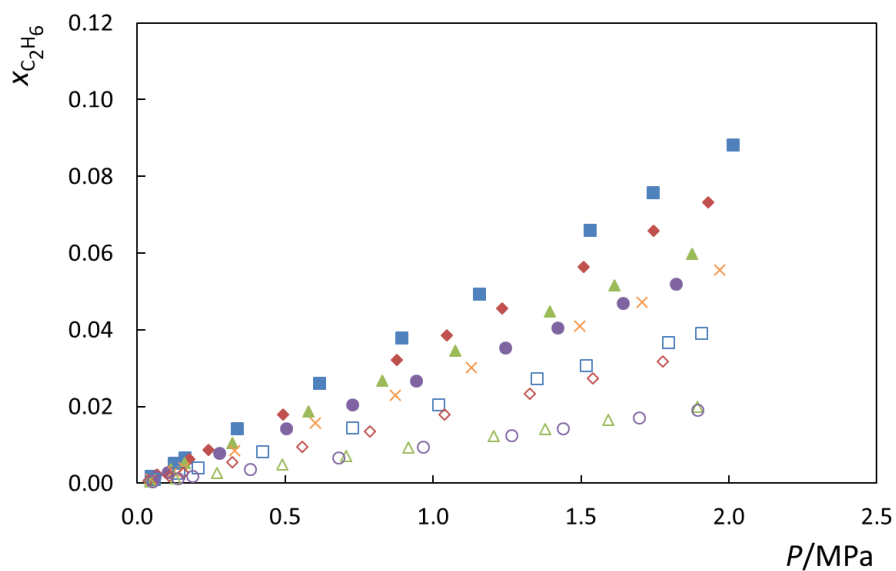


Figure S7. Solubility of ethane, $x_{C_2H_6}$, in ILs with different anion as function of pressure, P , at temperature 298.15 K predicted using COSMO-RS. Symbols: (■), [C₄C₁im][DBP]; (◆), [C₄C₁im][OcSO₄]; (▲), [C₄C₁im][Ac]; (●), [C₄C₁im][DMP]; (×), [C₄C₁im][Tf₂N]; (□), [C₄C₁im][EtSO₄]; (◇), [C₄C₁im][TFA]; (△), [C₄C₁im][PF₆]; and (○), [C₄C₁im][BF₄].

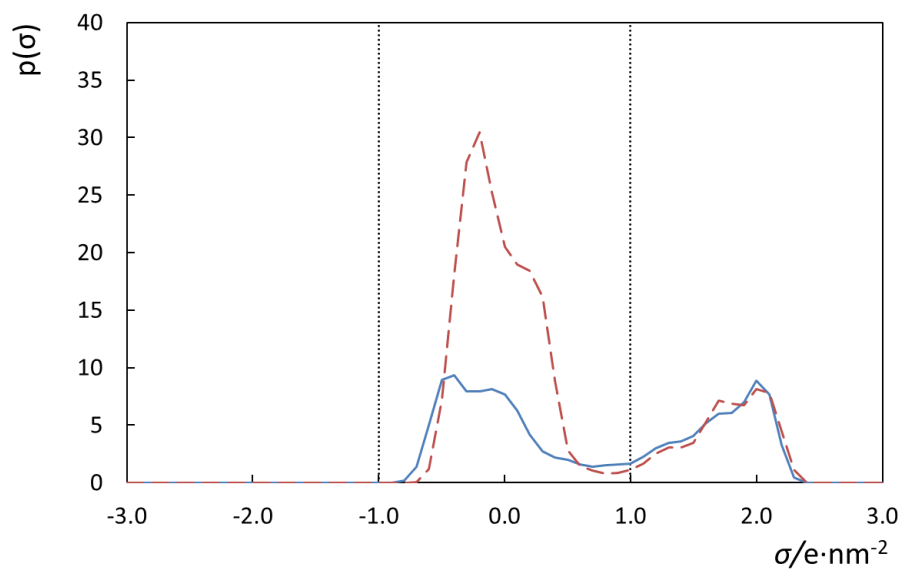


Figure S8. The σ -profile of $[\text{DMP}]^-$ (full line) and $[\text{DBP}]^-$ (dashed line).

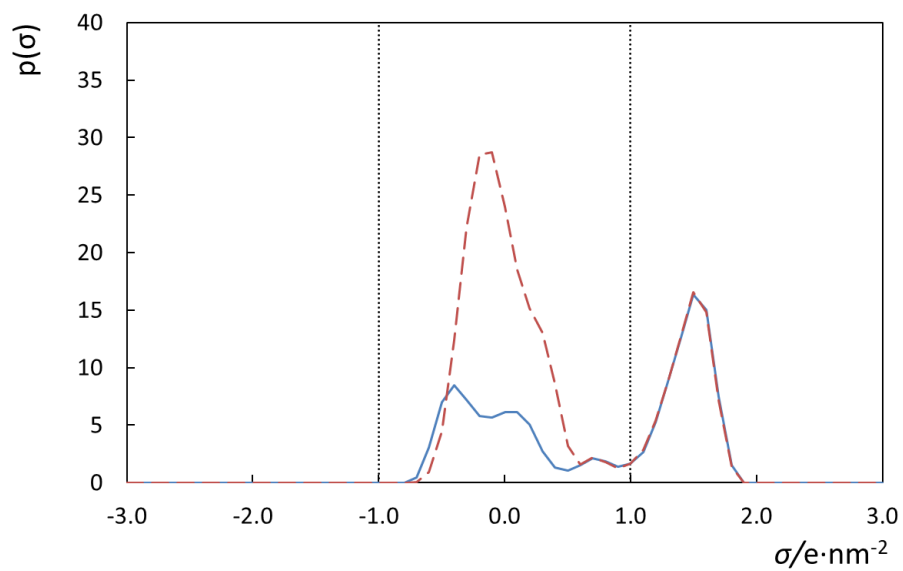


Figure S9. The σ -profile of $[\text{EtSO}_4]^-$ (full line) and $[\text{OcSO}_4]^-$ (dashed line).

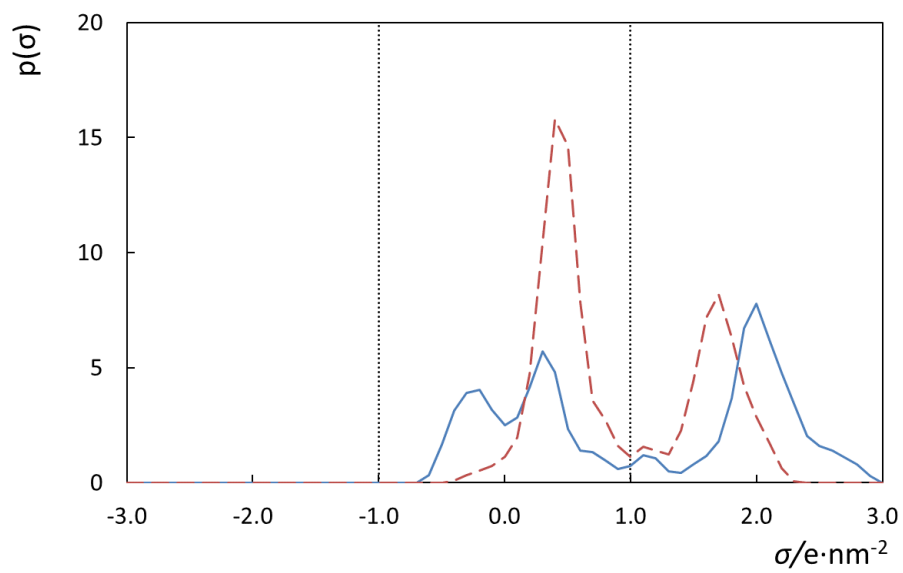


Figure S10. The σ -profile of $[\text{Ac}]^-$ (full line) and $[\text{TFA}]^-$ (dashed line).

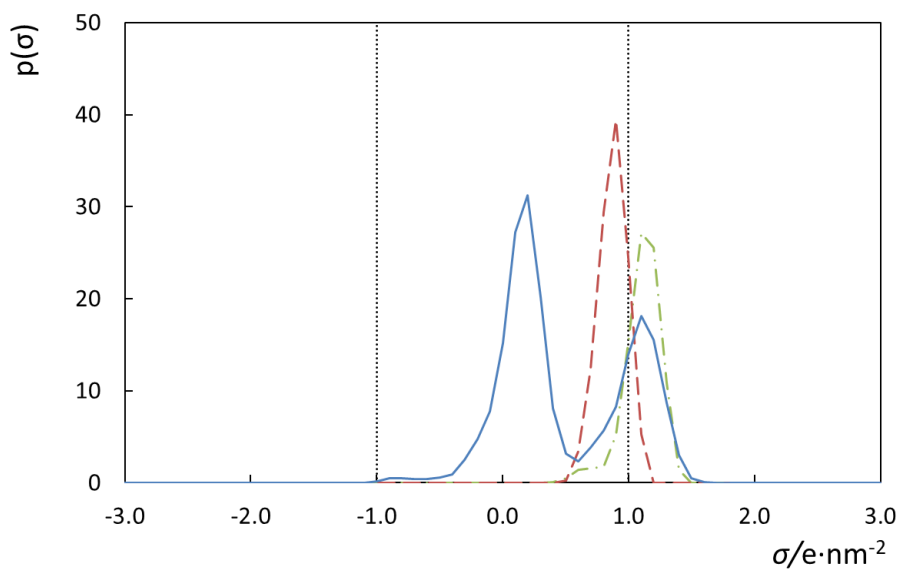


Figure S11. The σ -profile of $[\text{Tf}_2\text{N}]^-$ (full line), $[\text{PF}_6]^-$ (dashed line), and $[\text{BF}_4]^-$ (dashed-dotted line)

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