

Supplementary information:

NMR analysis of the ionic liquids:

The ^1H , ^{13}C and ^{19}F spectra were acquired on an Avance III Bruker spectrometer with a permanent field of 9.397 T.

N-butyl-N-methylpyrrolidinium fluorosulfonyl-(trifluoromethanesulfonyl)imide
(PYR₁₄FTFSI):

^1H -NMR: (DMSO- D_6) δ = 0.89 (t, J = 7.4 Hz, 3H), 1.37 (sext., J = 7.4 Hz, 2H), 1.72 (m, 2H), 2.12 (m, 4H), 3.02 (s, 1H), 3.33 (m, 2H), 3.49 (m, 4H)

^{13}C - $\{^1\text{H}\}$ -NMR: (DMSO- D_6) δ = 14.25, 20.19, 21.99, 25.84, 48.45, 63.93, 64.38, 120.5 (q, J = 322 Hz)

^{19}F -NMR: (DMSO- D_6) δ = -77.88 (d, J = 3.4 Hz, 3F), 57.51 (q, J = 3.4 Hz, 1F)

N-methyl-N-propylpyrrolidinium fluorosulfonyl-(trifluoromethanesulfonyl)imide
(PYR₁₃TFSI):

^1H -NMR: (DMSO- D_6) δ = 0.95 (t, J = 7.3 Hz, 3H), 1.37 (m, 2H), 2.12 (m, 4H), 3.01 (s, 3H), 3.29 (m, 2H), 3.49 (m, 4H)

^{13}C - $\{^1\text{H}\}$ -NMR: (DMSO- D_6) δ = 11.25, 17.45, 21.99, 48.46, 64.35, 65.42, 120.5 (q, J = 322 Hz)

^{19}F -NMR: (DMSO- D_6) δ = -77.88 (d, J = 3.4 Hz, 3F), 57.51 (q, J = 3.4 Hz, 1F)

N-methoxyethyl-N-methylpyrrolidinium fluorosulfonyl-(trifluoromethanesulfonyl)imide
PYR₁₂₀₁FTFSI:

^1H -NMR: (DMSO- D_6) δ = 2.12 (m, 4H), 3.35 (s, 3H), 3.53 (m, 4H), 3.59 (m, 2H), 3.78 (m, 2H)

^{13}C - $\{^1\text{H}\}$ -NMR: (DMSO- D_6) δ = 21.80, 48.97, 59.03, 62.99, 65.08, 66.92, 120.5 (q, J = 322 Hz)

^{19}F -NMR: (DMSO- D_6) δ = -77.88 (d, J = 3.4 Hz, 3F), 57.51 (q, J = 3.4 Hz, 1F)