

**Table S1.** The abbreviation and full chemical name of some common ILs.

Abbreviation	Full chemical name
[A336][C272]	[Trialkylmethylammonium][bis 2,4,4-trimethyl-pentylphosphinate]
[A336][Cl]; Aliquat 336	Tricaprylmethylammonium chloride
[A336][DEHP]	Tri-n-octylmethylammonium bis(2-ethylhexyl)phosphate
[A336][DGA]	Tri-noctylmethylammonium bis(2-ethylhexyl)diglycolamate
[A336][MTBA]	Tricaprylmethylammonium 2-(methylthio)benzoate
[bmim][PF <sub>6</sub> ]	1-butyl-3-methylimidazolium hexafluorophosphate
[bmim][BF <sub>4</sub> ]	1-butyl-3-methylimidazolium tetrafluoroborate
[bmim][NO <sub>3</sub> ]	1-butyl-3-methylimidazolium nitrate
[bmim][Tf <sub>2</sub> N]	1-butyl-3-methylimidazolium bis(trifluoromethylsulfonyl)imide
[bmim][TfO]	1-butyl-3-methylimidazolium trifluoromethanesulfonate
[bmim][SCN]	1-butyl-3-methylimidazolium thiocyanate
[bmim][DCA]	1-butyl-3-methylimidazolium dicyanamide
[bmim][Ac]	1-butyl-3-methylimidazolium acetate
[bmim][CH <sub>3</sub> SO <sub>3</sub> ]	1-Butyl-3-methylimidazolium methanesulfonate
[bmim][TFSI]	1-Butyl-3-methylimidazolium bis(trifluoromethanesulfonyl) imide
[bmim][Br]	1-Butyl-3-methylimidazolium bromide
[bmim][Cl]	1-Butyl-3-methylimidazolium chloride
[bmim][FeCl <sub>4</sub> ]	1-Butyl-3-methylimidazolium tetrachloroferrate
[bbim][BF <sub>4</sub> ]	1-Benzyl-3-butylimidazolium tetrafluoroborate
[BMP][Tf <sub>2</sub> N]	1-butyl-1-methylpyrrolidinium bis(trifluoromethylsulfonyl)imide
[C <sub>4</sub> mim][Tf <sub>2</sub> N]	1-butyl-3-methylimidazolium bis(trifluoromethyl)sulfonylamide
[C <sub>6</sub> mim][PF <sub>6</sub> ]	1-hexyl-3-methylimidazolium hexafluorophosphate
[C <sub>8</sub> mim][PF <sub>6</sub> ]	1-octyl-3-methylimidazolium hexafluorophosphate
[C <sub>9</sub> mim][PF <sub>6</sub> ]	1-nonyl-3-methylimidazolium hexafluorophosphate
[C <sub>6</sub> mim][BF <sub>4</sub> ]	1-hexyl-3-methylimidazolium tetrafluoroborate
[C <sub>8</sub> mim][BF <sub>4</sub> ]	1-octyl-3-methylimidazolium tetrafluoroborate
[C <sub>10</sub> mim][Tf <sub>2</sub> N]	1-decyl-3-methylimidazolium bis(trifluoromethyl)sulfonylamide
Cyanex 272	Bis(2,4,4-trimethylpentyl)phosphinic acid
Cyanex 302	Bis(2,4,4-trimethylpentyl)monothiophosphinic acid
[dmim][Tf <sub>2</sub> N]	1,2-dimethylimidazolium bis(trifluoromethylsulfonyl)imide
[dema][Tf <sub>2</sub> N]	Diethylmethylammonium bis(trifluoromethane sulfonyl)amide
[dema][TfO]	Diethylmethylammonium trifluoromethanesulfonate
D <sub>2</sub> EHFA	Di(2-ethylhexyl)phosphoric acid
[emim][BF <sub>4</sub> ]	1-ethyl-3-methylimidazolium tetrafluoroborate
[emim][Tf <sub>2</sub> N]	1-ethyl-3-methylimidazolium bis(trifluoromethylsulfonyl)imide
[emim][pivalate]	1-ethyl-3-methylimidazolium pivalate
[emim][C <sub>2</sub> N <sub>3</sub> ]	1-ethyl-3-methylimidazolium dicyanamide
[emim][Ac]	1-ethyl-3-methylimidazolium acetate
[emim][MDEGSO <sub>4</sub> ]	1-ethyl-3-methylimidazolium 2-(2-methoxyethoxy)ethylsulfate
[emim][lactate]	1-ethyl-3-methylimidazolium lactate
[emim][benzoate]	1-ethyl-3-methylimidazolium benzoate
[HJMT][Cy272]	Tertiary alkyl (C6-C12) primary ammonium bis 2,4,4-(trimethylpentyl)phosphinate
HEF	2-hydroxy ethylammonium formate
HEAF	2-(2-hydroxy ethoxy)-ammonium formate
HEAA	2-(2-hydroxy ethoxy)-ammonium acetate
[HOPmim][NO <sub>3</sub> ]	Hydroxypropylmethylimidazolium nitrate
[MPS <sub>2</sub> PIP][Tf <sub>2</sub> N]	1-methyl-1-[4,5-bis(methylsulfide)]pentylpiperidin-ium bis(trifluoromethylsulfonyl)imide
[MPTPYRRO][Tf <sub>2</sub> N]	1-methyl-2-pentenepyrrolidinium bis(trifluoromethylsulfonyl)imide
[MOPIP][Tf <sub>2</sub> N]	1-methyl-1-octylpiperidinium bis(trifluoromethylsulfonyl)imide
[MTBDH][PhO]	9-methyl-2,3,4,6,7,8-hexahydropyrimido[1,2-a]pyrimidine phenol
[MTBDH][TFPA]	9-methyl-2,3,4,6,7,8-hexahydropyrimido[1,2-a]pyrimidine imidazole

[MTBDH][Im]	9-methyl-2,3,4,6,7,8-hexahydropyrimido[1,2-a]pyrimidine trifluoroethanol
[MTBDH][TFE]	Methyl trioctyl ammonium chloride
[MTOA][Cl]	Tetrabutylammonium bis (2-ethylhexyl)phosphate
[N <sub>4444</sub> ][DEHP]	N-butylpyridinium tetrafluoroborate
[N-bupy][BF <sub>4</sub> ]	1-propylamide-3-butyl imidazolium tetrafluoroborate
[NH <sub>2</sub> p-bim][BF <sub>4</sub> ]	Tetrabutylammonium heptadecafluorooctanesulfonate
[NBu <sub>4</sub> ][(PFOc)SO <sub>3</sub> ]	Tetramethylammonium glycinate
[N <sub>1111</sub> ][Gly]	1-octyl-3-methylimidazolium tetrafluoroborate
[OMIM][BF <sub>4</sub> ]	
[OMIM][Tf <sub>2</sub> N]	
[OMIM][PF <sub>6</sub> ]	
[OMIM][FeCl <sub>4</sub> ]	1-octyl-3-methylimidazolium bis(trifluoromethylsulfonyl)imide
[P <sub>6,6,6,14</sub> ][Tf <sub>2</sub> N]	1-Octyl-3-methylimidazolium hexafluorophosphate
[P <sub>14,6,6,6</sub> ][Tf <sub>2</sub> N]	1-Octyl-3-methylimidazolium tetrachloroferrate
[P(C <sub>4</sub> ) <sub>4</sub> ][Ala]	Trihexyltetradecylphosphonium bis(trifluoromethylsulfonyl)sulfonamide
[P(C <sub>4</sub> ) <sub>4</sub> ][Gly]	Trihexyltetradecylphosphonium bis(trifluoromethylsulfonyl)imide
[P <sub>66614</sub> ][Met]	Tetrabutylphosphonium l- $\alpha$ -aminopropionic acid salt
[P <sub>66614</sub> ][Pro]	Tetrabutylphosphonium aminoethanoic acid salt
[(P <sub>2</sub> -Et)H][TFE]	Trihexyl(tetradecyl)phosphonium methioninate
	Trihexyl(tetradecyl)phosphonium proline
[(P <sub>2</sub> -Et) H][Im]	Tetramethyl(tris(dimethylamino)phosphoranylidene)phosphorictriamid-Et-imin trifluoroethanol
	Tetramethyl(tris(dimethylamino)phosphoranylidene)phosphorictriamid-Et-imin imidazole
[(P <sub>2</sub> -Et) H][Pyr]	Tetramethyl(tris(dimethylamino)phosphoranylidene)phosphorictriamid-Et-imin pyrrolidone
	Tetramethyl(tris(dimethylamino)phosphoranylidene)phosphorictriamid-Et-imin phenol
[(P <sub>2</sub> -Et) H][PhO]	Trihexyl(tetradecyl)phosphonium pyrazole
	Trihexyl(tetradecyl)phosphonium imidazole
[P <sub>66614</sub> ][Pyr]	Trihexyl(tetradecyl)phosphonium indole
[P <sub>66614</sub> ][Im]	Trihexyl(tetradecyl)phosphonium Trizole
[P <sub>66614</sub> ][Ind]	Trihexyl(tetradecyl)phosphonium bentrizole
[P <sub>66614</sub> ][Triz]	Trihexyl(tetradecyl)phosphonium tetrazole
[P <sub>66614</sub> ][Bentriz]	Trihexyl(tetradecyl)phosphonium oxazolidinone
[P <sub>66614</sub> ][Tetz]	Trihexyl(tetradecyl)phosphonium phenol
[P <sub>66614</sub> ][Oxa]	Trihexyl(tetradecyl)phosphonium hexachlorogadolinium
[P <sub>66614</sub> ][PhO]	Trihexyl(tetradecyl)phosphonium tetrachlorocobalt
[P <sub>6,6,6,14</sub> ][GdCl <sub>6</sub> ]	Trihexyl(tetradecyl)phosphonium tetrachloroferrate
[P <sub>6,6,6,14</sub> ][CoCl <sub>4</sub> ]	Trihexyl(tetradecyl)phosphonium tetrachloromanganese
[P <sub>6,6,6,14</sub> ][FeCl <sub>4</sub> ]	Poly([2-(methylacryloyloxy)ethyl]trimethylammonium) chloride
[P <sub>6,6,6,14</sub> ][MnCl <sub>4</sub> ]	Poly(1-styrenemethyl-3-methylimidazolium bis(trifluoromethylsulfonyl)imide)
poly[META][Cl]	Poly(1-vinyl-3-ethyl-imidazolium) bis(trifluoromethane sulfonyl)amide
poly[SMIM][Tf <sub>2</sub> N]	Poly(1-vinyl-3-ethyl-imidazolium) bromide
poly[ViEtIm][Tf <sub>2</sub> N]	Poly(1-vinyl-3-ethyl-imidazolium) tetrafluoroborate
poly[ViEtIm][Br]	1,3-Di(3-methylimidazolium)propane bis(trifluoromethylsulfonyl)imide
poly[ViEtIm][BF <sub>4</sub> ]	Trihexyl(tetradecyl)phosphonium chloride
pr[MIM] <sub>2</sub> [Tf <sub>2</sub> N] <sub>2</sub>	Trihexyl(tetradecyl)phosphonium bromide
[QP][Cl]; Cyphos IL 101	1-(Silylpropyl)-3-methyl-imidazolium hexafluorophosphate
[QP][Br]; Cyphos IL 102	Tri-(2-hydroxy ethyl)-ammonium acetate
[SPMIM][PF <sub>6</sub> ]	Quaternary ammonium compounds, coco alkylbis (hydroxyethyl)methyl, ethoxylated, chlorides, methyl chloride
THEAA	
TEGO IL K <sub>5</sub>	