Electronic Supplementary Material (ESI) for Chemical Society Reviews

Supporting Information

Aqueous Biphasic Systems: A boost brought about by using ionic liquids

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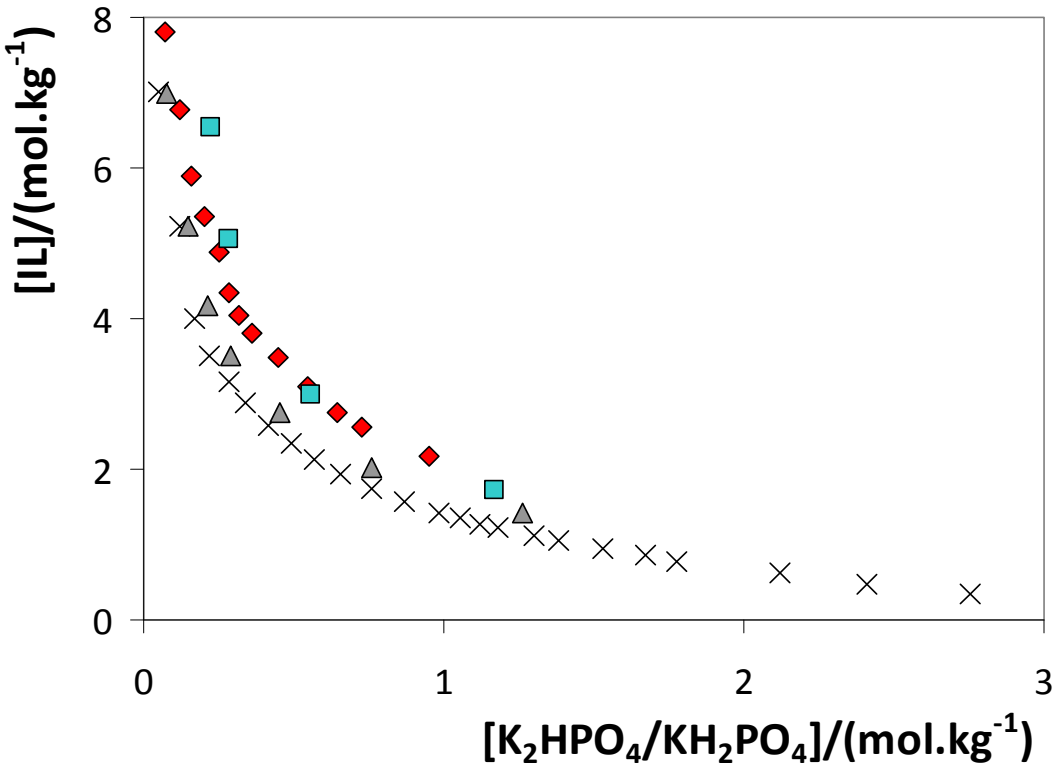

Fig. S1 Ternary phase diagrams for ABS composed of chloride-based ionic liquids + K_2HPO_4/KH_2PO_4 at 298 K: ■, $[C_4C_1pyr]Cl$; ♦, $[C_4C_1im]Cl$; ▲, $[C_4C_1pip]Cl$; ×, $[C_4$-3-$C_1py]Cl$.[45]

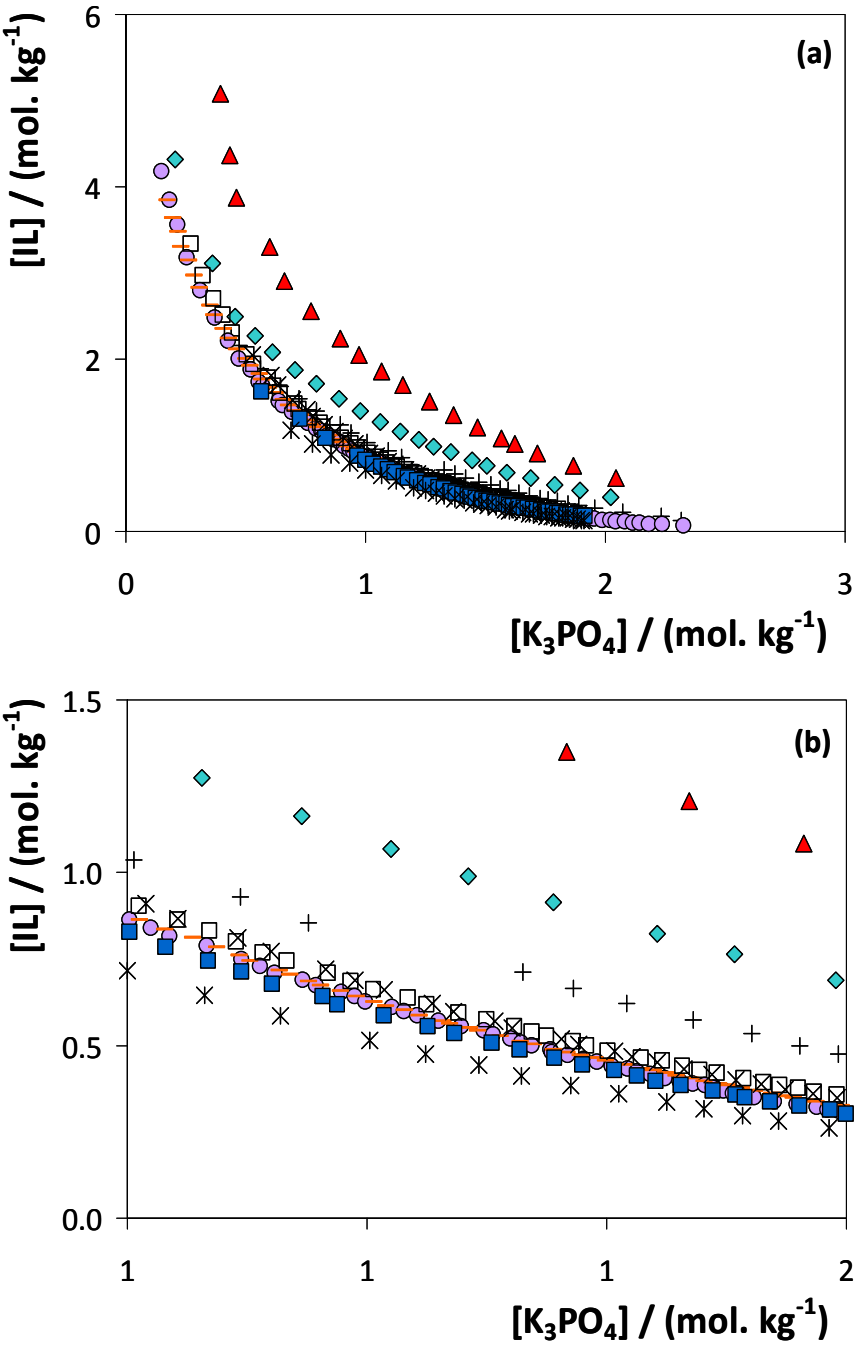

Fig. S2 Ternary phase diagrams for ABS composed of $[C_nC_1im]Cl$ ionic liquids + K_3PO_4 at 298 K: ▲, $[C_1C_1im]Cl$; ♦, $[C_2C_1im]Cl$; +, $[C_4C_1im]Cl$; ●, $[C_6C_1im]Cl$; —, $[C_7C_1im]Cl$; □, $[C_8C_1im]Cl$; ×, $[C_{10}C_1im]Cl$; ■, $[C_{12}C_1im]Cl$; ✳, $[C_{14}C_1im]Cl$.[18] (b) is an expansion of (a).

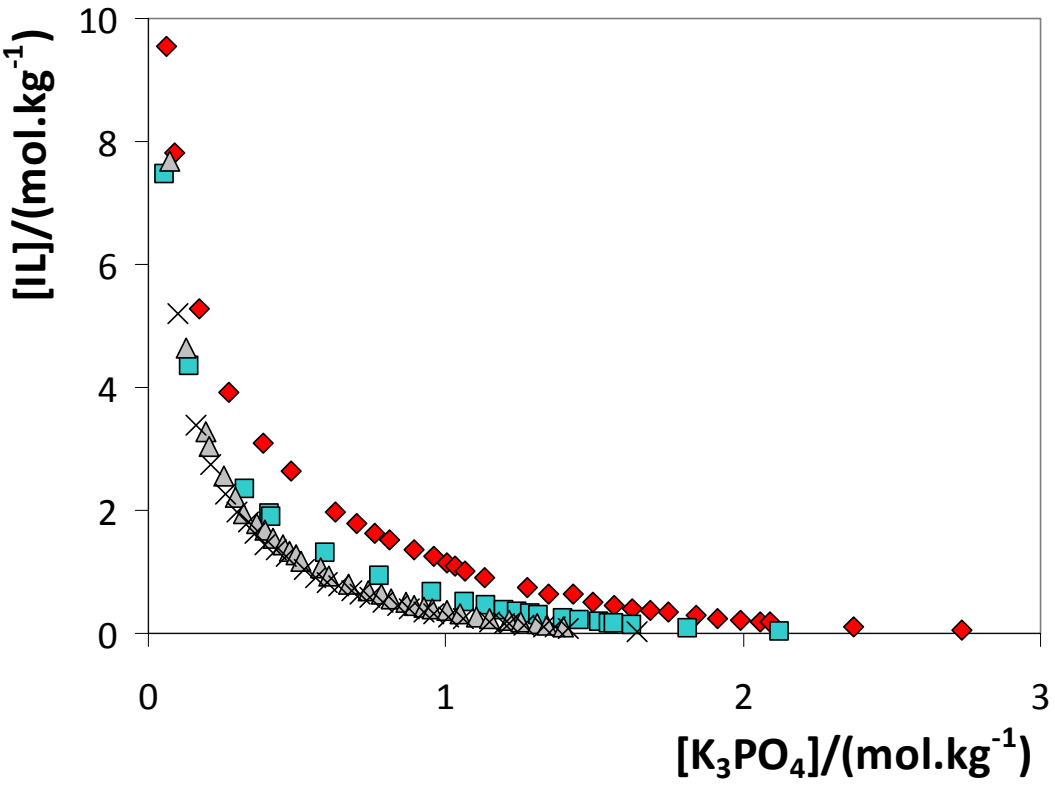

Fig. S3 Ternary phase diagrams for ABS composed of $[C_2C_1im]$-based ionic liquids + K_3PO_4 at 298.15 K: ♦, $[C_2C_1im][C_1SO_4]$; ■, $[C_2C_1im][C_4SO_4]$; ▲, $[C_2C_1im][C_6SO_4]$; ×, $[C_2C_1im][C_8SO_4]$.[11]

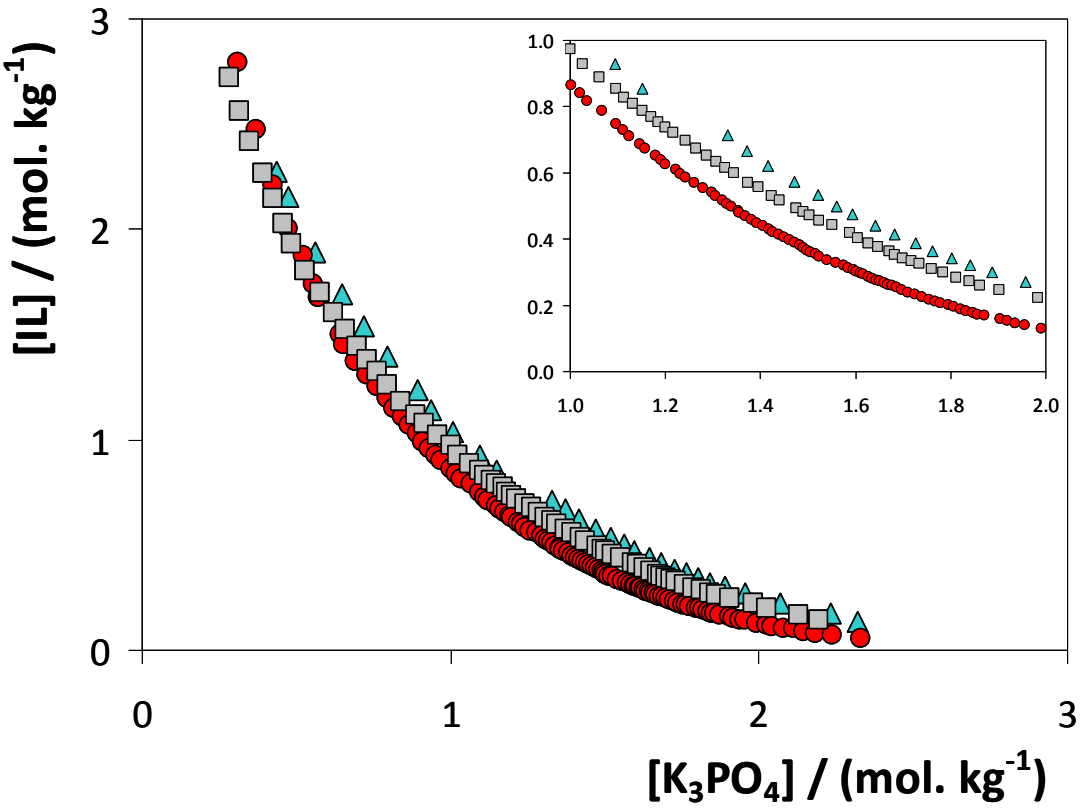

Fig. S4 Ternary phase diagrams for ABS composed of imidazolium-based ionic liquids + K_3PO_4 at 298 K: ■, $[C_4C_1C_1im]Cl$; ▲, $[C_4C_1im]Cl$; ●, $[C_6C_1im]Cl$.[18]

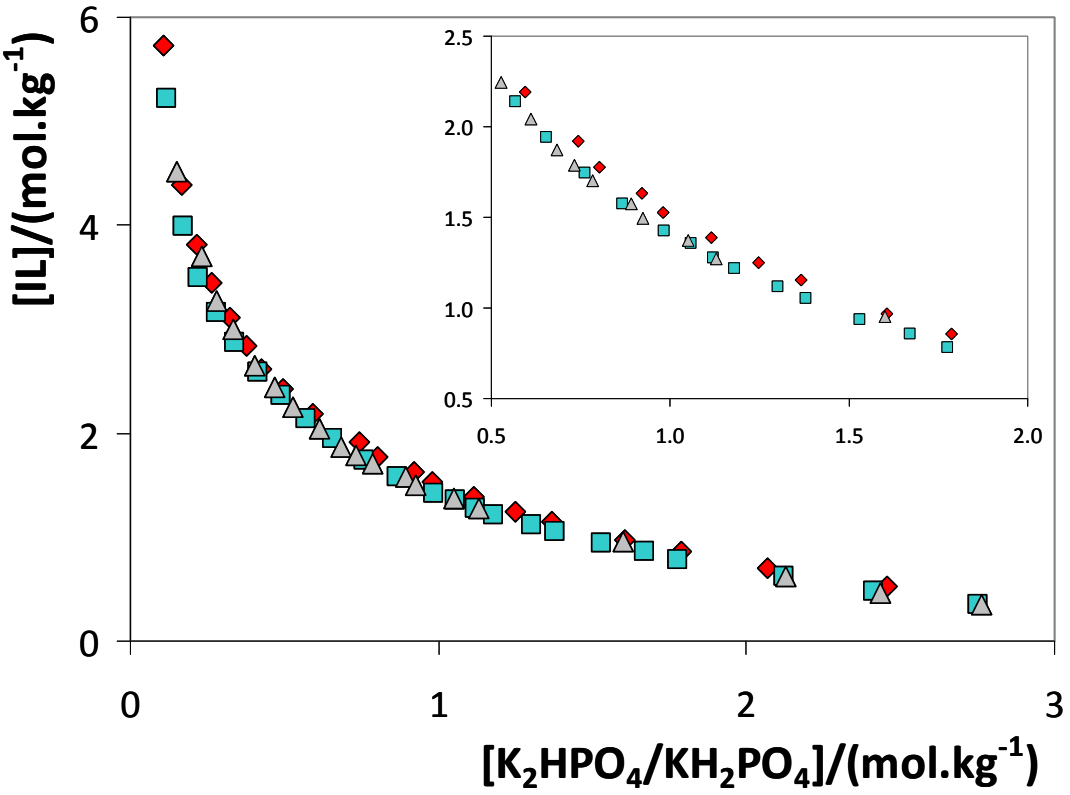

Fig. S5 Ternary phase diagrams for ABS composed of pyridinium-chloride-based ionic liquids + K_2HPO_4/KH_2PO_4 at 298 K: ♦, [C_4-2-C_1py]Cl; ■, [C_4-3-C_1py]Cl; ▲, [C_4-4-C_1py]Cl.[45]

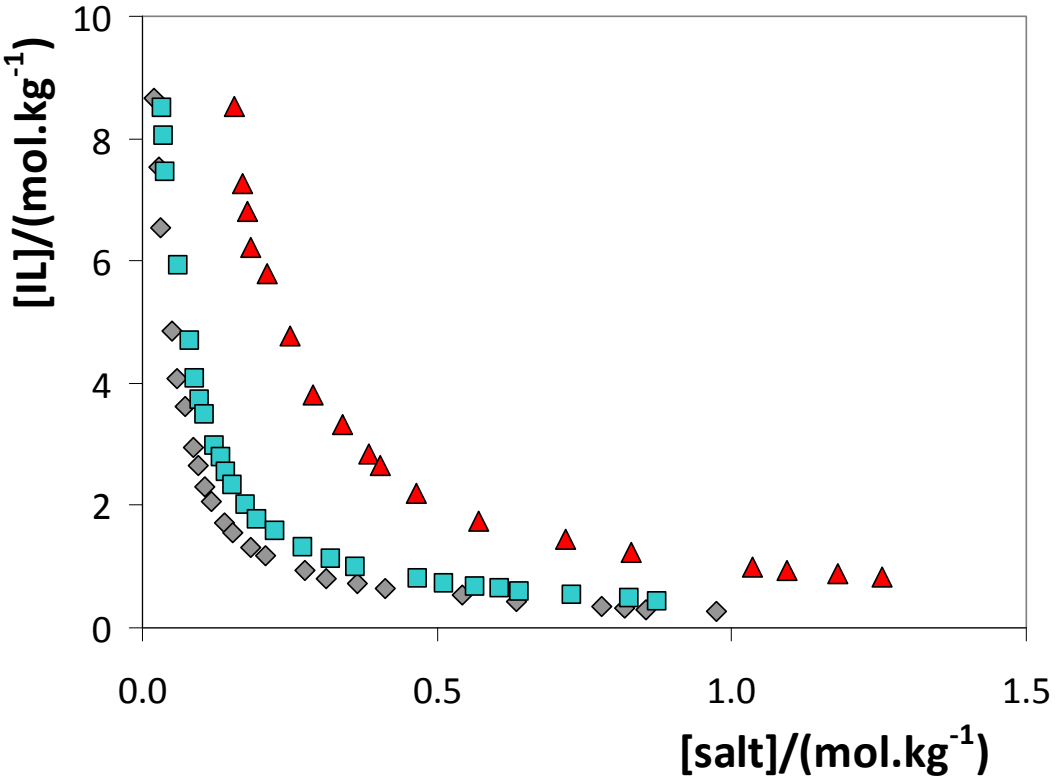

Fig. S6 Ternary phase diagrams for ABS composed of $[C_4C_1im][BF_4]$ + sodium-based salts at 298.15 K: ▲, $NaCH_3CO_2$; ■, $Na_2C_4H_4O_6$; ♦, $Na_3C_6H_5O_7$.[21]

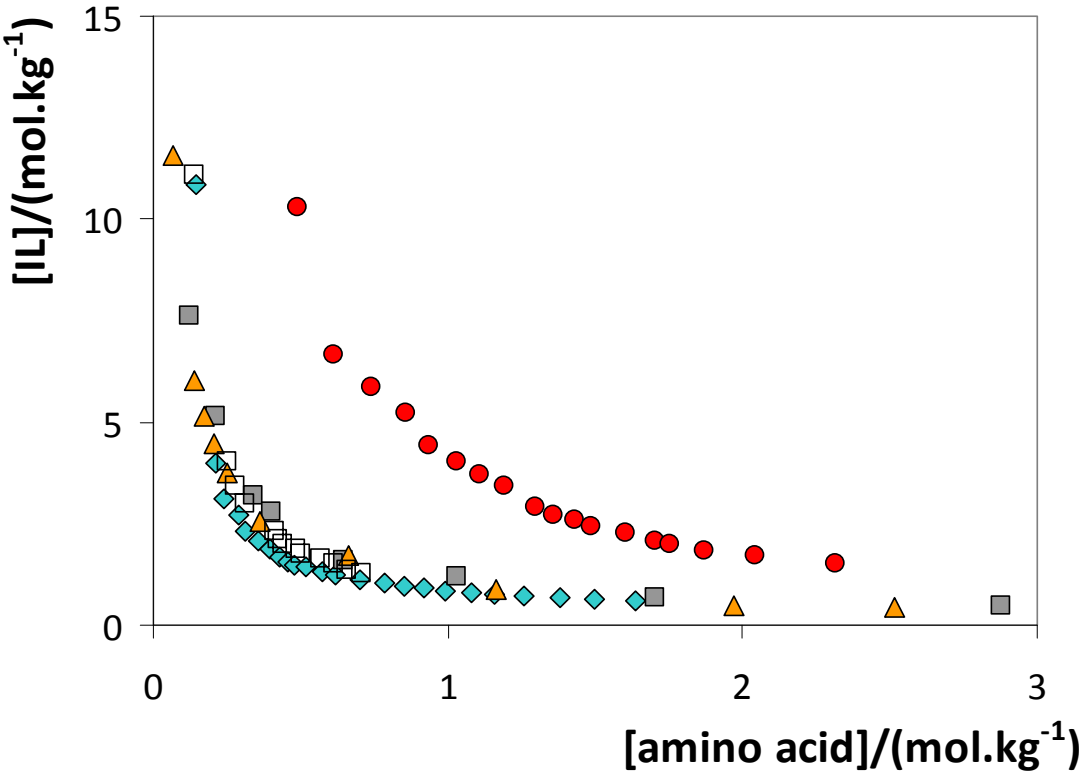

Fig. S7 Ternary phase diagrams for ABS composed of $[C_4C_1im][BF_4]$ + amino acids at 298 K: ●, L-proline; ■, glycine; ▲, L-serine; □, D,L-lysine·HCl; ♦, L-lysine.[14,58]

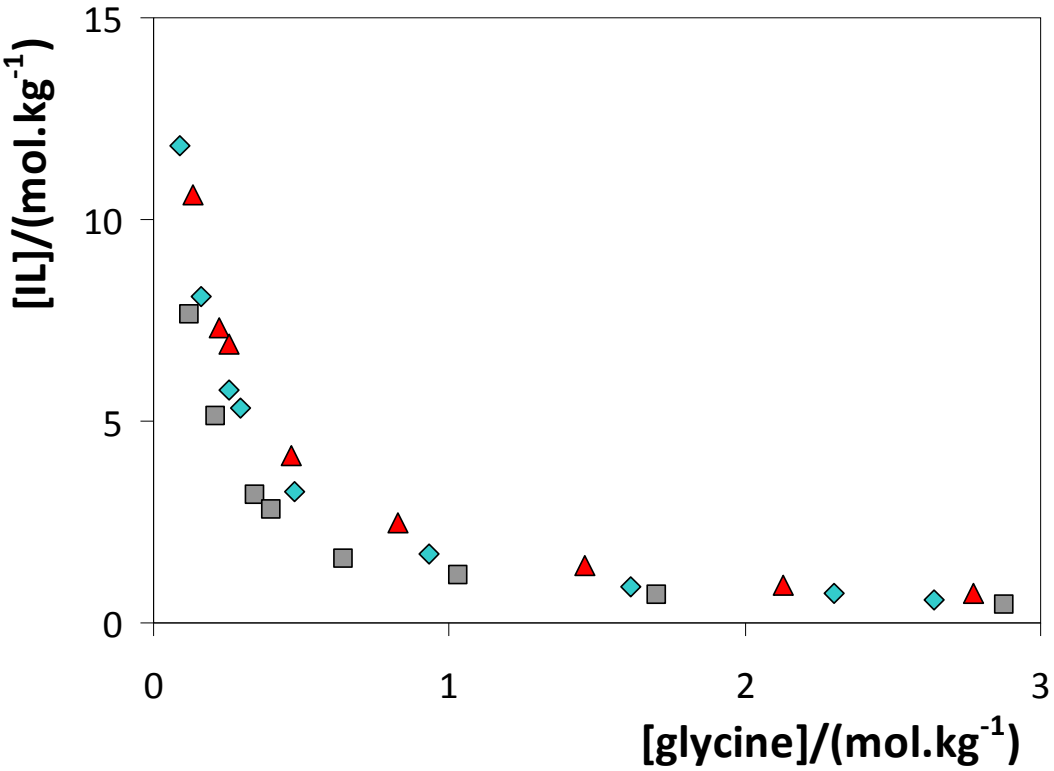

Fig. S8 Ternary phase diagrams for ABS composed of $[C_4C_1im][BF_4]$ + lysine at: ■, 298 K; ♦, 308.15 K; ▲, 318.15 K.[58]

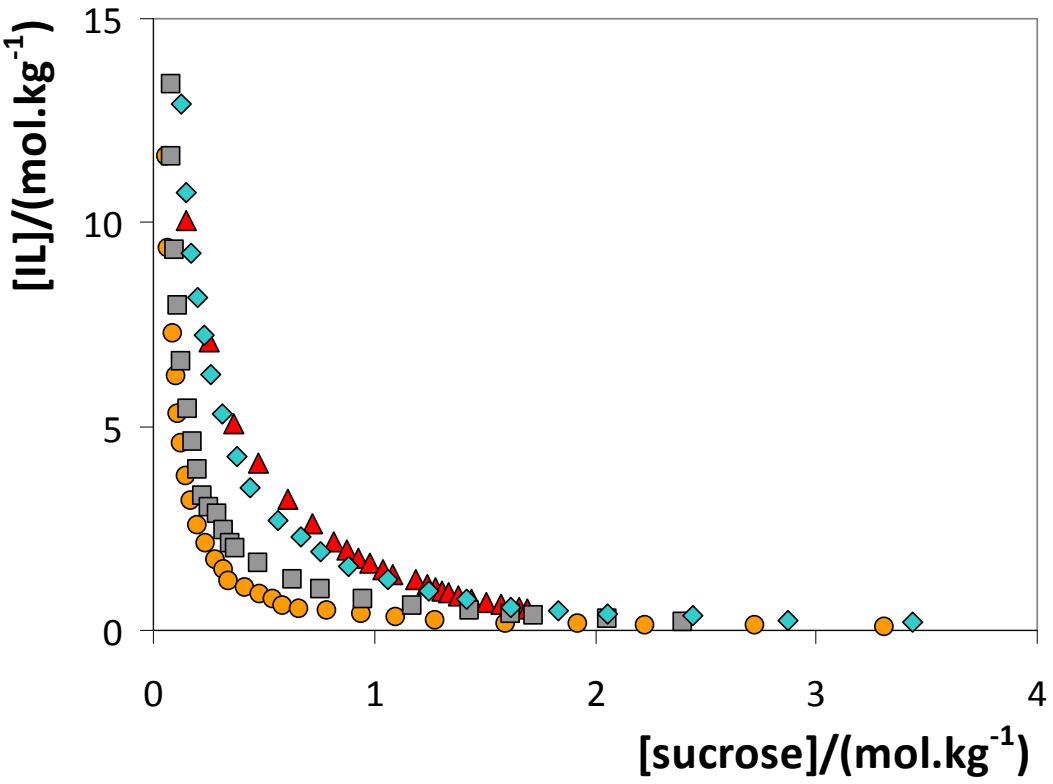

Fig. S9 Ternary phase diagrams for ABS composed of ionic liquids + sucrose at 298 K: ▲, $[C_4C_1im][CF_3SO_3]$; ♦, $[aC_1im]Cl$; ■, $[aC_1im]Br$; ●, $[C_4C_1im][BF_4]$.[17,51]

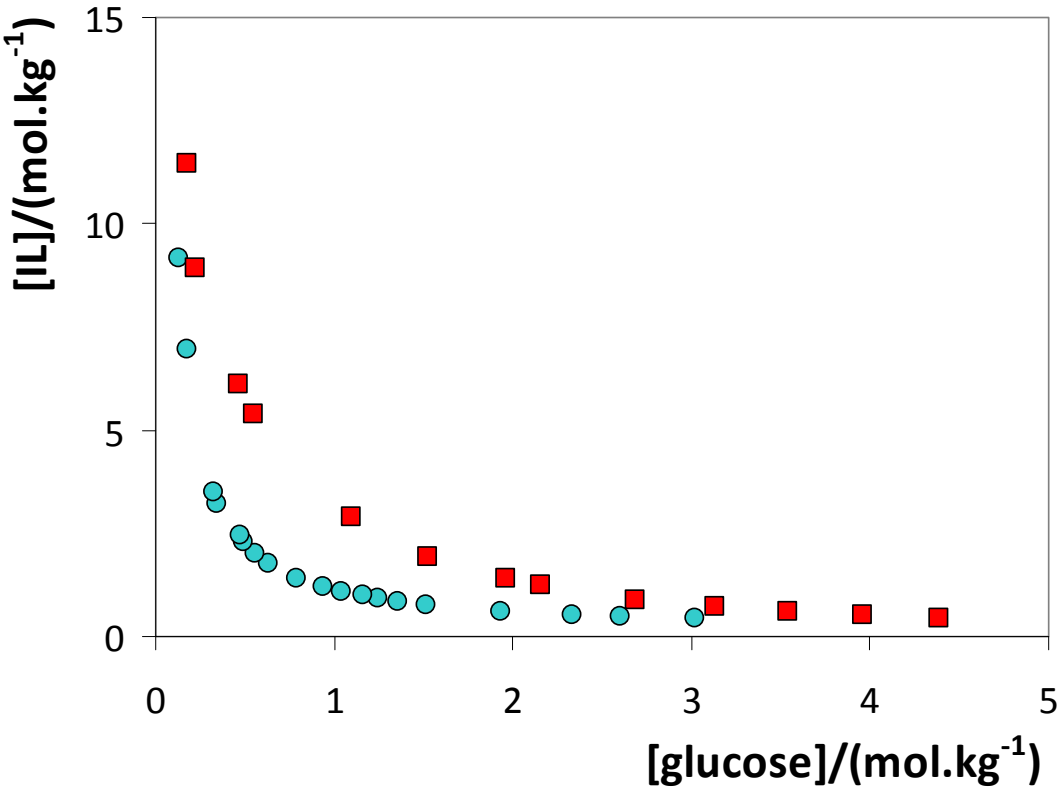

Fig. S10 Ternary phase diagrams for ABS composed of ionic liquids + glucose at 298 K: ■, $[C_3C_1im][BF_4]$; ●, $[C_4C_1im][BF_4]$.[8]

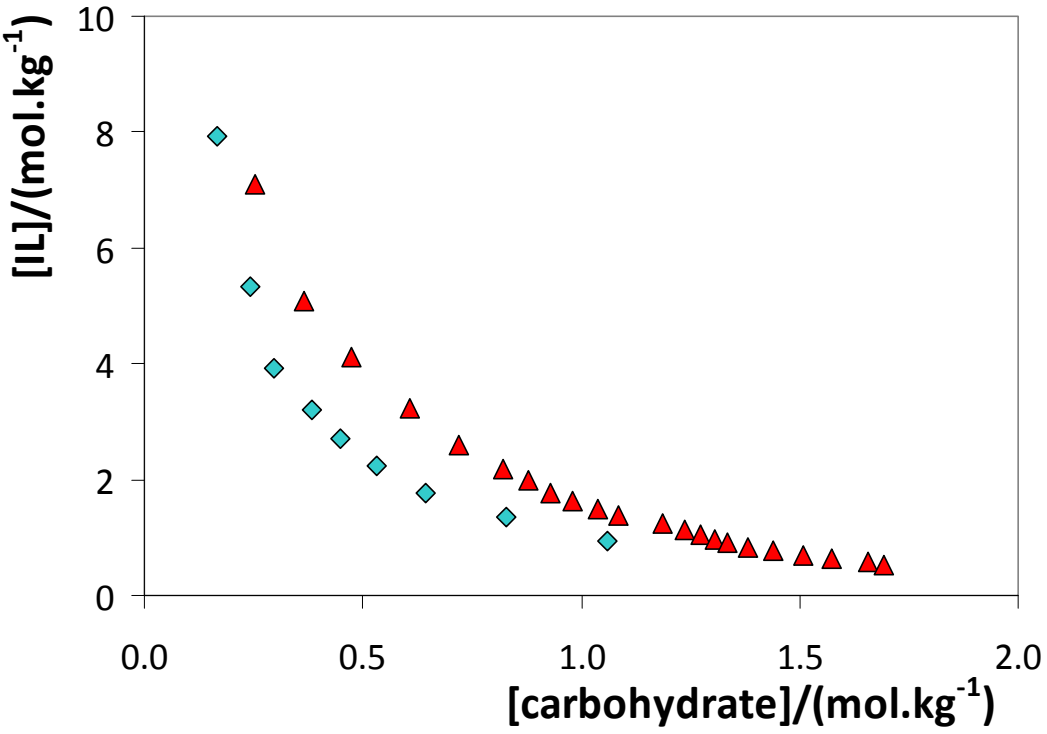

Fig. S11 Ternary phase diagrams for ABS composed of $[C_4C_1im][CF_3SO_3]$ + dissacharides at 298 K: ♦, D-(+)-maltose; ▲, sucrose.[17]

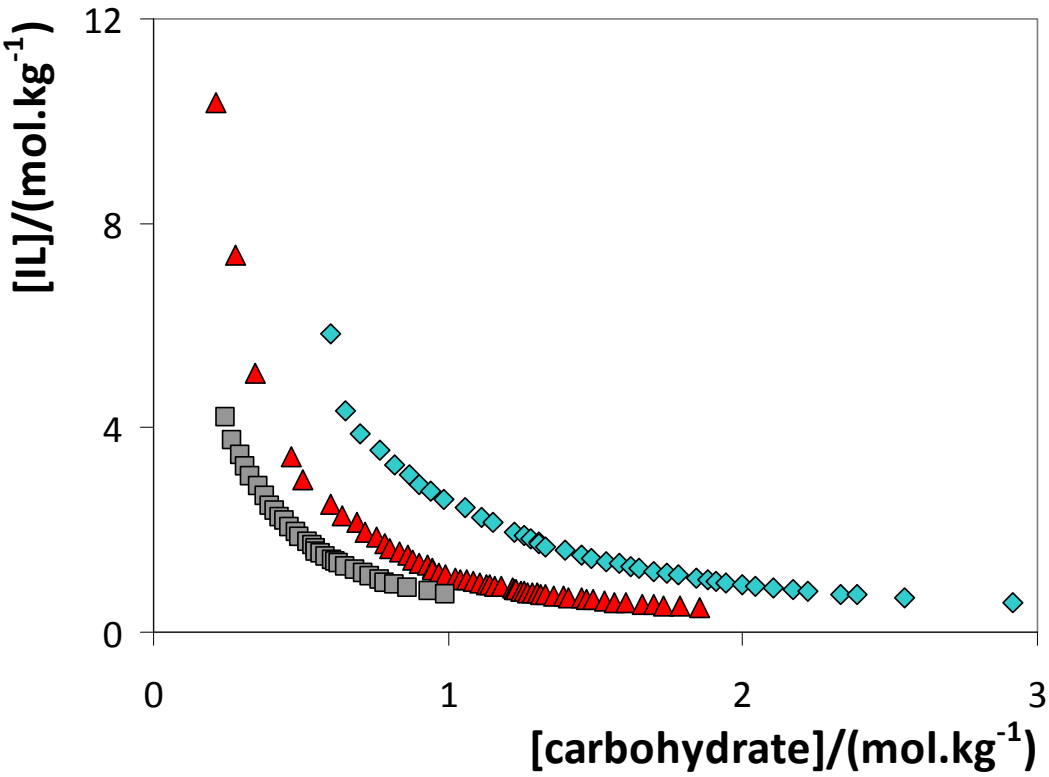

Fig. S12 Ternary phase diagrams for ABS composed of $[C_4C_1im][CF_3SO_3]$ + polyols at 298 K: ■, D-maltitol; ▲, D-sorbitol; ♦, xylitol.[17]

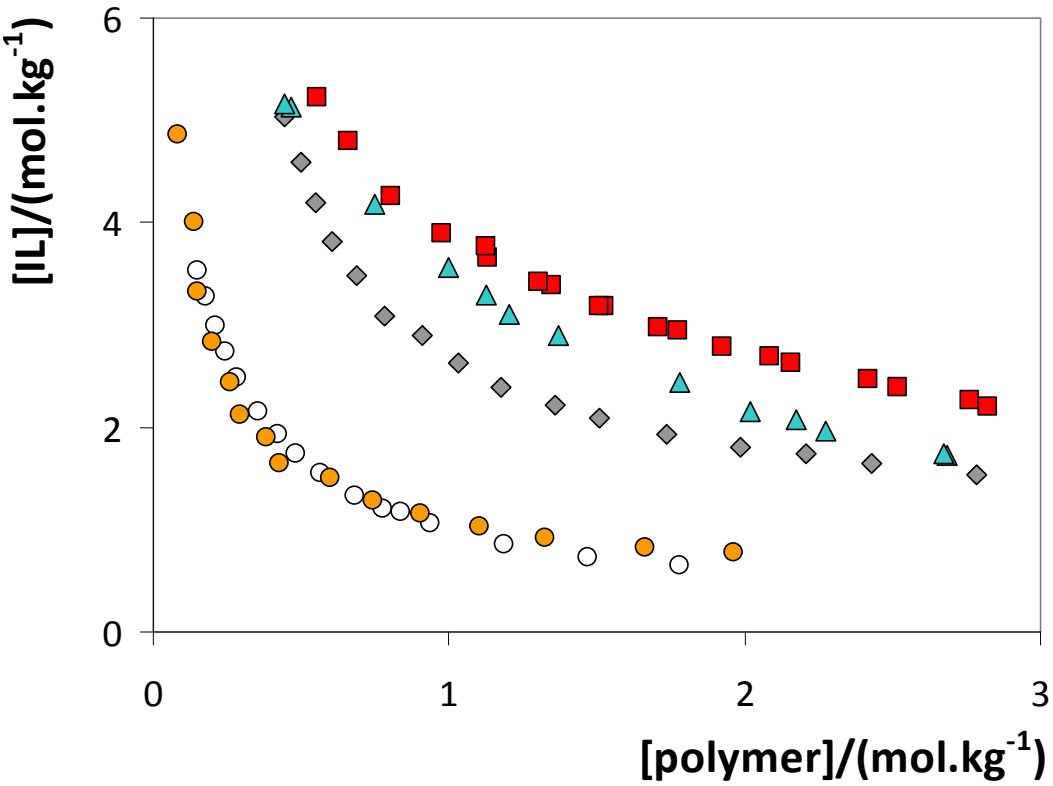

Fig. S13 Ternary phase diagrams for ABS composed of ionic liquid + PPG 400 at 298 K: ■, $[C_4C_1im]Br$; ▲, $[C_2C_1im]Br$; ♦, $[C_4C_1im]Cl$; ○, $[aC_1im]Cl$; ●, $[C_4C_1im][C_1CO_2]$.[63-64]

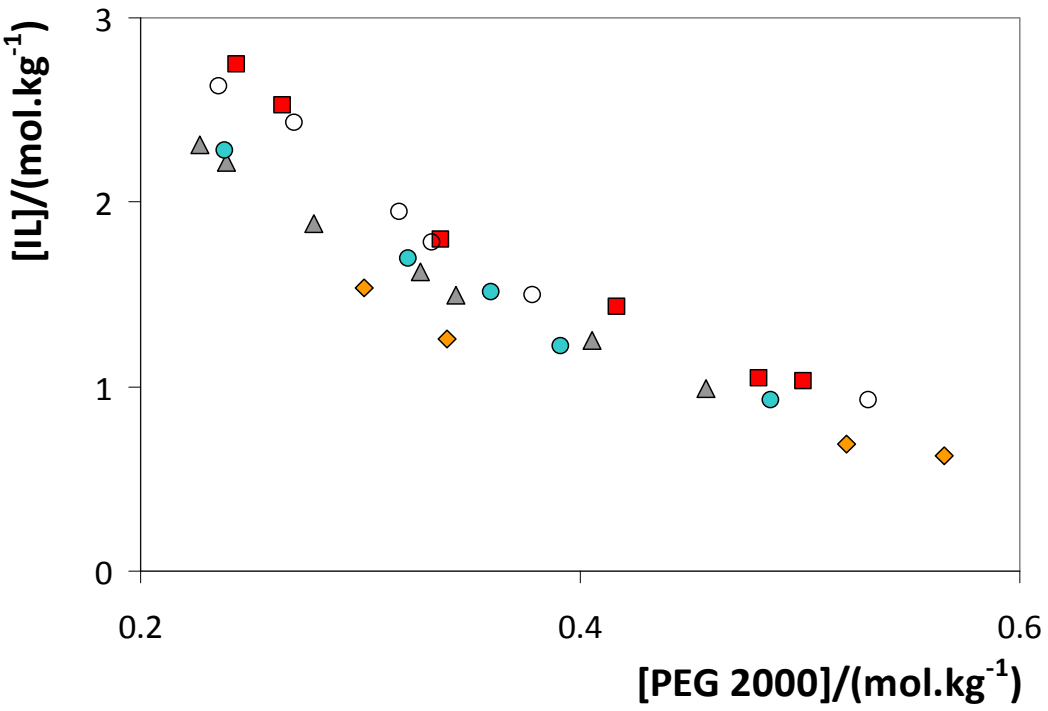

Fig. S14 Ternary phase diagrams for ABS composed of ionic liquid + PEG 2000 at 298 K: ■, $[C_4C_1im]Cl$; ○, $[C_4C_1py]Cl$; ●, $[C_4C_1pyr]Cl$; ▲, $[C_4C_1pip]Cl$; ♦, $[P_{4444}]Cl$.[60]

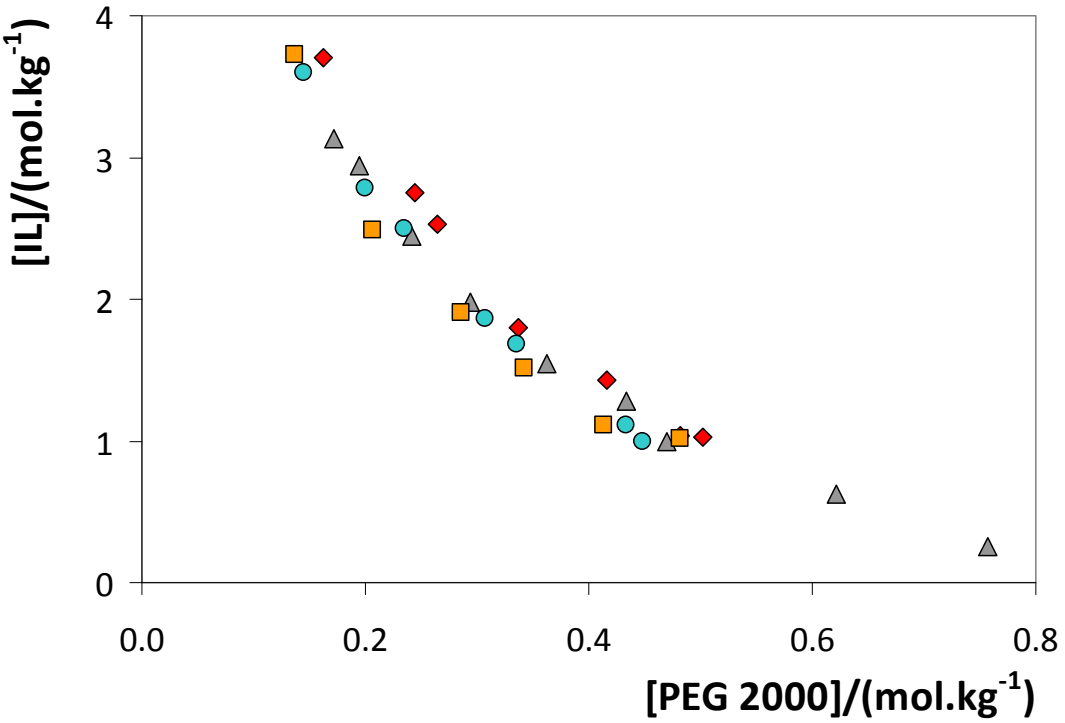

Fig. S15 Ternary phase diagrams for ABS composed of ionic liquid + PEG 2000 at 298 K: ♦, $[C_4C_1im]Cl$; ▲, $[C_2C_1im]Cl$; ●, $[aC_1im]Cl$; ■, $[OHC_2C_1im]Cl$.[60]

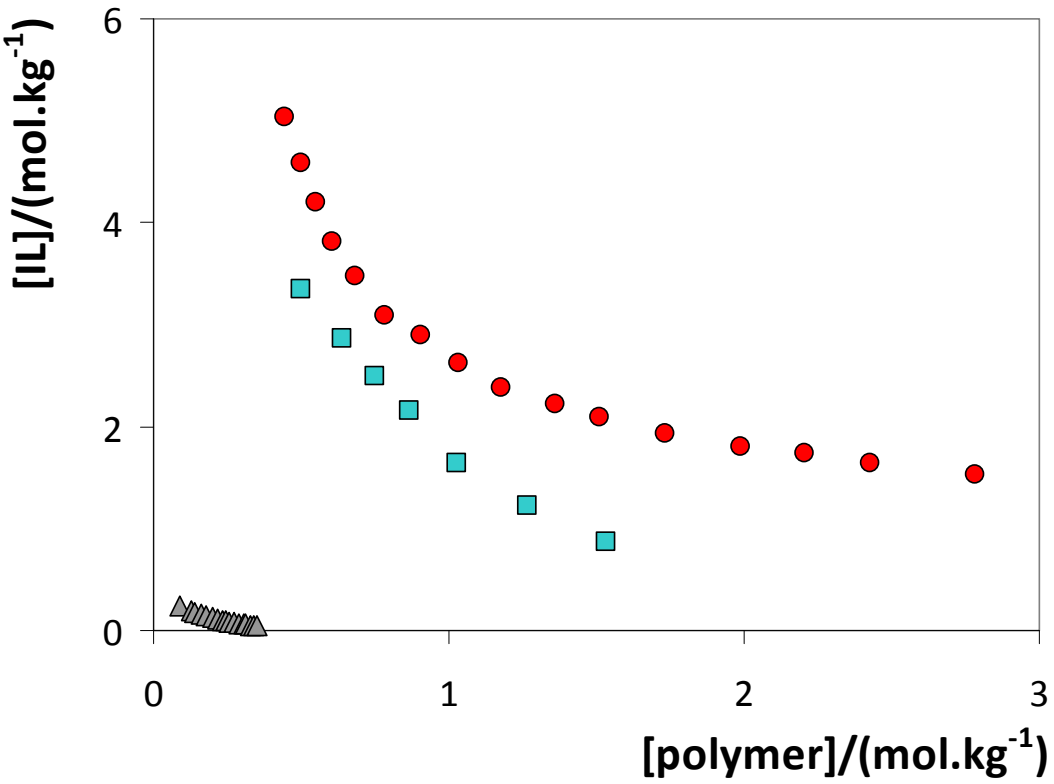

Fig. S16 Ternary phase diagrams for ABS composed of $[C_4C_1im]Cl$ + polymer at 298 K: ●, PPG 400; ■, PEG 1000; ▲, PPG 1000.[60,63]

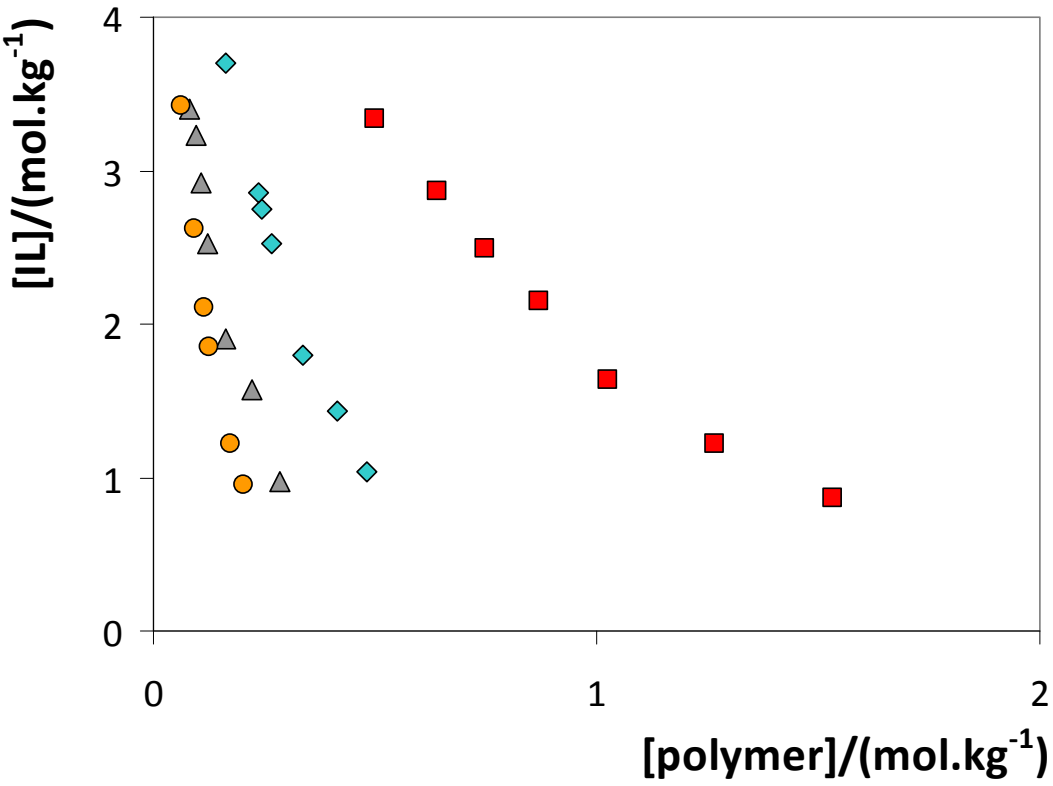

Fig. S17 Ternary phase diagrams for ABS composed of $[C_4C_1im]Cl$ + polymer at 298 K: ■, PEG 1000; ♦, PEG 2000; ▲, PEG 3400; ●, PEG 4000.[60]

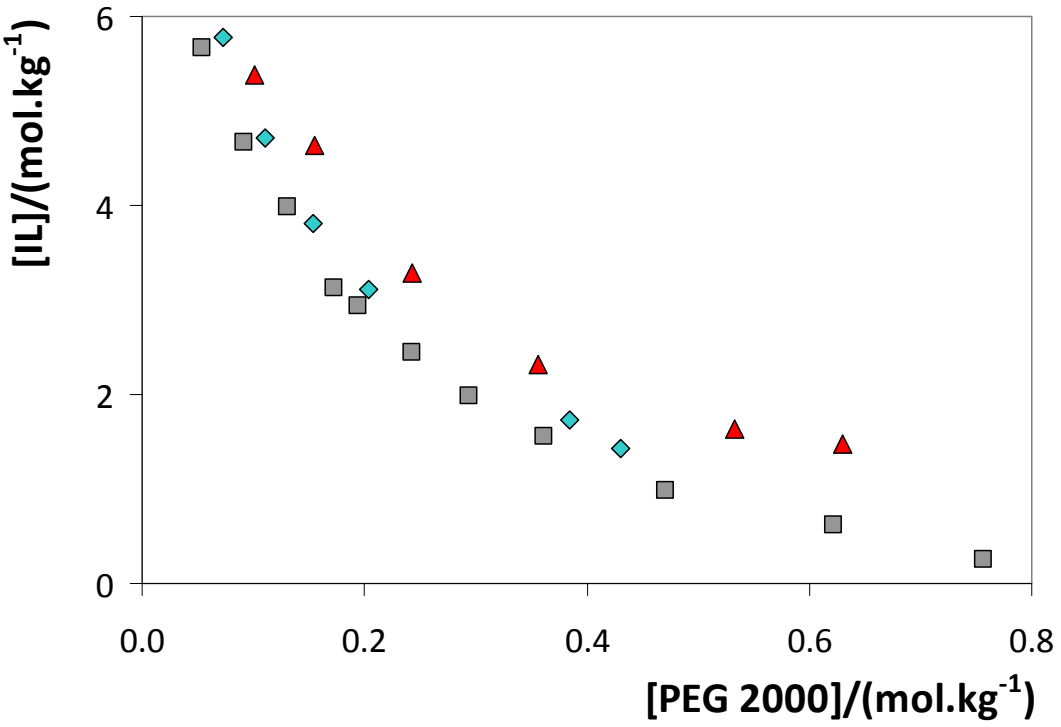

Fig. S18 Ternary phase diagrams for ABS composed of $[C_2C_1im]Cl$ + PEG 2000 at: ▲, 323 K; ♦, 308 K; ■, 298 K.[60]

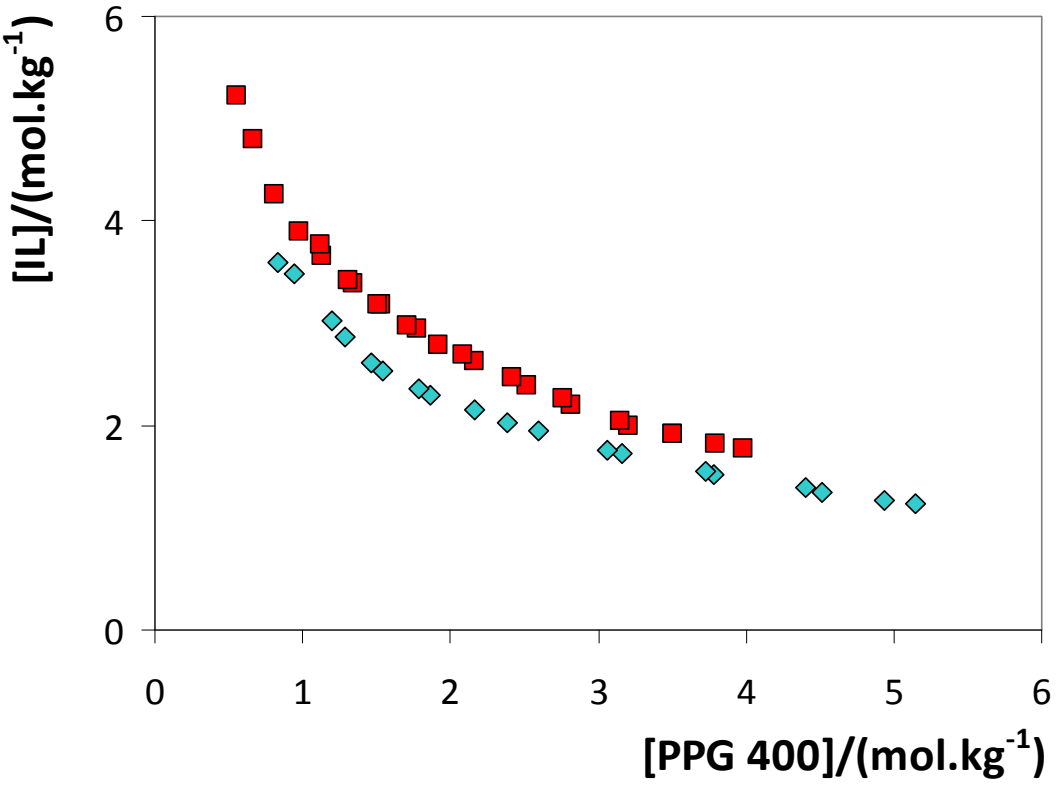

Fig. S19 Ternary phase diagrams for ABS composed of $[C_2C_1im]Br$ + PPG 400 at: ■, 298.15 K; ♦, 318.15 K.[64]

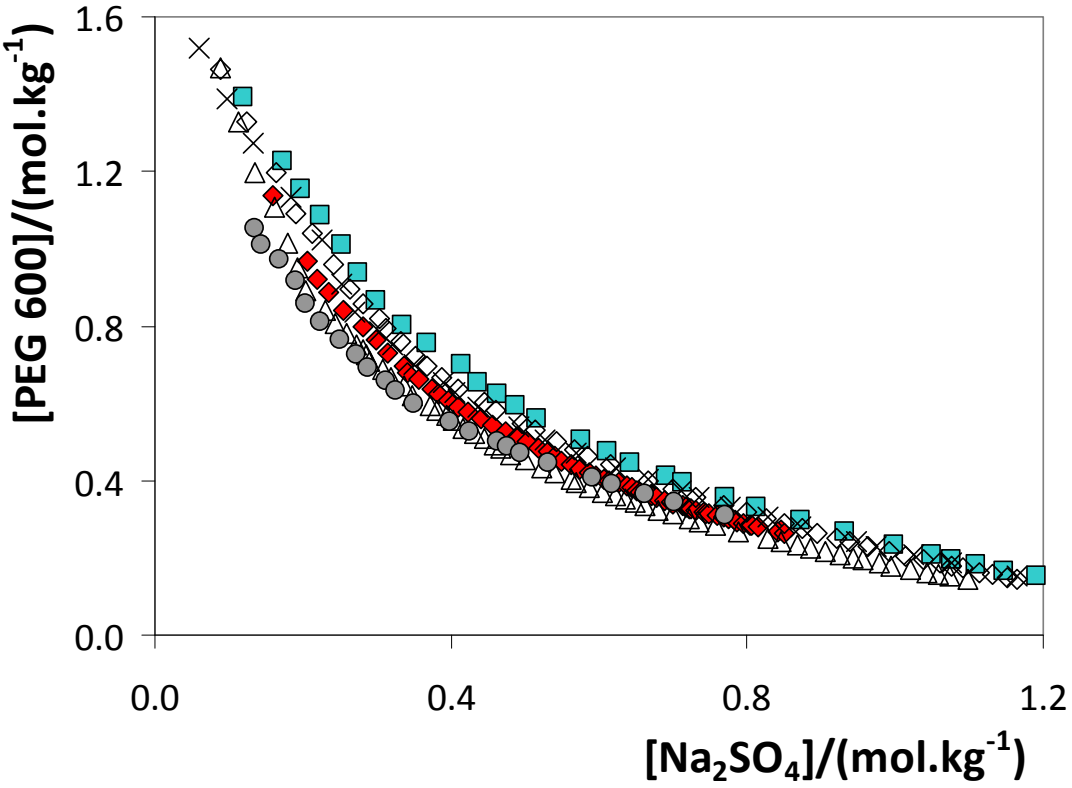

Fig. S20 Phase diagrams for ABS composed of PEG 600 + Na_2SO_4 + 5 wt % ionic liquid at 298 K: ♦, no ionic liquid; ■, [im]Cl; ◊, [C_1im]Cl, ×, [C_2C_1im]Cl; Δ, [C_4C_1im]Cl; ●, [$C_4C_1C_1$im]Cl.[61]

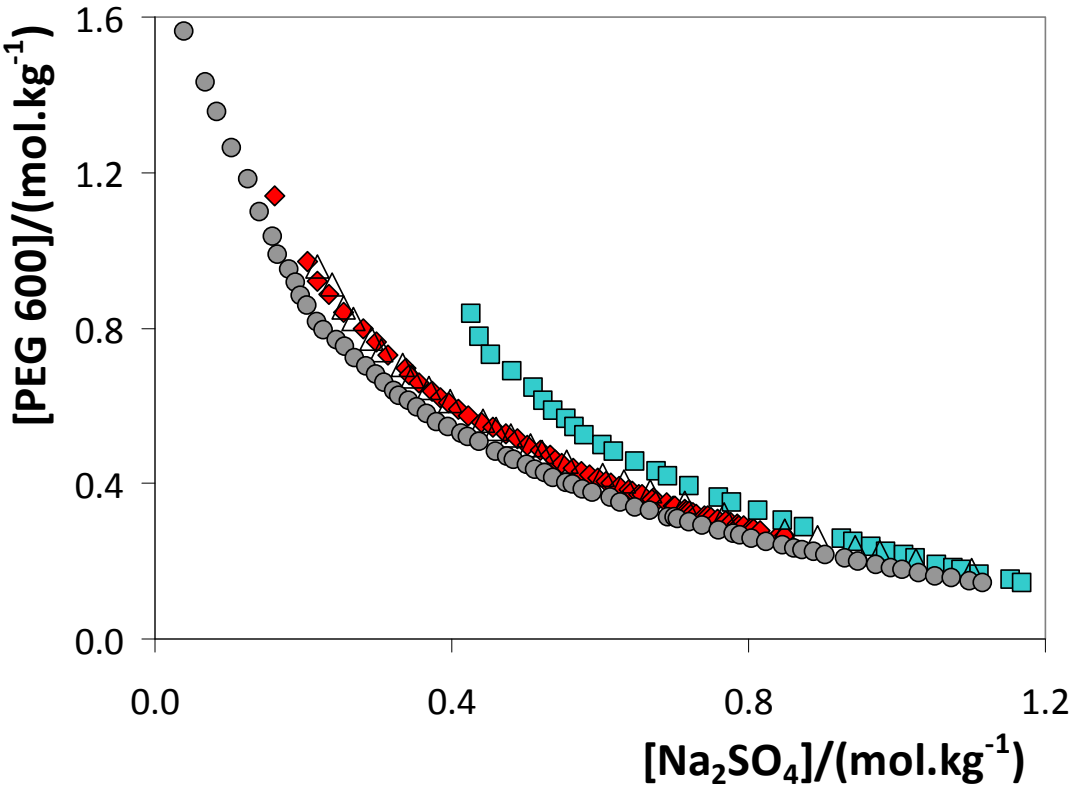

Fig. S21 Phase diagrams for ABS composed of PEG 600 + Na_2SO_4 + 5 wt % ionic liquid at 298 K: ♦, no ionic liquid; ■, [OHC_2C_1im]Cl; Δ, [aC_1im]Cl, ●, [$C_7H_7C_1$im]Cl.[61]

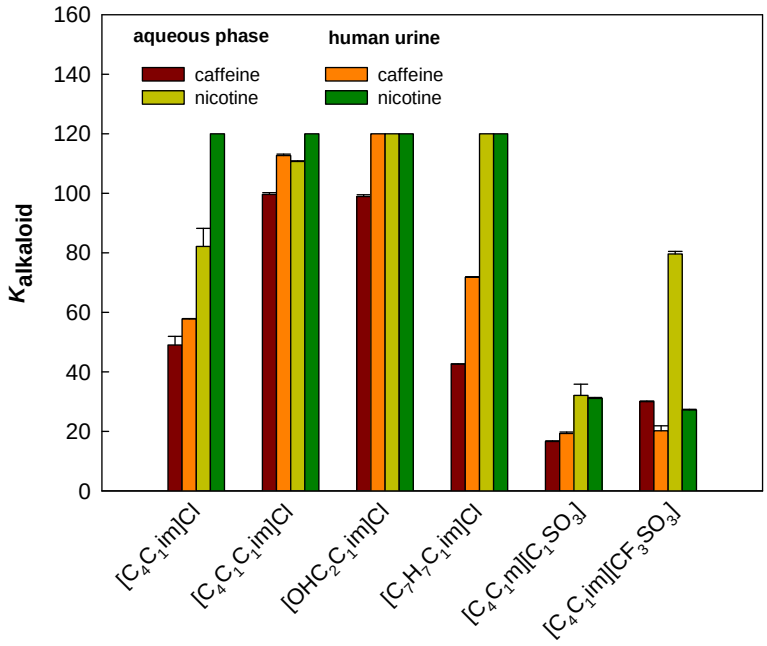

Fig. S22 Partition coefficients of caffeine and nicotine in different ABS at 298 K, obtained from the direct extraction of alkaloids from a synthetic biological sample – artificial human urine – and from simple aqueous phases.[74]

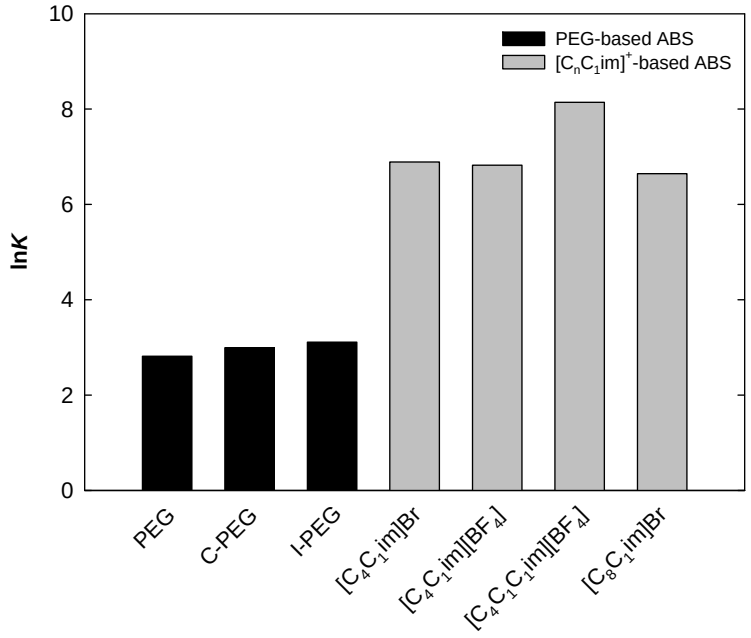

Fig. S23 Comparison of the partition coefficients of penicillin in ABS composed of several imidazolium-based ionic liquids and NaH_2PO_4 or Na_2HPO_4.[26,90]

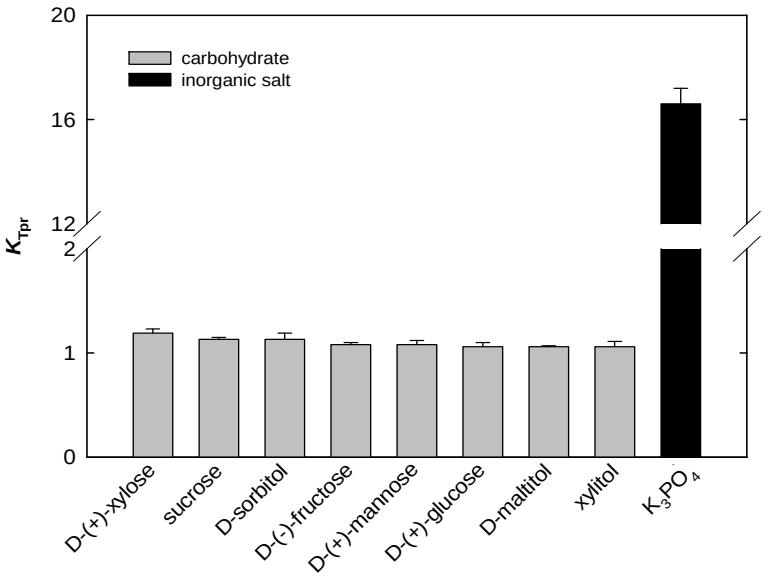

Fig. S24 Partitioning coefficients of L-tryptophan between $[C_4C_1im][CF_3SO_3]$- and carbohydrate-rich aqueous phases at 298 K. The effect of inorganic salt K_3PO_4 on the partition coefficient is also depicted to address the extraction efficiency of carbohydrates.[17,43]

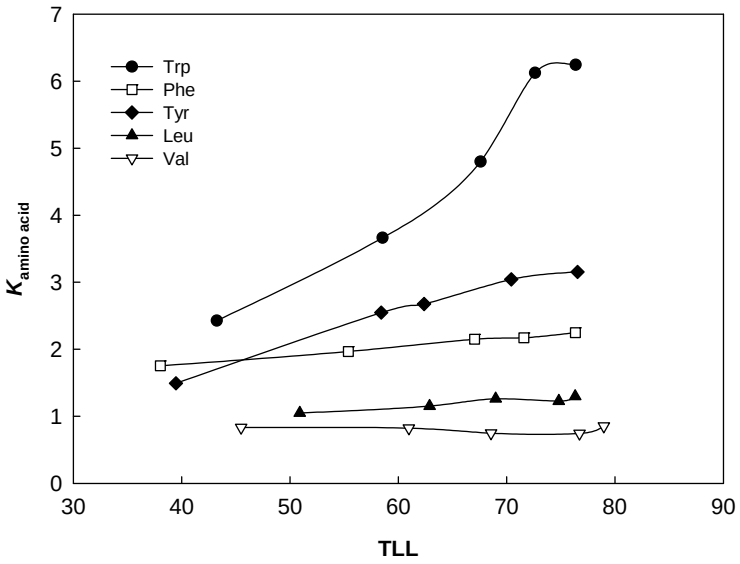

Fig. S25 Effect of the tie-line length (TLL) on the partitioning coefficients of amino acids for the $[C_4C_1im]Br$ + potassium citrate/citric acid + H_2O ABS at pH = 6, a pH close to the isoelectric point, at 298.15 K.[95]

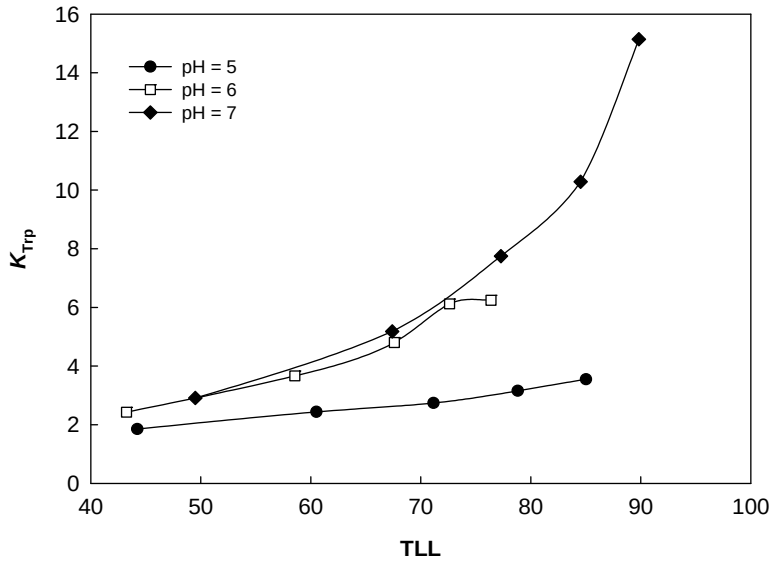

Fig. S26 Effect of the pH on the partitioning coefficients of tryptophan in the $[C_4C_1im]Br$ + potassium citrate/citric acid + H_2O ABS at 298.15 K.[95]