Supporting Information

Soluting-In, Soluting-Out, and Washing-Out Effects of Various Additives on Aqueous 1-Butanol Solutions

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Table S1. The Liquid-liquid demixing data as cloud point temperature (T_{Cp}) against 1-butanol mass fraction (w_b) for ternary systems of 1-butanol in aqueous amino acid solutions at P = 845 hPa.

Amino acid	Glycine	L-Alanine	L-Serine	L-Proline	S-Glutamine
T_{Cp} / K	w_b				
1-Butanol in aqueous 0.2 mol.kg^{-1} of amino acid					
283.1	0.0796	0.0816	0.0784	0.0837	0.0845
293.1	0.0719	0.0723	0.0674	0.0742	0.0753
303.1	0.0646	0.0656	0.0624	0.0680	0.0686
313.1	0.0613	0.0623	0.0605	0.0635	0.0642
323.1	0.0610	0.0619	0.0589	0.0630	0.0636
333.1	0.0619	0.0627	0.0600	0.0634	0.0635
343.1	0.0646	0.0655	0.0630	0.0661	0.0666
353.1	0.0676	0.0685	0.0660	0.0688	0.0694
1-Butanol in aqueous 0.4 mol.kg^{-1} of amino acid					
283.1	0.0709	0.0763	0.0683	0.0768	
293.1	0.0638	0.0662	0.0602	0.0668	
303.1	0.0592	0.0613	0.0567	0.0620	
313.1	0.0579	0.0594	0.0554	0.0599	
323.1	0.0567	0.0579	0.0549	0.0585	
333.1	0.0576	0.0590	0.0563	0.0595	
343.1	0.0614	0.0621	0.0597	0.0625	
353.1	0.0646	0.0653	0.0637	0.0654	
1-Butanol in aqueous 0.6 mol.kg^{-1} of amino acid					
283.1	0.0650	0.0660	0.0610	0.0663	
293.1	0.0578	0.0584	0.0549	0.0590	
303.1	0.0541	0.0548	0.0514	0.0558	
313.1	0.0530	0.0540	0.0510	0.0545	
323.1	0.0524	0.0536	0.0502	0.0544	
333.1	0.0545	0.0553	0.0524	0.0556	
343.1	0.0585	0.0590	0.0565	0.0593	
353.1	0.0621	0.0629	0.0604	0.0633	

The standard uncertainty in w_b, m_s, T_{Cp} and P is $5\cdot10^{-4}$, $1\cdot10^{-1}$mol.kg^{-1}, $4\cdot10^{-1}$ K and 10 hPa, respectively.

m_s : molality of the additive solute (here amino acids)

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Table S2. The Liquid-liquid demixing data as cloud point temperature (T_{Cp}) against 1-butanol mass fraction (w_b) for ternary systems of 1-butanol in aqueous ionic liquid (IL) solutions at P = 845 hPa.

IL	[C_4mim]Br	[C_8mim]Br
T_{Cp} / K	w_b	
1-Butanol in aqueous 0.2 mol.kg^{-1} of IL		
283.1	0.0923	0.2136
293.1	0.0852	0.2065
303.1	0.0789	0.2065
313.1	0.0769	0.2070
323.1	0.0773	0.2134
333.1	0.0780	0.2341
343.1	0.0851	0.2674
353.1	0.1014	0.3226
1-Butanol in aqueous 0.4 mol.kg^{-1} of IL		
283.1	0.0946	0.3618
293.1	0.0882	0.3633
303.1	0.0861	0.3706
313.1	0.0838	0.3813
323.1	0.0842	0.4048
333.1	0.0916	0.4395
343.1	0.1104	0.5044
353.1	0.1421	
1-Butanol in aqueous 0.6 mol.kg^{-1} of IL		
283.1	0.0963	0.4710
293.1	0.0913	0.4797
303.1	0.0904	0.4929
313.1	0.0967	0.5141
323.1	0.1061	
333.1	0.1399	
343.1	0.1917	
353.1	0.3571	

The standard uncertainty in w_b, m_s, T_{Cp} and P is $5\cdot10^{-4}$, $1\cdot10^{-1}$mol.kg^{-1}, $4\cdot10^{-1}$ K and 10 hPa, respectively.

m_s: molality of the additive solute (here IL)

Table S3. The Liquid-liquid demixing data as cloud point temperature (T_{Cp}) against 1-butanol mass fraction (w_b) for ternary systems of 1-butanol in aqueous polymer solutions at P = 845 hPa.

IL	PEG400	PEG10000
T_{Cp} / K	w_b	
1-Butanol in aqueous 0.05 w/w of PEG		
283.1	0.0900	0.0880
293.1	0.0806	0.0814
303.1	0.0785	0.0783
313.1	0.0781	0.0763
323.1	0.0789	0.0758
333.1	0.0799	0.0757
343.1	0.0887	0.0759
353.1	0.0982	0.0730
1-Butanol in aqueous 0.10 w/w of PEG		
283.1	0.0904	0.0892
293.1	0.0817	0.0838
303.1	0.0814	0.0831
313.1	0.0818	0.0827
323.1	0.0874	0.0893
333.1	0.0987	0.0949
343.1	0.1135	0.0947
353.1	0.1415	0.0903
1-Butanol in aqueous 0.15 w/w of PEG		
283.1	0.0908	0.0870
293.1	0.0878	0.0832
303.1	0.0909	0.0895
313.1	0.0958	0.0999
323.1	0.1102	0.1177
333.1	0.1326	0.1206
343.1	0.1634	0.1148
353.1	0.2097	0.0997

The standard uncertainty in w_b, w_s, T_{Cp} and P is $5 \cdot 10^{-3}$, $1 \cdot 10^{-2}$, $4 \cdot 10^{-1}$ K and 10 hPa, respectively.

w_s: mass fraction of the additive solute (here PEG)

Table S4. The Liquid-liquid demixing data as cloud point temperature (T_{Cp}) against 1-butanol mass fraction (w_b) for ternary systems of 1-butanol in aqueous 1-/2-propanol solutions at P = 845 hPa.

IL	1-Propanol	2-Propanol
T_{Cp} / K	w_b	
1-Butanol in aqueous 0.05 w/w of 1-/2-propanol		
283.1	0.0700	0.0812
293.1	0.0668	0.0751
303.1	0.0642	0.0711
313.1	0.0616	0.0699
323.1	0.0636	0.0706
333.1	0.0676	0.0760
343.1	0.0746	0.0815
353.1	0.0877	0.0925
1-Butanol in aqueous 0.10 w/w of 1-/2-propanol		
283.1	0.0758	0.0820
293.1	0.0720	0.0808
303.1	0.0702	0.0834
313.1	0.0728	0.0875
323.1	0.0789	0.0950
333.1	0.0852	0.1073
343.1	0.1013	0.1221
353.1	0.1232	0.1490
1-Butanol in aqueous 0.15 w/w of 1-/2-propanol		
283.1	0.0836	0.1044
293.1	0.0869	0.1180
303.1	0.0920	0.1295
313.1	0.0991	0.1416
323.1	0.1106	0.1567
333.1	0.1280	0.1725
343.1	0.1520	0.1959
353.1	0.1844	0.2265

The standard uncertainty in w_b, w_s, T_{Cp} and P is $5 \cdot 10^{-3}$, $1 \cdot 10^{-2}$, $4 \cdot 10^{-1}$ K and 10 hPa, respectively.

w_s: mass fraction of the additive solute (here 1-/2-propanol)

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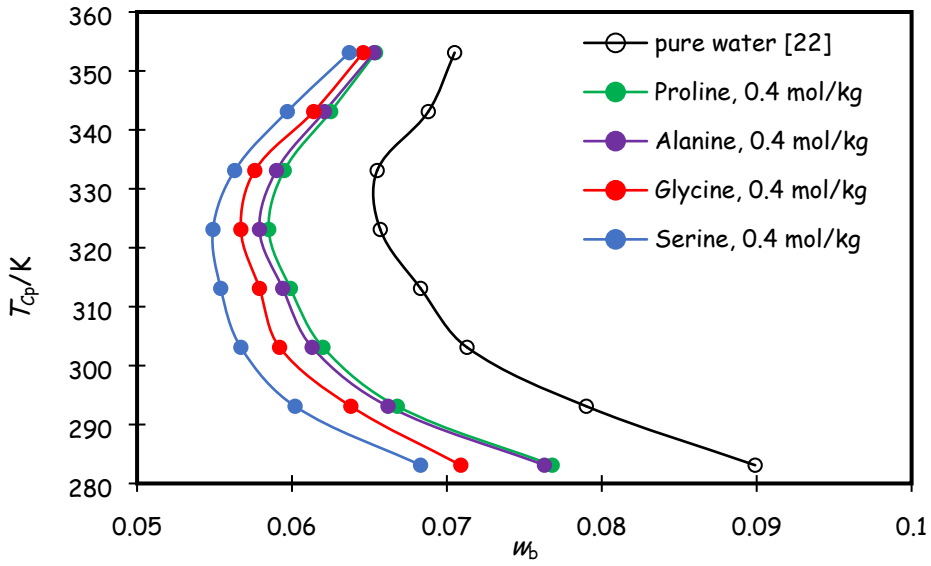


Figure S1. Cloud point temperature, T_{Cp}, against 1-butanol mass fraction, w_b, for the binary system of 1-butanol in water and the ternary systems of 1-butanol in aqueous solutions of 0.4 mol.kg^{-1} of the amino acids investigated.

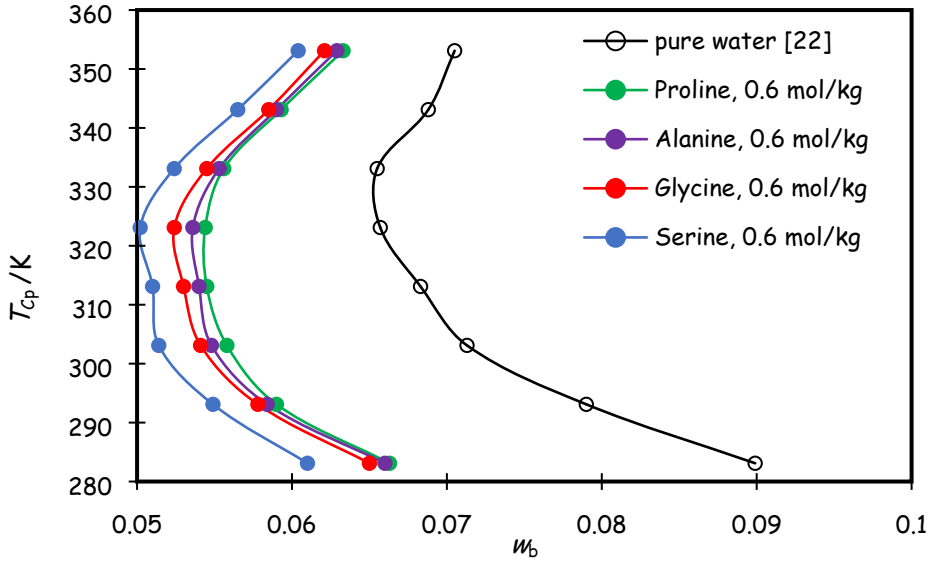


Figure S2. Cloud point temperature, T_{Cp}, against 1-butanol mass fraction, w_b, for the binary system of 1-butanol in water and the ternary systems of 1-butanol in aqueous solutions of 0.6 mol.kg^{-1} of the amino acids investigated.

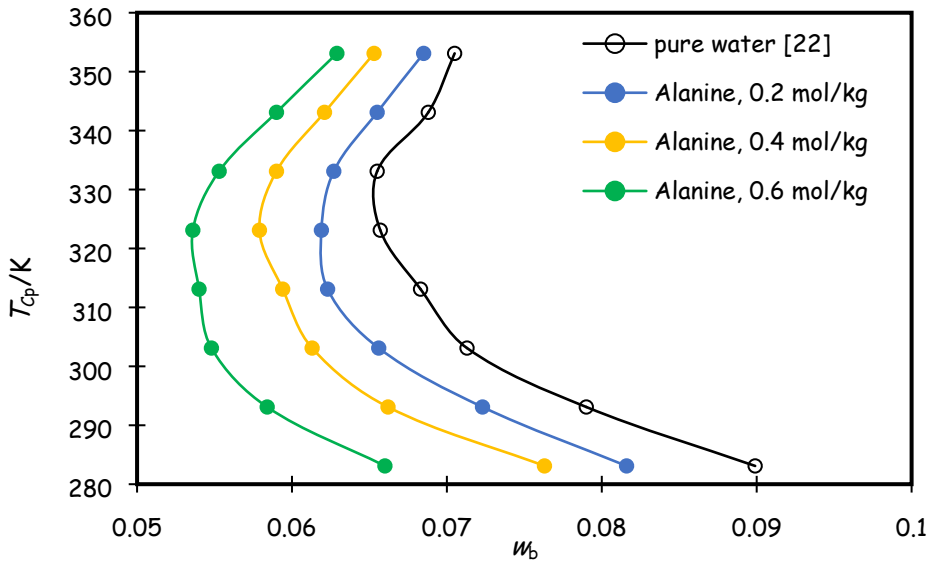


Figure S3. Cloud point temperature, T_{Cp}, against 1-butanol mass fraction, w_b, for the binary system of 1-butanol in water and the ternary systems of 1-butanol in aqueous solutions of 0.2, 0.4, and 0.6 mol.kg^{-1} of the amino acid alanine.

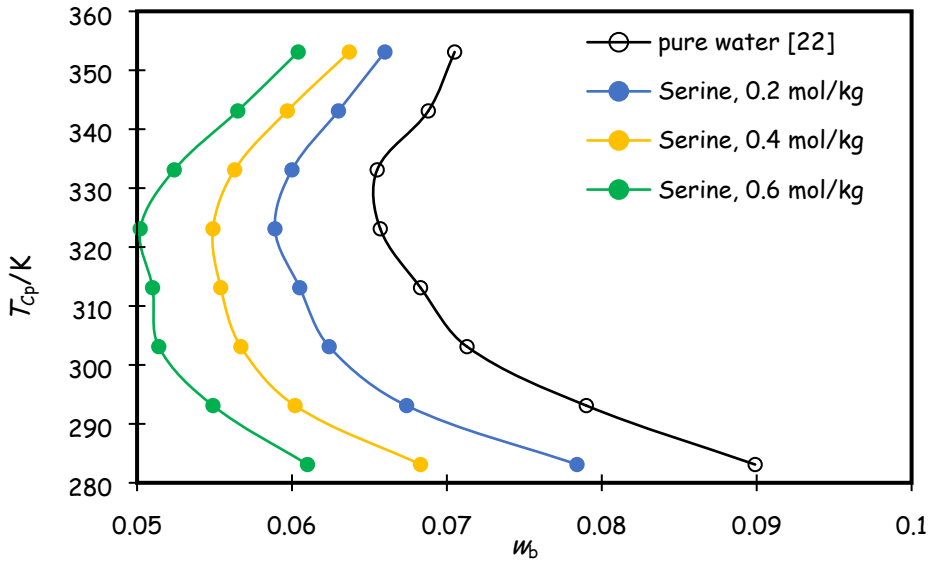


Figure S4. Cloud point temperature, T_{Cp}, against 1-butanol mass fraction, w_b, for the binary system of 1-butanol in water and the ternary systems of 1-butanol in aqueous solutions of 0.2, 0.4, and 0.6 mol.kg^{-1} of the amino acid serine.

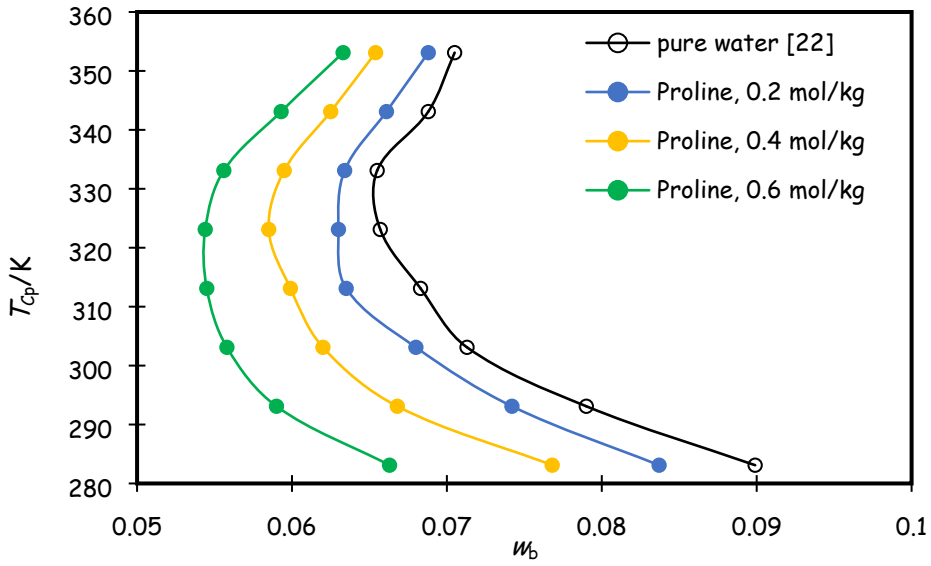
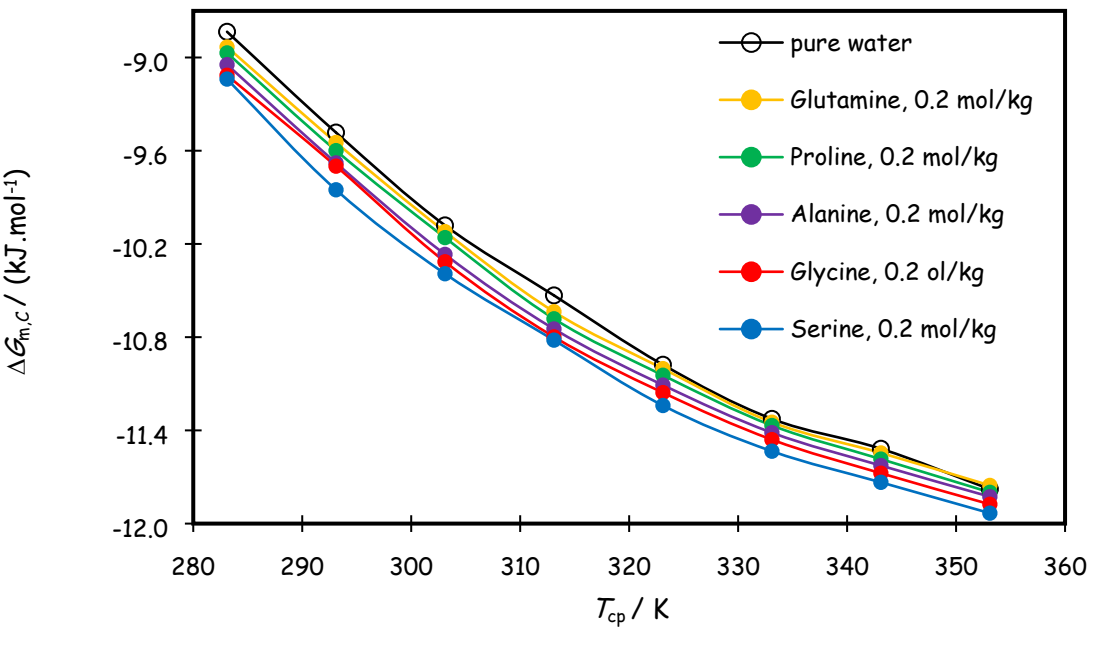
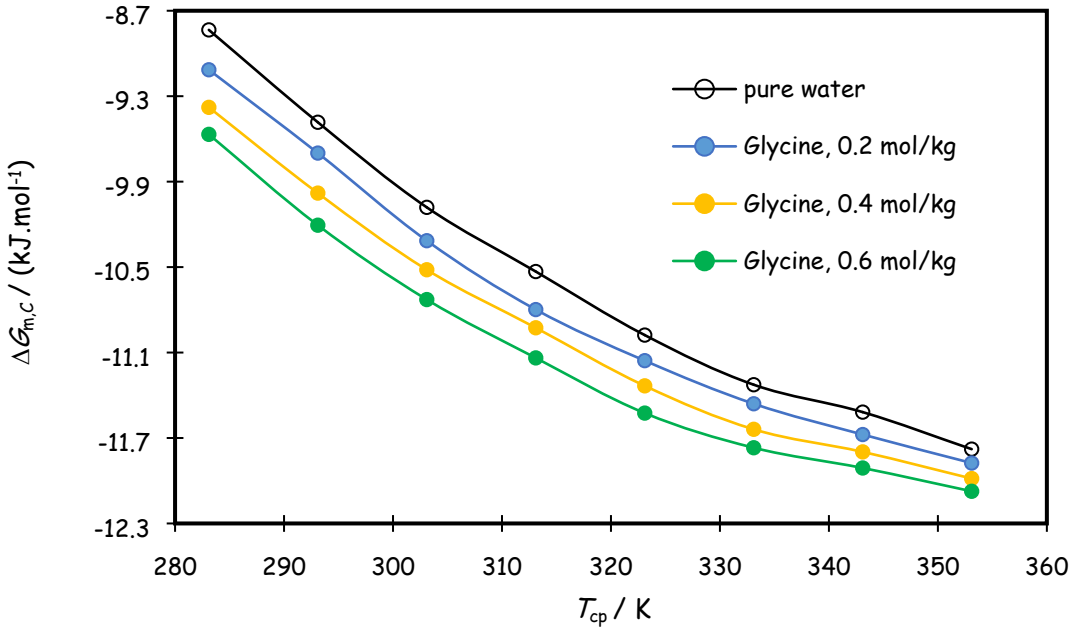


Figure S5. Cloud point temperature, T_{Cp}, against 1-butanol mass fraction, w_b, for the binary system of 1-butanol in water and the ternary systems of 1-butanol in aqueous solutions of 0.2, 0.4, and 0.6 mol.kg^{-1} of the amino acid proline.



(a)



(b)

Figure S6. Gibbs free energy of clouding, $\Delta G_{m,C}$, against cloud point temperature, T_{Cp}, for **(a)** 1-butanol in aqueous solutions of 0.2 mol.kg^{-1} of the amino acids investigated; and **(b)** 1-butanol in aqueous solutions of 0.2, 0.4, and 0.6 mol.kg^{-1} of the amino acid glycine.

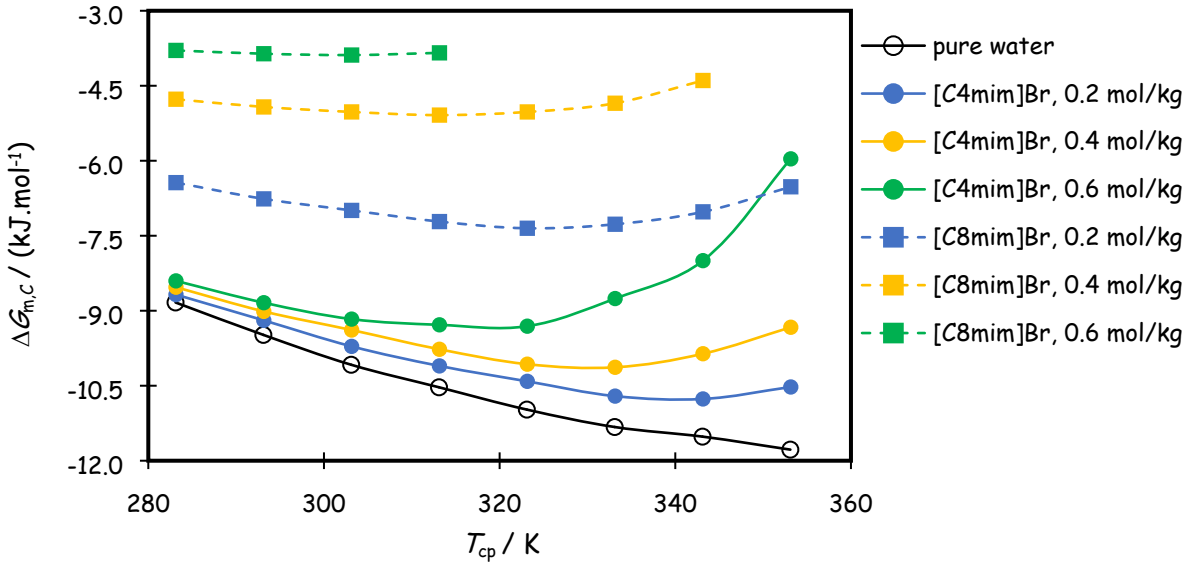


Figure S7. Gibbs free energy of clouding, $\Delta G_{m,C}$, against cloud point temperature, T_{Cp}, for 1-butanol in aqueous solutions of 0.2, 0.4, and 0.6 mol.kg^{-1} of the ILs investigated.

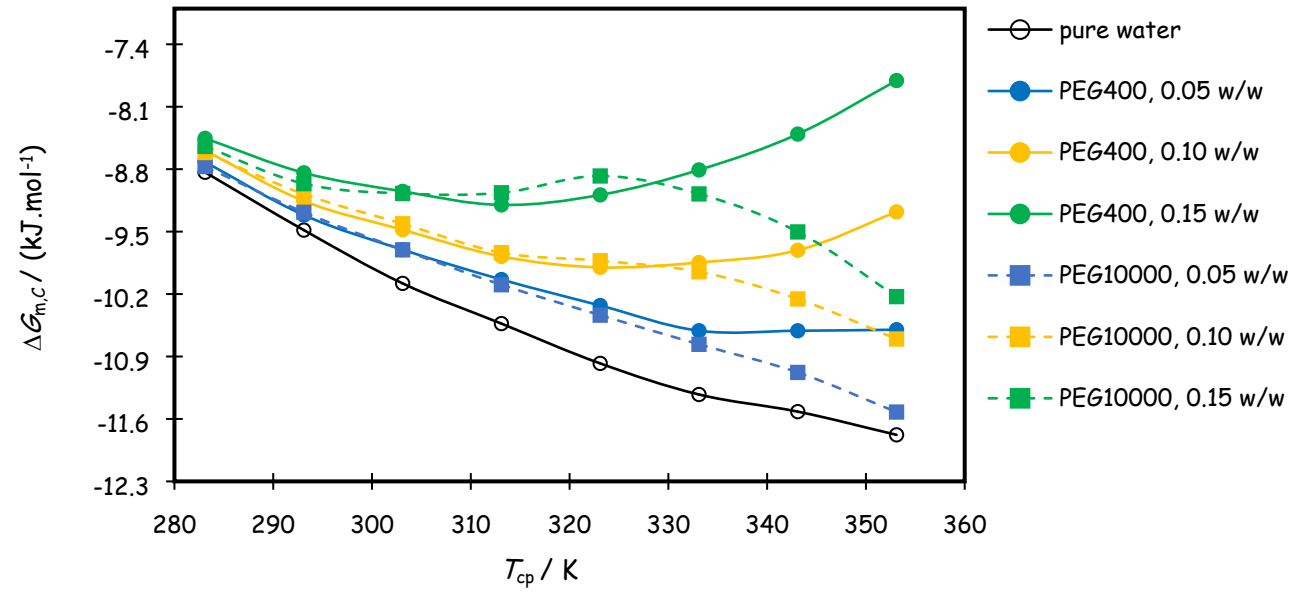


Figure S8. Gibbs free energy of clouding, $\Delta G_{m,C}$, against cloud point temperature, T_{Cp}, for 1-butanol in aqueous solutions of 0.05, 0.10, and 0.15 w/w of the polymers investigated.

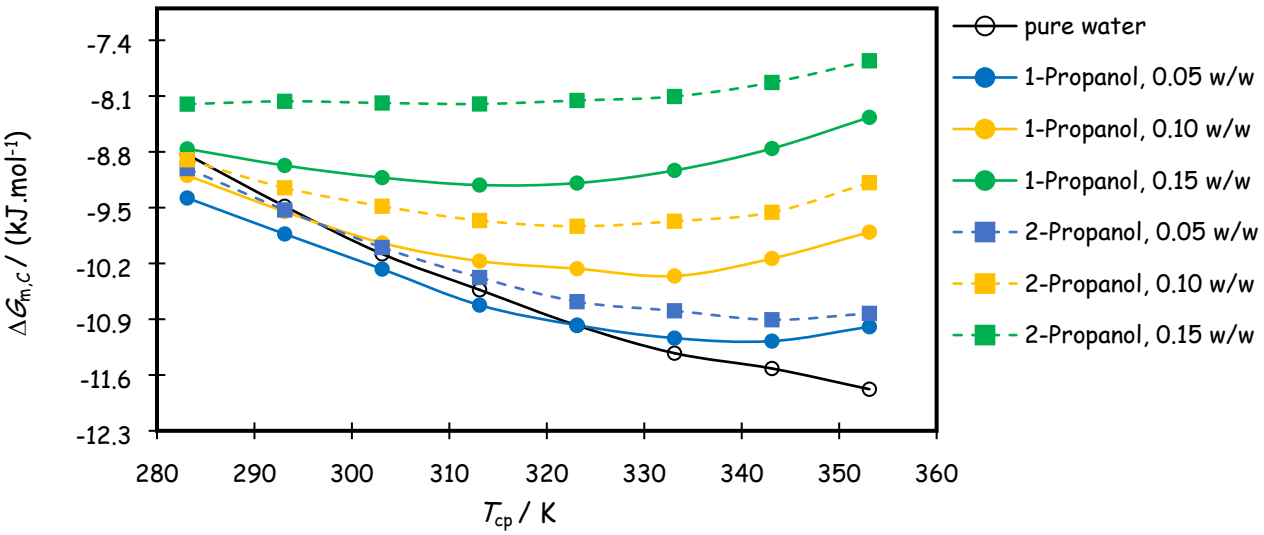


Figure S9. Gibbs free energy of clouding, $\Delta G_{m,C}$, against cloud point temperature, T_{Cp}, for 1-butanol in aqueous solutions of 0.05, 0.10, and 0.15 w/w of 1-/2-propanol.

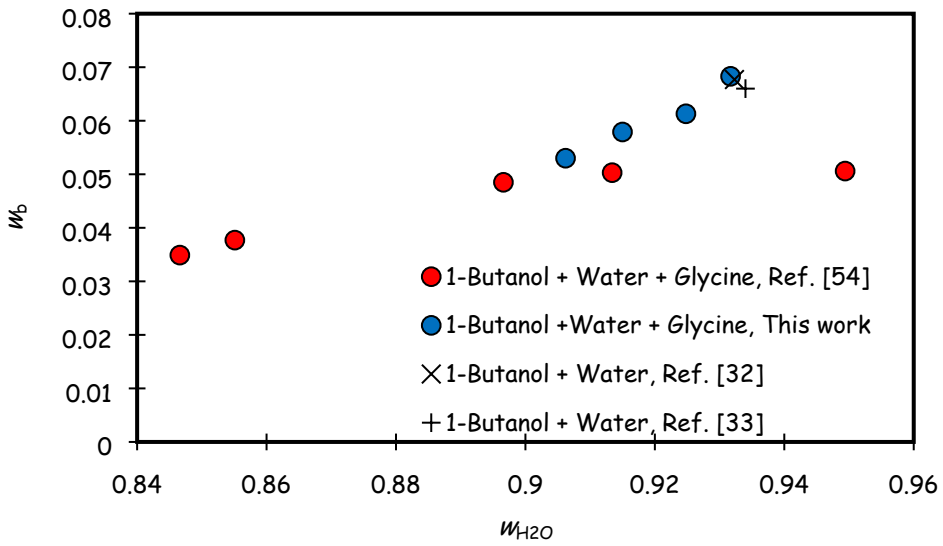


Figure S10. Comparison of liquid-liquid phase diagram data obtained by us and literature,[54] for ternary mixtures of 1-butanol + water + glycine, as 1-butanol mass fraction (w_b) against water mass fraction (w_{H2O}), at 313.1 K.

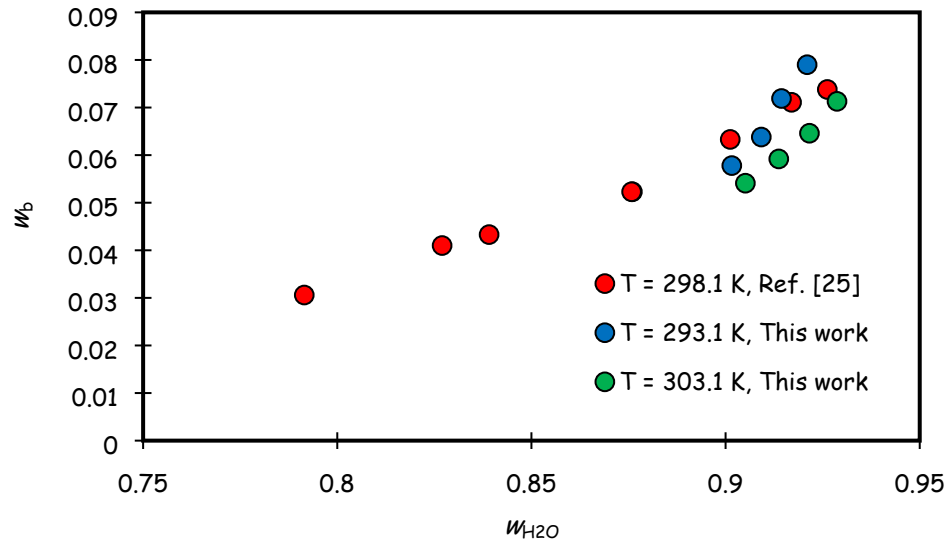


Figure S11. Comparison of liquid-liquid phase diagram data obtained by us at 293.1 and 303.1K, and literature at 298.1 K,[25] for ternary mixtures of 1-butanol + water + glycine, as 1-butanol mass fraction (w_b) against water mass fraction (w_{H2O}).

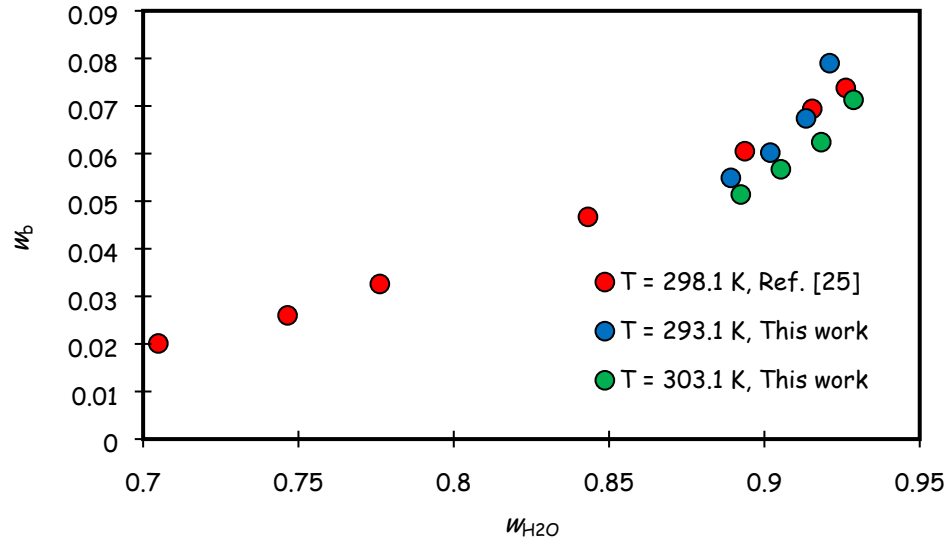


Figure S12. Comparison of liquid-liquid phase diagram data obtained by us at 293.1 and 303.1K, and literature at 298.1 K,[25] for ternary mixtures of 1-butanol + water + L-serine, as 1-butanol mass fraction (w_b) against water mass fraction (w_{H2O}).

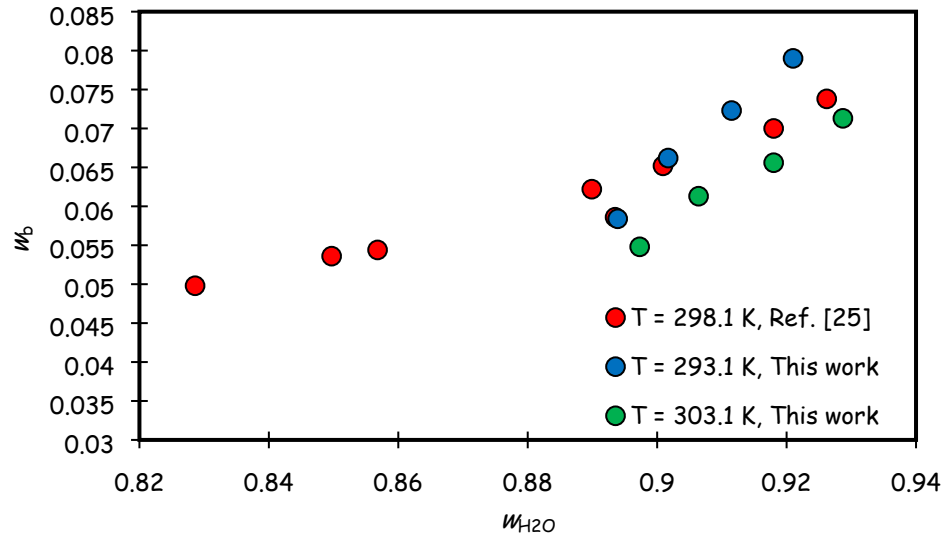


Figure S13. Comparison of liquid-liquid phase diagram data obtained by us at 293.1 and 303.1K, and literature at 298.1 K,[25] for ternary mixtures of 1-butanol + water + L-alanine, as 1-butanol mass fraction (w_b) against water mass fraction (w_{H2O}).

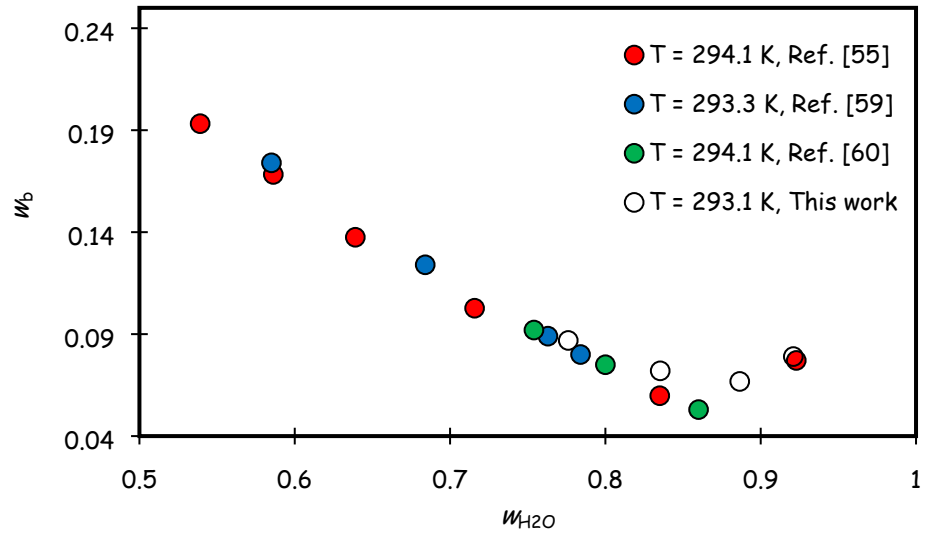


Figure S14. Comparison of liquid-liquid phase diagram data obtained by us at 293.1, and literature at 293.3 and 294.1 K,[55,59,60] for ternary mixtures of 1-butanol + water + 1-propanol, as 1-butanol mass fraction (w_b) against water mass fraction (w_{H2O}).

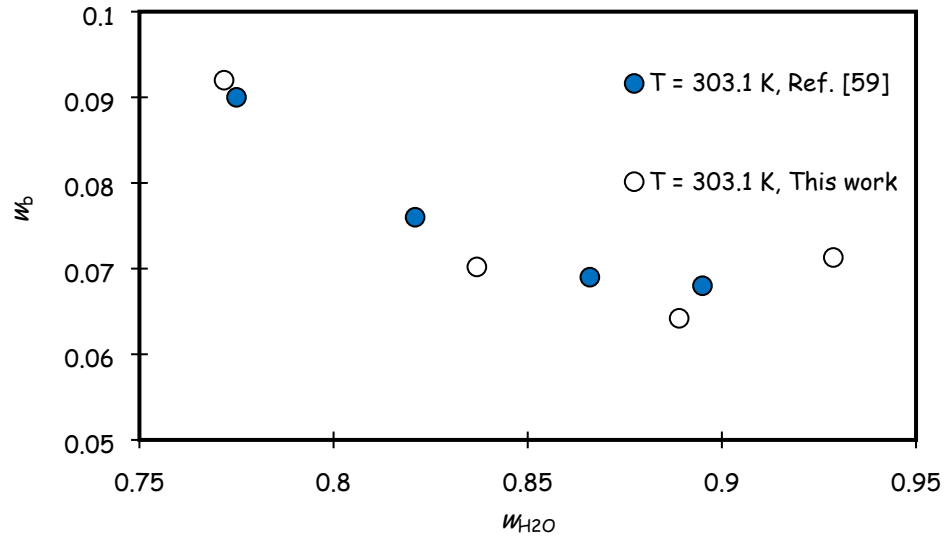


Figure S15. Comparison of liquid-liquid phase diagram data obtained by us and literature,[59] for ternary mixtures of 1-butanol + water + 1-propanol, as 1-butanol mass fraction (w_b) against water mass fraction (w_{H2O}), at 303.1 K.

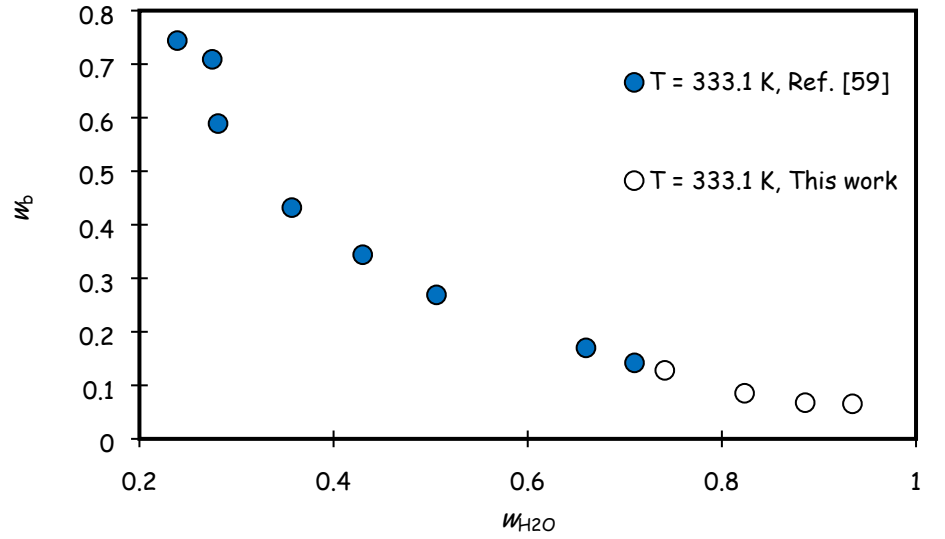


Figure S16. Comparison of liquid-liquid phase diagram data obtained by us and literature,[59] for ternary mixtures of 1-butanol + water + 1-propanol, as 1-butanol mass fraction (w_b) against water mass fraction (w_{H2O}), at 333.1 K.

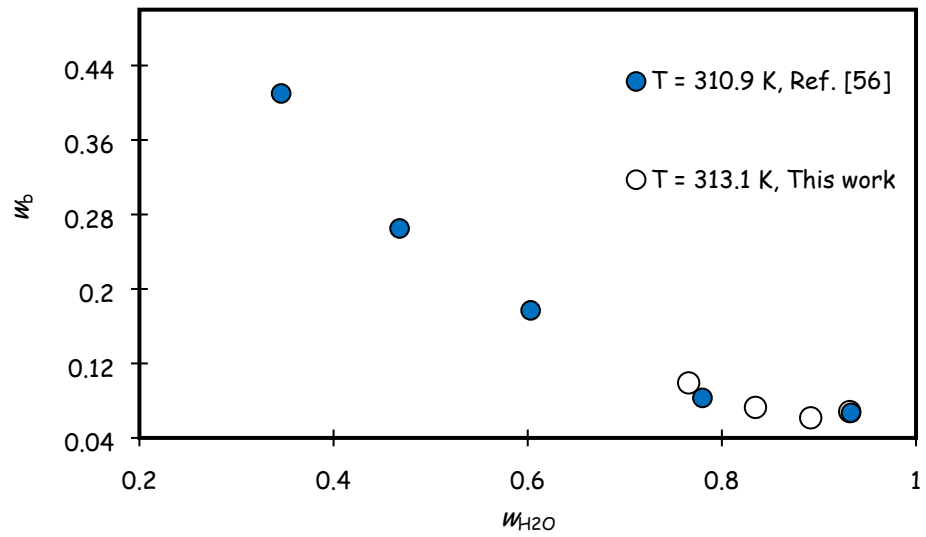


Figure S17. Comparison of liquid-liquid phase diagram data obtained by us at 313.1, and literature at 310.9 K,[56] for ternary mixtures of 1-butanol + water + 1-propanol, as 1-butanol mass fraction (w_b) against water mass fraction (w_{H2O}).

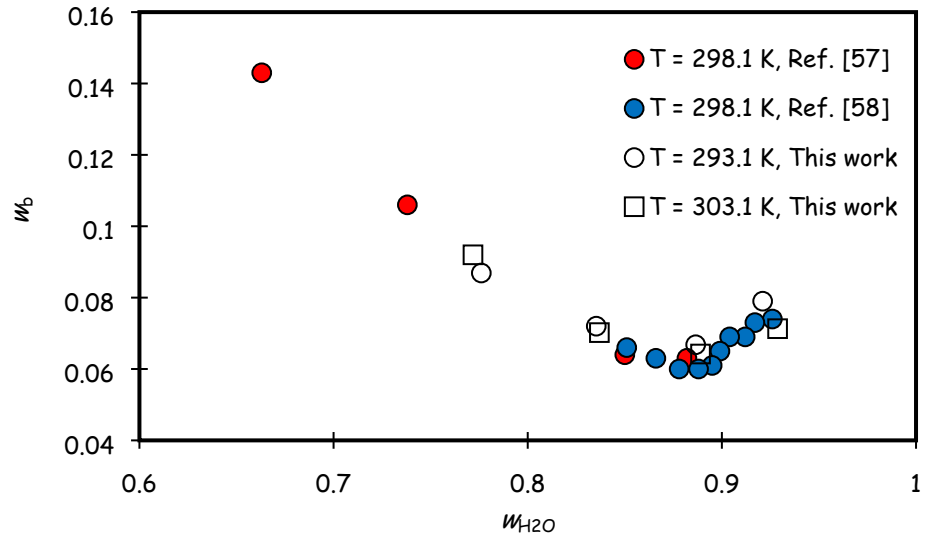


Figure S18. Comparison of liquid-liquid phase diagram data obtained by us at 293.1 and 303.1 K, and literature at 298.1 K,[57,58] for ternary mixtures of 1-butanol + water + 1-propanol, as 1-butanol mass fraction (w_b) against water mass fraction (w_{H2O}).

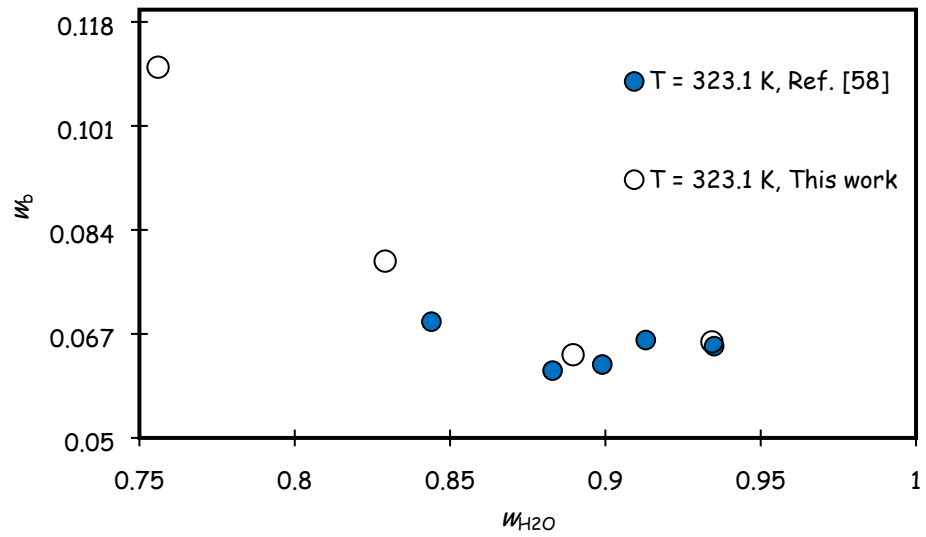


Figure S19. Comparison of liquid-liquid phase diagram data obtained by us and literature,[58] for ternary mixtures of 1-butanol + water + 1-propanol, as 1-butanol mass fraction (w_b) against water mass fraction (w_{H2O}), at 323.1 K.

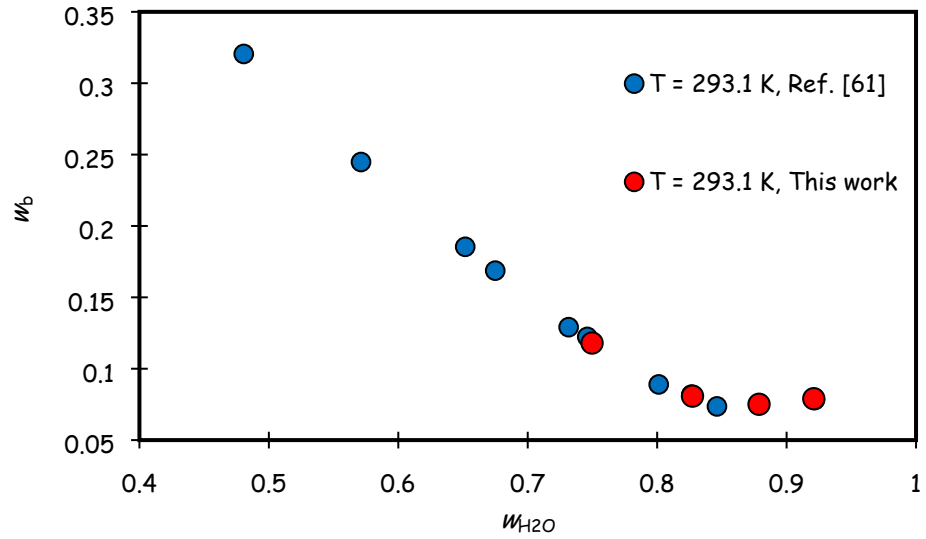


Figure S20. Comparison of liquid-liquid phase diagram data obtained by us and literature,[61] for ternary mixtures of 1-butanol + water + 2-propanol, as 1-butanol mass fraction (w_b) against water mass fraction (w_{H2O}), at 293.1 K.

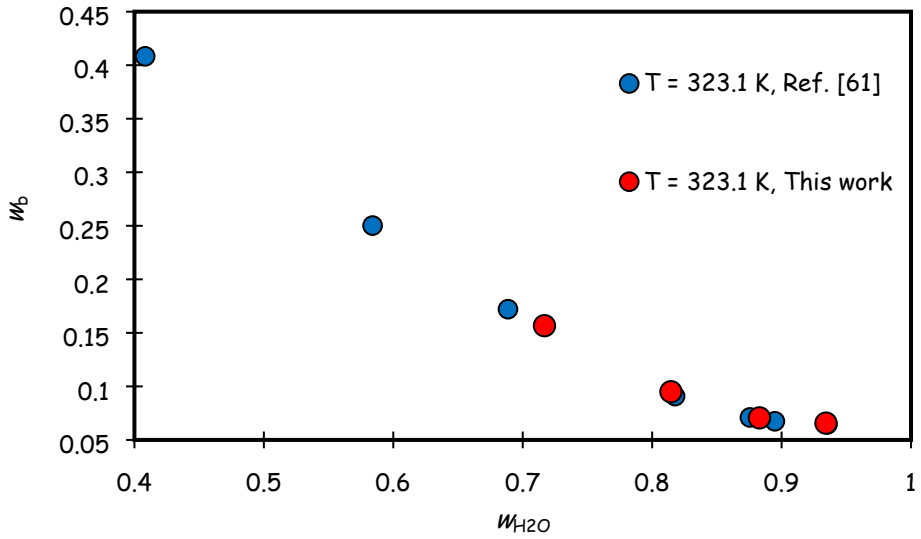


Figure S21. Comparison of liquid-liquid phase diagram data obtained by us and literature,[61] for ternary mixtures of 1-butanol + water + 2-propanol, as 1-butanol mass fraction (w_b) against water mass fraction (w_{H2O}), at 323.1 K.

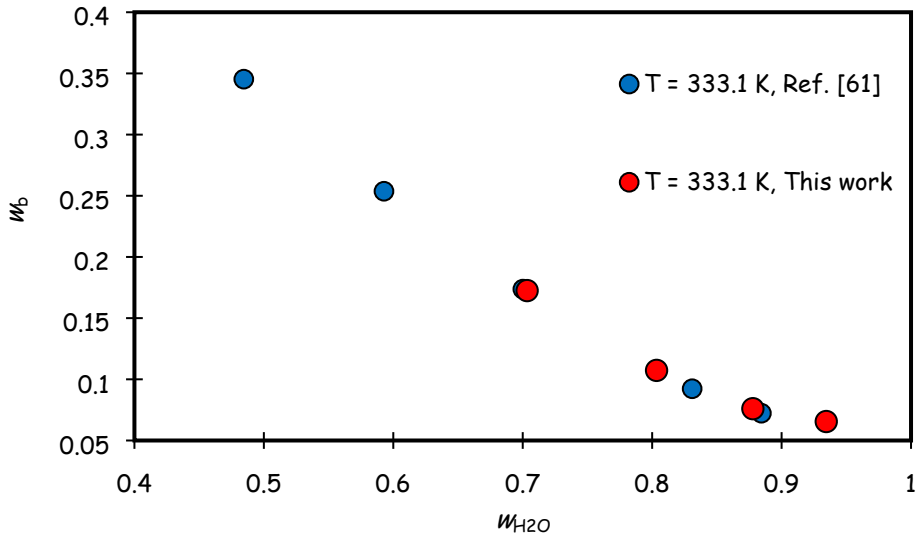


Figure S22. Comparison of liquid-liquid phase diagram data obtained by us and literature,[61] for ternary mixtures of 1-butanol + water + 2-propanol, as 1-butanol mass fraction (w_b) against water mass fraction (w_{H2O}), at 333.1 K.

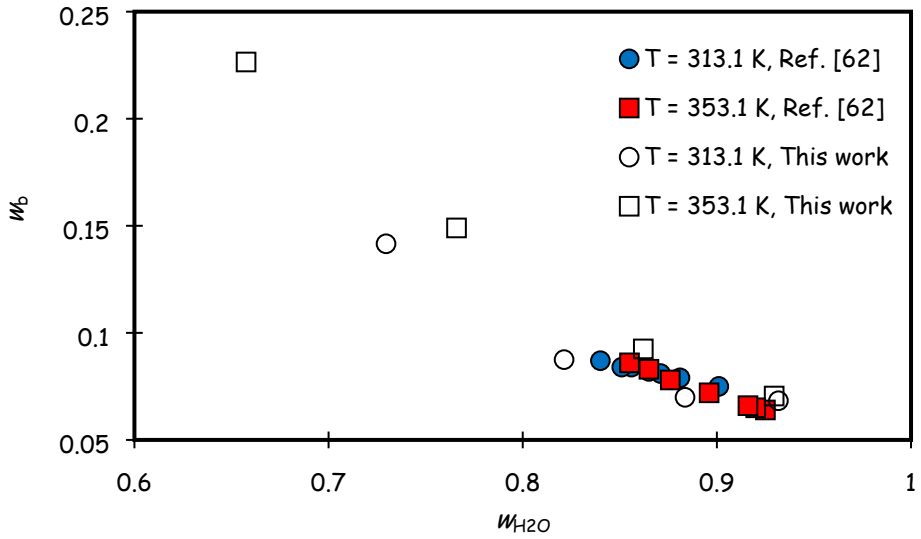


Figure S23. Comparison of liquid-liquid phase diagram data obtained by us and literature,[62] for ternary mixtures of 1-butanol + water + 2-propanol, as 1-butanol mass fraction (w_b) against water mass fraction (w_{H2O}), at 313.1 and 353.1 K.