

† Electronic supplementary information (ESI)

HSPs of the mixtures were calculated by:

$$\delta_x = \sum_{i=1}^n a_i \cdot \delta_{i,x}$$

Where δ_x is a partial solubility parameter component of a mixture, n , number of solutions in the mixture, a_i , volume fraction of a solvent in the mixture and $\delta_{i,x}$ represents a partial solubility parameter component of a solvent in the mixture.

Table 1. Solvent systems compositions

Sample No.	Solvent 1 (Vol. %)	Solvent 2 (Vol. %)	Solvent 3 (Vol. %)	Solvent 4 (Vol. %)	δ_d	δ_p	δ_h	R
1	100% 2-chloroethanol				17.21	11.24	17.49	21.21
2	100% 2-butanol				15.8	5.7	14.5	26.06
3	100% 1,4-dioxane				17.5	1.8	9.0	32.61
4	100% DMSO				18.4	16.4	10.2	27.91
5	100% ethanol				15.8	8.8	19.4	20.35
6	100% 2-propanol				15.8	6.1	16.4	24.18
7	100% n-butanol				16	5.7	15.8	24.85
8	100% formamide				17.2	26.2	19.0	21.21
9	100% n-methylacetamide				16.9	17.0	13.0	24.98
10	100% triethanol amine				17.3	7.6	21.0	19.28
11	100% 2-pyrrolidone				18.2	12.0	9.0	29.45
12	100% propylene carbonate				20.0	18.0	4.1	34.41
13	100% glycerol Carbonate				17.9	25.5	17.4	22.43
14	100% urea				20.9	18.7	26.4	14.05
15	60% water	20% 2-chloroethanol	20% 2-butanol		15.96	12.99	31.78	7.55
16	60% water	20% 2-chloroethanol	20% 1,4-dioxane		16.30	12.21	30.68	8.71
17	60% water	20% 2-chloroethanol	20% DMSO		16.48	15.13	30.92	7.32
18	60% water	20% 2-chloroethanol	20% ethanol		15.96	13.61	32.76	6.45
19	60% water	20% 2-chloroethanol	20% 2-propanol		15.96	13.07	32.16	7.20
20	60% water	20% 2-chloroethanol	20% 2-butanol		16.00	12.99	32.04	7.32
27	40% water	20% 2-chloroethanol	20% 1,4-dioxane	20% 2-butanol	16.34	10.15	25.12	14.51
28	40% water	40% 2-chloroethanol	20% 1,4-dioxane		16.62	11.26	25.72	13.45
29	40% water	40% 2-chloroethanol	20% 2-butanol		16.28	12.04	26.82	12.20
30	40% water	40% 2-chloroethanol	10% 2-butanol	10% 1,4-dioxane	16.45	11.65	26.27	12.82
31	40% water	20% 2-chloroethanol	20% DMSO	20% 1,4-dioxane	16.86	12.29	24.26	14.42
32	40% water	20% 2-chloroethanol	20% ethanol	20% 1,4-dioxane	16.34	10.77	26.10	13.36
33	40% water	20% 2-chloroethanol	20% ethanol	20% 2-butanol	16.00	11.55	27.20	12.14

34	40% water	20% 2-chloroethanol	20% DMSO	20% propanol	16.52	13.15	25.74	12.79
35	40% water	20% 2-chloroethanol	20% ethanol	20% propanol	16.00	11.63	27.58	11.77
36	40% water	20% DMSO	20% 2-butanol	20% 1,4-dioxane	16.58	11.18	23.66	15.38
37	60% water	20% DMSO	20% 2-butanol		16.20	14.02	30.32	8.29
38	60% water	20% DMSO	10% 2-butanol	10% 1,4-dioxane	16.37	13.63	29.77	8.87
39	60% water	20% 2-butanol	10% DMSO	10% 1,4-dioxane	16.11	12.56	30.20	9.02
40	60% water	20% 1,4-dioxane	10% DMSO	10% sec-butanol	16.28	12.17	29.65	9.61
41	60% water	20% DMSO	10% 2-propanol	10% 1,4-dioxane	16.37	13.67	29.96	8.68
42	60% water	20% propanol	10% DMSO	10% 1,4-dioxane	16.11	12.64	30.58	8.65
43	60% water	20% DMSO	10% ethanol	10% 1,4-dioxane	16.37	13.94	30.26	8.31
44	60% water	20% ethanol	10% DMSO	10% 1,4-dioxane	16.11	13.18	31.18	7.89
45	60% water	20% 1,4-dioxane	10% ethanol	10% DMSO	16.28	12.48	30.14	9.04
46	60% water	20% 2-butanol	10% 2-propanol	10% ethanol	15.68	12.23	31.86	8.06
47	40% water	20% DMSO	20% 2-butanol	20% 1,4-dioxane	16.58	11.18	23.66	15.38
48	40% water	40% 2-chloroethanol	20% 1,4-dioxane		16.62	11.26	25.72	13.45
49	40% water	40% 2-chloroethanol	20% 2-butanol		16.28	12.04	26.82	12.20
50	40% water	40% 2-chloroethanol	10% 2-butanol	10% 1,4-dioxane	16.45	11.65	26.27	12.82
51	40% water	20% DMSO	20% 2-butanol	20% 1,4-dioxane	16.62	14.25	26.02	12.24
52	60% water	20% DMSO	20% 2-butanol		16.86	15.28	24.56	13.50
53	60% water	20% DMSO	10% 2-butanol	10% 1,4-dioxane	16.34	13.14	25.42	13.13
54	60% water	20% 1,4-dioxane	10% DMSO	10% sec-butanol	16.80	17.17	26.26	11.73
55	60% water	20% DMSO	10% 2-propanol	10% 1,4-dioxane	16.62	17.24	26.32	11.70
56	60% water	20% 2-propanol	10% DMSO	10% 1,4-dioxane	16.28	18.02	27.42	10.74
57	40% water	40% formamide	20% DMSO		16.80	20.16	26.56	11.93
58	60% water	40% formamide			16.24	19.48	32.98	5.92
59	60% water	20% formamide	20% 2-butanol		15.96	15.98	32.08	6.32
60	60% water	20% formamide	20% 1,4-dioxane		16.60	15.20	30.66	7.52
61	40% water	20% n-methylacetamide	20% 2-chloroethanol	20% 1,4-dioxane	16.56	12.41	24.82	13.88
62	40% water	20% n-methylacetamide	20% DMSO	20% 1,4-dioxane	16.80	13.44	23.36	14.99
63	40% water	20% n-methylacetamide	20% 2-butanol	20% 1,4-dioxane	16.28	11.30	24.22	14.87
64	40% water	20% n-methylacetamide	20% DMSO	20% 2-chloroethanol	16.74	15.33	25.06	13.01
65	40% water	40% n-methylacetamide	20% 1,4-dioxane		16.50	13.56	23.92	14.45
66	40% water	40% n-methylacetamide	20% 2-butanol		16.16	14.34	25.02	13.29
67	40% water	40% n-methylacetamide	20% DMSO		16.68	16.48	24.16	13.84
68	60% water	40% n-methylacetamide			16.12	17.08	30.94	7.28
69	60% water	20% n-methylacetamide	20% 2-butanol		15.90	14.48	31.06	7.62
70	60% water	20% n-methylacetamide	20% 1,4-dioxane		16.54	13.70	29.64	8.92
71	60% water	20% formamide	20% 2-butanol		15.96	15.98	32.08	6.32
72	60% water	20% formamide	20% 1,4-dioxane		16.30	15.20	30.98	7.31
73	40% water	20% formamide	20% 2-chloroethanol	20% 1,4-dioxane	16.62	14.25	26.02	12.24

74	40% water	20% formamide	20% DMSO	20% 1,4-dioxane	16.86	15.28	24.56	13.50
75	40% water	20% formamide	20% 2-butanol	20% 1,4-dioxane	16.86	15.28	24.56	13.50
76	40% water	20% formamide	20% DMSO	20% 2-chloroethanol	18.24	9.54	17.28	22.04
77	40% water	40% formamide	20% 1,4-dioxane		17.50	8.86	15.48	23.85
78	40% water	40% formamide	20% 2-butanol		17.92	7.36	12.82	26.90
79	40% water	40% formamide	20% DMSO		18.10	7.50	17.28	22.76
80	60% water	20% formamide	20% 2-butanol		17.88	8.52	15.22	24.25
81	60% water	20% formamide	20% 1,4-dioxane		17.46	10.02	17.88	21.20
82	40% water	20% n-methylacetamide	20% 2-chloroethanol	20% 1,4-dioxane	16.56	12.41	24.82	13.88
83	40% water	20% n-methylacetamide	20% DMSO	20% 1,4-dioxane	16.80	13.44	23.36	14.99
84	40% water	20% n-methylacetamide	20% 2-butanol	20% 1,4-dioxane	16.28	11.30	24.22	14.87
85	40% water	20% n-methylacetamide	20% DMSO	20% 2-chloroethanol	16.74	15.33	25.06	13.01
86	40% water	40% n-methylacetamide	20% 1,4-dioxane		16.50	13.56	23.92	14.45
87	40% water	40% n-methylacetamide	20% 2-butanol		16.16	14.34	25.02	13.29
88	40% water	40% n-methylacetamide	20% DMSO		16.68	16.48	24.16	13.84
89	60% water	40% n-methylacetamide			16.12	16.40	30.58	7.63
90	60% water	20% n-methylacetamide	20% 2-butanol		15.90	14.14	30.88	7.89
91	60% water	20% n-methylacetamide	20% 1,4-dioxane		16.24	13.36	29.78	9.00
92	60% water	20% n-methylformamide	20% 2-chloroethanol		16.18	15.25	31.48	6.88
93	60% water	20% n-methylformamide	20% DMSO		17.20	13.78	23.62	14.66
94	60% water	20% n-methylformamide	20% 2-butanol		15.90	14.14	30.88	7.89
95	60% water	20% n-methylformamide	20% DMSO		16.42	16.28	30.02	8.06
96	40% water	40% n-methylformamide	20% 1,4-dioxane		16.50	13.56	23.92	14.45
97	40% water	40% n-methylformamide	20% 2-butanol		16.36	15.06	26.18	11.99
98	40% water	40% n-methylformamide	20% DMSO		16.88	17.20	25.32	12.67
99	60% water	40% n-methylformamide			16.32	17.12	31.74	6.41
100	60% water	20% n-methylformamide	20% 2-butanol		15.90	14.14	30.88	7.89
101	60% water	20% n-methylformamide	20% 1,4-dioxane		16.64	13.72	30.04	8.52
102	60% water	25% triethanol amine	15% 2pyrrolidone		16.72	17.81	33.00	5.13
103	60% water	15% triethanolamine	25% 2pyrrolidone		16.90	17.31	31.70	6.31
104	60% water	40% 2pyrrolidone			17.12	16.56	30.00	7.98
105	70% water	30% 2pyrrolidone			16.74	16.42	33.00	5.02
106	60% water	25% triethanol amin	15% propylene carbonate		16.81	17.90	32.00	6.11
107	50% water	25% triethanol amine	25% 2pyrrolidone		17.10	17.95	29.55	8.51
108	70% water	30% triethanol amine			16.26	17.92	36.30	2.58

109	60% water	40% triethanol amine		16.50	18.56	34.70	3.90
110	50% water	50% triethanol amine		16.70	19.20	33.00	5.60
111	70% water	20% triethanol amine	10% 1,4-dioxane	16.40	15.90	35.00	3.34
112	60% water	30% triethanol amine	10% 1,4-dioxane	16.60	16.50	33.20	4.86
113	75% Water	15% Glycerol Carbonate	10% Propylene Carbonate	16.20	17.40	35.60	2.99
114	85% water	15% propylene carbonate		16.00	16.70	37.70	2.10
115	100% water			15.60	16.00	42.30	5.25
116	1 M urea			15.84	16.12	41.58	4.38
117	2 M urea			16.08	16.25	40.85	3.49
118	3 M urea			16.32	16.37	40.14	2.62
119	4 M urea			16.56	16.49	39.41	1.73
120	5 M urea			16.80	16.61	38.69	0.87
121	6 M urea			17.04	16.73	37.98	0.01