Supporting Information

Use of tunable copolymers in aqueous biphasic systems for extractive bioconversion aimed at continuous fructooligosaccharides production

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Experimental details on heterologous expression and purification of levanosucrase (Section 2.3 of the Materials and Methods)

To express the recombinant levansucrase, a single colony was transferred to a 50 mL centrifuge tube containing 10 mL of LB medium with kanamycin and gentamicin (50 µg/mL, each). The inoculum was incubated overnight at 37 °C and 180 rpm and used to inoculate a 2 L Erlenmeyer containing 1 L of LB medium with kanamycin and gentamicin (50 µg/mL, each). After incubation at 37 °C and 180 rpm until reaching the optical density (OD_{600}) of 0.5, the temperature was lowered to 12 °C and the protein expression was induced for 24 h by adding of 0.5 mM IPTG (isopropyl β-D-1-thiogalactopyranoside). Cells were separated by centrifugation at 2264 x *g* at 4 °C for 30 min, the pellet was suspended in lysis buffer (lysozyme, 50 mM Tris-HCl pH 7.0, 10% glycerol, 10 mM imidazole, 2 mM dithiothreitol, 0.2 mM phenylmethylsulfonyl fluoride and 300 mM NaCl) and submitted to disruption by sonication (Q125 Sonicator, Qsonica, Newton, USA) with amplitude of 40% for 10 min (cycles of 30 s sonicating and 30 s resting).

For protein purification, the resulting lysate was centrifuged at 4 °C for 30 min at 9800 x *g*, and the supernatant loaded onto a high-performance immobilized metal affinity chromatography column (IMAC) with 5 mL Ni Sepharose resin (Cytiva Life Science, Marlborough, MA, USA). The bound protein was eluted with 50 mM Tris-HCl and 500 mM imidazole pH 7.0 (gradient from 0 to 500 mM). The TEV protease in a proportion of 1:50 mg was applied to cleave the His_6-thioredoxin tag from *N*-terminus, which was removed by repeating the IMAC purification step. The final solution containing the *B. subtilis* levansucrase was submitted to a last purification step in an ÄKTA Pure M25 system (Cytiva Life Science) with a size exclusion chromatography column HiLoad Superdex 75 pg 26/60 (Cytiva Life Science) using 50 mM Tris-HCl, pH 7.0, as a buffer. The purified enzyme was frozen and used for further applications.

Table S1: Weight fraction data (*w*) for the systems composed of EO/PO polymers (1) + NaPA 8000 (2) + water.

PEG 2000		PEG 8000		PPG 400	
100 w_1	**100 w_2**	**100 w_1**	**100 w_2**	**100 w_1**	**100 w_2**
4.53	12.72	6.14	7.47	7.31	12.14
4.95	11.93	6.47	7.45	8.03	11.41
5.74	11.13	6.90	7.22	8.41	11.06

6.42	10.73	7.25	6.85	8.71	10.83
7.29	10.30	7.57	6.62	9.21	10.57
8.56	9.69	7.95	6.29	9.63	10.31
9.03	8.95	8.34	6.06	9.86	10.04
10.27	8.10	8.72	5.85	10.13	9.82
10.62	7.66	9.36	5.85	10.51	9.56
11.12	7.32	9.80	5.39	11.34	9.34
11.91	6.95	10.41	5.34	12.02	8.75
12.55	6.57	11.32	4.98	12.78	8.24
12.96	6.25	36.23	3.18	13.49	7.84
13.46	5.93			14.07	7.50
13.78	5.72			15.48	6.98
14.64	5.33			25.83	5.00
14.70	5.14			31.98	3.14
15.43	4.93			62.43	2.35
15.80	4.71				
16.74	4.41				
17.74	4.12				
20.98	3.72				
39.13	2.94				

Table S2: Weight fraction data (*w*) for the systems composed of Pluronic PE copolymers (1) + NaPA 8000 (2) + water.

Pluronic PE 6200		**Pluronic PE 6400**		**Pluronic PE 6800**		**Pluronic PE 6800**	
100 w_1	**100 w_2**	**100 w_1**	**100 w_1**	**100 w_1**	**100 w_2**	**100 w_1**	**100 w_2**
10.24	6.80	9.50	7.48	4.67	8.82	7.72	8.34
10.39	6.39	9.83	7.39	4.74	8.81	7.86	8.26
10.79	6.32	10.19	7.18	4.81	8.77	7.95	8.19
11.22	6.10	10.58	7.06	4.89	8.78	8.11	8.25

11.55	5.83	10.93	6.86	4.96	8.72	8.29	8.20
11.88	5.69	11.17	6.75	5.01	8.68	8.44	8.10
12.56	5.63	11.64	6.39	5.07	8.68	8.64	8.12
13.12	5.46	12.14	6.22	5.14	8.68	8.97	8.16
13.62	5.24	12.60	6.12	5.20	8.64	9.23	8.00
14.02	4.97	12.91	5.82	5.29	8.68	9.46	7.81
14.43	4.92	13.35	5.74	5.38	8.65	9.79	7.83
14.99	4.74	13.83	5.63	5.48	8.70	10.02	7.68
15.50	4.56	14.29	5.53	5.58	8.69	10.11	7.51
16.11	4.34	14.88	5.50	5.65	8.67	10.29	7.59
16.70	4.06	15.23	5.24	5.74	8.66	10.55	7.50
17.04	3.85	15.57	5.24	5.84	8.69	10.86	7.49
17.37	3.71	15.94	5.06	5.93	8.61	11.06	7.29
17.85	3.59	16.28	4.93	6.04	8.64	11.16	7.22
18.24	3.41	16.76	4.93	6.12	8.56	11.34	7.22
18.78	3.25	17.48	4.88	6.22	8.58	11.65	7.25
19.99	3.19	18.43	4.61	6.34	8.58	11.90	7.11
21.76	3.10	19.72	4.27	6.47	8.52	12.44	7.07
24.49	2.72	21.59	4.06	6.60	8.51	12.86	6.91
27.51	2.12	23.69	3.69	6.71	8.45	13.31	6.68
48.04	1.72	47.73	2.09	6.79	8.38	14.16	6.77
				6.91	8.48	14.95	6.86
				7.00	8.45	16.15	6.76
				7.15	8.48	17.75	6.60
				7.25	8.37	19.54	6.57
				7.35	8.37	21.73	6.42
				7.47	8.37	23.73	6.09
				7.57	8.32		

Table S3: Correlation Merchuk parameters used to describe the experimental phase diagrams data by Eq. (1) and respective standard deviation (σ).

NaPA 800-based ABS system	*A* ± σ	*B* ± σ	$10^{-12}\cdot(C)$ $10^{-13} < \sigma < 10^{-11}$	R^2
PEG 2000	220.2 ± 86.16	-1.14 ± 0.198	7.18	0.875
PEG 8000	1521 ± 972.1	-2.11± 0.371	0.138	0.973
PPG 400	302.2 ± 87.37	-1.11 ± 0.169	4.51	0.944
Pluronic PE 6200	190.7 ± 55.14	-1.20 ± 0.189	31.3	0.889

Pluronic PE 6400	305.0 ± 22.97	-1.30 ± 0.0461	0.0334	0.992
Pluronic PE 6800	29024 ± 4325	-2.89 ± 0.659	2.20	0.954

Table S4. Partition coefficient (*K*), recovery yield (*Y*) and partitioning behavior in the NaPA 8000-based ABS of the selected carbohydrates: FOS, D-fructose, D-glucose, and sucrose.

	K	log (*K*)	*Y* (%)	Partitioning phase
Fructooligosaccharides				
PEG 8000	0.01 ± 0.00	-1.95	98.89 ± 0.12	bottom
PEG 2000	0.01 ± 0.00	-2.00	100 ± 0	bottom
Pluronic PE 6800	38.12 ± 8.28	1.57	97.32 ± 0.57	top
Pluronic PE 6400	19.83 ± 1.04	1.30	95.19 ± 0.24	top
Pluronic PE 6200	2.77 ± 0.55	0.43	72.94 ± 3.91	top
PPG 400	100 ± 0	2.00	94.02 ± 2.70	interphase
D-Fructose				
PEG 8000	0.01 ± 0.00	-2.00	100 ± 0	bottom
PEG 2000	0.51 ± 0.12	-0.31	62.3 ± 5.49	bottom
Pluronic PE 6800	0.01 ± 0.00	-2.00	100 ± 0	bottom
Pluronic PE 6400	0.01 ± 0.00	-2.00	100 ± 0	bottom
Pluronic PE 6200	0.01 ± 0.00	-2.00	100 ± 0	bottom
PPG 400	0.01 ± 0.00	-2.00	100 ± 0	bottom
D-Glucose				
PEG 8000	0.93 ± 0.09	-0.03	52.00 ± 2.54	bottom
PEG 2000	1.31 ± 0.42	0.09	60.03 ± 7.95	top
Pluronic PE 6800	1.45 ± 0.01	0.16	59.20 ± 0.16	top
Pluronic PE 6400	1.95 ± 0.78	0.25	63.56 ± 9.62	top
Pluronic PE 6200	0.67 ± 0.09	-0.18	60.23 ± 3.38	bottom
PPG 400	0.01 ± 0.00	-2.00	100 ± 0	bottom
Sucrose				
PEG 8000	0.01 ± 0.00	-2.00	100 ± 0	bottom
PEG 2000	0.51 ± 0.04	-0.29	61.81 ± 1.88	bottom
Pluronic PE 6800	0.27 ± 0.00	-0.58	79.00 ± 0.17	bottom
Pluronic PE 6400	0.28 ± 0.01	-0.55	78.07 ± 0.47	bottom
Pluronic PE 6200	0.01 ± 0.00	-2.00	100 ± 0	bottom
PPG 400	0.01 ± 0.00	-2.00	100 ± 0	bottom

Table S5: Weight percentage compositions and physicochemical characteristics of each ABS.

ABS blanks	**Mass percent composition (wt %)**				**pH**		**Conductivity ($mS.cm^{-1}$ at 25° C)**	
	EO/PO*	**NaPA-8000**	**water**	**V_{Top}/V_{Bottom}**	**Top**	**Bottom**	**Top**	**Bottom**
PEG-2000/NaPA-8000	10.06	10.12	79.82	1.06	7.50	7.78	0.83	19.20
PEG-8000/NaPA-8000	10.02	10.11	79.87	0.80	7.76	7.65	0.01	25.42
PEG-6800/NaPA-8000	10.06	10.13	79.81	0.80	7.77	7.76	0.33	25.15

PE-6400/NaPA-8000	10.04	10.09	79.87	0.45	7.79	7.74	0.83	28.73
PE-6200/NaPA-8000	9.95	10.15	79.89	0.34	7.20	7.48	0.01	21.32
PPG-400/NaPA-8000	9.95	10.18	79.86	1.00	7.64	7.63	0.01	13.39

*EO/PO corresponds to polymer (PEG or PPG) or triblock Pluronic PE copolymers.

Table S6: Weight percentage compositions, partition coefficient (*K*), log (*K*), Yield (Y_{Lev}) and Mass Balance (MB_v) (with respective standard deviations) of each ABS.

ABS	Weight fraction (wt %)			Enzyme**	*K*	Log (*K*)	Y_{Lev} (%)	MB_V (%)
	EO/PO*	NaPA-8000	Water					
PEG-2000/NaPA-8000	10.05 ± 0.02	10.32 ± 0.55	68.44 ± 0.32	10.62 ± 1.00	16.55 ± 7.23	1.20 ± 0.20	94.42 ± 2.31	91.28 ± 16.86
PEG-8000/NaPA-8000	10.04 ± 0.19	10.14 ± 0.05	68.37 ± 0.13	11.38 ± 0.57	0.07 ± 0.04	-1.20 ± 0.25	94.41 ± 3.88	89.60 ± 10.53
PEG-6800/NaPA-8000	10.26 ± 0.14	10.17 ± 0.03	69.07 ± 0.06	10.50 ± 0.17	0.04 ± 0.01	-1.37 ± 0.14	97.18 ± 0.14	96.42 ± 0.21 ***
PE-6400/NaPA-8000	10.14 ± 0.04	10.16 ± 0.01	69.41 ± 0.09	10.50 ± 0.17	0.25 ± 0.06	-0.60 ± 0.10	91.55 ± 0.12	98.37 ± 6.65 ***
PE-6200/NaPA-8000	10.20 ± 0.12	10.27 ± 0.13	69.22 ± 0.09	10.31 ± 0.08	0.22 ± 0.03	-0.65 ± 0.05	93.90 ± 0.32	99.53 ± 1.44
PPG-400/NaPA-8000	9.85 ± 0.02	10.05 ± 0.15	69.78 ± 0.37	11.32 ± 0.24	0.49 ± 0.07	-0.31 ± 0.06	78.25 ± 6.87	85.37 ± 0.06

*EO/PO corresponds to polymer (PEG or PPG) or triblock Pluronic PE copolymers.**Levansucrase initial concentration was 0.1 mg/mL.***Precipitate formation in the interface.

Table S7: Excess enthalpies of H_2O + NaPA 8000/polymer/co-polymer predicted by COSMO-RS at 298.15 K as the contribution of electrostatic misfit ($H_{E,MF}$), hydrogen bond ($H_{E,HB}$), and Van der Walls forces ($H_{E,VdW}$) of each component.

H_2O + NaPA8000										
No	x_{H2O}	$H_{E,H2O}$/kJ·mol^{-1}			$H_{E,Na+}$/kJ·mol^{-1}			$H_{E,PA8000-}$/kJ·mol^{-1}		
		$H_{E,MF}$	$H_{E,HB}$	$H_{E,VdW}$	$H_{E,MF}$	$H_{E,HB}$	$H_{E,VdW}$	$H_{E,MF}$	$H_{E,HB}$	$H_{E,VdW}$
1	1.0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
2	0.9	0.1528	0.1158	-0.0312	0.1232	0.0000	-0.0006	-0.1042	-1.1697	0.0294
3	0.8	0.2496	0.1565	-0.0525	0.1889	0.0000	-0.0031	-0.1694	-1.8521	0.0455
4	0.7	0.3060	0.1637	-0.0638	0.2158	0.0000	-0.0052	-0.2146	-2.1961	0.0526
5	0.6	0.3303	0.1530	-0.0670	0.2158	0.0000	-0.0065	-0.2457	-2.2932	0.0534
6	0.5	0.3281	0.1329	-0.0641	0.1971	0.0000	-0.0069	-0.2631	-2.2024	0.0499
7	0.4	0.3030	0.1085	-0.0567	0.1660	0.0000	-0.0064	-0.2634	-1.9626	0.0434
8	0.3	0.2569	0.0823	-0.0459	0.1275	0.0000	-0.0052	-0.2414	-1.6015	0.0348
9	0.2	0.1907	0.0552	-0.0325	0.0855	0.0000	-0.0037	-0.1916	-1.1410	0.0245
10	0.1	0.1048	0.0274	-0.0171	0.0425	0.0000	-0.0019	-0.1112	-0.6012	0.0128
11	0.0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
H_2O + PEG8000										
No	x_{H2O}	$H_{E,H2O}$/kJ·mol^{-1}			$H_{E,PEG8000}$/kJ·mol^{-1}					
		$H_{E,MF}$	$H_{E,HB}$	$H_{E,VdW}$	$H_{E,MF}$	$H_{E,HB}$	$H_{E,VdW}$			
1	1.0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000			
2	0.9	0.0289	0.1593	-0.0320	-0.0942	-0.4094	0.0139			
3	0.8	0.0414	0.2367	-0.0303	-0.1061	-0.4810	0.0135			
4	0.7	0.0441	0.2590	-0.0272	-0.1018	-0.4750	0.0123			
5	0.6	0.0423	0.2529	-0.0236	-0.0919	-0.4370	0.0107			
6	0.5	0.0379	0.2299	-0.0199	-0.0791	-0.3819	0.0091			
7	0.4	0.0320	0.1958	-0.0160	-0.0648	-0.3162	0.0073			

8	0.3	0.0250	0.1540	-0.0120	-0.0494	-0.2435	0.0055			
9	0.2	0.0172	0.1066	-0.0081	-0.0334	-0.1658	0.0037			
10	0.1	0.0088	0.0550	-0.0040	-0.0169	-0.0843	0.0019			
11	0.0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000			
H_2O + PEG2000										
No	x_{H2O}	$H_{E,H2O}$/kJ·mol^{-1}			$H_{E,PEG2000}$/kJ·mol^{-1}					
		$H_{E,MF}$	$H_{E,HB}$	$H_{E,VdW}$	$H_{E,MF}$	$H_{E,HB}$	$H_{E,VdW}$			
1	1.0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000			
2	0.9	0.0357	0.1939	-0.0607	-0.1448	-0.6227	0.0263			
3	0.8	0.0579	0.3196	-0.0590	-0.1767	-0.7816	0.0262			
4	0.7	0.0649	0.3662	-0.0534	-0.1755	-0.7940	0.0240			
5	0.6	0.0639	0.3667	-0.0467	-0.1612	-0.7418	0.0212			
6	0.5	0.0583	0.3386	-0.0393	-0.1404	-0.6545	0.0180			
7	0.4	0.0497	0.2916	-0.0317	-0.1158	-0.5455	0.0146			
8	0.3	0.0391	0.2312	-0.0239	-0.0889	-0.4220	0.0110			
9	0.2	0.0270	0.1610	-0.0160	-0.0603	-0.2883	0.0074			
10	0.1	0.0139	0.0834	-0.0081	-0.0306	-0.1470	0.0037			
11	0.0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000			
H_2O + Pluronic6800										
No	x_{H2O}	$H_{E,H2O}$/kJ·mol^{-1}			$H_{E,Pluronic6800}$/kJ·mol^{-1}					
		$H_{E,MF}$	$H_{E,HB}$	$H_{E,VdW}$	$H_{E,MF}$	$H_{E,HB}$	$H_{E,VdW}$			
1	1.0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000			
2	0.9	0.0389	0.0735	-0.0349	-0.1236	-0.5114	0.0143			
3	0.8	0.0600	0.1256	-0.0326	-0.1592	-0.6610	0.0136			
4	0.7	0.0655	0.1355	-0.0291	-0.1624	-0.6820	0.0122			
5	0.6	0.0630	0.1250	-0.0252	-0.1514	-0.6422	0.0107			

6	0.5	0.0563	0.1059	-0.0212	-0.1330	-0.5687	0.0090			
7	0.4	0.0471	0.0837	-0.0170	-0.1103	-0.4747	0.0072			
8	0.3	0.0364	0.0611	-0.0128	-0.0849	-0.3674	0.0055			
9	0.2	0.0248	0.0393	-0.0085	-0.0577	-0.2509	0.0037			
10	0.1	0.0126	0.0188	-0.0043	-0.0293	-0.1278	0.0018			
11	0.0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000			
H_2O + Pluronic6400										
No	x_{H2O}	$H_{E,H2O}$/kJ·mol^{-1}			$H_{E,Pluronic6400}$/kJ·mol^{-1}					
		$H_{E,MF}$	$H_{E,HB}$	$H_{E,VdW}$	$H_{E,MF}$	$H_{E,HB}$	$H_{E,VdW}$			
1	1.0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000			
2	0.9	0.0317	0.0470	-0.0474	-0.1124	-0.4392	0.0196			
3	0.8	0.0544	0.1063	-0.0455	-0.1567	-0.5927	0.0190			
4	0.7	0.0632	0.1338	-0.0409	-0.1658	-0.6232	0.0173			
5	0.6	0.0635	0.1390	-0.0356	-0.1582	-0.5931	0.0151			
6	0.5	0.0586	0.1301	-0.0300	-0.1412	-0.5289	0.0128			
7	0.4	0.0502	0.1124	-0.0241	-0.1185	-0.4436	0.0103			
8	0.3	0.0397	0.0890	-0.0182	-0.0921	-0.3445	0.0078			
9	0.2	0.0275	0.0617	-0.0122	-0.0631	-0.2359	0.0052			
10	0.1	0.0142	0.0318	-0.0061	-0.0323	-0.1205	0.0026			
11	0.0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000			
H_2O + Pluronic6200										
No	x_{H2O}	$H_{E,H2O}$/kJ·mol^{-1}			$H_{E,Pluronic6200}$/kJ·mol^{-1}					
		$H_{E,MF}$	$H_{E,HB}$	$H_{E,VdW}$	$H_{E,MF}$	$H_{E,HB}$	$H_{E,VdW}$			
1	1.0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000			
2	0.9	0.0222	0.0611	-0.0428	-0.0811	-0.3554	0.0179			
3	0.8	0.0411	0.1234	-0.0418	-0.1171	-0.4938	0.0178			

4	0.7	0.0499	0.1554	-0.0379	-0.1268	-0.5314	0.0163			
5	0.6	0.0518	0.1639	-0.0331	-0.1231	-0.5151	0.0143			
6	0.5	0.0489	0.1560	-0.0279	-0.1114	-0.4663	0.0122			
7	0.4	0.0428	0.1368	-0.0225	-0.0945	-0.3960	0.0099			
8	0.3	0.0344	0.1096	-0.0170	-0.0742	-0.3108	0.0075			
9	0.2	0.0241	0.0767	-0.0114	-0.0512	-0.2147	0.0050			
10	0.1	0.0126	0.0398	-0.0057	-0.0263	-0.1105	0.0025			
11	0.0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000			
H_2O + PPG400										
No	x_{H2O}	$H_{E,H2O}$/kJ·mol^{-1}			$H_{E,PPG400}$/kJ·mol^{-1}					
		$H_{E,MF}$	$H_{E,HB}$	$H_{E,VdW}$	$H_{E,MF}$	$H_{E,HB}$	$H_{E,VdW}$			
1	1.0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000			
2	0.9	0.3102	0.3262	-0.4849	-1.0320	-4.6052	0.1970			
3	0.8	0.5632	0.9705	-0.4656	-1.5154	-6.4571	0.1922			
4	0.7	0.6744	1.3404	-0.4194	-1.6310	-6.9372	0.1753			
5	0.6	0.6904	1.4625	-0.3653	-1.5673	-6.6970	0.1541			
6	0.5	0.6451	1.4119	-0.3077	-1.4050	-6.0349	0.1307			
7	0.4	0.5589	1.2449	-0.2480	-1.1826	-5.1036	0.1059			
8	0.3	0.4446	0.9990	-0.1870	-0.9209	-3.9900	0.0802			
9	0.2	0.3100	0.6994	-0.1252	-0.6319	-2.7470	0.0539			
10	0.1	0.1606	0.3625	-0.0628	-0.3232	-1.4092	0.0271			
11	0.0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000			

Table S8: Excess enthalpies of H_2O + NaPA 8000 + Polymer/co-polymer predicted by COSMO-RS at 298.15 K as the contribution of electrostatic misfit ($H_{E,MF}$), hydrogen bond ($H_{E,HB}$), and Van der Walls forces ($H_{E,VdW}$) of each component.

H_2O + NaPA8000 + PPG400

No	[PPG400]/ wt%	NaPA8000/ wt%	$H_{E,PPG400}$/J·mol^{-1}			$H_{E,Na+}$/J·mol^{-1}			$H_{E,PA8000-}$/J·mol^{-1}			$H_{E,H2O}$/J·mol^{-1}		
			$H_{E,MF}$	$H_{E,HB}$	$H_{E,VdW}$	$H_{E,MF}$	$H_{E,HB}$	$H_{E,VdW}$	$H_{E,MF}$	$H_{E,HB}$	$H_{E,VdW}$	$H_{E,MF}$	$H_{E,HB}$	$H_{E,VdW}$
1	7.31	12.14	-21.56	-262.37	44.38	2.10	0.00	0.03	-10.36	-109.65	2.62	0.72	-2.09	-11.57
2	8.03	11.41	-24.25	-287.72	47.93	1.97	0.00	0.03	-9.74	-102.98	2.45	0.76	-2.30	-12.47
3	8.41	11.06	-25.72	-301.20	49.77	1.91	0.00	0.03	-9.45	-99.83	2.37	0.78	-2.41	-12.94
4	8.71	10.83	-26.91	-312.00	51.23	1.87	0.00	0.03	-9.26	-97.81	2.31	0.80	-2.50	-13.31
5	9.21	10.57	-29.01	-330.50	53.68	1.83	0.00	0.03	-9.07	-95.71	2.25	0.84	-2.64	-13.94
6	9.63	10.31	-30.79	-345.92	55.69	1.78	0.00	0.03	-8.86	-93.50	2.19	0.87	-2.75	-14.45
7	9.86	10.04	-31.72	-353.83	56.70	1.73	0.00	0.03	-8.63	-90.99	2.13	0.88	-2.81	-14.70
8	10.13	9.82	-32.87	-363.53	57.93	1.69	0.00	0.02	-8.44	-89.03	2.08	0.90	-2.89	-15.02
9	10.51	9.56	-34.54	-377.39	59.67	1.65	0.00	0.02	-8.23	-86.78	2.02	0.92	-2.99	-15.46
10	11.34	9.34	-38.52	-409.46	63.58	1.62	0.00	0.02	-8.10	-85.36	1.97	1.00	-3.20	-16.44
11	12.02	8.75	-41.63	-433.83	66.45	1.51	0.00	0.02	-7.60	-80.01	1.84	1.04	-3.37	-17.17
12	12.78	8.24	-45.32	-461.87	69.67	1.43	0.00	0.02	-7.18	-75.54	1.73	1.11	-3.56	-17.98
13	13.49	7.84	-48.93	-488.59	72.64	1.36	0.00	0.02	-6.86	-72.11	1.64	1.17	-3.73	-18.72
14	14.07	7.50	-51.95	-510.42	75.00	1.30	0.00	0.02	-6.58	-69.15	1.57	1.22	-3.86	-19.32
15	15.48	6.98	-59.90	-565.91	80.76	1.22	0.00	0.02	-6.19	-65.00	1.46	1.37	-4.17	-20.76
16	25.83	5.00	-138.48	-1024.76	117.86	0.93	0.00	0.01	-4.94	-51.55	1.07	2.96	-5.84	-29.93
17	31.98	3.14	-198.88	-1322.77	134.83	0.61	0.00	0.01	-3.28	-34.22	0.68	4.26	-6.13	-34.05
18	62.43	2.35	-802.00	-3742.38	191.64	0.67	0.00	0.01	-4.01	-43.09	0.72	22.07	14.85	-47.43

H_2O + NaPA8000 + PEG2000

No	[PEG2000]/	NaPA8000/	$H_{E,PEG2000}$/J·mol^{-1}			$H_{E,Na+}$/J·mol^{-1}			$H_{E,PA8000-}$/J·mol^{-1}			$H_{E,H2O}$/J·mol^{-1}		

	wt%	wt%	$H_{E,MF}$	$H_{E,HB}$	$H_{E,VdW}$	$H_{E,MF}$	$H_{E,HB}$	$H_{E,VdW}$	$H_{E,MF}$	$H_{E,HB}$	$H_{E,VdW}$	$H_{E,MF}$	$H_{E,HB}$	$H_{E,VdW}$
1	4.53	12.72	-9.63	-41.10	5.63	2.20	0.00	0.03	-10.53	-112.47	2.86	0.28	0.38	-1.49
2	4.95	11.93	-10.47	-44.70	6.12	2.05	0.00	0.03	-9.84	-105.02	2.67	0.26	0.37	-1.60
3	5.74	11.13	-12.13	-51.80	7.07	1.91	0.00	0.03	-9.18	-97.96	2.49	0.25	0.38	-1.84
4	6.42	10.73	-13.60	-58.11	7.90	1.85	0.00	0.03	-8.88	-94.75	2.40	0.24	0.39	-2.05
5	7.29	10.30	-15.50	-66.29	8.98	1.78	0.00	0.03	-8.57	-91.42	2.32	0.24	0.41	-2.33
6	8.56	9.69	-18.31	-78.40	10.57	1.69	0.00	0.02	-8.13	-86.69	2.19	0.23	0.44	-2.73
7	9.03	8.95	-19.24	-82.41	11.09	1.56	0.00	0.02	-7.48	-79.80	2.01	0.22	0.44	-2.86
8	10.27	8.10	-21.95	-94.09	12.60	1.41	0.00	0.02	-6.81	-72.56	1.83	0.21	0.47	-3.24
9	10.62	7.66	-22.66	-97.17	12.99	1.33	0.00	0.02	-6.43	-68.54	1.72	0.20	0.47	-3.34
10	11.12	7.32	-23.76	-101.91	13.60	1.28	0.00	0.02	-6.16	-65.62	1.65	0.19	0.48	-3.49
11	11.91	6.95	-25.55	-109.64	14.58	1.22	0.00	0.02	-5.88	-62.62	1.57	0.19	0.51	-3.74
12	12.55	6.57	-26.98	-115.85	15.37	1.15	0.00	0.02	-5.57	-59.38	1.49	0.19	0.52	-3.93
13	12.96	6.25	-27.88	-119.73	15.86	1.10	0.00	0.02	-5.31	-56.55	1.42	0.18	0.54	-4.06
14	13.46	5.93	-29.00	-124.58	16.46	1.04	0.00	0.02	-5.05	-53.77	1.35	0.18	0.55	-4.21
15	13.78	5.72	-29.71	-127.69	16.85	1.01	0.00	0.01	-4.88	-51.93	1.30	0.17	0.56	-4.30
16	14.64	5.33	-31.71	-136.36	17.93	0.94	0.00	0.01	-4.57	-48.67	1.21	0.17	0.59	-4.58
17	14.70	5.14	-31.79	-136.70	17.97	0.91	0.00	0.01	-4.40	-46.86	1.17	0.17	0.58	-4.59
18	15.43	4.93	-33.55	-144.33	18.91	0.88	0.00	0.01	-4.25	-45.23	1.13	0.17	0.62	-4.82
19	15.80	4.71	-34.40	-148.03	19.37	0.84	0.00	0.01	-4.07	-43.29	1.08	0.17	0.63	-4.94
20	16.74	4.41	-36.69	-157.98	20.58	0.79	0.00	0.01	-3.84	-40.85	1.02	0.16	0.67	-5.24
21	17.74	4.12	-39.17	-168.79	21.89	0.75	0.00	0.01	-3.62	-38.51	0.96	0.16	0.71	-5.57
22	20.98	3.72	-47.82	-206.49	26.36	0.70	0.00	0.01	-3.39	-36.05	0.89	0.18	0.90	-6.69
23	39.13	2.94	-111.98	-488.21	55.74	0.70	0.00	0.01	-3.48	-36.81	0.86	0.42	2.95	-13.99
H_2O + NaPA8000 + PEG8000														
No	[PEG8000]/	NaPA8000/	$H_{E,PEG8000}$/J·mol^{-1}			$H_{E,Na+}$/J·mol^{-1}			$H_{E,PA8000-}$/J·mol^{-1}			$H_{E,H2O}$/J·mol^{-1}		

	wt%	wt%	$H_{E,MF}$	$H_{E,HB}$	$H_{E,VdW}$	$H_{E,MF}$	H_HB	H_vdW	$H_{E,MF}$	$H_{E,HB}$	$H_{E,VdW}$	$H_{E,MF}$	H_HB	H_vdW
1	6.14	7.47	-5.01	-21.63	2.83	1.24	0.00	0.02	-5.93	-63.33	1.62	0.16	0.22	-0.76
2	6.47	7.45	-5.29	-22.87	2.99	1.24	0.00	0.02	-5.94	-63.39	1.62	0.16	0.23	-0.80
3	6.90	7.22	-5.66	-24.45	3.19	1.21	0.00	0.02	-5.77	-61.58	1.57	0.16	0.23	-0.85
4	7.25	6.85	-5.94	-25.68	3.35	1.14	0.00	0.02	-5.47	-58.41	1.49	0.15	0.23	-0.89
5	7.57	6.62	-6.21	-26.84	3.50	1.11	0.00	0.02	-5.29	-56.51	1.44	0.14	0.22	-0.93
6	7.95	6.29	-6.53	-28.20	3.67	1.05	0.00	0.02	-5.03	-53.72	1.37	0.14	0.22	-0.97
7	8.34	6.06	-6.86	-29.64	3.86	1.01	0.00	0.01	-4.86	-51.85	1.32	0.13	0.22	-1.02
8	8.72	5.85	-7.18	-31.05	4.04	0.98	0.00	0.01	-4.70	-50.16	1.28	0.13	0.23	-1.07
9	9.36	5.85	-7.76	-33.57	4.36	0.99	0.00	0.01	-4.73	-50.53	1.29	0.13	0.24	-1.15
10	9.80	5.39	-8.13	-35.14	4.56	0.91	0.00	0.01	-4.36	-46.55	1.19	0.12	0.23	-1.20
11	10.41	5.34	-8.69	-37.57	4.87	0.91	0.00	0.01	-4.35	-46.42	1.18	0.12	0.24	-1.28
12	11.32	4.98	-9.50	-41.11	5.33	0.85	0.00	0.01	-4.08	-43.57	1.11	0.12	0.25	-1.39
13	36.23	3.18	-41.27	-179.93	22.02	0.74	0.00	0.01	-3.61	-38.35	0.95	0.18	0.89	-5.67
H_2O + NaPA8000 + Pluronic6200														
No	[Pluronic6200]/ wt%	NaPA8000/ wt%	$H_{E,Pluronic6200}$/J·mol^{-1}			$H_{E,Na+}$/J·mol^{-1}			$H_{E,PA8000-}$/J·mol^{-1}			$H_{E,H2O}$/J·mol^{-1}		
			$H_{E,MF}$	$H_{E,HB}$	$H_{E,VdW}$	$H_{E,MF}$	H_HB	H_vdW	H_MF	$H_{E,MF}$	$H_{E,HB}$	$H_{E,VdW}$	$H_{E,MF}$	H_vdW
1	10.24	6.80	7.07	-42.27	-21.80	1.18	0.00	0.02	-5.62	-60.02	1.53	0.21	0.07	-0.83
2	10.39	6.39	7.15	-42.75	-22.05	1.10	0.00	0.02	-5.26	-56.23	1.44	0.21	0.06	-0.85
3	10.79	6.32	7.46	-44.57	-22.99	1.09	0.00	0.02	-5.23	-55.83	1.43	0.21	0.06	-0.86
4	11.22	6.10	7.77	-46.47	-23.97	1.06	0.00	0.02	-5.06	-54.02	1.38	0.21	0.06	-0.87
5	11.55	5.83	8.01	-47.87	-24.69	1.01	0.00	0.01	-4.84	-51.67	1.32	0.21	0.06	-0.88
6	11.88	5.69	8.25	-49.35	-25.46	0.99	0.00	0.01	-4.73	-50.55	1.29	0.21	0.05	-0.90
7	12.56	5.63	8.79	-52.56	-27.12	0.99	0.00	0.01	-4.72	-50.39	1.29	0.21	0.05	-0.91
8	13.12	5.46	9.23	-55.17	-28.46	0.96	0.00	0.01	-4.60	-49.10	1.25	0.21	0.05	-0.92
9	13.62	5.24	9.61	-57.47	-29.65	0.93	0.00	0.01	-4.43	-47.28	1.21	0.21	0.05	-0.93

10	14.02	4.97	9.91	-59.25	-30.57	0.88	0.00	0.01	-4.21	-44.92	1.15	0.21	0.05	-0.95
11	14.43	4.92	10.24	-61.25	-31.61	0.87	0.00	0.01	-4.18	-44.67	1.14	0.21	0.05	-0.96
12	14.99	4.74	10.69	-63.93	-33.00	0.85	0.00	0.01	-4.05	-43.23	1.10	0.21	0.05	-0.98
13	15.50	4.56	11.10	-66.37	-34.26	0.82	0.00	0.01	-3.91	-41.76	1.07	0.21	0.04	-0.99
14	16.11	4.34	11.59	-69.32	-35.79	0.78	0.00	0.01	-3.74	-39.94	1.02	0.21	0.04	-1.01
15	16.70	4.06	12.06	-72.14	-37.24	0.73	0.00	0.01	-3.51	-37.51	0.96	0.21	0.04	-1.03
16	17.04	3.85	12.33	-73.73	-38.07	0.70	0.00	0.01	-3.34	-35.63	0.91	0.21	0.04	-1.04
17	17.37	3.71	12.60	-75.33	-38.90	0.67	0.00	0.01	-3.22	-34.41	0.88	0.21	0.03	-1.06
18	17.85	3.59	13.00	-77.77	-40.16	0.66	0.00	0.01	-3.13	-33.45	0.85	0.22	0.03	-1.08
19	18.24	3.41	13.32	-79.68	-41.15	0.62	0.00	0.01	-2.98	-31.86	0.81	0.21	0.03	-1.09
20	18.78	3.25	13.78	-82.43	-42.58	0.60	0.00	0.01	-2.86	-30.51	0.78	0.22	0.03	-1.11
21	19.99	3.19	14.89	-89.05	-46.00	0.60	0.00	0.01	-2.85	-30.40	0.78	0.22	0.02	-1.13
22	21.76	3.10	16.57	-99.09	-51.20	0.59	0.00	0.01	-2.83	-30.20	0.77	0.22	0.02	-1.16
23	24.49	2.72	19.24	-115.10	-59.48	0.54	0.00	0.01	-2.56	-27.35	0.70	0.22	0.02	-1.18
24	27.51	2.12	22.36	-133.72	-69.11	0.43	0.00	0.01	-2.06	-22.04	0.56	0.22	0.01	-1.20
25	48.04	1.72	54.59	-326.54	-168.77	0.49	0.00	0.01	-2.34	-25.01	0.64	0.22	0.01	-1.21
H_2O + NaPA8000 + Pluronic6400														
No	[Pluronic6400]/ wt%	NaPA8000/ wt%	$H_{E,Pluronic6400}$/J·mol^{-1}			$H_{E,Na+}$/J·mol^{-1}			$H_{E,PA8000-}$/J·mol^{-1}			$H_{E,H2O}$/J·mol^{-1}		
			$H_{E,MF}$	$H_{E,HB}$	$H_{E,VdW}$	$H_{E,MF}$	H_HB	H_vdW	H_MF	$H_{E,MF}$	$H_{E,HB}$	$H_{E,VdW}$	$H_{E,MF}$	H_vdW
1	9.50	7.48	2.89	-30.13	-12.03	1.29	0.00	0.02	-6.18	-65.98	1.69	0.21	0.07	-0.83
2	9.83	7.39	3.00	-31.27	-12.49	1.28	0.00	0.02	-6.12	-65.37	1.67	0.21	0.06	-0.85
3	10.19	7.18	3.11	-32.47	-12.97	1.25	0.00	0.02	-5.96	-63.63	1.63	0.21	0.06	-0.86
4	10.58	7.06	3.24	-33.82	-13.51	1.23	0.00	0.02	-5.88	-62.77	1.60	0.21	0.06	-0.87
5	10.93	6.86	3.35	-35.00	-13.99	1.20	0.00	0.02	-5.72	-61.10	1.56	0.21	0.06	-0.88
6	11.17	6.75	3.43	-35.83	-14.32	1.18	0.00	0.02	-5.64	-60.22	1.54	0.21	0.05	-0.90
7	11.64	6.39	3.58	-37.38	-14.94	1.12	0.00	0.02	-5.34	-57.08	1.46	0.21	0.05	-0.91

8	12.14	6.22	3.75	-39.15	-15.65	1.09	0.00	0.02	-5.22	-55.79	1.43	0.21	0.05	-0.92
9	12.60	6.12	3.91	-40.81	-16.31	1.08	0.00	0.02	-5.16	-55.13	1.41	0.21	0.05	-0.93
10	12.91	5.82	4.01	-41.82	-16.72	1.03	0.00	0.02	-4.91	-52.44	1.34	0.21	0.05	-0.95
11	13.35	5.74	4.16	-43.43	-17.37	1.02	0.00	0.01	-4.86	-51.94	1.33	0.21	0.05	-0.96
12	13.83	5.63	4.33	-45.20	-18.08	1.00	0.00	0.01	-4.79	-51.18	1.31	0.21	0.05	-0.98
13	14.29	5.53	4.49	-46.91	-18.76	0.99	0.00	0.01	-4.73	-50.50	1.29	0.21	0.04	-0.99
14	14.88	5.50	4.71	-49.19	-19.68	0.99	0.00	0.01	-4.74	-50.57	1.29	0.21	0.04	-1.01
15	15.23	5.24	4.83	-50.40	-20.17	0.94	0.00	0.01	-4.52	-48.24	1.23	0.21	0.04	-1.03
16	15.57	5.24	4.95	-51.74	-20.71	0.95	0.00	0.01	-4.54	-48.44	1.24	0.21	0.04	-1.04
17	15.94	5.06	5.08	-53.10	-21.25	0.92	0.00	0.01	-4.39	-46.89	1.20	0.21	0.03	-1.06
18	16.28	4.93	5.21	-54.37	-21.77	0.90	0.00	0.01	-4.29	-45.81	1.17	0.22	0.03	-1.08
19	16.76	4.93	5.39	-56.32	-22.55	0.90	0.00	0.01	-4.32	-46.09	1.18	0.21	0.03	-1.09
20	17.48	4.88	5.67	-59.24	-23.72	0.90	0.00	0.01	-4.31	-46.01	1.17	0.22	0.03	-1.11
21	18.43	4.61	6.03	-63.01	-25.24	0.86	0.00	0.01	-4.11	-43.85	1.12	0.22	0.02	-1.13
22	19.72	4.27	6.53	-68.26	-27.34	0.81	0.00	0.01	-3.85	-41.12	1.05	0.22	0.02	-1.16
23	21.59	4.06	7.31	-76.39	-30.61	0.78	0.00	0.01	-3.74	-39.97	1.02	0.22	0.02	-1.18
24	23.69	3.69	8.21	-85.80	-34.39	0.73	0.00	0.01	-3.48	-37.19	0.95	0.22	0.01	-1.20
25	47.73	2.09	23.89	-249.75	-100.10	0.60	0.00	0.01	-2.85	-30.43	0.78	0.22	0.01	-1.21
H_2O + NaPA8000 + Pluronic6800														
No	[Pluronic6400]/ wt%	NaPA8000/ wt%	$H_{E,Pluronic6800}$/J·mol^{-1}				$H_{E,Na+}$/J·mol^{-1}			$H_{E,PA8000-}$/J·mol^{-1}			$H_{E,H2O}$/J·mol^{-1}	
			$H_{E,MF}$	$H_{E,HB}$	$H_{E,VdW}$	$H_{E,MF}$	H_HB	H_vdW	H_MF	$H_{E,MF}$	$H_{E,HB}$	$H_{E,VdW}$	$H_{E,MF}$	H_vdW
1	4.67	8.82	-2.78	-18.76	3.03	1.46	0.00	0.02	-6.99	-74.67	1.91	0.21	0.07	-0.83
2	4.74	8.81	-2.83	-19.05	3.07	1.46	0.00	0.02	-6.99	-74.64	1.91	0.21	0.06	-0.85
3	4.81	8.77	-2.87	-19.34	3.12	1.46	0.00	0.02	-6.96	-74.32	1.90	0.21	0.06	-0.86
4	4.89	8.78	-2.92	-19.68	3.17	1.46	0.00	0.02	-6.97	-74.49	1.90	0.21	0.06	-0.87
5	4.96	8.72	-2.96	-19.97	3.22	1.45	0.00	0.02	-6.93	-73.98	1.89	0.21	0.06	-0.88

6	5.01	8.68	-2.99	-20.17	3.25	1.44	0.00	0.02	-6.90	-73.65	1.88	0.21	0.05	-0.90
7	5.07	8.68	-3.03	-20.42	3.29	1.44	0.00	0.02	-6.90	-73.70	1.88	0.21	0.05	-0.91
8	5.14	8.68	-3.08	-20.72	3.34	1.44	0.00	0.02	-6.91	-73.76	1.89	0.21	0.05	-0.92
9	5.20	8.64	-3.11	-20.97	3.38	1.44	0.00	0.02	-6.88	-73.44	1.88	0.21	0.05	-0.93
10	5.29	8.68	-3.17	-21.36	3.44	1.45	0.00	0.02	-6.92	-73.89	1.89	0.21	0.05	-0.95
11	5.38	8.65	-3.23	-21.74	3.50	1.44	0.00	0.02	-6.90	-73.69	1.88	0.21	0.05	-0.96
12	5.48	8.70	-3.30	-22.19	3.57	1.45	0.00	0.02	-6.95	-74.24	1.90	0.21	0.05	-0.98
13	5.58	8.69	-3.36	-22.61	3.64	1.45	0.00	0.02	-6.95	-74.23	1.90	0.21	0.04	-0.99
14	5.65	8.67	-3.40	-22.91	3.69	1.45	0.00	0.02	-6.94	-74.11	1.89	0.21	0.04	-1.01
15	5.74	8.66	-3.46	-23.30	3.75	1.45	0.00	0.02	-6.94	-74.09	1.89	0.21	0.04	-1.03
16	5.84	8.69	-3.53	-23.74	3.82	1.46	0.00	0.02	-6.97	-74.46	1.90	0.21	0.04	-1.04
17	5.93	8.61	-3.58	-24.11	3.88	1.44	0.00	0.02	-6.91	-73.78	1.88	0.21	0.03	-1.06
18	6.04	8.64	-3.65	-24.59	3.96	1.45	0.00	0.02	-6.94	-74.16	1.89	0.22	0.03	-1.08
19	6.12	8.56	-3.70	-24.92	4.01	1.44	0.00	0.02	-6.88	-73.47	1.88	0.21	0.03	-1.09
20	6.22	8.58	-3.77	-25.36	4.08	1.44	0.00	0.02	-6.91	-73.75	1.88	0.22	0.03	-1.11
21	6.34	8.58	-3.85	-25.88	4.16	1.45	0.00	0.02	-6.92	-73.85	1.89	0.22	0.02	-1.13
22	6.47	8.52	-3.93	-26.44	4.25	1.44	0.00	0.02	-6.87	-73.39	1.87	0.22	0.02	-1.16
23	6.60	8.51	-4.01	-27.01	4.34	1.44	0.00	0.02	-6.88	-73.41	1.87	0.22	0.02	-1.18
24	6.71	8.45	-4.08	-27.47	4.41	1.43	0.00	0.02	-6.83	-72.94	1.86	0.22	0.01	-1.20
25	6.79	8.38	-4.13	-27.80	4.46	1.42	0.00	0.02	-6.78	-72.34	1.85	0.22	0.01	-1.21
26	6.91	8.48	-4.22	-28.37	4.55	1.44	0.00	0.02	-6.87	-73.39	1.87	0.22	0.01	-1.24
27	7.00	8.45	-4.28	-28.75	4.62	1.43	0.00	0.02	-6.85	-73.18	1.87	0.22	0.01	-1.25
28	7.15	8.48	-4.38	-29.43	4.72	1.44	0.00	0.02	-6.89	-73.60	1.88	0.22	0.00	-1.28
29	7.25	8.37	-4.44	-29.84	4.79	1.42	0.00	0.02	-6.80	-72.64	1.85	0.22	0.00	-1.30
30	7.35	8.37	-4.50	-30.29	4.86	1.42	0.00	0.02	-6.81	-72.72	1.85	0.22	0.00	-1.32
31	7.47	8.37	-4.58	-30.82	4.94	1.43	0.00	0.02	-6.82	-72.82	1.86	0.22	-0.01	-1.34
32	7.57	8.32	-4.65	-31.25	5.01	1.42	0.00	0.02	-6.78	-72.43	1.85	0.22	-0.01	-1.36

33	7.72	8.34	-4.75	-31.94	5.12	1.42	0.00	0.02	-6.82	-72.75	1.85	0.22	-0.01	-1.39
34	7.86	8.26	-4.84	-32.54	5.21	1.41	0.00	0.02	-6.75	-72.11	1.84	0.22	-0.02	-1.41
35	7.95	8.19	-4.90	-32.92	5.27	1.40	0.00	0.02	-6.70	-71.51	1.82	0.22	-0.02	-1.43
36	8.11	8.25	-5.01	-33.67	5.39	1.41	0.00	0.02	-6.77	-72.22	1.84	0.23	-0.02	-1.46
37	8.29	8.20	-5.13	-34.47	5.52	1.41	0.00	0.02	-6.74	-71.90	1.83	0.23	-0.03	-1.49
38	8.44	8.10	-5.23	-35.11	5.62	1.39	0.00	0.02	-6.66	-71.06	1.81	0.23	-0.03	-1.52
39	8.64	8.12	-5.36	-36.04	5.76	1.40	0.00	0.02	-6.69	-71.43	1.82	0.23	-0.04	-1.56
40	8.97	8.16	-5.60	-37.58	6.00	1.41	0.00	0.02	-6.75	-72.09	1.83	0.23	-0.04	-1.62
41	9.23	8.00	-5.77	-38.71	6.18	1.38	0.00	0.02	-6.63	-70.77	1.80	0.23	-0.05	-1.67
42	9.46	7.81	-5.91	-39.69	6.33	1.35	0.00	0.02	-6.48	-69.12	1.76	0.23	-0.06	-1.71
43	9.79	7.83	-6.15	-41.25	6.58	1.36	0.00	0.02	-6.52	-69.59	1.77	0.23	-0.07	-1.77
44	10.02	7.68	-6.30	-42.26	6.73	1.34	0.00	0.02	-6.40	-68.32	1.74	0.23	-0.08	-1.81
45	10.11	7.51	-6.35	-42.60	6.79	1.31	0.00	0.02	-6.25	-66.74	1.70	0.23	-0.08	-1.83
46	10.29	7.59	-6.48	-43.49	6.93	1.32	0.00	0.02	-6.34	-67.67	1.72	0.23	-0.09	-1.86
47	10.55	7.50	-6.66	-44.68	7.11	1.31	0.00	0.02	-6.28	-67.00	1.70	0.23	-0.10	-1.91
48	10.86	7.49	-6.88	-46.16	7.34	1.31	0.00	0.02	-6.29	-67.16	1.71	0.23	-0.10	-1.97
49	11.06	7.29	-7.01	-47.01	7.47	1.28	0.00	0.02	-6.13	-65.37	1.66	0.23	-0.11	-2.01
50	11.16	7.22	-7.08	-47.45	7.54	1.27	0.00	0.02	-6.07	-64.76	1.64	0.23	-0.11	-2.02
51	11.34	7.22	-7.21	-48.32	7.67	1.27	0.00	0.02	-6.08	-64.90	1.65	0.23	-0.12	-2.06
52	11.65	7.25	-7.44	-49.84	7.91	1.28	0.00	0.02	-6.13	-65.44	1.66	0.24	-0.13	-2.12
53	11.90	7.11	-7.61	-50.98	8.09	1.26	0.00	0.02	-6.02	-64.27	1.63	0.24	-0.14	-2.17
54	12.44	7.07	-8.00	-53.61	8.49	1.26	0.00	0.02	-6.03	-64.30	1.63	0.24	-0.15	-2.27
55	12.86	6.91	-8.30	-55.60	8.80	1.23	0.00	0.02	-5.91	-63.05	1.60	0.24	-0.16	-2.35
56	13.31	6.68	-8.62	-57.70	9.12	1.19	0.00	0.02	-5.73	-61.11	1.55	0.24	-0.18	-2.44
57	14.16	6.77	-9.28	-62.10	9.79	1.22	0.00	0.02	-5.88	-62.67	1.59	0.25	-0.20	-2.62
58	14.95	6.86	-9.92	-66.28	10.43	1.25	0.00	0.02	-6.02	-64.21	1.62	0.26	-0.22	-2.79
59	16.15	6.76	-10.87	-72.60	11.38	1.25	0.00	0.02	-6.02	-64.17	1.62	0.27	-0.25	-3.04

60	17.75	6.60	-12.19	-81.28	12.69	1.24	0.00	0.02	-5.99	-63.84	1.61	0.29	-0.30	-3.38
61	19.54	6.57	-13.76	-91.55	14.21	1.27	0.00	0.02	-6.11	-65.05	1.63	0.31	-0.35	-3.78
62	21.73	6.42	-15.76	-104.63	16.13	1.27	0.00	0.02	-6.14	-65.35	1.64	0.33	-0.41	-4.28
63	23.73	6.09	-17.65	-116.91	17.91	1.23	0.00	0.02	-5.96	-63.45	1.58	0.35	-0.48	-4.75

Table S9: Excess enthalpies of H_2O + NaPA 8000 + Polymer/co-polymer in the presence of various sugars predicted by COSMO-RS at 298.15 K as the contribution of electrostatic misfit ($H_{E,MF}$), hydrogen bond ($H_{E,HB}$), and Van der Walls forces ($H_{E,VdW}$) of each component. The experimental data of recovery are given in Table S4.

No	Polymer/ co-polymer	Y/%	$H_{E,Na+}$/J·mol^{-1}			$H_{E,PA8000}$/J·mol^{-1}			$H_{E,Polymer}$/J·mol^{-1}			$H_{E,H2O}$J·mol^{-1}			$H_{E,Sugar}$/J·mol^{-1}		
			$H_{E,MF}$	$H_{E,HB}$	$H_{E,VdW}$	$H_{E,MF}$	$H_{E,HB}$	$H_{E,VdW}$	$H_{E,MF}$	$H_{E,HB}$	$H_{E,VdW}$	$H_{E,MF}$	$H_{E,HB}$	$H_{E,VdW}$	$H_{E,MF}$	$H_{E,HB}$	$H_{E,VdW}$
D-Fructose																	
1	PEG8000	100.00	1.788	0.000	0.026	-1.557	-16.620	0.423	-8.782	-37.937	4.920	2.049	5.456	-13.610	0.209	-2.761	0.384
2	PEG2000	62.30	1.778	0.000	0.026	-1.557	-16.598	0.418	-21.800	-93.345	12.498	2.256	7.079	-32.669	0.209	-2.739	0.353
3	Pluronic6800	100.00	1.787	0.000	0.026	-1.557	-16.618	0.422	-6.469	-43.322	6.896	2.628	1.659	-19.185	0.207	-2.760	0.375
4	Pluronic6400	100.00	1.789	0.000	0.026	-1.557	-16.621	0.424	-3.963	-24.698	4.797	2.428	1.918	-13.499	0.208	-2.765	0.385
5	Pluronic6200	100.00	1.790	0.000	0.026	-1.557	-16.621	0.424	-2.956	-20.913	3.936	2.128	3.827	-11.081	0.207	-2.766	0.388
6	PPG400	100.00	1.726	0.000	0.025	-1.563	-16.480	0.385	-32.377	-358.767	57.319	8.707	-26.509	-148.808	0.178	-2.631	0.162
D-Glucose																	
7	PEG8000	52.00	1.788	0.000	0.026	-1.557	-16.622	0.424	-8.784	-37.942	4.920	2.009	4.717	-13.620	0.323	-2.651	0.357
8	PEG2000	60.03	1.778	0.000	0.026	-1.557	-16.600	0.418	-21.805	-93.358	12.497	2.207	6.340	-32.679	0.321	-2.619	0.330
9	Pluronic6800	59.20	1.787	0.000	0.026	-1.557	-16.620	0.422	-6.471	-43.326	6.895	2.578	0.929	-19.195	0.321	-2.650	0.350
10	Pluronic6400	63.56	1.789	0.000	0.026	-1.557	-16.622	0.424	-3.965	-24.701	4.797	2.378	1.189	-13.509	0.322	-2.657	0.357
11	Pluronic6400	60.23	1.790	0.000	0.026	-1.557	-16.623	0.424	-2.957	-20.916	3.936	2.078	3.098	-11.091	0.322	-2.658	0.361
12	PPG400	100.00	1.726	0.000	0.025	-1.563	-16.482	0.385	-32.403	-358.812	57.313	8.667	-27.215	-148.848	0.280	-2.467	0.168
Sucrose																	
13	PEG8000	100.00	1.788	0.000	0.026	-1.557	-16.623	0.424	-8.783	-37.944	4.920	2.019	4.537	-13.601	0.183	-2.204	0.358
14	PEG2000	61.81	1.778	0.000	0.026	-1.557	-16.601	0.418	-21.802	-93.365	12.499	2.227	6.161	-32.671	0.183	-2.181	0.337
15	Pluronic6800	79.00	1.787	0.000	0.026	-1.557	-16.621	0.422	-6.469	-43.329	6.896	2.598	0.749	-19.177	0.181	-2.204	0.352
16	Pluronic6400	78.07	1.789	0.000	0.026	-1.557	-16.623	0.424	-3.963	-24.703	4.798	2.398	1.009	-13.490	0.182	-2.208	0.358
17	Pluronic6400	100.00	1.790	0.000	0.026	-1.557	-16.624	0.424	-2.956	-20.918	3.937	2.098	2.918	-11.072	0.182	-2.209	0.361
18	PPG400	100.00	1.726	0.000	0.025	-1.563	-16.483	0.385	-32.383	-358.835	57.315	8.678	-27.396	-148.888	0.159	-2.073	0.207

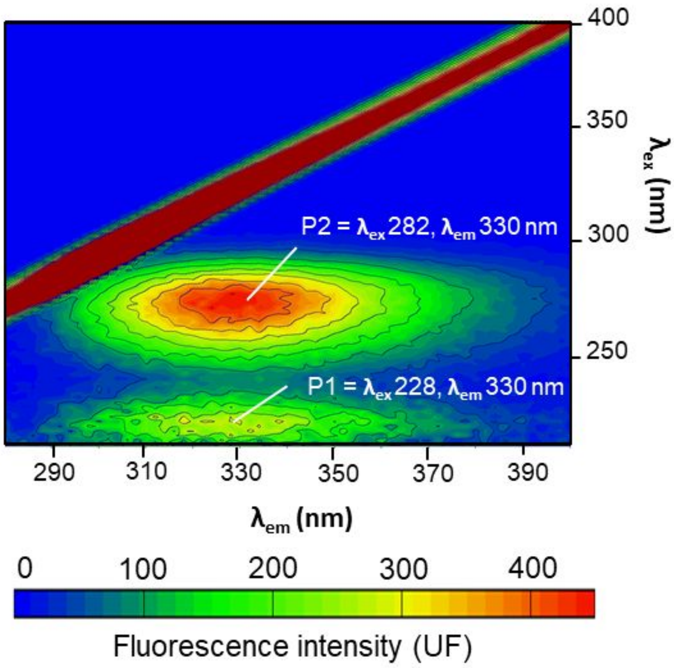

Figure S1. 3D fluorescence spectra of levansucrase (0.1 mg.mL^{-1}) at 25 °C. The 3D fluorescence spectra show the excitation wavelengths in the Y-axis (λ_{ex}), the emission wavelengths in the X-axis (λ_{em}), and the fluorescence intensity (units of fluorescence, UF) is given by the color scale from blue to red (0 to 450 UF). 3D fluorescence spectra ranged from 220 to 400 nm for λ_{ex} and 280 to 400 nm for λ_{em}. P1 and P2 represent the two fluorescence peaks of levansucrase.

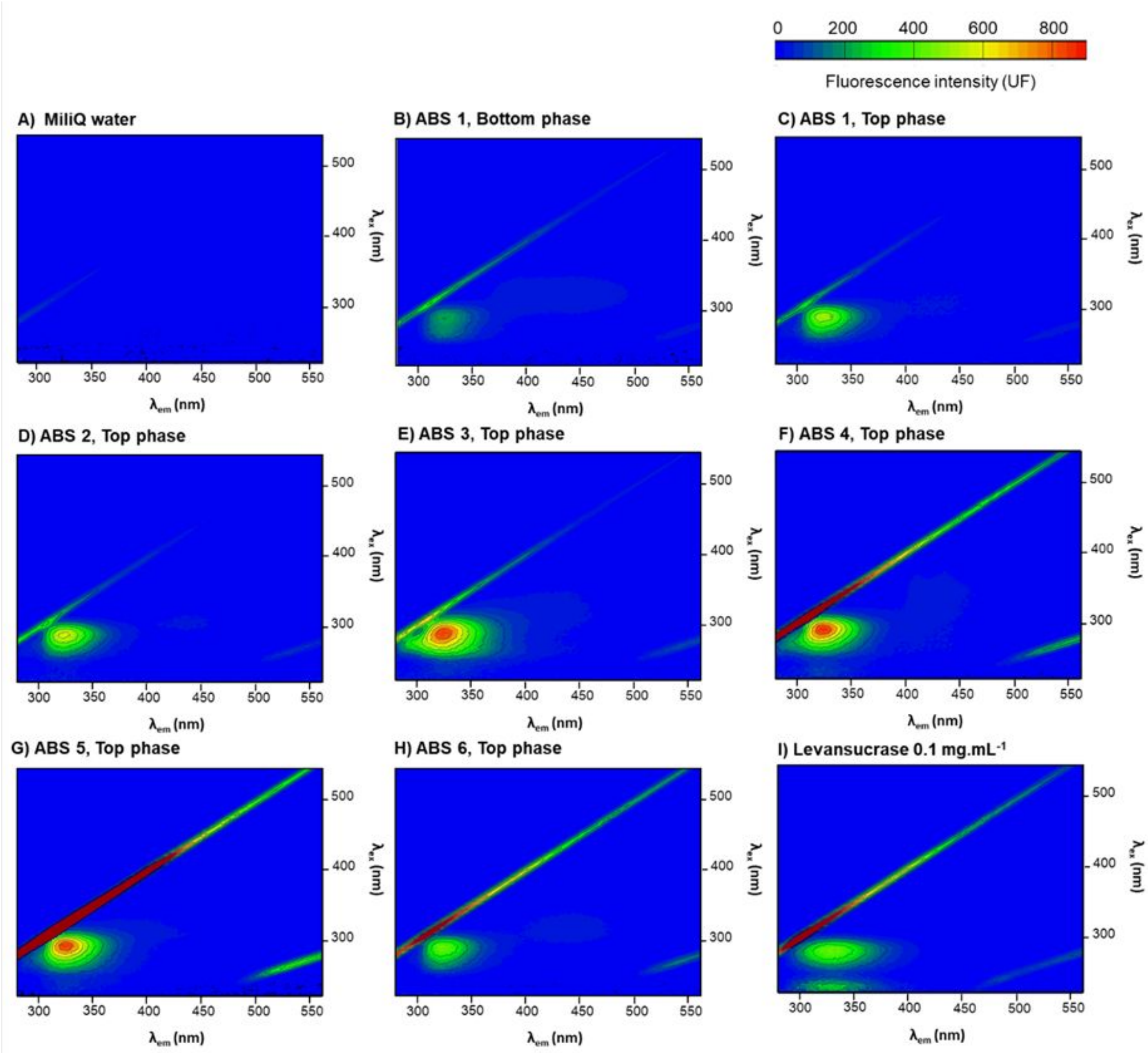

Figure S2. 3D fluorescence spectra of the A) MilliQ water, B to H) ABS phases and I) levansucrase (0.1 mg.mL^{-1}) at 25 ºC. The 3D fluorescence spectra show the excitation wavelengths in the Y-axis (λ_{Ex}), the emission wavelengths in the X-axis (λ_{Em}), and the fluorescence intensity (units of fluorescence, UF) is given by the color scale from blue to red (0 to 900 UF). 3D fluorescence spectra ranged from 220 to 550 nm for λ_{Ex} and 280 to 560 nm for λ_{Em}.

As can be seen in **Figure S1**, levansucrase exhibits two peaks (P1 – λ_{Ex} 228 nm, λ_{Em} 330 nm; P2 – λ_{Ex} 282 nm, λ_{Em} 330 nm) of intrinsic fluorescence, due to the presence of fluorescent amino acids (tyrosine, tryptophan, and phenylalanine) in its structure [CBI68350.1 levansucrase (*Bacillus subtilis*)]. Although P2 is more intense and would be preferable for quantification, the different ABS phases also possess fluorescence activity around λ_{Ex} 280 nm (**Figure S2**), which would interfere with levansucrase quantification in those systems. Hence, we selected the peak P1 for the quantification of the enzyme, considering that none of the ABS phases has an intense fluorescence at λ_{Ex} 228 nm.

Figure S3 below shows the calibration curves for the total protein quantification with BSA as a standard, namely **(A)** Bradford protein assay and **(B)** Fluorescence spectroscopy at λ_{Ex} 228 nm, λ_{Em} 330 nm. **Figure S3.C** shows the calibration curve using a pure levansucrase solution (0.1 mg.mL^{-1}) and fluorescence spectroscopy at λ_{Ex} 228 nm, λ_{Em} 330 nm.

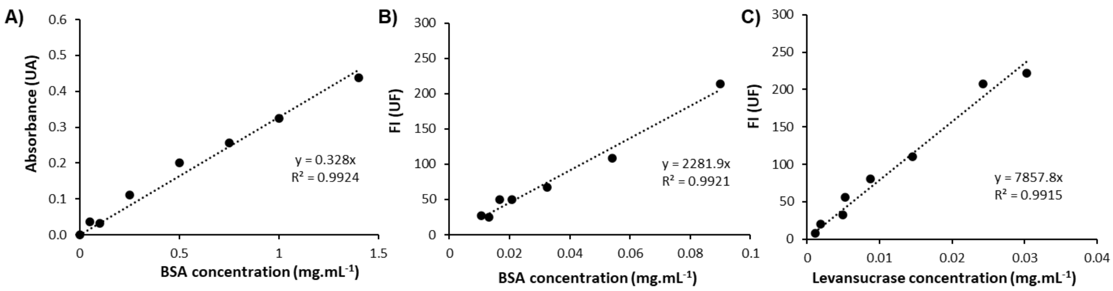

Figure S3. Calibration curves for: **(A)** Total protein quantification (with BSA as a standard) according to the Bradford method (absorbance at 595 nm). **(B)** Total protein quantification (with BSA as a standard) with fluorescence spectroscopy (intrinsic fluorescence of proteins at λ_{Ex} 228 nm, λ_{Em} 330 nm). **(C)** Levansucrase quantification (0.1 mg.mL^{-1} pure levansucrase) with fluorescence analysis (intrinsic fluorescence of proteins at λ_{Ex} 228 nm, λ_{Em} 330 nm). FI – Fluorescence intensity.

The two protein quantification methods (**Figures S3.A** and **S3.B**) provided very similar concentrations for the initial levansucrase solution (Bradford: 0.098 mg.mL^{-1}; Fluorescence: 0.102 mg.mL^{-1}). After determining the concentration of levansucrase, the solution was used as a standard for a new calibration curve (**Figure 3.C**).

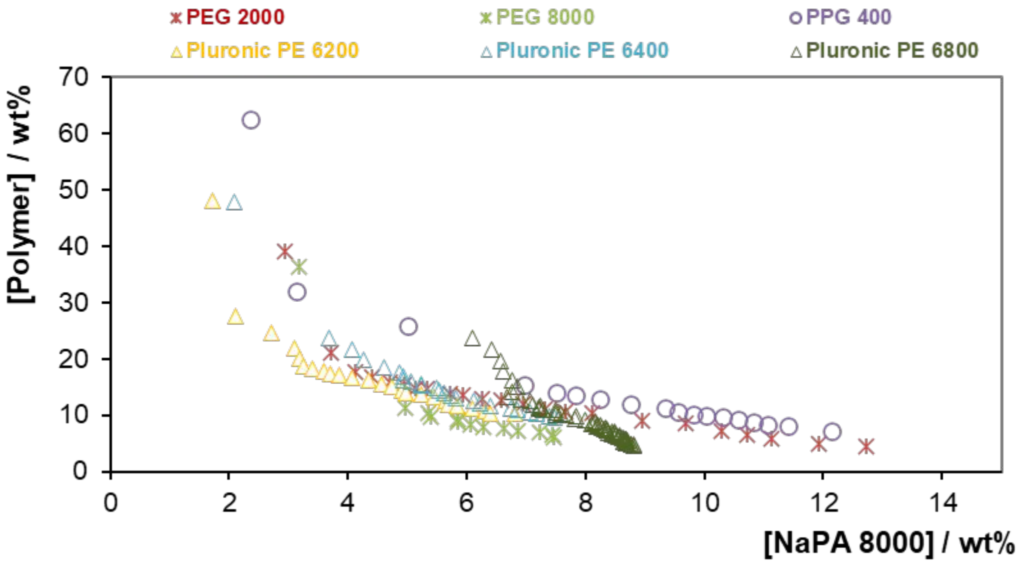

Fig. S4. Phase diagrams for the systems composed of NaPA 8000 + polymers/copolymers (PEG 2000, PEG 8000, PPG 400, Pluronic PE 6200, Pluronic PE 6400 and Pluronic PE 6800) at 298 (±1) K in weight percentage (wt%) units.