Electronic Supplementary Material (ESI) for Green Chemistry

On the double role of surfactants as microalga cell lysis agents and antioxidants extractants

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Electronic Supplementary Information

Table 1 Binodal data for {Tween 20 (1) + salt (2) + H_2O (3)} two-phase systems at room temperature as a function of mass percentage of the components.

100 w_2	100 w_1	100 w_2	100 w_1
Sodium citrate		Sodium tartrate	
0.41	63.47	5.03	57.91
0.60	61.54	5.90	52.84
1.36	56.17	5.78	51.76
2.33	51.39	7.05	44.92
4.30	42.95	7.39	40.89
4.69	39.40	8.22	35.70
5.62	34.72	9.04	31.28
6.46	31.33	9.44	28.83
7.12	28.09	9.80	26.55
7.92	23.85	9.75	24.98
8.50	20.42	10.42	22.15
9.03	17.68	10.71	16.82
9.52	14.88	11.05	14.97
9.86	13.15	11.52	13.02
10.17	11.44	11.61	11.47
10.73	10.13	11.81	10.13
11.22	7.51	12.23	8.07
11.88	5.46	12.77	5.61
15.12	0.85	13.04	3.78
16.80	0.21	13.27	2.67
17.29	0.14	13.92	3.78
		15.01	1.85
		15.99	0.89

Table 2 Binodal data for {Triton X-102 (1) + salt (2) + H_2O (3)} two-phase systems at room temperature as a function of mass percentage of the components.

100 w_2	100 w_1	100 w_2	100 w_1
Sodium citrate		Sodium tartrate	
1.09	51.60	1.11	54.54
1.29	50.32	2.03	49.84
3.44	39.71	2.23	48.99
3.99	36.56	2.78	46.97
4.79	32.80	3.14	45.62
5.45	29.08	4.01	40.45
6.00	25.58	6.84	26.59
6.93	22.66	8.08	23.20
7.68	18.65	8.60	19.07
8.02	17.26	8.95	17.13
8.57	14.20	9.53	13.96
8.82	12.93	10.07	11.35
9.24	11.02	10.44	9.38
9.92	7.81	10.68	7.98
10.39	5.36	11.31	6.29
10.68	4.18	11.60	4.53
11.37	3.53	11.91	3.51
11.38	3.04	12.29	2.32
11.70	1.59	15.46	0.36
		16.47	0.14
		18.17	0.02

Table 3 Fitting parameters of Merchuck equation and standard deviation

	A	B	$C \cdot 10^{-3}$	σ
Tween 20 (1)+ Sodium citrate (2) + H_2O (3)	73.38	-0.2268	1.03	0.451
Tween 20 (1)+ Sodium tartrate (2) + H_2O (3)	101.69	-0.1937	0.90	1.456
Triton X-102 (1)+ Sodium citrate (2) + H_2O (3)	67.28	-0.2553	1.37	0.791
Triton X-102 (1)+ Sodium tartrate (2) + H_2O (3)	66.06	-0.1900	1.16	0.972

Table 4 Experimental tie–lines in mass percentage for {Surfactant (1) + salt (2) + H_2O (3)} at room temperature and antioxidant extraction

Surfactant-rich phase		Inorganic salt-rich phase			
w_1^{I}	w_2^{I}	w_1^{II}	w_2^{II}	*TLL*	*S*
Tween 20 (1) + Sodium Citrate (2) + H_2O (3)					
63.47	0.41	0.14	17.29	65.54	-3.75
56.17	1.36	0.85	15.12	57.01	-4.02
61.54	0.60	0.21	16.80	63.43	-3.78
Tween 20 (1) + Sodium Tartrate (2) + H_2O (3)					
57.91	5.03	0.89	15.99	58.06	-5.20
44.92	7.05	3.78	13.92	41.71	-5.99
52.84	5.90	1.85	15.01	51.80	-5.60
Tween 20 (1) + Sodium Carbonate + H_2O (3)*					
56.50	0.28	0.206	9.24	57.00	-6.28
59.41	0.10	0.035	10.19	60.23	-5.88
42.74	2.14	1.815	7.70	41.30	-7.36
Triton X-102 (1) + Sodium Citrate (2) + H_2O (3)					
51.60	1.09	0.02	17.13	54.02	-3.21
39.71	3.44	0.51	14.17	40.64	-3.65
50.32	1.29	0.29	14.78	51.81	-3.71
Triton X-102 (1) + Sodium Tartrate (2) + H_2O (3)					
48.99	2.23	0.02	18.17	51.50	-3.07
45.62	3.14	0.36	15.46	46.90	-3.67
46.97	2.78	0.14	16.47	48.79	-3.42
Triton X-102 (1) + Sodium Carbonate + H_2O (3)*					
47.72	1.25	0.021	9.84	48.47	-5.56
43.31	1.64	0.149	8.82	43.76	-6.02
45.83	1.41	0.066	9.26	46.43	-5.83

*Data from Ref. 18