Supplementary Section

A detailed assessment on the interaction of sodium alginate with a surface-active ionic liquid and a conventional surfactant: a multitechnique approach

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Table S1. Fitting parameters and lifetimes (τ_1, τ_2 and $<\tau>$) for different time resolved decay plots calculated using IBH DAS-6 software by nonlinear least square iterative method in presence of two different surfactants with their different concentrations in presence and absence of 0.005% (w/v) NaAlg.

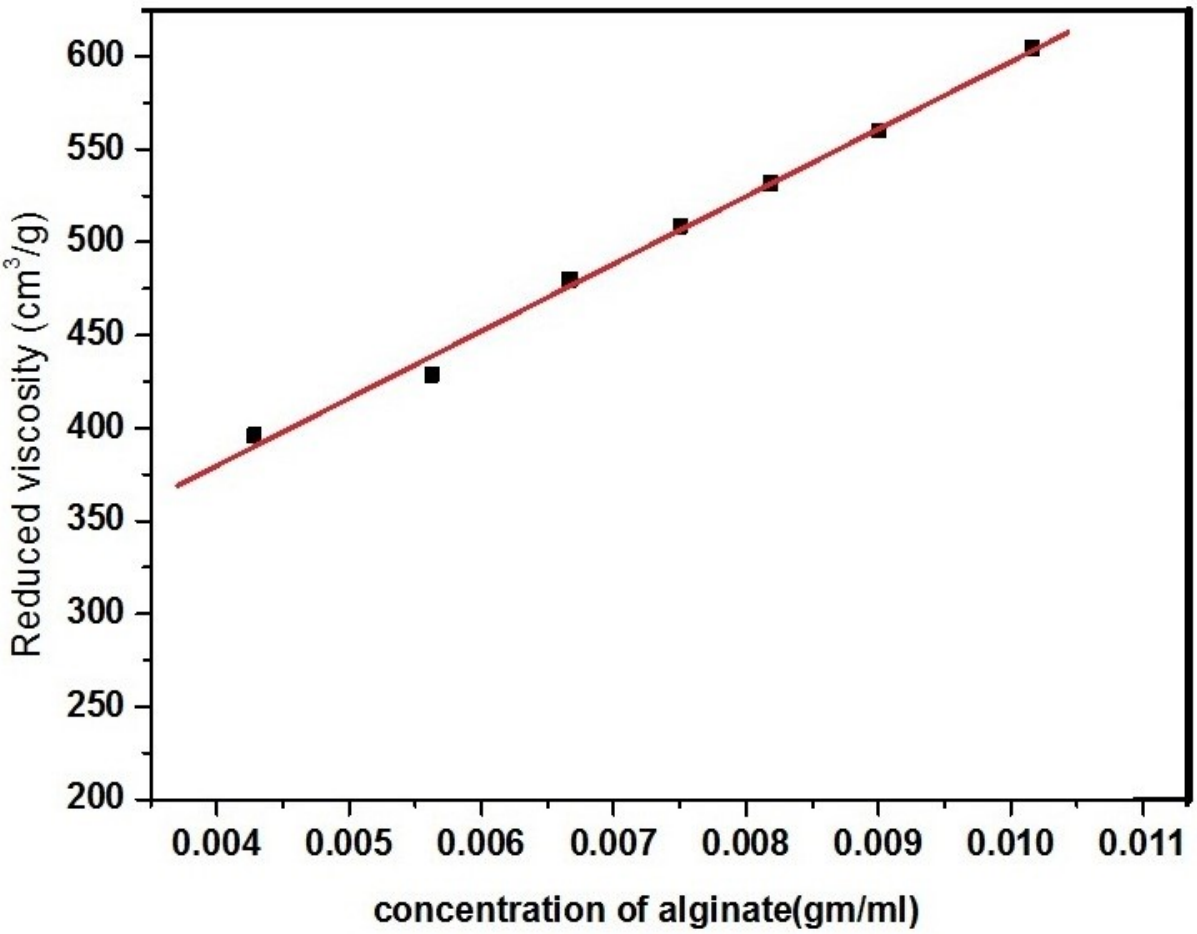
[NaAlg] = 0.005% (w/v)						
[C_{16}MImCl]/ mM	a_1	a_2	τ_1	τ_2	$<\tau>$	χ^2
0			123.5		123.5	1.05
0.012	13.5	86.5	32.57	124.8	112.3	1.06
0.036	16.9	83.0	36.07	124.8	109.8	1.01
0.073	23.1	76.9	39.14	120.6	101.8	0.99
0.121	34.4	65.6	64.38	163.9	129.6	0.99
0.211	35.2	64.8	75.76	192.3	151.3	1.01
0.318	30.4	69.6	70.39	180.6	147.1	1.13
0.469	29.7	70.3	69.44	170.9	140.7	1.08
0.668	37.6	62.3	74.51	180.5	140.6	1.03
0.943	27.9	72.0	67.64	161.9	135.5	0.95
1.310	11.1	88.9	52.62	163.8	151.5	1.06
1.756	17.1	82.9	83.42	184.7	167.4	1.06
2.939	4.38	95.6	55.35	170.4	165.4	1.03
3.690	9.17	90.8	81.80	175.3	166.7	0.99
4.510	3.18	96.8	40.71	170.3	166.2	1.02
5.353	6.96	93.0	82.24	174.1	167.7	1.02
[NaAlg] = 0.005% (w/v)						
[C_{16}TPB]/ mM	a_1	a_2	τ_1	τ_2	τ_{av}	χ^2
0			123.5		123.5	1.05
0.005	6.80	93.2	16.89	125.9	118.5	1.03
0.017	20.6	79.4	21.50	123.3	102.3	1.01
0.032	37.6	62.4	27.43	118.8	84.38	1.01
0.058	52.2	47.8	29.65	113.3	69.65	1.05
0.097	65.8	34.2	32.04	106.3	57.47	1.05
0.146	71.3	28.7	32.11	82.93	46.72	1.12
0.232	74.1	25.9	33.14	71.71	43.15	1.14

0.338	74.9	25.0	32.05	70.67	41.72	0.95
0.446	80.3	19.7	32.14	54.52	36.54	1.06
0.555	53.9	46.1	25.80	47.49	35.79	1.09
0.695	74.4	25.6	27.72	54.82	34.65	1.06
0.852	24.2	75.8	18.55	35.59	31.46	1.16
1.025	79.0	20.9	26.81	64.89	34.79	1.03
1.220	11.4	88.6	17.47	31.60	29.98	0.97
1.424	74.1	25.9	26.31	42.58	30.52	1.05
1.707	8.98	91.0	10.27	30.57	28.75	1.09
1.965	11.9	88.0	12.61	31.34	29.09	1.11
2.274	12.5	87.5	19.99	29.84	28.60	1.08

Table S2. Coefficients of A, B_1 and B_2 values derived from the fitting of $Y = A + B_1*X + B_2*X^2$ of γ vs. log [surfactant] plots given in Fig. S3.

[NaAlg] % w/v	C_{16}TPB			C_{16}MImCl		
	A	B_1	B_2	A	B_1	B_2
0	30.4	-8.67	1.16	34.8	-19.8	-3.94
0.001	41.8	7.78	5.12	37.5	-7.55	-0.004
0.005	43.2	-1.06	3.00	39.9	-16.6	-1.72
0.01	61.9	7.49	4.86	50.8	-15.6	-2.53

Fig. S1. Plot of reduced viscosity (cm^3/gm) vs. concentration of alginate (gm/ml) at 298.15 K at a fixed NaCl concentration (0.1 M) #



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Intrinsic viscosity [η] of a polyelectrolyte can be determined in salt medium using Huggins equation:

$$\frac{\eta_{sp}}{C_P} = [\eta] + k_H[\eta]^2 C_P$$

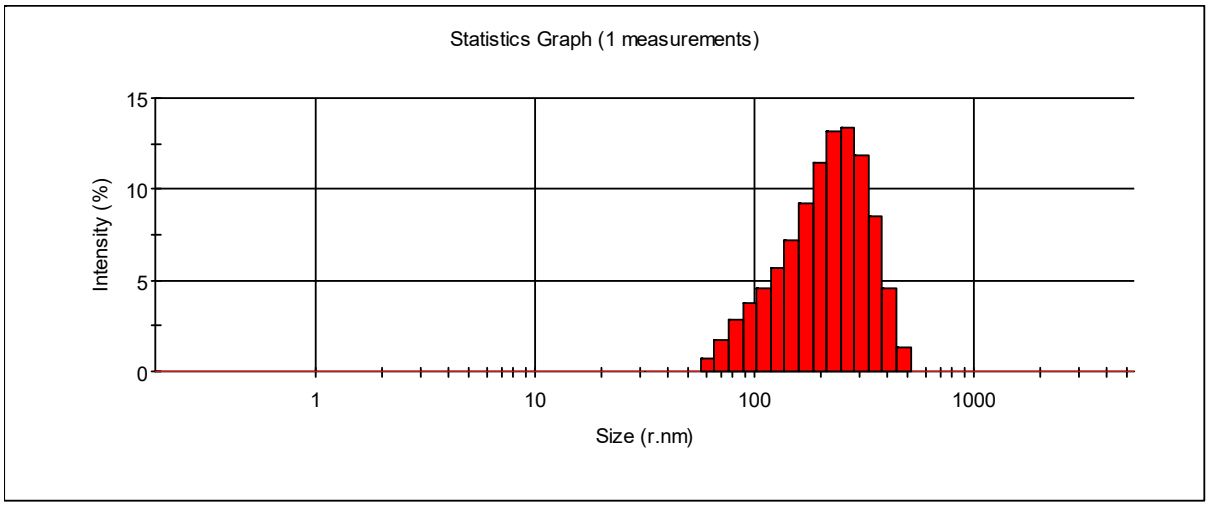
where, η_{sp} is the specific viscosity and C_P is the concentration of NaAlg (gm/ml). k_H is the Huggins constant. $\frac{\eta_{sp}}{C_P}$, termed as reduced viscosity in cm^3/g unit. A stock NaAlg solution was prepared in 0.1 M NaCl solution and progressively added to a 0.1 M NaCl solution taken in an ubbelohde viscometer fitted in a thermostatic water bath at 298.15 K and flow times were measured in triplicate after each addition of stock NaAlg. Reduced viscosity vs. concentration of alginate was plotted (shown in above). Intrinsic viscosity determined for NaAlg is 235 cm^3 /gm at 298.15 K and 0.01 M NaCl medium. Average viscometric molecular weight (M_v) of NaAlg was determined using Mark–Houwink equation:

$[\eta] = K M_v^{\alpha}$

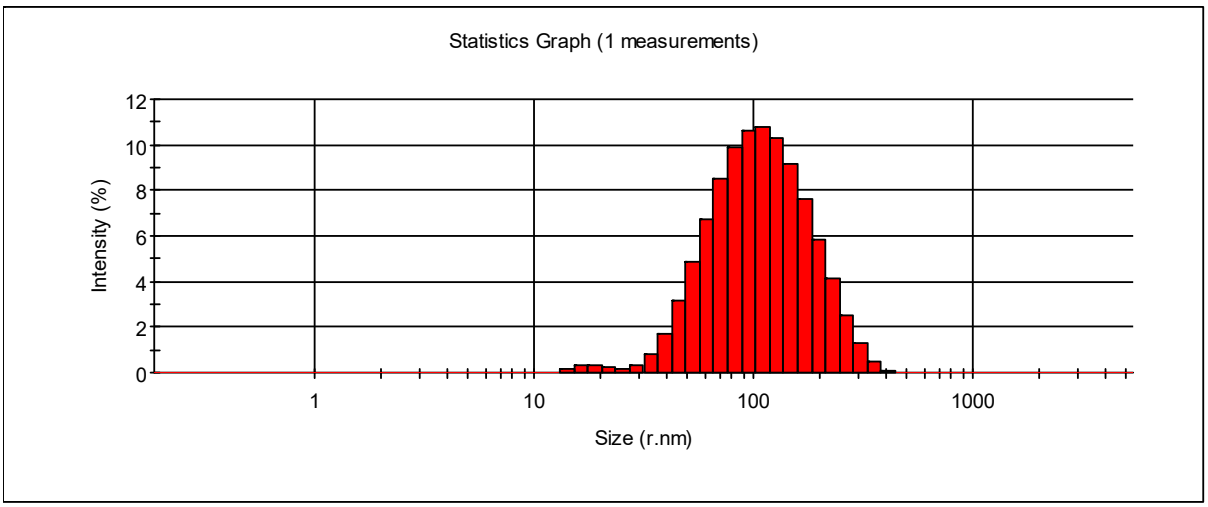
K and α are constants and characteristic of the medium, temperature and polymer. K and α values are taken from Clementi *et. al.* [41], and Masuelli M. A. *et al.* [42]. K = 0.0023 cm^3 /gm , α = 0.984.

Fig.S2. Plot of % Intensity vs. hydrodynamic diameter of pure NaAlg (0.01% w/v) and with varying the concentrations of C_{16}MImCl (A) and C_{16}TPB (B) added to it. Concentrations of surfactants have been shown at the bottom of each plot. PDI values are given within a bracket beside each figure caption.

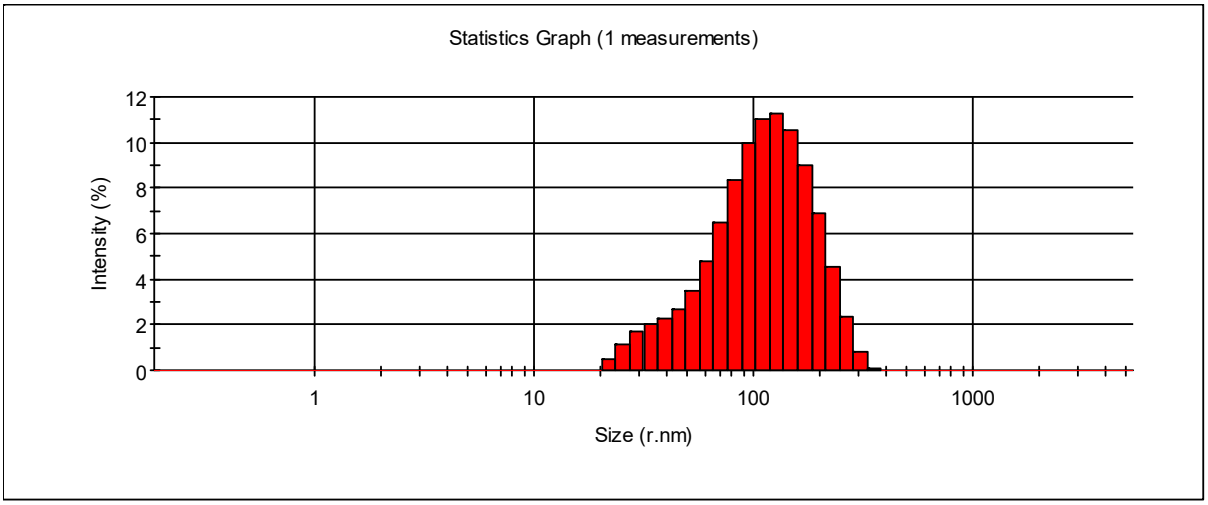
A



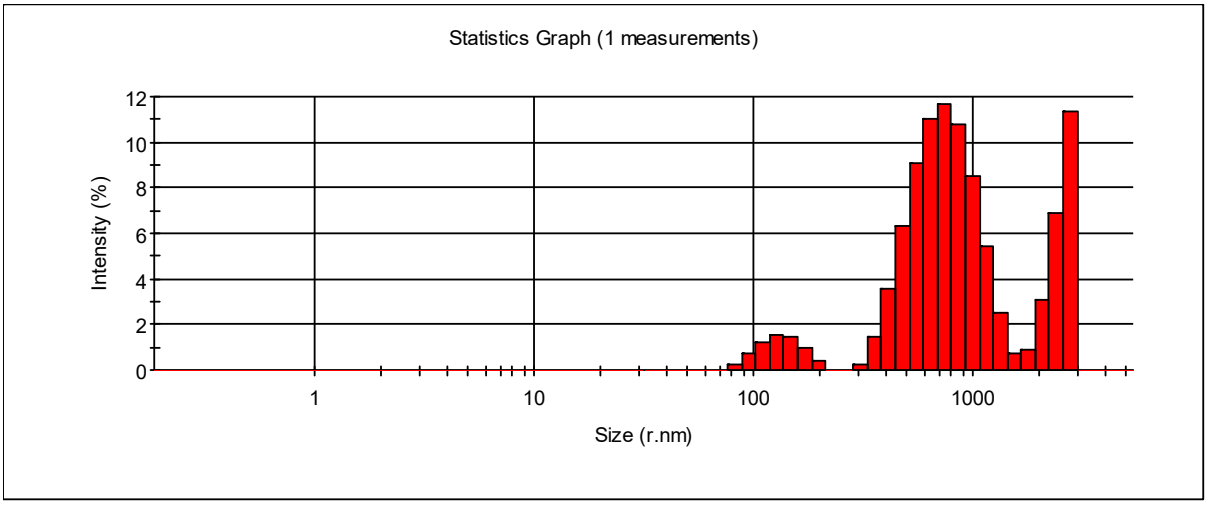
Free NaAlg 0.01% (PDI = 0.668)



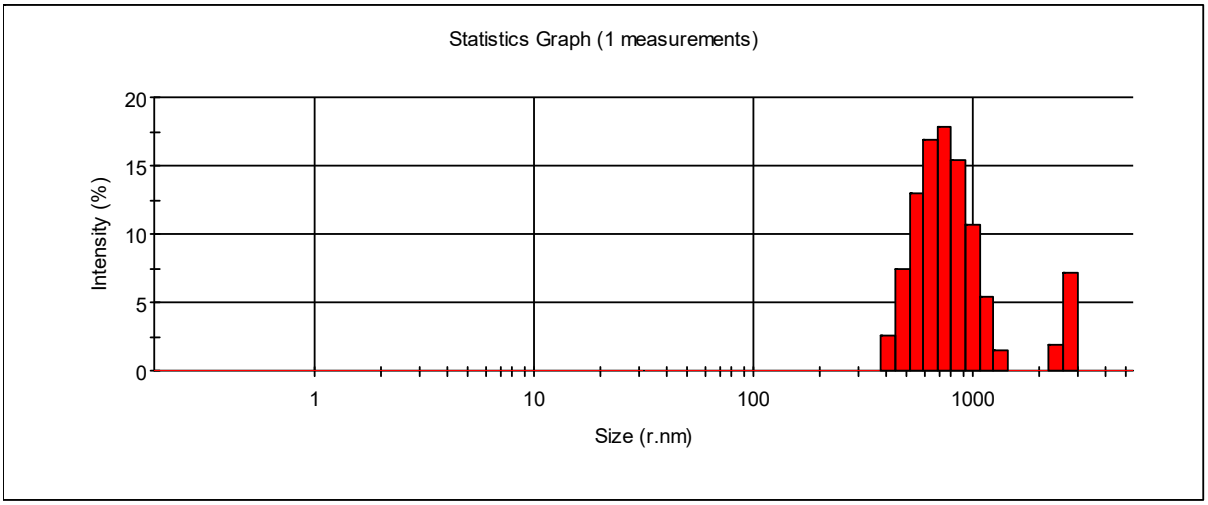
NaAlg 0.01% + 0.09 mM C_{16}MImCl (PDI = 0.218)



NaAlg 0.01% + 0.30 mM C_{16}MImCl (PDI = 0.221)

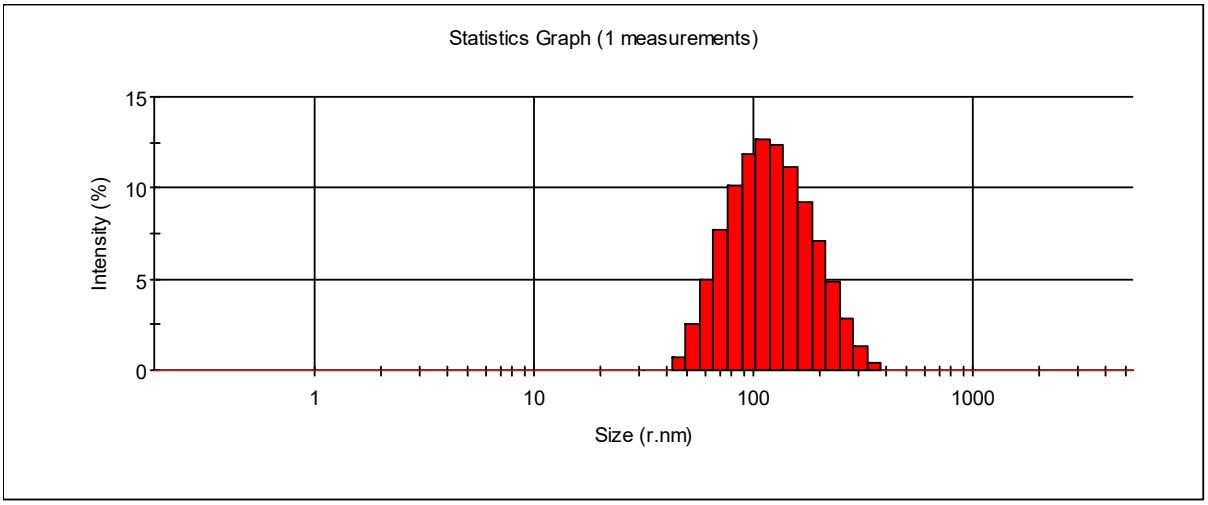


NaAlg 0.01% + 1.42 mM C_{16}MImCl (PDI = 0.470)

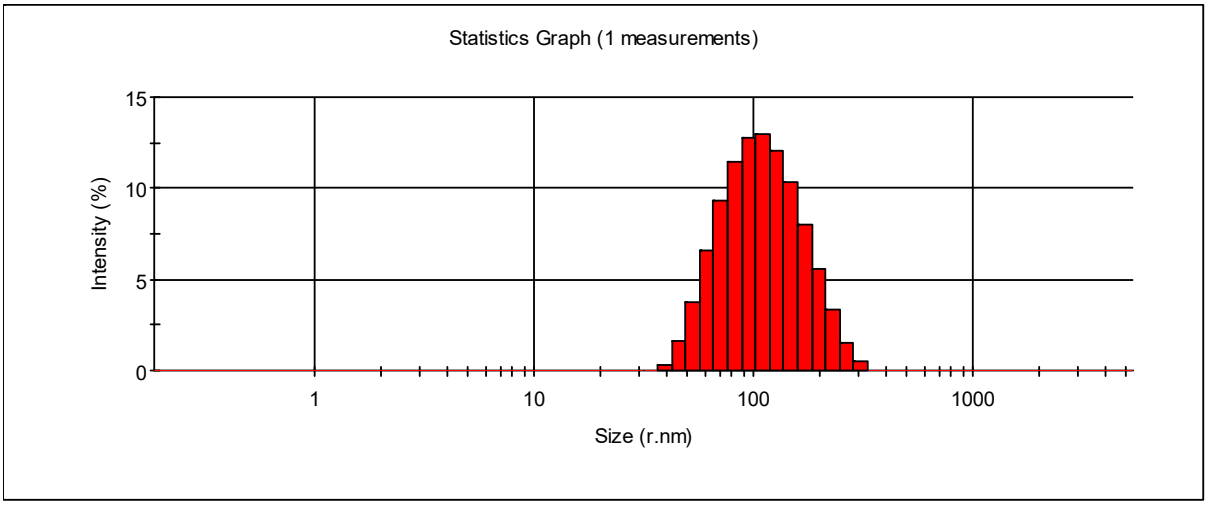


NaAlg 0.01% + 3.32 mM C_{16}MImCl (0.490)

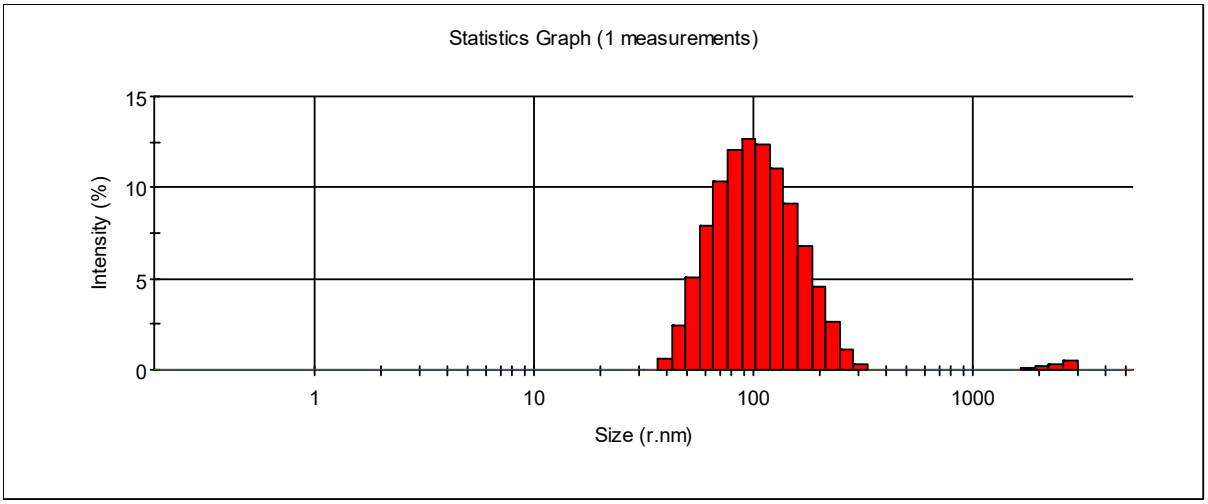
B



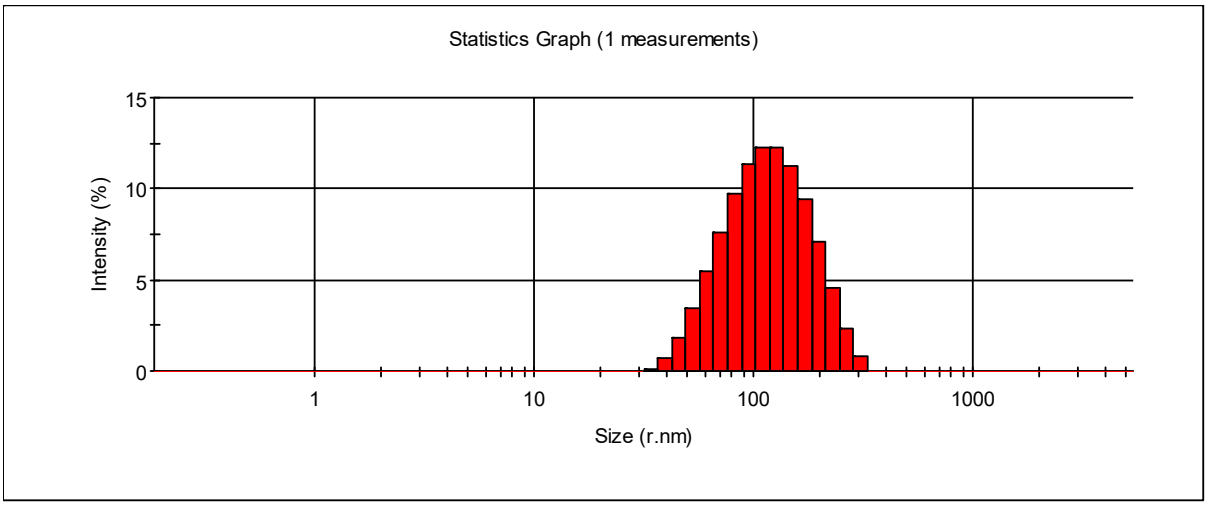
NaAlg 0.01% + 0.05 mM C_{16}TPB (PDI = 0.184)



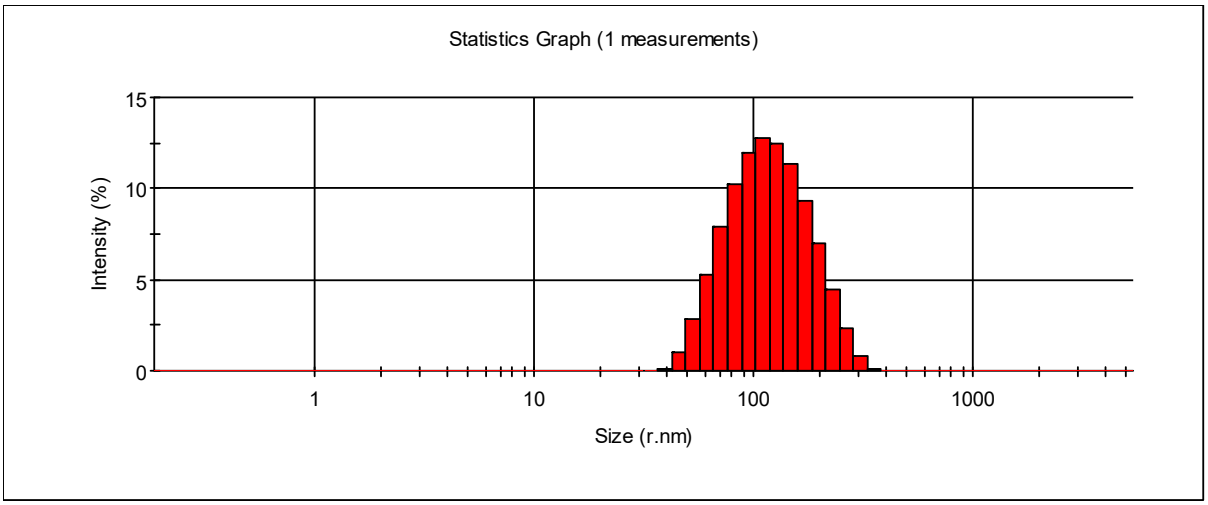
NaAlg 0.01% + 0.18 mM C_{16}TPB (PDI = 0.186)



NaAlg 0.01% + 0.89 mM C16TPB (PDI = 0.197)



NaAlg 0.01% + 1.95 mM C16TPB (PDI = 0.150)



NaAlg 0.01% + 2.33 mM C16TPB (PDI = 0.181)

Fig. S3. γ with corresponding log[surfactant] values up to cmc /C_m* and fitted them with second order polynomials [a: free C_{16}MImCl, b: free C_{16}TPB, c: C_{16}MImCl + 0.001% (w/v) NaAlg, d: C_{16}MImCl + 0.005% (w/v) NaAlg, e: C_{16}MImCl + 0.01% (w/v) NaAlg, f: C_{16}TPB + 0.001% (w/v) NaAlg, g: C_{16}TPB + 0.005% (w/v) NaAlg, h: C_{16}TPB + 0.01% (w/v) NaAlg]

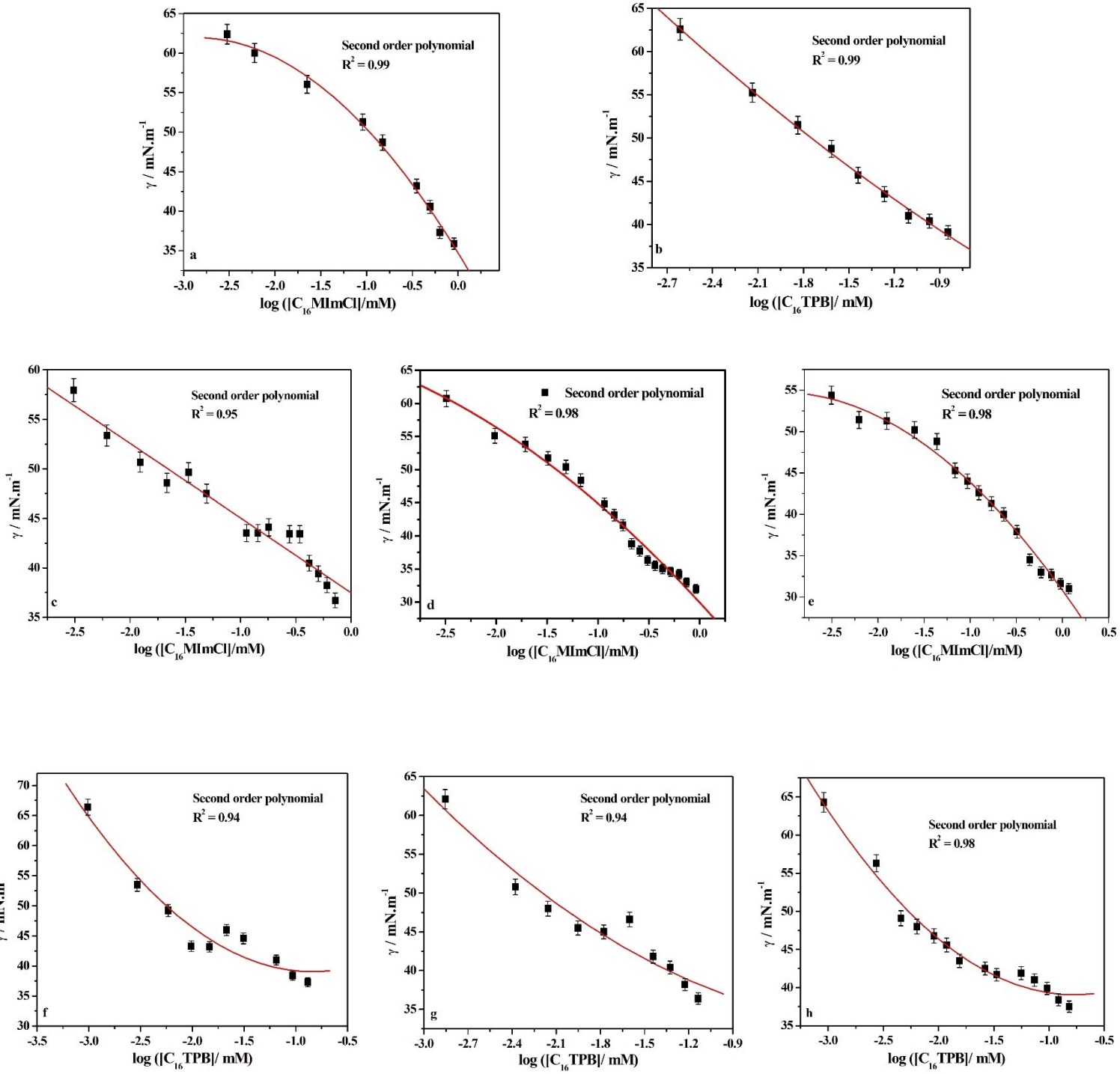


Fig. S4. ln (I_0/I) vs. [CPC] in presence of two different surfactants in presence and absence of NaAlg with varying wt %. Surfactant concentrations have been fixed to ~ 10 mM for each system showing in the legend.