Supporting Information for

Physicochemical Studies of Pyridinium Gemini Surfactants with Promethazine Hydrochloride in Aqueous Solution

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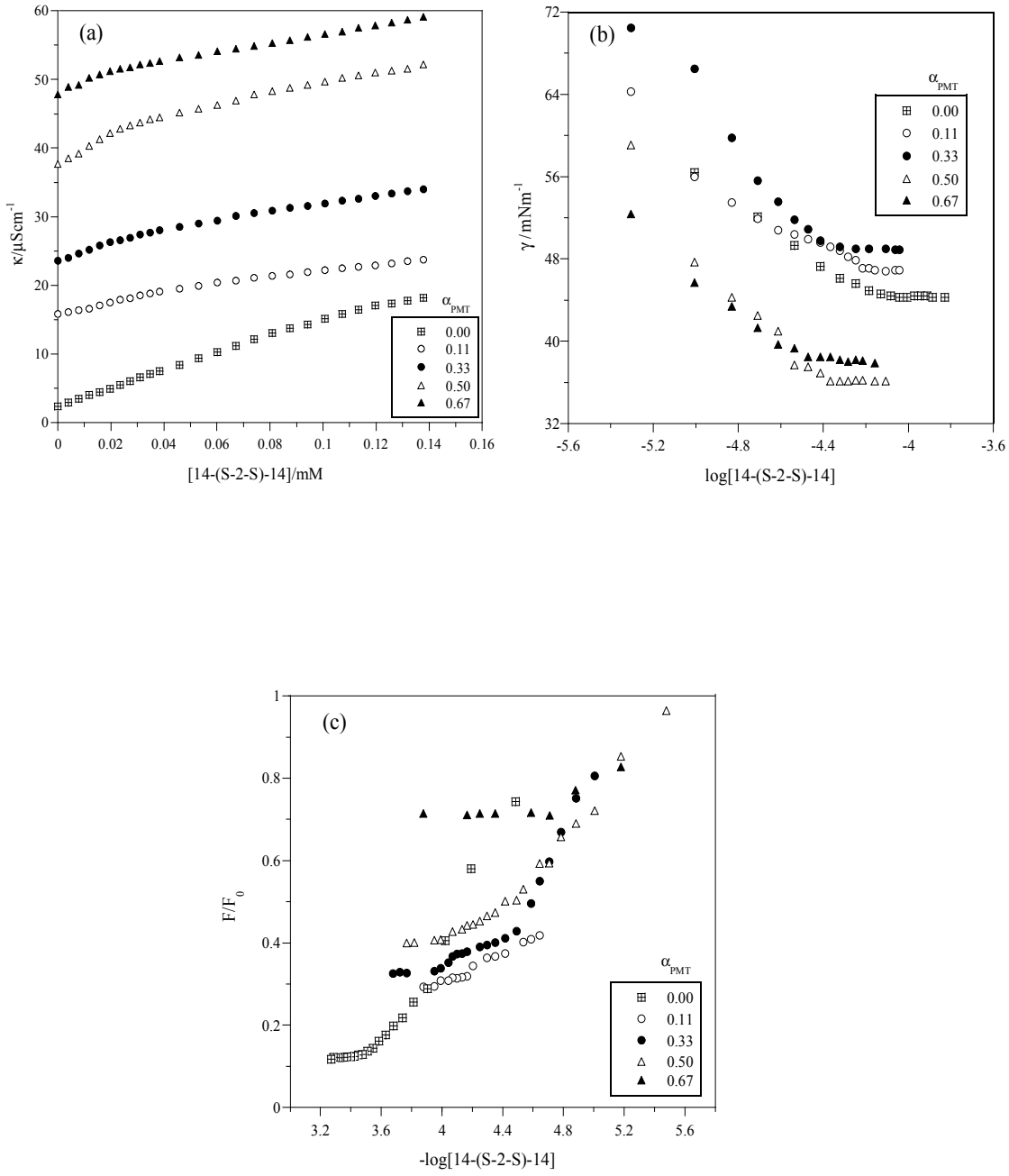

Fig. S1. Plots for cmc determination of [14-(S-2-S)-14]-PMT mixed system by (a) conductivity, (b) surface tension and (c) fluorescence techniques. In (a), the scale shown is for pure [14-(S-2-S)-14]. Other curves have been shifted downwards by 1, 2, 6 and 12 scale units, respectively. In (c), the curve for α_{PMT} = 0.50 has been shifted upward by 0.5 scale units.

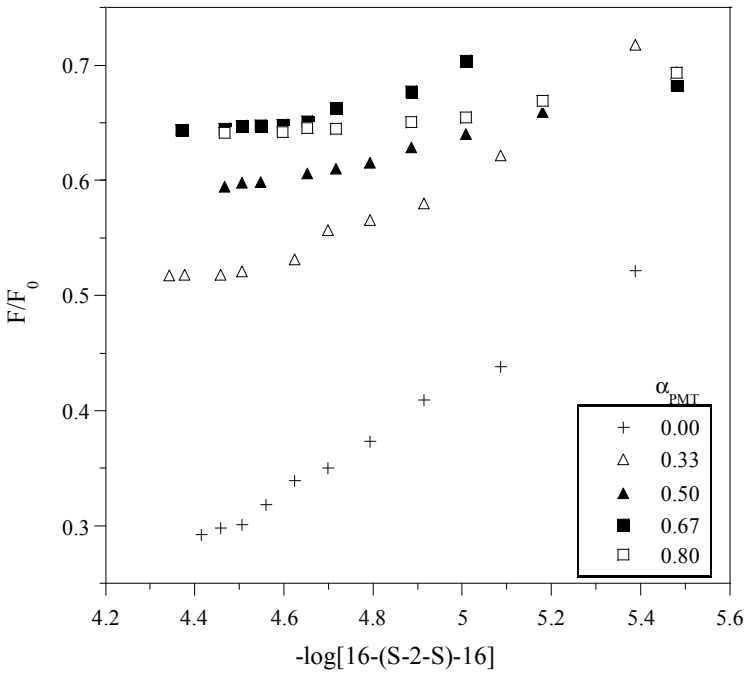

Fig. S2. Fluorescence plot for cmc determination of [16-(S-2-S)-16]-PMT mixed system. The scale shown is for pure [16-(S-2-S)-16]. Other curves have been shifted downwards by 1, 1.5, 2 and 2.5 scale units, respectively.

Table S1. Chemical shifts and observations determined by ^{1}H NMR Titrations of Promethazine Hydrochloride (PMT) with increasing equivalents of Pyridinium Gemini surfactants

Entry	NMR Titration Experiments	^{1}H NMR chemical shift range in δ (ppm) for aromatic protons of PMT	Observations after addition of surfactant solution	^{1}H NMR chemical shift in δ (ppm) of pyridinium protons	Observations with increasing concentration of surfactant solution
1	PMT	6.75-6.88 (m, Hd & Hc) 7.00-7.11(m, Hb & Ha)			
2a	1 equivalent PMT + 0.25 equivalent of [12-(S-2-S)-12]	6.83-6.88 (t, Hc) 6.95-6.98 (d, Hd) 7.00-7.03 (d, Ha) 7.13-7.18 (t, Hb)	i) Deshielding observed for Hd and Hb protons. ii) Hc and Hb protons appeared as distinct distorted triplet. iii) Ha and Hd protons appeared as distinct distorted doublet.	7.85 (br. s, Hy) 8.42 (br. s, Hz) 8.70 (br. s, Hx)	i) All protons of pyridinium ring observed as broad singlet.
2b	1 equivalent PMT + 0.50 equivalent of [12-(S-2-S)-12]	6.78-6.83 (t, Hc) 6.92-6.96 (d, Ha & Hd) 7.13-7.18 (t, Hb)	i) Shielding observed for Hc proton. ii) Deshielding effect of Hd proton and shielding effect of Ha proton results in formation of overlapped distorted doublet.	7.87 (br. s, Hy) 8.40 (br. s, Hz) 8.72 (br. s, Hx)	i) Shielding effect for Hz proton. ii) Deshielding observed for Hy & Hx protons.
2c	1 equivalent PMT + 1.00 equivalent of [12-(S-2-S)-12]	6.81-6.86 (t, Hc) 6.93-6.97 (d, Hd) 7.06-7.09 (d, Ha) 7.18-7.23 (t, Hb)	i) Deshielding observed for all protons. ii) Disappearance of overlapped signal of Ha & Hd protons and formation of two independent distorted doublet.	7.96 (br. m, Hy) 8.48 (br. m. Hz) 8.83 (br. m, Hx)	i) Deshielding observed for all protons.
2d	1 equivalent PMT + 1.5 equivalent of [12-(S-2-S)-12]	6.81-6.86 (t, Hc) 6.93-6.96 (d, Hd) 7.11-7.13 (d, Ha) 7.20-7.25 (t, Hb)	i) Deshielding observed for protons Ha and Hb.	7.97 (br. m, Hy) 8.50 (br. m, Hz) 8.86 (br. m, Hx)	i) Deshielding observed for all protons.
3a	1 equivalent PMT + 0.25 equivalent of [14-(S-2-S)-14]	6.85-6.93 (m, Hd & Hc) 7.03-7.06 (d, Ha) 7.13-7.18 (t, Hb)	i) Shielding observed for Hd & Hc. ii) Ha and Hb appeared as doublet and distorted triplet respectively with significant downfield chemical shift.	7.90 (br. s, Hy) 8.43 (br. s, Hz) 8.71 (br. s, Hx)	i) All protons of pyridinium ring observed as broad singlet.
3b	1 equivalent PMT + 0.50 equivalent of [14-(S-2-S)-14]	6.85-6.90 (t, Hc) 6.98-7.05 (br. m, Ha & Hd) 7.16-7.21 (t, Hb)	i) Hc appeared as distinct distorted triplet with upfeild chemical shift. ii) Deshielding observed for Hd proton, while shielding observed for Ha proton. iii) Deshielding observed for Hb proton.	7.94 (br. s, Hy) 8.47 (br. s, Hz) 8.80 (br. s, Hx)	i) Downfield chemical shift for all protons.
3c	1 equivalent PMT + 1.00 equivalent of [14-(S-2-S)-14]	6.83 (br. m, Hc) 6.96 (br. m, Hd) 7.05-7.07 (br. m, Ha) 7.16-7.19 (br. m, Hb)	i) All signal appeared as individual broad multiplet. ii) Shielding effect observed for all protons shift except Ha which shows downfield chemical shift.	7.95 (br. s, Hy) 8.47 (br. s, Hz) 8.84 (br. s, Hx)	i) Deshielding observed for Hx and Hy protons.
3d	1 equivalent PMT + 1.50 equivalent of [14-(S-2-S)-14]	6.82 (br. s, Hc) 6.95 (br. s, Hd) 7.08 (br. s, Ha) 7.16 (br. s, Hb)	i) All signal appeared as individual broad singlet. ii) No significant chemical shift apart from proton Ha which show downfield chemical shift.	7.94 (br. s, Hy) 8.45 (br. s, Hz) 8.86 (br. s, Hx)	i) Deshielding observed for Hx protons.
4a	1 equivalent PMT + 0.25 equivalent of [16-(S-2-S)-16]	6.86-6.94 (br. m, Hd & Hc) 7.03 (m, Ha) 7.18 (m, Hb)	i) Deshielding observed for all protons. ii) Ha and Hb appeared as distinct multiplet.	7.93 (br. s, Hy) 8.47 (br. s, Hz) 8.78 (br. s, Hx)	i) All protons of pyridinium ring observed as broad singlet.
4b	1 equivalent PMT + 0.50 equivalent of [16-(S-2-S)-16]	6.88 (m, Hc) 6.98 (m, Hd) 7.05 (m, Ha) 7.18 (m, Hb)	i) Hc and Hd appeared as distinct multiplet.	7.94 (br. s, Hy) 8.47 (br. s, Hz) 8.83 (br. s, Hx)	i) Deshielding observed for Hx proton.
4c	1 equivalent PMT + 1.00 equivalent of [16-(S-2-S)-16]	6.82 (br. s, Hc) 6.95 (br. s, Hd) 7.07 (br. s, Ha) 7.17 (br. s, Hb)	i) Peak broadening as all signal appeared as broad singlet. ii) Shielding effect observed for Hc & Hd protons.	7.95 (br. s, Hy) 8.47 (br. s, Hz) 8.88 (br. s, Hx)	i) Deshielding observed for Hx proton.
4d	1 equivalent PMT + 1.50 equivalent of [16-(S-2-S)-16]	6.83 (br. s, Hc) 6.94 (br. s, Hd) 7.08 (br. s, Ha) 7.18 (br. s, Hb)	i) No significant change.	7.94 (br. s, Hy) 8.46 (br. s, Hz) 8.90 (br. s, Hx)	i) Deshielding observed for Hx proton.

Note: Distorted triplet and distorted doublet were observed in all cases making the determination of *J* value difficult.