Electronic Supplementary Material (ESI) for Soft Matter.

Micellization and Related Behavior of Sodium Dodecylsulfate in Mixed Binary Solvent Media of Tetrahydrofuran (Tf) and Formamide (Fa) with Water: A Detailed Physicochemical Investigation

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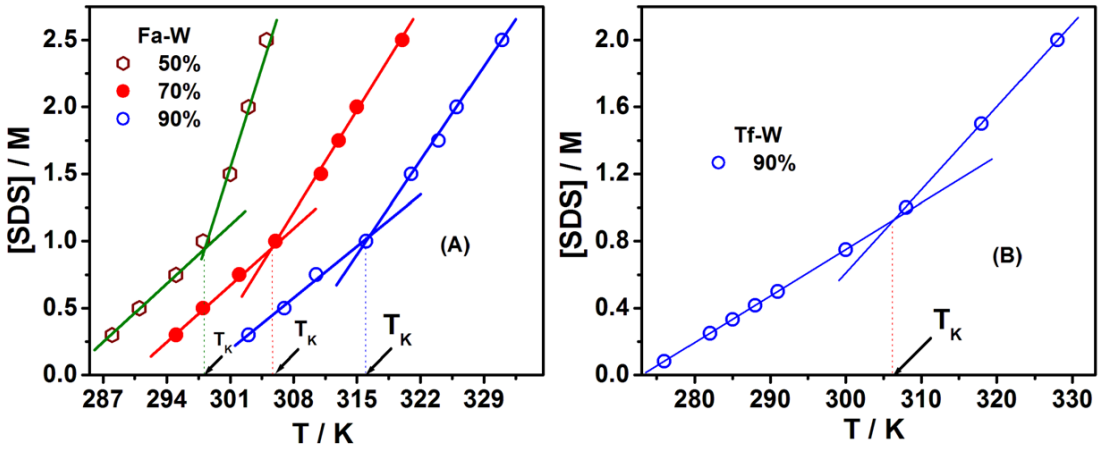

Figure S1: Temperature solubility diagram of SDS in (A) Fa-W and (B) Tf-W medium.

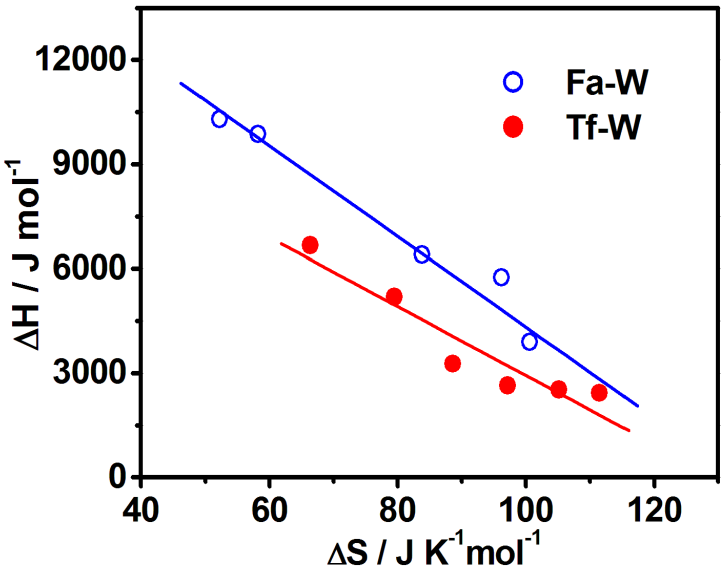

Figure S2: Enthalpy-entropy compensation plots for the micellization of SDS in Tf-W and Fa-W mixed media. The plots are least squared.

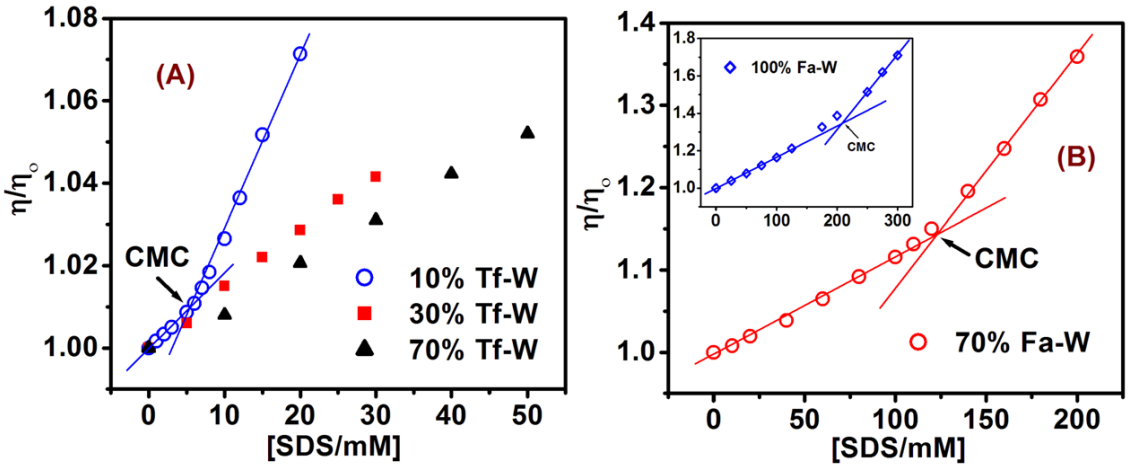

Figure S3: Relative viscosity of SDS solution in Tf-W and Fa-W mixed solvent media at 303 K., **(A):** 10, 30 and 70 vol% of Tf and **(B):** 70 v% of Fa in main plot, **(Inset):** 100 v% Fa.

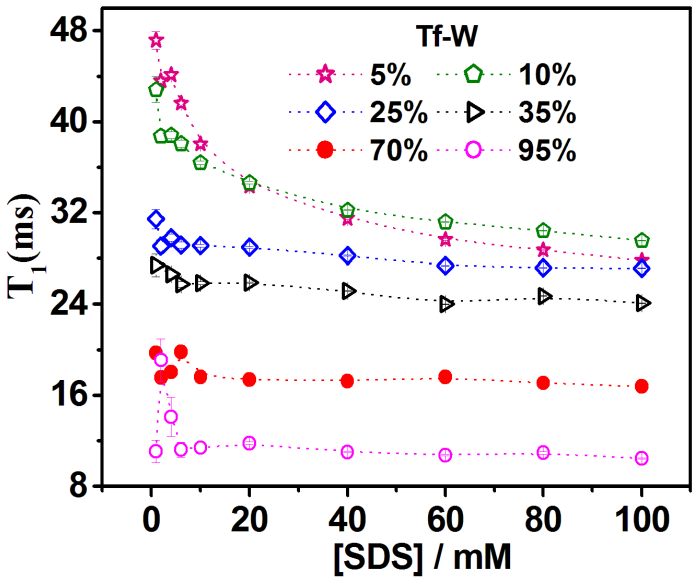

Figure S4: ^{23}Na relaxation (T_1) vs [SDS] in differentTf-D_2O (5, 10, 25, 35, 70 and 95 v%) mixed systems.

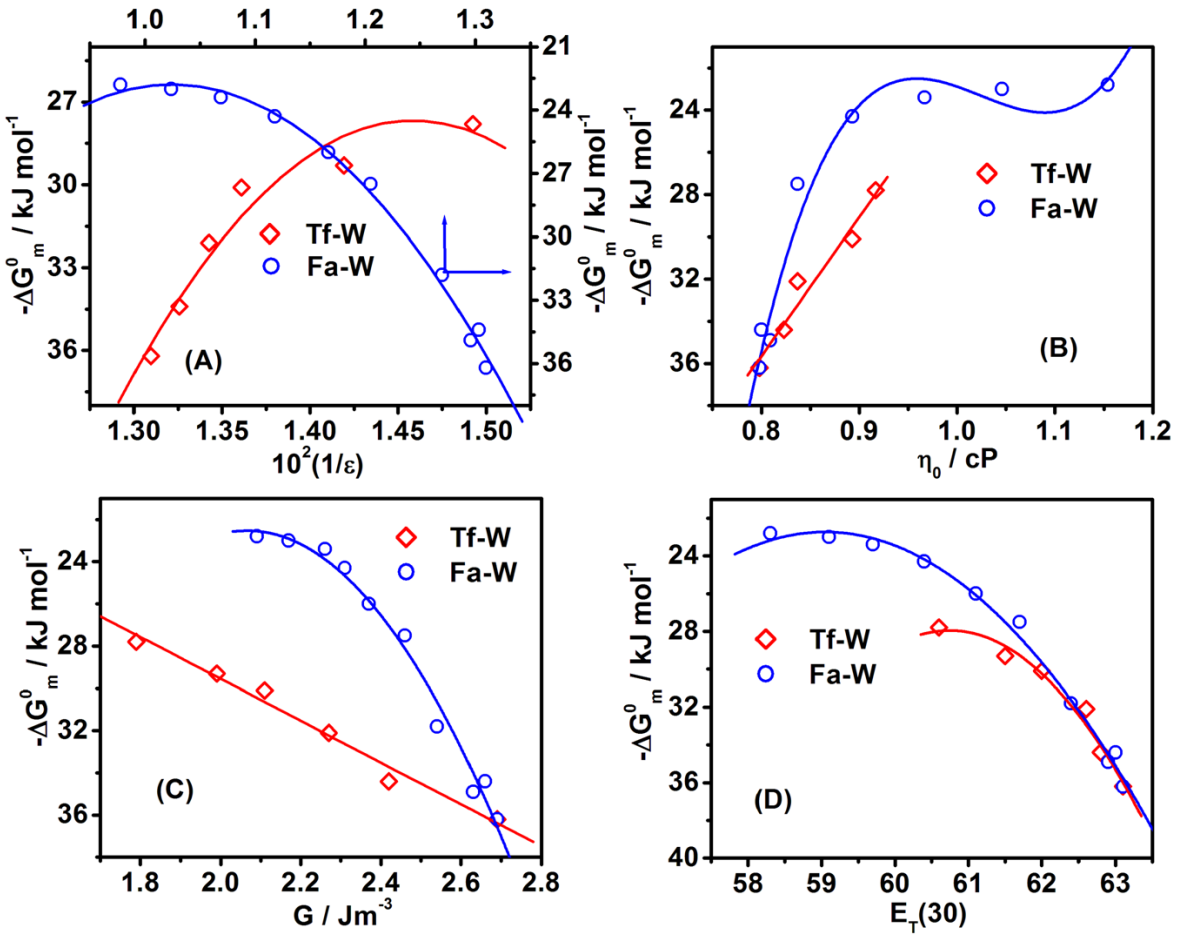

Figure S5: Free energy of micellization (ΔG^0_m) vs solvent parameters in different Tf-W and Fa-W mixed solvent media at 303 K. **(A):** Dependence on 1/ε; **(B):** Dependence on η_o; **(C):** Dependence on G; **(D):** Dependence on $E_T(30)$.

Text S1: All the thermodynamic calculations were done in the rational scale. The rational activity coefficient, $f_{\pm}^{'}$ for electrolyte in mixed solvent is defined by the following relation;

$$\ln f_{\pm}^{'} = \ln f_{\pm} + \frac{\mathrm{n}}{\nu}\ln a_{\mathrm{W}} + \ln\frac{\mathrm{S}+\mathrm{T}+\nu-\mathrm{n}}{\mathrm{S}+\mathrm{T}+\nu}$$

Where, $n =$ Solvation number, here taken as 6 for SDS molecule

$\nu =$ Number of ionic species formed in solution, here $\nu = 2$

$a_{\mathrm{W}} =$ Mole fraction of water of the mixed solvent

$\mathrm{S} =$ Mole of water, and $\mathrm{T} =$ Mole of the other liquid

The required $\ln f_{\pm}$ has been obtained from the Debye-Hückel equation modified by Guggenheim: $\left(\log f_{\pm} = -\frac{A|Z_{+}Z_{-}|\sqrt{I}}{1+\sqrt{I}} + bI\right)$, where $A = \left(1.8246\times10^{6}\right)/\left(\varepsilon T\right)^{3/2}$ $\mathrm{mol}^{-1/2}\mathrm{L}^{1/2}\mathrm{K}^{3/2}$, Z_{+} and Z_{-} are the ionic charges of Na^{+} and DS^{-}, respectively, I is the ionic strength of the solution and b is an adjustable parameters taken as $0.1|Z_{+}Z_{-}|$ according to Davies.

(Reference: Robinson, R. A. and Stokes, R. H. *Electrolyte Solutions,* Butterworths Scientific Publications: London, 1955. pp – 229-230; 251-252)

Table S1: Various physicochemical parameters of the mixed solvents (Tf-W and Fa-W) media at 303 K.[a]

Solvent composition (V %)	Dielectric constant[a] (ε)		Reichardt's parameter (E_T30 / kcal mol^{-1})		Gordon parameter[b] (G / Jm^{-3})		Viscosity (η_o / cp)	
	W / Tf	W / Fa	W / Tf	W / Fa	W / Tf	W / Fa	W / Tf	W / Fa
0	76.36	76.36	63.1	63.1	2.69	2.69	0.798	0.798
1	75.43	76.74	62.8	63.0	2.42	2.66	0.823	0.800
2	74.48	-	62.6	-	2.27	-	0.837	-
3	-	77.17	-	62.9	-	2.63	-	0.809
4	73.47	-	62.0	-	2.09	-	0.893	-
5	-	77.59	-	62.7	-	2.59	-	0.818
6	70.46	-	61.5	-	1.99	-	0.917	-
10	67.01	78.74	60.6	62.4	1.79	2.54	1.002	0.837
15	63.56	-	-	-	1.65	-	-	-
20	59.39	82.98	58.1	61.7	1.47	2.46	1.220	0.893
30	55.09	85.73	55.7	61.1	1.25	2.37	1.383	0.967
40	47.84	89.44	53.1	60.4	1.18	-	1.474	1.046
50	39.08	93.57	51.1	59.7	1.05	2.26	1.524	1.154
60	30.62	97.69	-	59.1	0.98	2.17	1.339	1.291
70	23.63	102.28	45.7	58.3	0.91	2.09	1.144	1.473
80	17.67	105.16	-	57.5	0.85	1.98	0.885	1.739
90	9.84	-	40.1	56.6	0.79	-	0.649	2.147
100	7.27	107.97	37.4	55.4	0.67	1.71	0.454	2.846

[a,] Dielectric constant values of solvent mixtures are obtained from literature.[12]

[b,]The Gordon parameter was calculated from the relation $G = \gamma/\overline{V}_m^{1/3}$ ($\overline{V}_m$ is the molar volume of the mixed solvents). $\overline{V}_m = \sum X_i V_{m,i}$, where X_i and $V_{m,i}$ represent mole fraction and molar volume of i th solvent, respectively.