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Letter

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Comment on "Thermodynamics of Sodium Dodecyl Sulfate (SDS) Micellization: An Undergraduate Laboratory Experiment"

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ABSTRACT: A correction is made for the calculation equation of aggregation numbers of SDS at various temperatures proposed by Marcolongo and Mirenda in their paper "Thermodynamics of Sodium Dodecyl Sulfate (SDS) Micellization: An Undergraduate Laboratory Experiment".

KEYWORDS: *Upper-Division Undergraduate, Physical Chemistry, Laboratory Instruction, Hands-On Learning/Manipulatives, Aqueous Solution Chemistry, Conductivity, Micelles, Organosulfur Compounds, Thermodynamics*

An interesting laboratory experiment, "Thermodynamics of Sodium Dodecyl Sulfate (SDS) Micellization: An Undergraduate Laboratory Experiment", was presented by Marcolongo and Mirenda in this *Journal*.[1] The authors described a detailed process of thermodynamic treatment for SDS micellization, which was proved to be practical and feasible. In order to evaluate the degree of micelle ionization, α, a quadratic equation was used as follows:

$$n^{2/3}(p_1 - \lambda^{Na^+})\alpha^2 + \lambda^{Na^+}\alpha - p_2 = 0 \quad (1)$$

in which the aggregation number of SDS, n, must be obtained first. In the written directions for students included in the Supporting Information, the authors proposed an algebraic dependence between temperature T and aggregation number n:

$$T/°C = -0.28n - 5.3 \times 10^5 n^{-7/3} + 7.5 \quad (2)$$

However, this equation could not give the values of n = 72 (T = 284 K), 69 (T = 288 K), 65 (T = 293 K), 62 (T = 298 K), 59 (T = 303 K), 56 (T = 308 K), 54 (T = 313 K), 50 (T = 323 K), and 47 (T = 333 K) reported in their paper. In the range of n from 45 to 75, the values of T calculated by eq 2 were all lower than 0 °C (273 K).

The general formula of eq 2 was given by Bezzobotnov et al.[2] as

$$T = An - Bn^{-7/3} + C \quad (3)$$

With a suitable least-squares fitting procedure for the experimental points the values of A, B, and C can be determined. But Bezzobotnov et al. did not give the definite fitting parameters for SDS. Marcolongo et al. obtained eq 2 from experimental data reported by Benrraou et al.,[3] in which the aggregation numbers of SDS, n, were determined as 74 (10 °C), 62 (25 °C), and 54 (40 °C), respectively. With these data I recalculated the fitting parameters of eq 3 and got a different formula as follows:

$$T/°C = -0.34n + 4.91 \times 10^5 n^{-7/3} + 13.8 \quad (4)$$

The aggregation number of SDS at various temperatures can be easily determined graphically (Figure 1). The values of n calculated with eq 4, presented in Figure 1, are in good agreement with those obtained by Marcolongo et al. It is clear

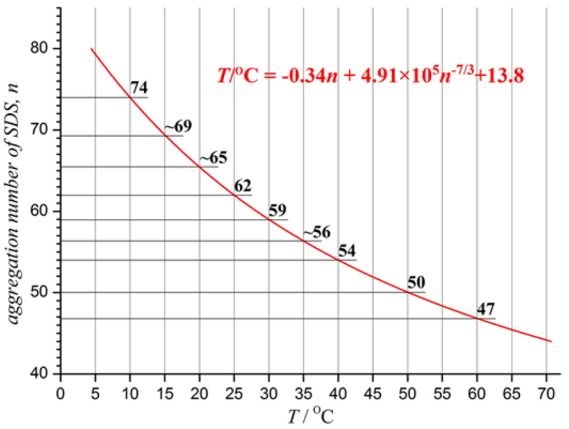

Figure 1. Graphic determination of n with eq 4.

that there is a typing mistake in the sign of the second term of eq 2 in the original version of the paper. Once this sign is corrected, the slight difference in the fitting parameters could be ascribed to different algorithms used for the analysis. Except for this small flaw, the design of the experiment for thermodynamics of micellization by the authors is perfect.

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Notes

The authors declare no competing financial interest.

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