Micelle Formation in Myristyltrimethyl Ammonium Bromide at Different Solvent Composition of Ethanol Water Mixed Solvent Media.

***Prem Kumar Shrestha*[1]*, Jaya Narayan Mitruka*[2] *and Subash Kumar Chapagain*[2*]**

[1]*Padma Kanya Multiple Campus, Tribhuvan University, Kathmandu*

[2]*Mechi Multiple Campus, Bhadratpur, Nepal*

Email: subaschapagain@gmail.com

Abstract

pH Changes as a function of concentration for myristyltrimethyl ammonium bromide in pure water and ethanol-mixed solvent media containing 0.1 and 0.2 volume fraction of ethanol at room temperature were observed by the addition of 1 N HC1 and 1 N KOH.The critical micelle concentration (CMC) for the myristyltrimethy1 ammonium bromide /HCI/KOH system increases when the amount of ethanol increases In water.

Keywords: *Myristyltrimethyl ammonium bromide (MTABr), HCl, KOH, ethanol, water digital pH meter.*

Introduction

In chemistry, surfactant is a species that accoumulates at the interface of two phases or substances and modifies the properties of the surface. Many surfactants play an important role in the field of science and technology due to their unique properties[1,2]. In an aqueous medium, both pure and mixed surfactants form micelles after reaching a concentration called the critical micelle concentration (CMC), whose determination has considerable practical importance normally to understand the self-organizing behaviors of surfactants in exact and detailed ways. Many studies have been devoted to the elucidation of micelle structures under different conditions[2-4]. There are so many articles for CMC calculation from conductivity measurements. But there is less work on pH of surfactant for CMC calculation. Hence, this research work will be very relevance in the field of research[5,6]. pH change with mixed-solvent composition may thus reflect the change in solvent structure and ion-solvent interactions[7]. A binary mixture of water and ethanol with ratio varying in a wide range, is the most frequently investigated medium.

Experimental Methods

The effect of pH on Myristyltrimethyl ammonium bromide concentration was determined at room temperature with a digital pH meter at different solvent composition of ethanol-water mixed solvent media. First, 7 mM myristyltrimethyl ammonium bromide solution was prepared, separately, and then each stock solution was diluted with water from 7 to 1 mM . For the Myristyltrimethyl ammonium bromide /HCl systems, a solution of 7ml of 7mM myristyltrimethyl ammonium bromide and 0.05 mL of 1 N HC1 and 0.5 ml of 1 N KOH was subjected to pH measurement at room temperature to prevent hydrolysis. For the Myristyltrimethyl ammonium bromide / KOH systems, a solution of 7mL of 7 mM myristyltrimethyl ammonium brodide and 0.05 mL of 1 N KOH and 0.5 ml of 1 N HCl was subjected to

[*] *Corresponding author*

pH measurement at room temperature to prevent hydrolysis and at different solvent composition of ethanol water mixed solvent media.

Results and Discussion

The plot of pH as a function of surfactant concentration of the Myristyltrimethyl ammonium bromide/HCl system in water and in two different ethanol-water mixtures (containing 0.10 and 0.20 volume fraction of ethanol) at room temperature are depicted in figs 2,3 and 4. The variation of pH as a function of surfactant concentration of the Myristyltrimethyl ammonium brodide/HCl system in water is determined, it is found that the increase of the concentration of the surfactant, the pH values also increases and then decreases; the breaking point is known as critical micelle concentration (CMC) and found to be 4.52mM. The similar trends has been observed in the variation of pH as a function of surfactant concentration of the Myristyltrimethyl ammonium brodide/HCl system in 0.10 to 0.20 volume fraction of ethanol in water, the CMC is found to be 4.7 mM and 4.80mM respectively.

The plot of pH as a function of surfactant concentrationof the Myristyltrimethyl ammonium brodide/KOH system in water and in two different ethanol-water mixtures (containing 0.10 to 0.20 volume fraction of ethanol) at room temperature are depicted in Figs 5, 6 and 7. The variation of pH as a function of surfactant concentrationof the Myristyltrimethyl ammonium bromide/KOH system in water is determined and it is found that the increase of the concentration of the surfactant, the pH values also increases and then decreases and increases, the breaking point is known as critical micelle concentration (CMC) and found to be 4.39mM. The similar trends has been observed in the variation of pH as a function of surfactant concentration of the Myristyltrimethyl ammonium bromide/KOH system in 0.10 to 0.20 volume fraction of ethanol in water, the CMC is found to be 4.65mM and 4.80mM respectively.

From these figures (1-6), it is evident that CMC increases with decreasing dielectric constant of ethanol water mixed solvent media (Table 1). Our CMC data for pure water of Myristyltrimethyl ammonium bromide match with the literature[6].

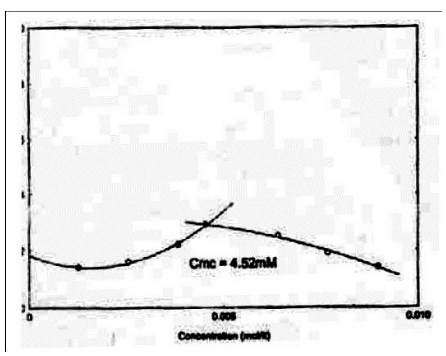

Figure 1: *Variationof pH as a function of surfactant concentration of the Myristyltrimethyl ammonium bromide/HCl system in water.*

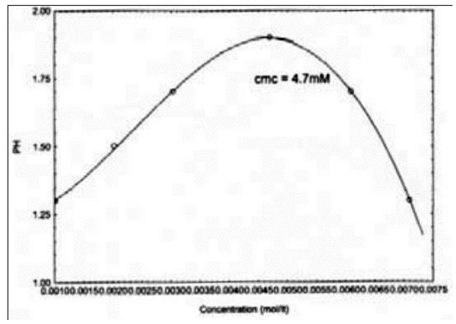

Figure 2: *Variation of pH as a function of surfactant concentration of the Myristyltrimethyl ammonium bromide/HCl system in 0.1 volume fraction of ethanol in water.*

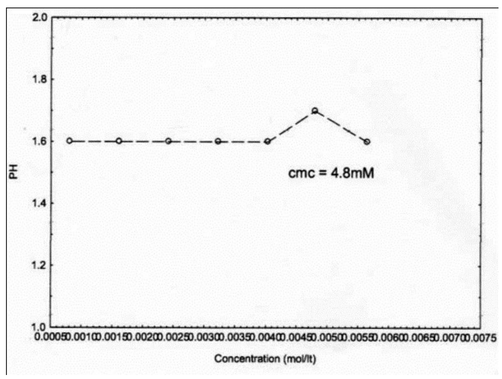

Figure 3: *Variation of pH as a function of surfactant concentrationof the Myristyltrimethyl ammonium bromide/HCl system in 0.2 volume fraction of ethanol in water.*

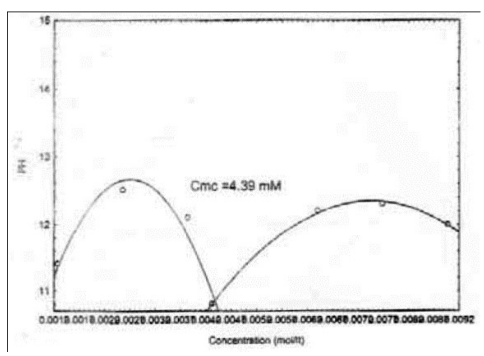

Figure 4: *Variation of pH as a function of surfactant concentration of the Myristyltrimethyl ammonium bromide/KOH system in water.*

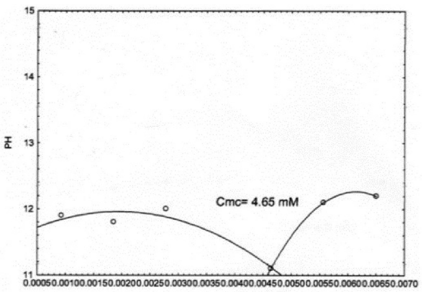

Figure 5: *Variation of pH as a function of surfactant concentration of the Myristyltrimethyl ammonium bromide/KOH system in 0.1 volume fraction of ethanol in water.*

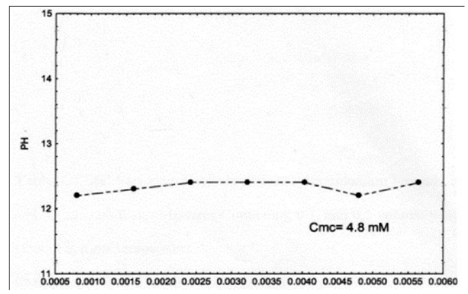

Figure 6: *Variation of pH as a function of surfactant concentration of the Myristyltrimethyl ammonium bromide/KOH system in 0.2 volume fraction of ethanol in water.*

Conclusions

Experimental measurements for pH of the different concentrations of Myristyltrimethyl ammonium bromide/HCl and KOH systems in pure water and 0.10 and 0.20 volume fractions of ethanol in ethanol (1) + water (2) mixed solvent media have been studied by pH meter. The following conclusions have been drawn from the above results and discussion:

i) Experimental results for the pH of solution of Myristyltrimethyl ammonium bromide/HCI and KOH systems in pure water and 0.10 and 0.20 volume fractions of ethanol in ethanol-water mixed solvent media have been presented as a function surfactant concentration.

ii) The calculated CMC by the breaking point for Myristyltrimethyl ammonium bromide/HCl and KOH systems are found to be almost same but the CMC values are found to increase with decreasing dielectric constant of solvent composition.

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References

1) R. Shelton, J. Am. Chem. Soc. 1946, **68,**753.
2) P. Mukeijee, K.J. Mysells, Natl. Stand. Ref. Data Ser. Nat. Bur. Stand, 1971, **36,** 105
3) C. Gonzalez, Appl. Surf. Sci. 2005, **243**, 10.
4) Y.H. Li, B.X. Huang, X.Q. Shan, Anal. Bioanal. Chem., 2003, **375**, 775.
5) Fuchs-Godec, R. Electrochim. Acta, 2009, **54**, 9.
6) A. Quan, A.B. McGeachie, D.J. Keating, E.M. van Dam, J. Rusak, N. Chau, C.S. Malladi, C. Chen, A. McCluskey, M.A. Cousin, P.J. Robinson, Mol. Pharmacol., 2007, **72,** 1425.
7) C. Mihali, G. Oprea, & E. Cical, POLTEHNICA Univ. (Timisoare), 2008, **53**, 159.
8) Y. Bayrak, Turk. J. Chem., 2003, **27**,487.
9) S. Das, S. Mondal, S. Ghosh, *J. Chem. Eng. Data,* 2013, **58**, 2586.
10) B.D. Flockhart, J. Coll. Sci., 1957, **12**,557.