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Determination of dissociation constant and stability constant of Mn-Myristic acid complex in ethanol-water mixture by using Matlab programming

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ABSTRACT

$pK_1$and pK_2 of Myristic acid in 70%-30% and 50%-50% Ethanol-water mixture is calculated byMatlab programming. The stepwise stability constant of Mn-Myristic acid complex in the same ethanol-water mixture is calculated and the values are comparable to the literature values.

KEY WORDS: dissociation constant; stability constant.

1. INTRODUCTION

Myristic acid is also found in palm kernel oil, coconut oil, butter fat and is a minor component of many other animal fats (2001). It is seen in spermaceti, the crystallized fraction of oil from the sperm whale and in the rhizomes of the Iris, including Orris root (Council of Europe, 2007)

2. MATERIALS AND METHODS

All the solutions are prepared in deionized water. The following titrations are carried out:

1. Free HNO3
2. Free HNO3 + Myristic acid
3. Free HNO3 + Myristic acid + Mn(II)

The above mentioned solutions are titrated against standardized 0.1M NaOH in 0.2 ml aliquots. 0.1M ionic strength is sustained throughout by 1M KNO_3. The concentration of Myristic acid and Mn(II) were 20 x 10^{-4}M and 4 x 10^{-4}M respectively.

3. RESULTS AND DISCUSSION

The dissociation constant and the stability constants are found for Mn(II) with Myristic acid in 70%-30% ethanol-water and 50%-50% ethanol-water. Irving Rossotti expression was used to calculate the proton ligand formation number nA (Irrving, 1953, 1954). The Bjerrum method was used to calculate the pKa values from nA.The nA values were computed by using the following equation:

$$nA = \frac{\gamma - (E^\circ + N) \times (V2 - V1)}{(V^\circ + V1) \times T^\circ L}$$

where γ subsists the replaceable H+ ions, E° subsists the concentration of acid, N subsists the normality of the base, T°L subsists the concentration of ligand, V° subsists the total volume and V2-V1 is the horizontal difference in the volume at the given pH.

Matlab programming is used to plot the graph from the half integral method and it is observed that the dissociation constant for Myristic acid in 70%-30% ethanol water mixture is established to be 4.90 (figure-1)

It is also observed that the dissociation constant for Myristic acid in 50%-50% ethanol water mixture is established to be 4.80 (figure-2)

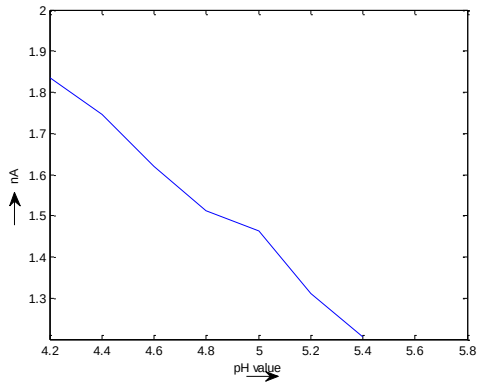

Figure.1.Dissociation constant for Myristic acid in 70%-30% ethanol-water mixture

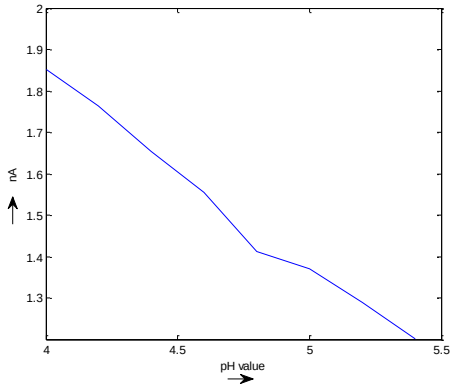

Figure.2.Dissociation constant for Myristic acid in 50%-50% ethanol-water mixture

The stability constant values at different concentrations of solvent are as follows (Table-1):

Table.1.Stability constant values at different concentrations of ethanol-water mixture

Ratio of ethanol-water	Log K1	Log K2
70%-30%	3.09	2.91
50%-50%	2.91	2.71

4. CONCLUSION

The stability constant of the metal at 70%-30% ethanol-water mixture is more than 50%-50% ethanol water mixture.

These studies help in future applications to study the usages of myristic acid in cosmetics and medicine.

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