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Refractometric measurements of substituted phenol in ethanol-water system

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ABSTRACT

Recently the refractometric measurements of 2-chloro-4-amino phenol was studied recently at different percentage concentration of solvent to find the effect of structure of 2-thiocarbamido phenol in different percentage concentrations. The data and result found during this study give the effect of ethanol and water in ethanol-water system.

Key words: Refractometric measurements, ethanol-water percentage concentrations, 2-thiocarbamidophenol.

INTRODUCTION

Biochemical, pharmaceuticals and medicinal study shows that phenol nucleus having drugs shows their identity in agriculture, pharmaceuticals and medicinal chemistry[1-10]. The result of refractometric study directly gives information regarding solute-solvent interactions. This study is an important tool for medicinal and pharmaceutical sciences. Taking all these facts into consideration, it was interesting to carry out refractometric measurement of 2-thiocarbamidophenol. One of the unique and important properties of liquid is refractive index. When a ray of light pass through less denser medium then there is change in direction of refraction and angle of refraction changes and ultimately the refractive index get changed. The result found during this investigation directly through light on dipole association of phenol.

MATERIALS AND METHODS

The 0.1M solution of phenol in 55% percentage of ethanol-water at different molar concentration i.e. 0.1M, 0.075M, 0.056M were prepared. The densities of the solution were determined by a bi-capillary pyknometer (± 0.2) containing a bulb volume of about 10 cm^3 and capillary having an internal diameter of 1mm. All weighing was made on Mechaniki Zaktady Precyzying Gdansk balance [Poland makes (± 0.001gm)]. The temperature of prism box was maintained at 30^0C .The refractive indices of solvent mixture and solution solutions were measured by Abbe's refractometer. Initially, the refractometer was calibrated with glass piece (n= 1.5220).provided with instrument.

The present work deals with the study of molar refraction and polarizability constant of 2-thiocarbamidophenol in 55% ethanol-water at 30^0 C. The data found have been used to compute intermolecular interaction. The refractometric reading was taken as described in literature.

RESULTS AND DISCUSSION

The molar refraction of 2-thiocarbamido phenol solution in ethanol-water mixture were determined by following equation,

$$R_m = \frac{(n^2-1)}{(n^2+2)}\left\{\frac{[x_1 m_1 + x_2 m_2 + x_3 m_3]}{d}\right\}$$

The polarizability constant (α) was determined by following relation,

$$R_{lig} = \frac{4}{3}\pi No\,\alpha$$

Table No:1 Molar refraction of different percentage of ethanol-water mixture

% of Ethanol-water mixture	Molar refraction (cm^3mole^{-1})
100	21.9097
55	11.9665

Table No: 2 Molar refraction and polarizability constant at various concentrations
System: 55% Ethanol Water Temp 30 ±0.1^{0}C

Concentration C (M)	Density P×10^3 Kg-m^4	Refractive Index (η)	R_{mix} M^1mole^1	R_{lig} M^1mole^1	$\alpha \times 10^{-23}$ (cm^3)
0.1	1.1805	1.4805	8.9714	0.530	0.0223
0.075	1.1803	1.4763	8.9227	0.4814	0.02
0.056	1.1802	1.4749	8.8816	0.440	0.01835
0.042	1.1801	1.4738	8.8801	0.442	0.01819

The value of molar refraction of ethanol-water mixture was presented in the Table No. 1 the values of molar concentration and polarizability constant at various concentration of 2-thiocarbamido phenol in 55% of ethanol–water mixture were given in Table No. 2. It was seen that from these tables that the molar refraction and polarizability constant of 2-thiocarbamido phenol decreases.

CONCLUSION

From the above experimental data we can conclude that, when the percentage of ethanol increases, molar refractivity i.e. true molar volume continuously increases at the same time polarizability constant of phenol decreases. This may be attributed that with the increase in percentage of ethanol it causes decrease in dielectric constant of medium and also considerable dipole association (intermolecular attraction) take place which can be accompanied by decrease in polarizability. It was observed from Table No. 2 when concentration of ethanol increases the refractive index also increase for phenol. More detail biochemical, medicinal and physical study is required on 2-thiocarbamido phenol.

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