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Refractometric Measurement of 2-Chloro-4-Amino Phenol in Ethanol-Water System

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

Keywords: Refractometric measurement, ethanol-water percentage concentrations, 2-chloro-4-amino phenol, molar refraction, polarizability constant

1. Introduction

Biochemical, pharmaceuticals and medicinal study shows that chloro, amino and phenol nucleus having drugs shows their identity in agriculture, pharmaceuticals and medicinal chemistry. Most of them are used as muscle relaxant [1] ,hypoglycemic agent[2], blood pressure depressant[3], anti diabetic drugs[4] , They shows anti-tumor properties [5-6], antibacterial[7-9], antiinflametory[10] , and anti-cancer properties[11] . These drugs also used as hormone antagonists[12,] and antipsychotic agent[13], in industries they are also used as finishing and brightening agents[14], In agricultural field they are also used as herbicidals [15-23] , sea water algicidals [24] , fugicidal[25] ,insecticidal and pesticidal[26]. Hence these compounds obtained the new branches of development in the agricultural, biochemical, pharmaceutical and medicinal field . The drug transmission, absorption, activity and effect will directly predicted by the refractometric measurement of the drug (solute) and solvent in the human anatomy. This information is important for deciding dose of drug to the patient. 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-chloro-4-amino phenol .This measurement explores the potency of 2-chloro-4-amino phenol, stability of a drug and also to renovate and modify the traditional drugs which are used by medicinal practitioner. 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 2-chloro-4-amino phenol, and mutual compensation of dipoles these results are so much useful for stability, activity and effect of drug hence study is necessary. From this point of view the present investigation was carried out 2-chloro-4-amino phenol in ethanol-water system at different percentage concentrations. This is hither to unknown. This study becomes milestone in medicinal, pharmaceuticals and drug of 2-chloro-4-amino phenol molecule.

2. Experimental

The 0.1M solution of 2-chloro-4-amino phenol in various percentage of ethanol-water at different concentration of 2-chloro-4-amino phenol (0.1M, 0.075M, 0.056M,) and 0.042M) in 60%, 70%, and 80% of ethanol-water mixture were prepared. The densities of the solution were determined by a bicapillary 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 32^0C .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.

3. Observation and Calculation

The present work deals with the study of molar refraction and polarizability constant of 2-chloro-4-amino phenol in 60% ethanol-water , 70% ethanol- water and 80% ethanol-water and ethanol- water mixture of various composition at 305^0 K (32^0 C). The data found have been used to compute intermolecular interaction. The refractometric reading was taken as described in literature.

4. Result and Discussion

The molar refraction of 2-chloro-4-amino phenol solution in ethanol-water mixture were determined by following equation,

$$R_m = \frac{(n^2-1)}{(n^2+2)}\left\{\frac{[x_1m_1 + x_2m_2 + x_3m_3]}{d}\right\}$$

Where,
η is refractive index of solution
X_1 is mole function of ethanol
X_2 is mole function of water
M_1, M2 and M_3 are molecular weights of ethanol, water and solute respectively
d is density of solution
The molar refraction of 2-chloro-4-amino phenol is calculated as

$R_{lig} = R_{mixture} - R_{ethanol\text{-}water}$

Where,

$R_{ethanol\text{-}water}$ is the molar refraction of solvent ethanol-water mixture

The polarizibility constant (α) of 2-chloro-4-amino phenol from the following relation

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

Where No is Avogadro's number

Table 1: Molar refraction of different percentage of ethanol-water mixture

% of Ethanol-water mixture	Molar refraction (cm^3mole^{-1})
100	21.9097
80	15.7704
70	12.252
60	11.9684

A] Molar refraction and polarizibility constant at various concentration of 2-chloro-4-amino phenol

Table 2: System- 60% Ethanol water Temp 32 ±0.1^{0}C

Concentration C (M)	Density $P\times10^3$ $Kg\text{-}m^4$	Refractive Index η	R_{mix} M^1mole^1	R_{lig} M^1mole^1	$\alpha\times10^{-23}$ (cm^3)
0.1	1.1817	1.4821	8.9734	0.531	0.0226
0.075	1.1815	1.4781	8.9254	0.4819	0.02002
0.056	1.1812	1.4766	8.8838	0.4403	0.01837
0.042	1.1809	1.4769	8.8801	0.4466	0.01822

Table 3: System- 70% Ethanol water Temp 32 ±0.1^{0}C

Concentration C (M)	Density $P\times10^3$ $Kg\text{-}m^4$	Refractive Index η	R_{mix} M^1mole^1	R_{lig} M^1mole^1	$\alpha\times10^{-23}$ (cm^3)
0.1	1.0297	1.4056	9.987	0.3106	0.01588
0.075	1.0305	1.4044	9.9174	0.261	0.01283
0.056	1.0295	1.4036	9.8685	0.2121	0.01089
0.042	1.0283	1.4425	9.8298	0.1737	0.00702

Table 4: System- 80% Ethanol water Temp 32 ±0.1^{0}C

Concentration C (M)	*Density $P\times10^3$ $Kg\text{-}m^4$*	*Refractive Index η*	*R_{mix} M^1mole^1*	*R_{lig} M^1mole^1*	*$\alpha\times10^{-23}$ (cm^3)*
0.1	1.0345	1.4119	12.2672	0.3282	0.01616
0.075	1.0324	1.4111	12.2114	0.2724	0.01395
0.056	1.0312	1.4103	12.1614	0.2179	0.01179
0.042	1.0296	1.4091	12.1092	0.1702	0.00991

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-chloro-4-amino phenol in 60%, 70% and 80% of ethanol–water mixture were given in Table No. 2 to 4. It was seen that from these tables that the molar refraction and polarizabilty constant of 2-chloro-4-amino phenol decreases in the concentration of 2-chloro-4-amino phenol

From these it can be predicted that, when the percentage of ethanol increases , molar refractivity i.e. true molar volume continuously increases .At the same time polarizablity constant of a 2-chloro-4-amino 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. 2-4 when concentration of ethanol increases the refractive index also increase for 2-chloro-4-amino phenol. More detail biochemical, medicinal and physical study is required on 2-chloro-4-amino phenol.

From this study it is clear that when the percentage of ethanol increase the solute solvent interaction i.e. interaction of 2-chloro-4-amino phenol and ethanol increases which may stabilize the drug of higher percentage of ethanol. From this it can be concluded that the drug transmission , drug effect and drug absorption of 2-chloro-4-amino phenol is more effective at higher concentration of ethanol.

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