

Refractometric Study of 2-Chloro-4-Amino Phenol In Ethanol-Water Systems

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Abstract: Recently in this laboratory the refractometric study of 2-chloro-4-amino phenol was studied at various percentage compositions of solvents to investigate the effect of structure of 2-chloro-4-amino phenol in various percentage compositions. The data and results obtained during this study give the effect of ethanol and water in the ethanol-water system.

Key Words: 2-Chloro-4-amino phenol, ethanol– water percentage compositions, refractometry study

I. Introduction

Pharmaceutical, medicinal and biochemical literature survey showed that amino, chloro and phenol nucleus containing drugs produced their identity in medicinal, agricultural and pharmaceutical chemistry. Most of them are used as muscle relaxant¹, hypoglycemic agent², blood pressure depressant³, anti diabetic drugs⁴. They showed anti-tumor properties⁶ anti-bacterial⁷⁻⁹, anti-inflammatory¹⁰ and anti-cancer properties¹¹. These drugs are also used as hormone antagonists¹² and antipsychotic agent¹³ in industries they are also used as finishing and brightening agents¹⁴. In agricultural field they are used as herbicides¹⁵⁻²³, sea water, algicides²⁴, fungicidal²⁵ insecticidal and pesticidal²⁶. Hence, these compounds obtained the new branches of development in the medicinal, pharmaceuticals, agricultural and biochemical fields. The drug absorption, transmission, activity and effect will directly predicted by the refractometric measurement of the solute (drug) and solvent in the human anatomy. This information is essential for deciding dose of drug to the patient. Result of refractometric measurement directly gives information regarding solute-solvent interactions. This study is an important tool for pharmaceutical and medicinal sciences. Taking all these things into consideration, it was thought interesting to carry out the refractometric measurement of 2-chloro-4-amino phenol. This study 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 passes from less dense to denser medium then there is change in the direction of refraction and angle of refraction changes and ultimately the refractive index get changed. The result obtained during this investigation directly through light on the dipole association of 2-chloro-4-amino phenol, and mutual compensation of dipoles these results are much more useful for transmission, stability, activity and effect of drug hence this study is essential. From this point of view the present investigation was carried out 2-chloro-4-amino phenol in ethanol-water system at various percentage compositions. This is hitherto unknown. This study becomes milestone in drug, medicinal, pharmaceutical of 2-chloro-4-amino phenol molecule.

Experimental

The 0.1M solution of 2-chloro-4-amino phenol in different percentage of ethanol- water at different concentration of 2-chloro-4-amino phenol (0.1M ,0.075M ,0.056M ,0.042M) in 60% ,70% and 80% ethanol-water mixture were prepared .All weighing was made on Mechaniki Zaktady Precyzying Gdansk Balance [Poland make (±0.001gm)]. The densities of the solutions were determined by a bicapillary pycnometer (± 0.2%) having a bulb volume of about 10 cm³ and capillary having an internal diameter of 1 mm . The refractive indices of solvent mixture and solutions were measured by Abbe's refractometer (± 0.001). The temperature of prism box was maintained at 29^oC. Initially, the refractometer was calibrated with glass piece (n = 1.5220) provided with the instrument.

II. 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 mixture of different composition at 302^oK (29^oC) . The data obtained have been used to compute intermolecular interaction. The refractometric reading were taken as described in literature.

III. Result and Discussion

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

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

Where,

η is refractive index of solution

X_1 is mole function of ethanol

X_2 is mole function of water

$M_1, M_2,$ 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

$$R_{lig} = R_{mixture} - R_{Ethanol-water}$$

Where

$R_{Ethanol-water}$ - The molar refraction of solvent Ethanol-Water mixture

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

Where N_0 is Avogadro's number

$$R_{lig} = \frac{4}{3} \pi N_0 \alpha$$

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

% of Ethanol-Water Mixture	Molar Refraction (RM) (cm ³ mole ⁻¹)
100	22.5187
90	16.3794
80	12.86
70	12.5764
60	10.9761

A] Molar refraction and polarizability constant at different concentration for 2-chloro-4-amino phenol

TableNo:2 System: 60% Ethanol-Water

Temp: 29 ± 0.1⁰ C

Concentration C(M)	Density P×10 ³ (Kg-m ⁴)	Refractive Index (η)	R _{mix} (M ³ mole ¹)	R _{lig} (M ³ mole ¹)	α×10 ⁻²³ (Cm ³)
0.1	1.256	1.5174	9.1992	0.5764	0.0249
0.075	1.2558	1.5134	9.1512	0.5273	0.02232
0.056	1.2555	1.5119	9.1096	0.4857	0.02067
0.042	1.2552	1.5122	9.1059	0.492	0.02052

Table No : 3 System: 70% Ethanol-Water

Temp: 29 ± 0.1⁰ C

Concentration C(M)	Density P×10 ³ (Kg-m ⁴)	Refractive Index (η)	R _{mix} (M ³ mole ¹)	R _{lig} (M ³ mole ¹)	α×10 ⁻²³ (Cm ³)
0.1	1.0295	1.4054	9.9868	0.3304	0.01568
0.075	1.0303	1.4042	9.9172	0.2608	0.01263
0.056	1.0293	1.4034	9.8683	0.2119	0.01069
0.042	1.0281	1.4423	9.8296	0.1735	0.00916

Table No: 4 System: 80% Ethanol-Water

Temp: 29 ± 0.1⁰ C

Concentration C(M)	Density P×10 ³ (Kg-m ⁴)	Refractive Index (η)	R _{mix} (M ³ mole ¹)	R _{lig} (M ³ mole ¹)	α×10 ⁻²³ (Cm ³)
0.1	1.0347	1.4121	12.2674	0.3284	0.01636
0.075	1.0326	1.4113	12.2116	0.2726	0.01415
0.056	1.0314	1.4105	12.1616	0.2181	0.01199
0.042	1.0298	1.4093	12.1094	0.1704	0.01011

The values of molar refraction of ethanol-Water mixture were presented in the Table No 1. The values of molar refraction and polarizability constant at different 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 observed from these tables that the molar refraction and polarizability constant of 2-chloro-4-amino phenol decreases in the concentration of 2-chloro-4-amino phenol .

From the data it can be predicted that, when the percentage of ethanol increases, molar refractivity (true molar volume) continuously increases. At the same time polarizability constant of a 2-chloro-4-amino phenol decreases. This may be attributed that with the increase in percentage of ethanol it causes decreases in dielectric

constant of medium and also considerable dipole association (intermolecular attraction) take place which can be accompanied by decrease in polarisability. It was observed from Table No. 2-4 when concentration of ethanol increase the refractive index also increase for 2-chloro-4-amino phenol..More detail physical, biochemical, and medicinal study is required on 2-chloro-4-amino phenol.

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

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