

## Viscosity and molar refraction measurements of derivative of dehydroacetic acid in different percentage of solvent system

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### ABSTRACT

In different percentages of dioxane-water solvent mixture the densities, refractive indices and viscosities of dehydroacetic acid have been measured. From the data, the relative viscosity, molar refraction and polarizability constants have been calculated and they are used to find out the solute-solvent interactions.

**Key words:** Viscosity measurement, molar refraction, polarizability constant  
solute – solvent interaction and nature of dipole.

### INTRODUCTION

Viscosities, refractive indices, polarizability constants of mixtures are studied by many workers<sup>1-3</sup>. The measurement of the properties of electrolyte in a mixture solution provides an excellent method of obtaining data on solute-solvent interaction, dipole nature, dielectric constant, refractive index and viscosity of binary mixture. The present work deals with the study of interaction of solute in 60%, 70%, 80% dioxane-water and viscosities, refractive indices, polarizability constants by changing the concentration.

### EXPERIMENTAL

1-(Phenylanil)-2-methyl-2 (2,4 -dione, 6 -methyl-3-pyran) imine is prepared by refluxing equimolar quantities of 3-acetyl-6-methyl-(2H)-pyran-2,4 (3H) dione and aniline. The purity of compound is confirmed by physical, chemical and spectral studies<sup>5</sup>.

The solution of different molarities  $1 \times 10^{-6}$ ,  $2 \times 10^{-6}$ ,  $3 \times 10^{-6}$ ,  $4 \times 10^{-6}$ ,  $5 \times 10^{-6}$  M were prepared by using mixture solvents at  $27 \pm 0.10^\circ\text{C}$ .

Densities of mixture solutions were determined by pycnometer ( $\pm 0.2\%$ ). Ostwald viscometer ( $\pm 0.2\%$ ) is used to determine viscosities. Abbe's refractometer ( $\pm 0.001$  unit) is used to determine refractive index of mixture solutions at  $27 \pm 0.10^\circ\text{C}$ . The relative viscosity of each compound solution is determined by using the empirical formula<sup>6</sup>.

$$nr = ds \times ts / db \times tb$$

The molar refraction of solute and the polarizability constants of different percentages of solvents and mixtures are calculated by using known empirical formula<sup>7</sup>.

1.  $R_{\text{solute}} = R_{\text{mixture}} - R_{\text{s-w}}$
2.  $R_{\text{solute}} = (4/3) \pi N_0 \alpha$

### RESULTS AND DISCUSSION

The observed values of relative viscosity, molar refraction and polarizability constants are put in Tables 1-3 .

The relative viscosity increases with decrease in the percentage of dioxane, which may be due to the increase in the molecular interactions. Relative viscosity increases in dioxane water due to increase in the contraction of solute because

interaction between solute-solvent increases with respect to change in the concentration.

In present investigation the nature of graph, for different percentage of dioxane-water solvent shows, stronger interaction between solute and solvent which favours an increase in relative viscosity.

The values of molar refraction indicates that, molar refraction goes on increasing as the concentration of the solvent increases in the same solvent mixture. But the values of molar refraction changes by keeping the same concentration of solute but by changing the concentration of the solvent mixture. Data indicates that as the

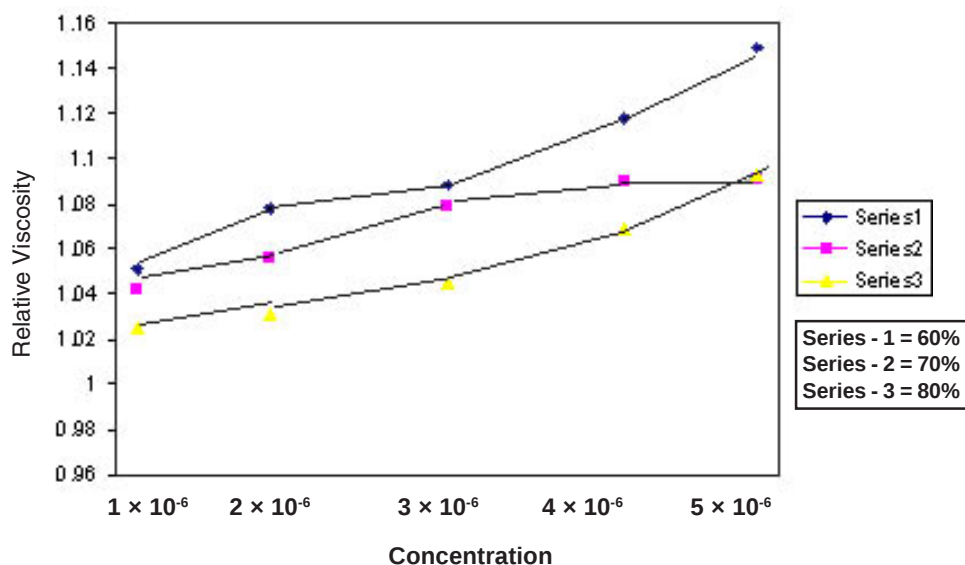


Fig. 1: Plots between Relative Viscosity Vs. Concentration

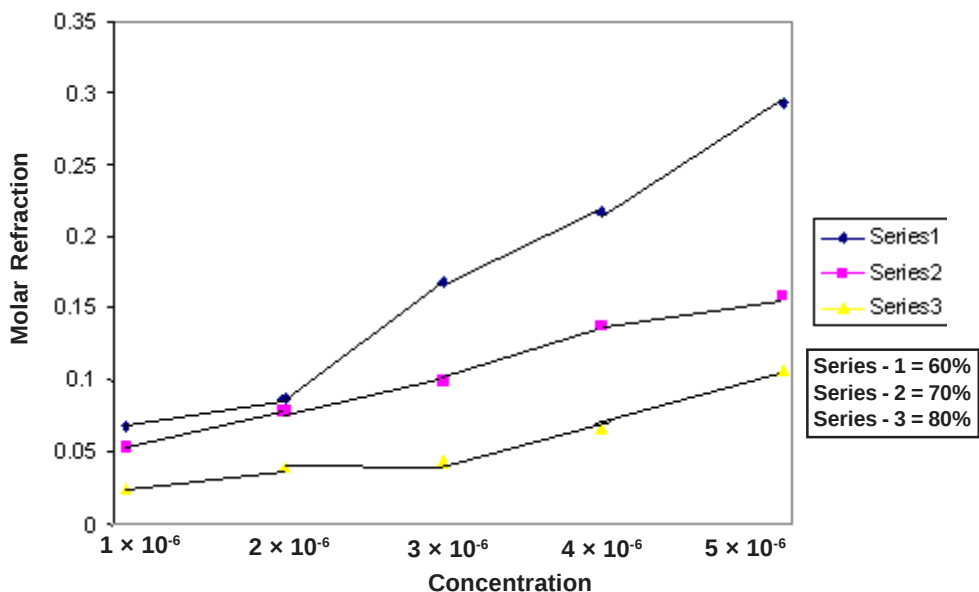


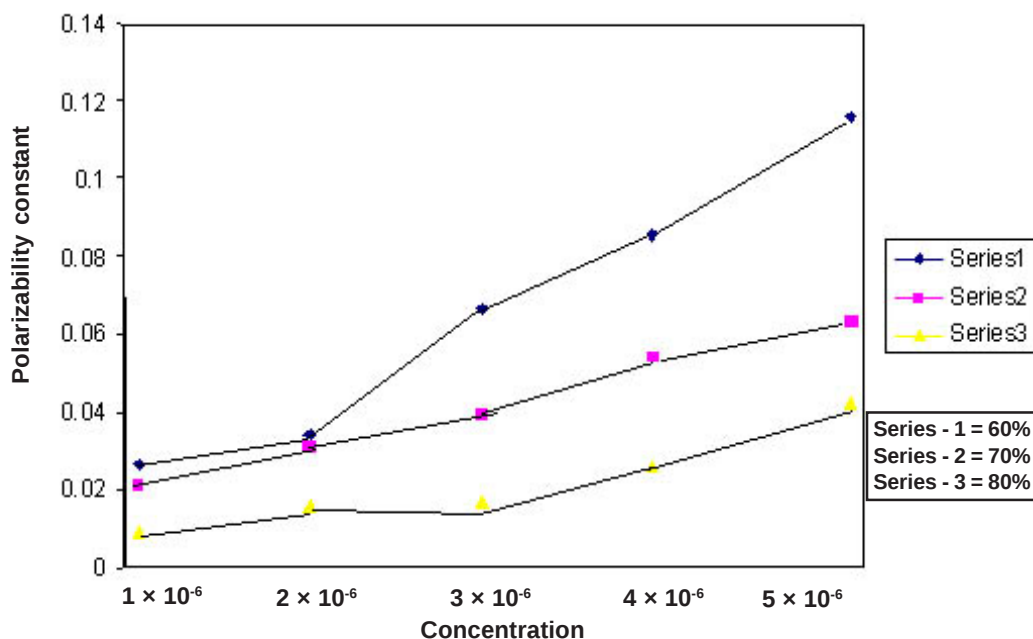
Fig. 1: Plots between Molar Refraction Vs. Concentration

**Table 1: Relative viscosity of 1-(phenylanil)-2-methyl-2 (2',4'-dione, 6'- methyl-3-pyran) imine in dioxane-water mixture at 300 K.**

| Concentration        | Relative viscosity (cp) |        |        |
|----------------------|-------------------------|--------|--------|
|                      | 60%                     | 70%    | 80%    |
| 1×10 <sup>-6</sup> M | 1.0513                  | 1.0419 | 1.0252 |
| 2×10 <sup>-6</sup> M | 1.0783                  | 1.0556 | 1.0313 |
| 3×10 <sup>-6</sup> M | 1.0885                  | 1.0786 | 1.0448 |
| 4×10 <sup>-6</sup> M | 1.1180                  | 1.0897 | 1.0691 |
| 5×10 <sup>-6</sup> M | 1.1494                  | 1.0906 | 1.0934 |

percentage of dioxane increases the values of molar refraction goes on decreasing this may be due to less association of solute with increase in concentration of non-polar solvents. Increase in concentration of non-polar solvents, decreases the values of molar refraction.

The values of polarizability constant indicates that they increases as a concentration of solute increases. The increase in percentage of dioxane the values of polarizability constant decreases. Increase in concentration of non-polar solvent is responsible to decreases the values of

**Fig. 1: Plots between polarizability Vs. concentration****Table 2 & 3 : Molar Refraction and Polarizability Constant of 1-(phenylanil) – 2- methyl- 2 (2',4'-dione, 6'- methyl-3-pyran) imine in dioxane – water mixture.**

| Concentration        | Molar refraction (cm <sup>3</sup> mol <sup>-1</sup> ) |        |        | Polarizability constant(10 <sup>-24</sup> cm <sup>3</sup> ) |        |        |
|----------------------|-------------------------------------------------------|--------|--------|-------------------------------------------------------------|--------|--------|
|                      | 60%                                                   | 70%    | 80%    | 60%                                                         | 70%    | 80%    |
| 1×10 <sup>-6</sup> M | 0.0680                                                | 0.0531 | 0.0228 | 0.0269                                                      | 0.0210 | 0.0090 |
| 2×10 <sup>-6</sup> M | 0.0859                                                | 0.0782 | 0.0400 | 0.0340                                                      | 0.0309 | 0.0158 |
| 3×10 <sup>-6</sup> M | 0.1685                                                | 0.0991 | 0.0430 | 0.0667                                                      | 0.0392 | 0.0170 |
| 4×10 <sup>-6</sup> M | 0.2167                                                | 0.1376 | 0.0666 | 0.0858                                                      | 0.0545 | 0.0263 |
| 5×10 <sup>-6</sup> M | 0.2932                                                | 0.1590 | 0.1060 | 0.1162                                                      | 0.0630 | 0.0420 |

polarizability. More the concentration of the polar solvent, more will be the values of polarizability constant. This may be due to more hydrogen bonding behavior of solute and polar solvent. Increase in concentration of polar solvent may be

responding more solute solvent interaction. Study also indicates that more dipole solvent causes more interaction, association with the complex organic molecule like 1-(phenylanil) – 2- methyl- 2 (2',4'-dione, 6'- methyl-3-pyran) imine.

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