

Studies in Physical Parameters p-hydroxy,3methoxybenzaldehyde in binary liquid systems

¹R. A. Thakare, ²A. S. Burghate, ³S. A. Wadhwal
¹Research student, ²Associate professor, ³Associate professor
 P. G. Department of Chemistry,
 Shri Shivaji Science College, Amravati, India.

Abstract: Viscosities and Densities of p-hydroxy,3 methoxybenzaldehyde aldehydes in binary solvent mixtures were measured with variation in percentage of binary mixtures at fixed concentrations. From relative viscosity, rheochor, and temperature coefficients were determined. The structure breaking and making property will judge the Solute - Solvent interactions.

Keywords: Relative viscosity, Rheochor, Temperature coefficient.

I. INTRODUCTION

Viscosity implies resistance to flow. Viscometry is a sensitive tool for understanding interactions of solutions. Viscosity measurements provide useful information about solute-solute and solute-solvent interaction. Temperature coefficient expresses the relation between change in physical property due to change in temperature. Rheochor is additive and constitutive property. These parameters are related with viscosity, Hence in present study attempt has been made to study Rheochor and Temperature coefficient by determining density and viscosity of substituted aldehydes in binary liquid system.

II. MATERIALS & METHODS

The reagent grade (purity 99.9%) and doubly distilled water were used. All weighing were made on Shimadzu corporation Japan type BL-220H No. D455008406 Capacity 220g Readability 0.001g. The accuracy of density measurement was within $\pm 0.1\%$ Kgm-3. The viscosity measurements were carried out using thoroughly cleaned, dried Ostwald's viscometer. The viscometer was kept in electrically heated water bath (SSCA /CHE/NCR-II/104/2008/01) and temperature variation was maintained within $\pm 0.1^\circ\text{C}$. The flow time was determined after equilibrating the viscometer with water bath temperature. The accuracy of viscosity measurement was within $\pm 0.11\%$ Kgm-1S-1.

Viscosity measurements for different percentage of binary solution were made to determine relative viscosity, Rheochor, temperature coefficient. Viscosities measurements are also made at different temperature to evaluate the values of thermodynamic parameters. The available data of velocities (η) and temperature (T) are used to plot the graph between $\log \eta$ Vs $1/T$.

The values of Rheochor may be evaluated by using formula,

$$R = \frac{M}{d} * \eta^{1/8}$$

R- Rheochor

M- Molecular weight

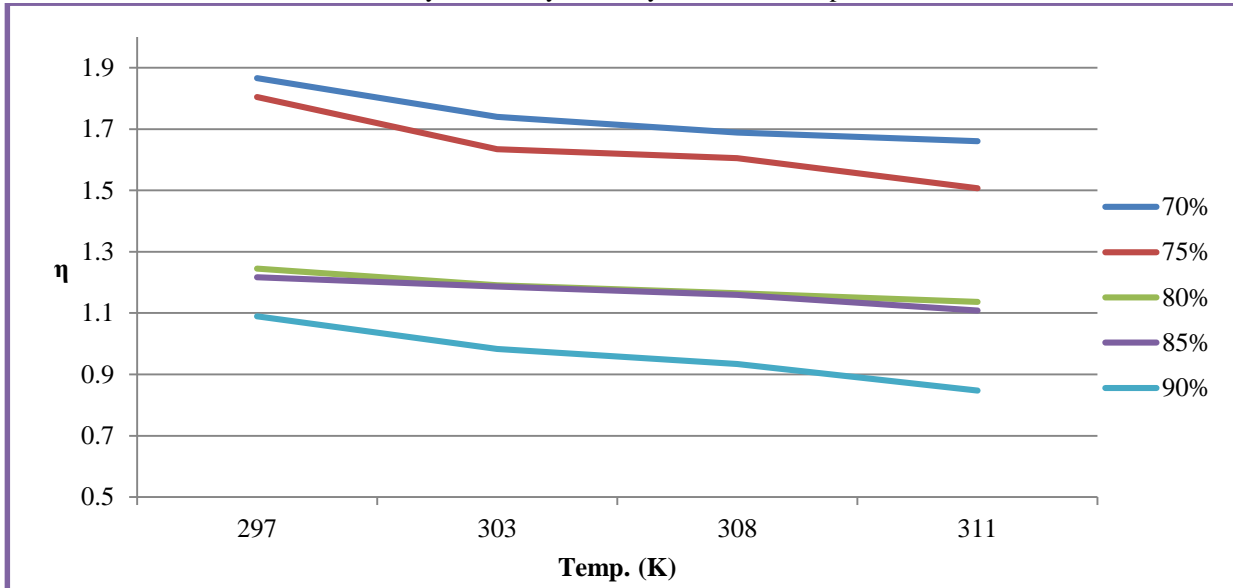
d- Density

η - Viscosity coefficient

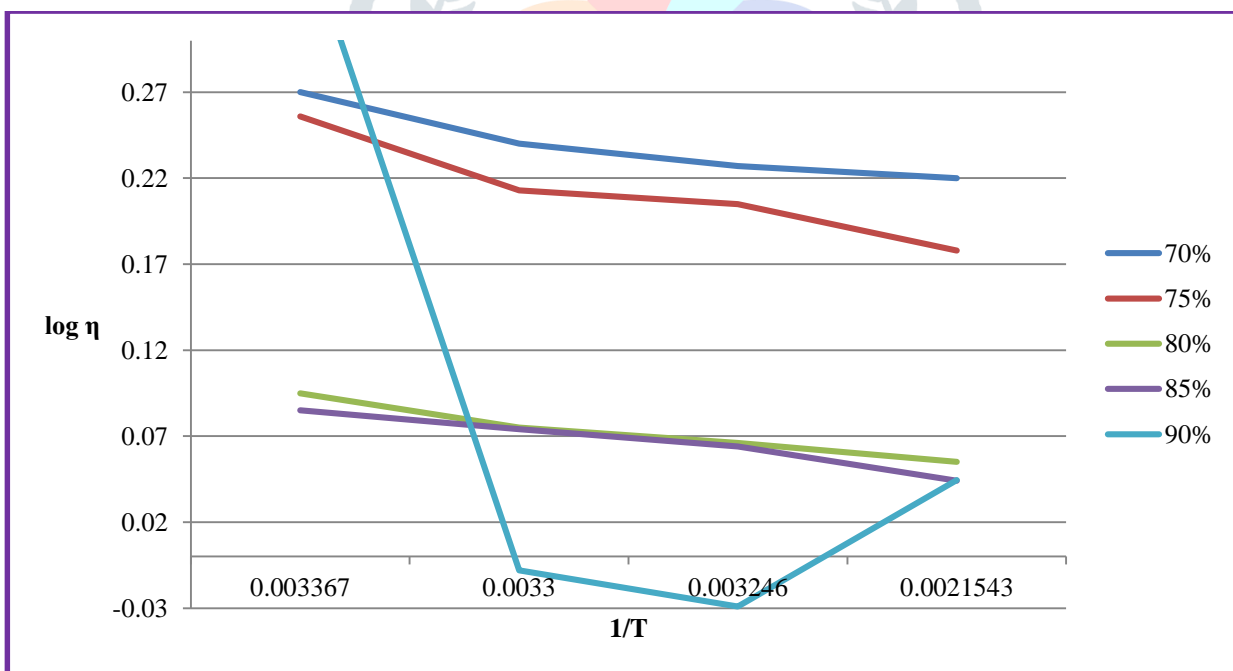
Binary System	Percentage Composition of Binary System	η_r	R	α
Acetone-Water	70%	2.232	96.860	-5.4×10^{-2}
	75%	2.159	99.760	-6.5×10^{-2}
	80%	1.489	98.102	-3.0×10^{-2}
	85%	1.456	98.162	-1.1×10^{-1}
	90%	1.304	97.891	-9.9×10^{-2}
Ethanol-Water	70%	2.382	105.55	-8.3×10^{-2}
	75%	2.242	102.84	-8.9×10^{-2}
	80%	2.096	102.35	-9.9×10^{-2}
	85%	2.054	102.17	-8.3×10^{-2}
	90%	1.851	103.61	-7.1×10^{-2}

1,4 Dioxane- Water	70%	3.898	94.010	-7.5 x 10-2
	75%	3.623	93.464	-1.34 x 10-1
	80%	3.427	92.849	-7.7 x 10-2
	85%	3.290	92.603	-1.5 x 10-1
	90%	2.902	91.172	-7.9 x 10-2

table 1: determination of densities, relative viscosities, rheochor, temperature coefficient of p--hydroxy,3 methoxybenzaldehyde aldehydes at room temperature 279k



graph 1: variation of viscosity (η) with respective temperature of acetone- water system for p--hydroxy,3 methoxybenzaldehyde aldehydes



graph 2: variation of log η with respective 1/t of acetone- water system for p--hydroxy,3 methoxybenzaldehyde aldehydes

II. RESULTS & DISCUSSIONS

In present investigation, relative viscosity, Rheochor. and temperature coefficient of p--hydroxy,3 methoxybenzaldehyde aldehydes in various percentage of binary mixtures system were determined at 0.1 M concentrations . The study was carried out with the variation in temperature .The binary solvents used for the study were acetone-water, ethanol-water, and 1,4-dioxane water . Newton friend introduced new constant Rheochor which is additive as well as constitutive property.

The reported values of viscosity & Rheochor are presented in table no.1 and their graphical variation may be represented from graph no. 1 & 2.

The values of Rheochor for selected system in binary solvent follow following trend.

For p--hydroxy,3 methoxybenzaldehyde aldehydes Ethanol -Water > Acetone -Water > 1,4-Dioxane - Water

For the given systems with increase in % composition of solvents at fixed concentrations, viscosity as well as Rheochor decreases.

The viscosity as well as Rheochor values were studied at different temperatures in the temperature range 297-311K. No specific observation has been reported for temperature coefficients of all compounds for all binary systems.

The graph between $\log \eta$ & $1/T$ are straight line graph as represented in graph no 2 from the nature of graph , non association of liquid molecule may be considered.

The physical constant Rheochor depends on presence of solute, Lyophilic collids and suspended impurities .Nature of compound on the basis of polarity also affect the Rheochor .Branched chain compound possess grater viscosity which in turn has greater Rheochor value .The reported results show variations which may be attributed due to the variation in molecular weights of selected compounds and variation in intermolecular interactions.

III. ACKNOWLEDGEMENT

Authors are thankful to Principal, Shri Shivaji Science College Amravati for providing necessary facilities.

IV. REFERENCES

- [1] A. S. Burghate, R. M. Kedar, P. B. Agrawal and M. L. Narwade ,2000. Viscosity and thermodynamic studies of chalcones in 70% Dioxane-water mixture ar different concentrations and temperatures. *Oriental Journal of Chemistry*, 16(3): 503-506.
- [2] Y. Srinivasa Rao, 2008. Studies on temperature coefficient of resistance (TCR) of polymer thick film resistors *Microelectronics International*, 25(3): 33-36.
- [3] M. L. Zhang and D. A. Drabold, 2012. Theory of temperature coefficient of resistivity: Application to amorphous Si and Ge *A Letters Journal Exploring the Frontiers of Physics*, 98: 17005.
- [4] Georgios E. Papanastasiou and Ioannis I. Ziogas, 1992. Physical Behavior of Some Reaction Media. 3. Density, Viscosity, Dielectric Constant, and Refractive Index Changes of Methanol Dioxane Mixtures at Several Temperatures *Journal of Chemical and Engineering Data*, 37(2): 167-172.
- [5] Xiangli Shi and Ital, 2018. *Physical Chemistry Chemical Physics*, 20: 1005-1011.
- [6] Hiannie Djojoputro and Suryadi Ismadji, 2005. *Journal of Chemical and Engineering data*, 50(6): 2003-2007.
- [7] K. Saravanakumar, T. G. Lavanya and T. R. Kubendran, 2012. *Chemical Science Transactions*, 1(2): 269-278.
- [8] Marjan Rafiee, Masoumeh Javaheri, 2015. *Molecular Biology Research Communications*, 4(3): 151-159.
- [9] V. Kannappan and R. Jaya Santhi, 2005. *Indian Journal of pure and applied Physics*, 43: 750-754.
- [10] Ashu N. Jain, Tanya R. Khan, Andrew J. Daugulis, 2010. *Biotechnol lett*, 32: 1649-1654.

