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Advances in Applied Science Research, 2015, 6(3):165-167

Pelagia Research Library

ISSN: 0976-8610
CODEN (USA): AASRFC

Verification of specific refraction and molar refraction for homologous alcohol series at 30˚C by suggested formula (PDJ)

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ABSTRACT

Refractive index and Density of Homologous Alcohol series have been studied at 30˚C temperature. The data obtained is utilized to determine specific refraction and molar refraction. It compare between Lorenz & Lorentz and PDJ formula for specific refraction and molar refraction. The values of specific refraction and molar refraction are increasing with increase of homologous alcohol series.

Keywords: Refractive index, Specific refraction, Molar refraction, PDJ and Lorenz and Lorentz.

INTRODUCTION

Refractive index is one of the most important properties of liquid. The measurement of the refractive index of liquids is in important work in engineering and science. Transmission and refraction detections near critical angles related to total internal reflection are common methods in refractive index measurement. When a ray of light passes from one medium to another, it suffers refraction, that is change in direction. If it passes from a less dense to a denser medium, it is refracted towards the normal so that the angle of refraction (r) is less that the angle of incidence (I) the refractive index (n) of the medium is the ratio of velocity of light in vacuum to the velocity of light in the medium. Refractive index is an important additive property of the structural arrangement of atom in molecule refractive index can be measured easily with high degree of accuracy. The value of refractive index depend on the temperature as well as on wavelength of light used. Oswal et.al[1]have been studied refractivity properties of some homologous series such as nethanoate, methyl alkanoats, ethyl alkanoates etc. A. N.Sonar[2] and N. S. Pawar have studied the molar refraction and polarizability constant of substituted heterocyclic compounds in different media from refractive indices. Burghate et.al[3] have studied the molar refraction and polarizability constant of substituted chalcones in different percentage of acetone-water mixture. J. D. Pandey et.al[4] have studied the refractometric and dielectric studies of binary liquid mixtures at different temperature. J. Padova[5] have studied the ion-solvent interaction in mixed solvent using ethanol and acetone medium. R. A. Synowicki et.al[6] implemented two different fluid measurement technique to determine the refractive index of liquids on a commercial spectroscopic ellipsometer system. In first technique they use roughened glass to which liquid is applied. And in second they use prism minimum deviation technique in a hollow prism cell. The advantages and disadvantages of both the techniques discussed. The present work deals with the study of specific refraction and molar refraction of homologous alcohol series.

MATERIALS AND METHODS

Above homologous alcohol series solvents taken of the extra pure. For density measurement, all the weighing were made on contact balance having accuracy (0.001gm). The refractive index of solvent solutions was measured using by Abbe's refractometer ranging reading from 1.3000 to 1.7000. The temperature of prism box was maintained constant by circulating water from thermostat at 30˚ C. (±0.1˚C).The refractometer was calibrated using glass test pieces of known refractive index supplied with the instrument. The Specific Refraction and molar refraction of solvent and solution were determined using Lorenz and Lorentz equation [7], DDJ formula [8, 9], and Patel Desai

and Joshi's [10, 11] formula. But in this research work we are compare Lorenz &Lorentz with PDJ formula as below.

$$R_M = \frac{n^2-1}{n^2+2} \cdot \frac{M}{d} \qquad (1)$$

$$R_M = \frac{n-0.91}{2.06} \cdot \frac{M}{d} \qquad (2)$$

The calculated values of specific refraction and molar refraction are shown in belowTable-1 Experimental refractive index(n), Density(d),Specific refraction(R),and Molar refraction(Rm) at 30˚C

Table-1. Comparitive study of Specific refraction and molar refraction between L&L and PDJ

Solvents	Density (d)	R.I (n)	M.F.	M.W.	Specific refraction R (L&L)	Specific refraction R (PDJ)	Molar refraction (Rm) L&L	Molar refraction (Rm) PDJ
Methanol	0.7861	1.3277	CH_4O	32.04	0.2579	0.2579	8.2624	8.2644
Ethanol	0.7862	1.358	C_2H_6O	46.07	0.2793	0.2766	12.8680	12.7437
Propanol	0.7901	1.3751	C_3H_8O	60.11	0.2898	0.2858	17.4198	17.1769
Butanol	0.8042	1.3983	$C_4H_{10}O$	74.14	0.3003	0.2948	22.2653	21.8528
Pantanol	0.8122	1.4111	$C_5H_{12}O$	88.00	0.3058	0.2995	26.9078	26.3558
Hexanol	0.8134	1.4152	$C_6H_{14}O$	102.00	0.3080	0.3015	31.4155	30.7533

RESULTS AND DISCUSSION

The present investigation considers the refractive indices and densities measurement of homologous alcohol series. The results obtained of specific refraction and molar refraction is reported in above Table-1.,and respective graphical representation is shown in Graph-1&2. From the results it may be predicted that for homologous alcohol series increase the refractive index, density, specific refraction and molar refraction. This may be due to the fact that the addition of $–CH_2$ group attach in the homologous alcohol series.

Figure-1. Comparison of specific refraction between L&L and Suggested formula (PDJ)

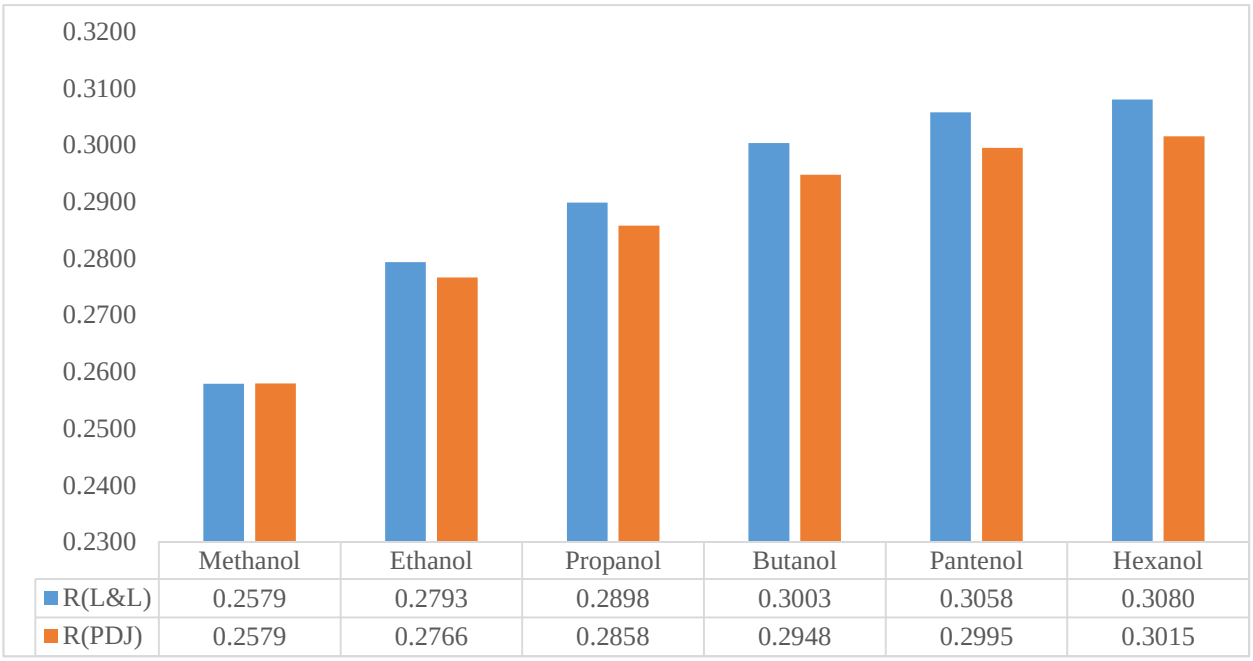
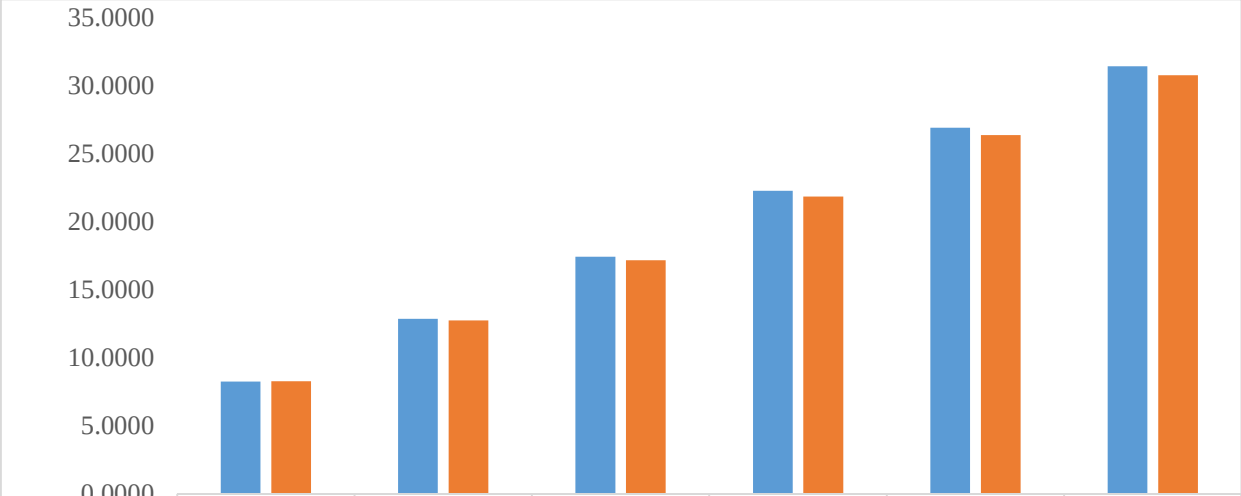


Figure-2. Comparison of molar refraction between L&L and Suggested formula (PDJ)



	Methanol	Ethanol	Propanol	Butanol	Pantenol	Hexanol
Rm(L&L)	8.2624	12.8680	17.4198	22.2653	26.9078	31.4155
Rm(PDJ)	8.2644	12.7437	17.1769	21.8528	26.3558	30.7533

CONCLUSION

In above experiment the specific refraction and molar refraction of homologous alcohol series are increases. It prove that the PDJ formula is good agreement with the Lorenz & Lorentz.

Acknowledgement
I am thankful to The H. N. S. B. Ltd. Science College, Himatnagar for providing excellent facility, Dr. H. D. Joshi (Ex. Principal Science College, Himatnagar) for encouraging entire research work and Dr. S. P. Vyas and Dr. K. V. Goswami for supporting this research work.

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