A comparative study of Specific refraction for some organic binary liquid mixture between lorenz and lorentz and suggested formula (PDJ)

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ABSTRACT

Firstofall The binary systems are prepared weight by weight and got the data of refractive index of acetic acid and acetone by various propositional of acetic acid and acetone .Then after got the value of Lorenz and Lorentz equation and also developed new PDJ formula and compare L&L Vs PDJ equation and verify with Q test.

Keywords: Refractometer, Binary mixture, Acetic acid and Acetone, L&L, PDJ and Q test

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INTRODUCTION

The measurement of refractive index and optical activity of organic liquids is of great importance in   chemistry. These measurement provide invaluable information regarding the molecular structure, purity of organic compounds and the composition of binary mixtures [1]. Moreover, electronic structure computations are widely used in understanding and design of molecules exhibiting linear or nonlinear. Other high frequency depended properties such as the refractive index has been less extensively explored, even when it is used for experimental and theoretical aspects more frequently to compare with different formula like Lorenz and Lorentz, DDJ, PDJ, and Q test[2-11].

MATERIALS AND METHODS

The A.R. grade chemicals were obtained from commercial sources and purified by either distillation or recrystallization before use. Following table provide information of % composition of Acetic acid and Acetone, refractive index, L&L, and also developed PDJ formula and at last difference of L&L and PDJ.

Table-1 Acetic acid + Acetone   (A= Acetic acid, B=Acetone)

Sr. No.	% Of A	% Of B	d gm/cm^3	Refractive index n	R_1 $R = \dfrac{n^2-1}{n^2+2} \cdot \dfrac{1}{d}$ L&L	R_2 $R_2 = \dfrac{n-0.91}{2.06} \times \dfrac{1}{d}$ PDJ	Diff. R_1-R_2
1	0	100	0.7922	1.358	0.2772	0.2745	0.0027
2	10	90	0.8235	1.367	0.2727	0.2694	0.0033
3	20	80	0.8383	1.365	0.2665	0.2635	0.0031
4	30	70	0.8621	1.368	0.2611	0.2579	0.0032
5	40	60	0.8933	1.373	0.2550	0.2516	0.0034
6	50	50	0.9218	1.375	0.2483	0.2449	0.0035
7	60	40	0.9460	1.376	0.2426	0.2391	0.0034
8	70	30	0.9750	1.378	0.2365	0.2330	0.0035
9	80	20	1.0061	1.38	0.2302	0.2268	0.0035
10	90	10	1.0414	1.384	0.2245	0.2209	0.0036
11	100	0	1.0500	1.378	0.2196	0.2164	0.0032

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$$R_1 = \frac{n^2-1}{n^2+2} \times \frac{1}{d}$$

$$R_2 = \frac{n-0.91}{2.06} \times \frac{1}{d}$$
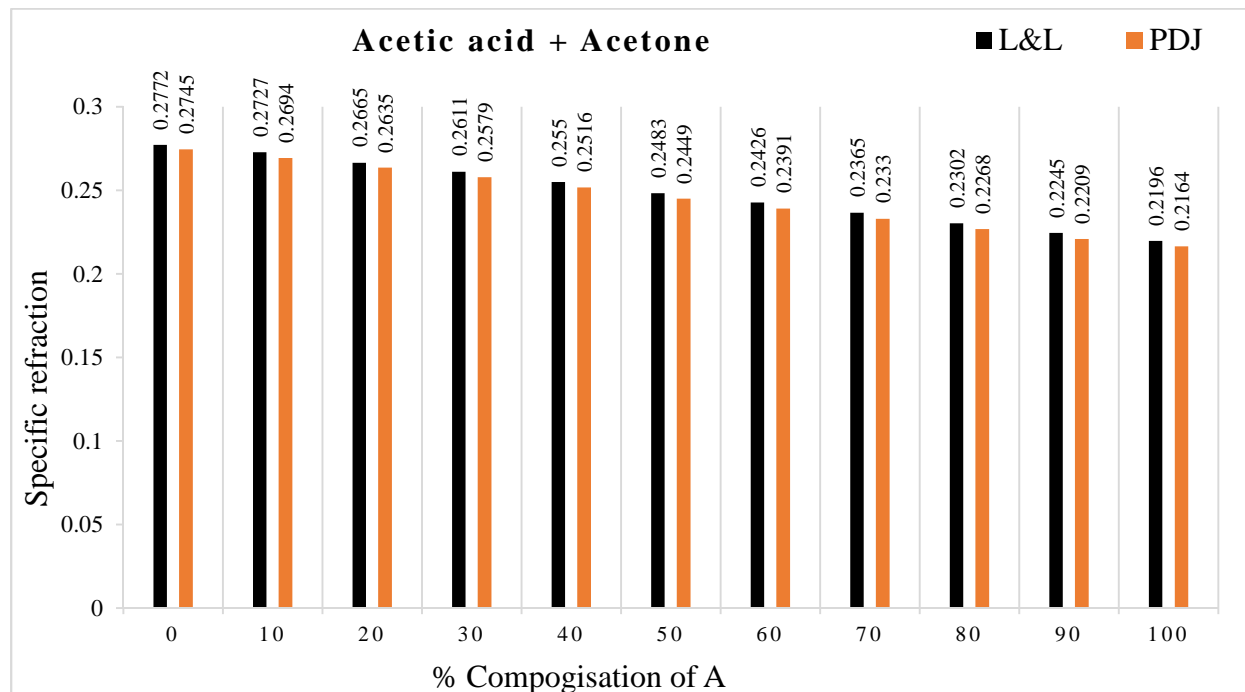
Lorenz and Lorentz formula

Suggested PDJ formula

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Table-2 Comparison of Theoretical and Experimental Specific Refraction for some organic Liquids in L&L and PDJ formula

Sr.NO	Name of liquid	Theoretical				Experimental			
		Density	R.I.	Specific Ref. (R)		Density d	R.I.	Specific Refraction R	
		d		L&L	PDJ			L&L	PDJ
1	Acetone	0.792	1.3588	0.2778	0.2751	0.7912	1.333	0.2513	0.2595
2	Toluene	0.866	1.4978	0.3384	0.3295	0.8508	1.495	0.3427	0.3338
3	Xylene	0.8745	1.5077	0.3407	0.3318	0.8539	1.508	0.3466	0.3400
4	Methanol	0.796	1.3311	0.2571	0.2568	0.7781	1.333	0.2642	0.2639
5	Ethanol	0.7893	1.3624	0.2813	0.2782	0.8058	1.364	0.2765	0.2735
6	Propanol	0.8044	1.3854	0.2916	0.2869	0.7943	1.384	0.2963	0.2897
7	Chloroform	1.4984	1.4464	0.1781	0.1738	1.4985	1.445	0.1776	0.1733
8	Carbon Tetrachloride	1.595	1.464	0.173	0.1686	1.5973	1.468	0.1741	0.1696
9	Cyclohexane	0.7785	1.4266	0.3295	0.3221	0.7665	1.431	0.3375	0.3300
10	Cyclohexanon	0.9478	1.4508	0.284	0.277	0.9429	1.458	0.2891	0.2821
11	Cyclohexanol	0.9624	1.4641	0.2868	0.2795	0.9587	1.47	0.2911	0.2836

RESULTS AND DISCUSSION

The graph of percentage composition of liquid A against specific refraction of binary mixture solutions are plotted for every system. The observed curves was classified as

1. Straight line curves or ideal system
2. Positive and negative deviation curves
3. Wave type curves or unsymmetrical curves

Verification from Q Test of acetic acid + acetone binary liquid mixture.

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Symbol	Values in increasing Order	Q_1	Q_2
		0.1202	0.1221
M1	0.2209	Q_1=(M2-M1) / (M9-M1)	
M2	0.2268	Q_2=(M9-M8) / (M9-M1)	
M3	0.2330		
M4	0.2391	Values of Q_1 and Q_2 are less than 95% Confidential level.	
M5	0.2449	Therefore all values are acceptable.	
M6	0.2516		
M7	0.2579		
M8	0.2635		
M9	0.2694		

"Q" test table
Rejection Quotient, Q, at Different Confidence Limits

No. of Observations	Confidence level		
	Q_{90}	Q_{95}	Q_{99}
3	0.941	0.970	0.994
4	0.765	0.829	0.926
5	0.642	0.710	0.821
6	0.560	0.625	0.740
7	0.507	0.568	0.680
8	0.468	0.526	0.634
9	0.437	0.493	0.598
10	0.412	0.466	0.568
15	0.338	0.384	0.475
20	0.300	0.342	0.425
25	0.277	0.317	0.393
30	0.260	0.298	0.372

CONCLUSION

In binary mixture of Acetic acid and Acetone, straight line curved is indicates that the both component behaving ideally at any concentration. This type of all the system obey Raoults law. In other words system were called completely miscible binary liquid mixture and suggested PDJ formula is good agreement between Lorenz and Lorentz and PDJ formula within 0.0001 to 0.0183 marginal different which is negligible.

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