



Structural Study of a Binary Mixture of Multifunctional Group Molecules Using Time Domain Reflectometry

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Abstract

The dielectric relaxation study of diethanolamine with triethanolamine binary mixture have been determined over the frequency range of 10 MHz to 20 GHz, at 30°C using time domain reflectometry (TDR) method for 11 concentrations of the system. The present work reveals molecular interaction between same multi-functional groups [-OH and -NH₂] of the alkanolamines (diethanolamine and triethanolamine) using different models such as Debye model, Excess model and Kirkwood model. The dielectric parameters viz. static dielectric constant (ϵ_0) and relaxation time (τ) have been obtained with Debye equation characterized by a single relaxation time without relaxation time distribution by the least squares fit method.

Key words: Structural Properties, Diethanolamine, and Triethanolamine.

1. Introduction

Dielectric study of binary polar liquids provides information regarding solute-solvent interaction. Considerable dielectric relaxation study has been done in aqueous solutions[1-3]. The diethanolamine (DEA) and triethanolamine (TEA) are multifunctional substances that are capable of hydrogen bonding by both donation and acceptance of hydrogen bonds. Their properties, in this respect, have not so far been determined, and it should be of interest to see how one functional group (the two hydroxy and primary secondary functional groups) affects to the behavior of the other (the two hydroxy and tertiary amine functional groups). Diethanolamine (DEA) and triethanolamine (TEA) both are highly polar liquids. Dielectric relaxation of liquid mixture gives information about molecular interactions. Objective of the present work is to report the dielectric relaxation study for DEA-TEA system at various concentrations at 30°C.

Article Info:



2. Experimental Details

DEA (AR grade, Merck Specialties, Pvt. Ltd., Mumbai, India) and TEA (AR grade, Qualigens fine chemicals Pvt. Ltd., Mumbai, India) were used without further purification. The solutions were prepared at 11 different volume percentage of DEA from 0 % to 100 %. Using these volume percent the mole fraction is calculated as

$$x = (v_1 \rho_1 m_1) / [(v_1 \rho_1 m_1) + (v_2 \rho_2 m_2)] \quad (1)$$

where m_i , v_i , and ρ_i represent the molecular weight, volume percent, and density of the i^{th} ($i=1, 2$) liquids, respectively.

The complex permittivity spectra were studied using the time domain reflectometry [4] method. The Hewlett Packard HP 54750 sampling oscilloscope with HP 54754A TDR plug in module has been used.

The relaxation behavior of DEA-TEA system agrees with the Debye model. Therefore the experimental values of $\epsilon^*(\omega)$ were fitted with the Debye equation [5].

A nonlinear Least-Squares fit method [6] was used to determine the values of dielectric parameters.

3. Results and discussions

3.1 Dielectric Properties

The static dielectric constant (ϵ_0), dielectric constant at high frequency (ϵ_∞) and relaxation time (τ) obtained by fitting experimental data with the Debye equation are listed in table (1) for DEA-TEA system.

The values of static dielectric constant randomly increase with increasing the temperatures up to the melting points of DEA and TEA in the system, and then it becomes smoothly decreases with increase in temperatures. This behavior of static dielectric constants of DEA and TEA indicates that the change of phase from semi solid state to liquid state and increase in static dielectric constant may be correlated to disturbance in antiparallel arrangement of dipoles which leads to increase effective dipole moment. The melting point of DEA is 28°C and TEA is 20.5°C. The values of relaxation



time decreases with increase of temperature, but these values suddenly decreases at the melting points.

Table 1 - Temperature dependent dielectric relaxation parameters for DEA-TEA mixture

x_2	T=15°C	T=20°C	T=25°C	T=28°C	T=30°C
ϵ_0					
0.0000	19.07	20.93	22.56	24.69	24.53
0.0743	23.44	25.12	27.20	29.77	27.53
0.1530	25.30	27.68	29.53	31.22	30.04
0.2364	26.80	28.60	30.47	31.53	31.18
0.3251	27.89	29.55	31.22	32.54	31.60
0.4194	28.10	32.05	32.44	33.18	32.74
0.5201	27.33	31.94	31.22	30.92	30.06
0.6277	27.19	31.56	30.64	30.13	29.35
0.7429	26.84	30.77	30.08	29.79	28.93
0.8667	26.12	30.34	29.94	29.02	28.60
1.0000	25.18	29.83	29.26	28.57	28.09
ϵ_∞					
0.0000	2.69	2.78	3.03	2.57	2.46
0.0743	2.84	2.79	3.10	2.59	2.49
0.1530	2.71	2.81	3.13	2.61	2.53
0.2364	2.99	2.81	3.19	2.68	2.55
0.3251	3.12	2.83	3.22	2.70	2.58
0.4194	3.21	2.88	3.27	2.73	2.60
0.5201	3.76	2.91	3.09	2.74	2.63



0.6277	3.04	2.93	3.01	2.81	2.64
0.7429	2.81	2.98	2.98	2.88	2.69
0.8667	2.77	3.13	3.04	2.96	2.71
1.0000	2.61	3.30	3.18	3.02	2.97
$\tau(\text{ps})$					
0.0000	474.21	439.73	414.84	307.48	285.94
0.0743	488.03	441.84	423.10	326.30	298.52
0.1530	496.51	443.98	425.62	332.83	307.03
0.2364	502.47	450.04	428.04	345.31	310.44
0.3251	509.85	452.08	430.16	349.43	316.85
0.4194	513.64	457.24	432.96	353.01	327.24
0.5201	519.33	458.73	435.82	361.60	339.61
0.6277	528.07	460.85	437.44	369.55	358.77
0.7429	531.63	464.52	440.72	384.74	364.64
0.8667	548.70	470.35	441.65	400.33	371.38
1.0000	556.34	472.20	443.13	407.54	383.19

3.2 Excess Dielectric Properties

The information related to liquids 1 and 2 interaction may be obtained by excess properties [7, 8] related to the permittivity and relaxation times in the mixture.

The excess permittivity may provide qualitative information about multimers formation in the mixture as follows:

$\varepsilon^E = 0$ indicates that the unlike molecules of the mixture constituents do not interact at all.

$\varepsilon^E < 0$ indicates that the unlike molecules of the mixture constituents interact in such a way that the total effective dipoles get reduced. These liquids may form multimers leading to the less effective dipoles.



$\epsilon^E > 0$ indicates that the unlike molecules of the mixture constituents interact in such a way that the total effective dipole moment increases. There is a tendency to form multimers, dipole aligned in a parallel direction.

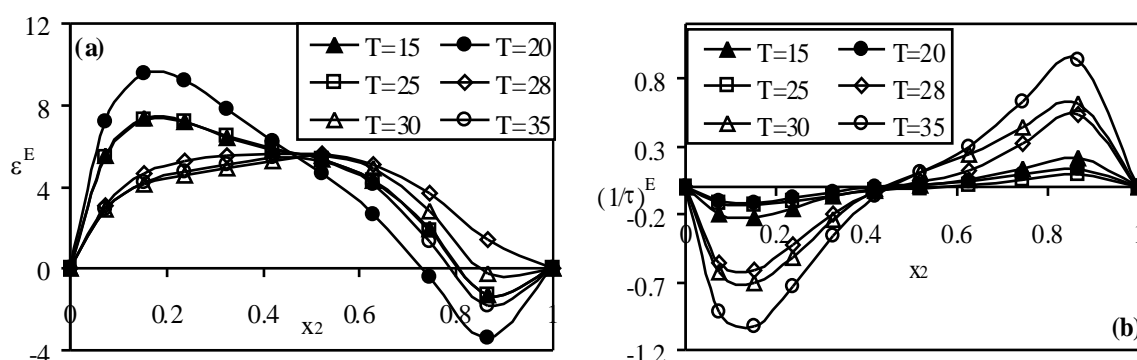


Fig. 1. (a) Excess permittivity (ϵ^E), (b) Excess inverse relaxation time $(1/\tau)^E$ versus mole fraction (x_2) of TEA in DEA at different temperatures.

The excess permittivity values are positive in the DEA rich region and negative in the TEA rich region, except 28°C. Excess inverse relaxation time value has reverse trend for all concentrations and at all temperatures. The positive peak values are different at all temperatures of excess permittivity in DEA rich region. The negative peak in the TEA rich region is at 0.8667 mole fraction of DEA in TEA in the system. The negative peak of excess inverse relaxation times is noted at 0.1530 and the positive peak at 0.8667 mole fraction of DEA in the TEA of the system. The excess permittivity values are positive up to the 80 % of TEA in DEA and then it becomes negative for 15, 25 and 30°C in the system. For 20°C, these values are positive up to the 90 % of TEA in DEA and then it becomes negative. At 28°C, all values are positive. The excess permittivity plots for the system studied show that, with addition of TEA, the values of excess permittivity become positive indicating formation of multimers in the mixture and it is negative in TEA rich region nearly 90 % TEA in the system.

Similarly, the excess inverse relaxation time $(1/\tau)^E$ which represents the average broadening of dielectric spectra. The inverse relaxation time analogy is taken from spectral line broadening (Which is the inverse of the relaxation time) in the resonant spectroscopy [9, 10].

The information regarding the dynamic of liquid 1 and 2 interactions from the excess inverse relaxation time is as follows:

$(1/\tau)^E = 0$: There is no change in the dynamics of liquid 1 and 2 interaction.



$(1/\tau)^E < 0$: The liquid 1 and 2 interaction produces a field such that the effective dipoles rotate slowly.

$(1/\tau)^E > 0$: The liquid 1 and 2 interaction produces a field such that the effective dipoles rotate quickly i.e. the field will co-operate in rotation of dipoles.

The excess inverse relaxation time values are negative up to the 50 % TEA and then it becomes positive in the system. The negative value of excess inverse relaxation time indicates slower rotation of the dipoles of the system and positive values indicates faster rotation of the dipoles of the system.

3.3 Kirkwood Properties

The Kirkwood correlation factor g [11] is also a parameter for getting information regarding the orientation of electric dipoles in polar liquids. The dipole moments for DEA and TEA in the gas phase are taken as 2.80D and 3.57D [12] respectively.

The structural information about the liquid by dielectric parameters can be obtained using Kirkwood correlation factor. The values of g^{eff} and g_r are tabulated in table (2). The value of g^{eff} is linearly increases up to 50 % TEA in DEA, and then it becomes decreases at 15oC. After all the temperatures (after the melting points) these values are linearly decreases with increase in the % volume of TEA in the system. After 28°C, these values are linearly increases with temperatures in DEA and TEA rich region (i.e. both are in liquid state). These values are greater than one indicating parallel orientation of the electric dipole and less than one indicating anti-parallel orientation of the electric dipole in the system. $g_f < 1$ for all concentrations at 20 to 30°C. The g_f values are close to unity for DEA-TEA system studied, indicating weaker intermolecular interactions between components of the system. The maximum deviation from unity is observed at 15°C, around 20 % of TEA in DEA mixture.

Table 2 - Temperature dependent Kirkwood parameters for DEA-TEA mixture.

ϕ_2	T=15°C	T=20°C	T=25°C	T=28°C	T=30°C
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g^{eff}					
1.0	0.8148	0.6783	0.7878	0.9391	0.9590
0.9	1.0304	0.8598	0.9860	1.1874	1.1263
0.8	1.1310	0.9903	1.1001	1.2925	1.2827
0.7	1.2168	1.0641	1.1624	1.3521	1.3852
0.6	1.2847	1.1437	1.2192	1.4477	1.4593
0.5	1.3110	1.2945	1.2982	1.5310	1.5741
0.4	1.2890	1.3396	1.2746	1.4733	1.4958
0.3	1.2986	1.3746	1.2780	1.4868	1.5173
0.2	1.2977	1.3913	1.2823	1.5242	1.5555
0.1	1.2777	1.4260	1.3060	1.5391	1.6004
0.0	1.2456	1.4578	1.3048	1.5723	1.6363
g_r					
1.0	1.0000	1.0000	1.0000	1.0000	1.0000
0.9	0.9823	0.9433	0.9728	0.9727	0.9623
0.8	0.9825	0.9235	0.9684	0.9634	0.9538
0.7	0.9937	0.9100	0.9683	0.9583	0.9538
0.6	1.0112	0.9095	0.9752	0.9698	0.9579
0.5	1.0235	0.9452	0.9977	0.9877	0.9821
0.4	1.0193	0.9529	0.9869	0.9637	0.9500
0.3	1.0279	0.9613	0.9863	0.9631	0.9504
0.2	1.0320	0.9644	0.9866	0.9762	0.9614
0.1	1.0227	0.9806	1.0008	0.9813	0.9805
0.0	1.0000	1.0000	1.0000	1.0000	1.0000



3.4 Conclusion

The Dielectric relaxation properties have been reported for some multifunctional (-OH and -NH₂) compounds binary mixture for various temperatures and concentrations.

- The values of static dielectric constant increase upto their melting points and then it becomes decreases with increasing the temperature in the system.
- The relaxation time of these molecules sudnly drops down at the melting points.
- The excess permittivity may provide qualitative infor-mation about multimers formation in the mixture.
- The information regarding the dynamic of liquid 1 and 2 interactions from the excess inverse relaxation time.
- The Kirkwood correlation factor is also a parameter for getting information regarding the orientation of electric dipoles in polar liquids.
- In semi-solid state, the strong inter-molecular intraction is observed as compaired to liquid state of the system contains same functional groups.

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References

- [1] A.V. Patil, G.N. Shinde, V.P. Pawar, "Dielectric relaxation study of hydrogen bonded structures in ethanolamine with diethanolamine using TDR technique," J. Mol. Liq., 168, 42-46, 2012.
- [2] A.V. Patil and V.P. Pawar, "Microwave dielectric spectra and molecular interaction in a binary mixture of ethanolamine with diethanolamine," J. Mol. Liq., 188, 1-4, 2013.
- [3] A.V. Patil, B.D. Achole, G.N. Shinde and V.P. Pawar, "Study of molecular interaction in binary mixture of dimethylene chloride with dimethylformamide using Bruggeman model," Scholars Research Library, Archives of Applied Science Research, 4(4), 1665-1669, 2012.
- [4] V.P. Pawar, A.V. Patil and S.C. Mehrotra, "Dielectric Relaxation Study of Acetonitrile with 1,2-dichloroethane Using TDR, International conference on dielectric Liquids," IEEE Explore, NTNU, Trondheim, Norway, 1-4, 2011.



- [5] P. Debye, "Polar Molecule; Chemical Catalog," Dover, NY, 1929.
- [6] P.R. Bevington, "Data reduction and error analysis for the physical sciences," McGraw Hill: New York, 1969.
- [7] V.P. Pawar, A.V. Patil, A.R. Patil, S.C. Mehrotra, "Dielectric relaxation study of solute-solvent interaction between dimethylene chloride and dimethylformamide using time domain reflectometry," J. Mol. Liq., 155, 16-19, 2010.
- [8] B.D. Achole, A.V. Patil, V.P. Pawar, S.C. Mehrotra, "Study of interaction through dielectrics: Behavior of -OH group molecules from 10 MHz to 20 GHz," J. Mol. Liq., 159, 152-156, 2011.
- [9] V.P. Pawar and A.V. Patil, "Dielectric relaxation studies on molecular interaction in binary mixture of dimethylene chloride with n-methylformamide," Fluid Phase Equilib., 376, 111-115, 2014.
- [10] V.P. Pawar and A.V. Patil, "Dielectric and thermodynamic properties in a binary mixture of dimethylene with formamide," J. Mol. Liq., 206, 239-243, 2015.
- [11] H. Fröhlich, "Theory of dielectrics", Oxford University press, London, 1949.
- [12] D.R. Lide, "CRC Handbook of Chemistry and Physics", 85th ed, CRC Press: Boca Raton, FL, 2007.



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Working Principle Of The Time Domain Reflectometry Technique And Its Applications

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Abstract

The Study of dielectric properties of polar liquids is very useful to understand the liquid structure, molecular interaction, dynamics and kinematics of the liquid mixture. Dielectric relaxation spectroscopy is used as an effective tool to get the information at the molecular level. Time Domain Spectroscopy (TDS) is a technique of recording the time dependent response of a system under the application of an electromagnetic signal. These dielectric parameters are used to find out excess dielectric permittivity, Kirkwood correlation factor, Bruggeman factor, and the thermodynamic parameters.

Keywords: Dielectric parameters, excess properties, Kirkwood parameters, thermodynamic properties and time domain reflectometry.

1. Introduction

Dielectric materials are mainly insulators, which mean that there is no flow of current when a voltage is applied. The interaction of electromagnetic radiation with a dielectric material gives a complex quantity as shown in equation (1).

$$\epsilon^*(\omega) = \epsilon' - j\epsilon'' \quad (1)$$

where $\epsilon^*(\omega)$ is the dielectric permittivity of the vacuum, ϵ' and ϵ'' indicates dielectric constant and dielectric loss.

The variation of complex permittivity with the logarithmic applied frequency is given in fig. 1.

A graph is drawn by taking dielectric loss along the x-axis and static permittivity along the y-axis, which decides the type of model followed by the system under consideration.



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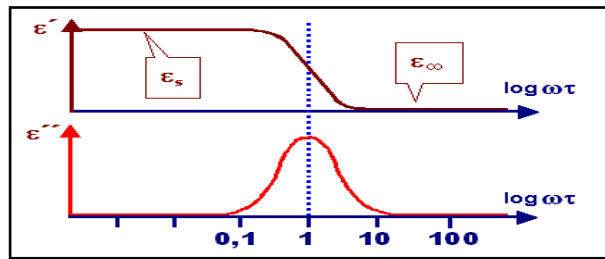


Fig. 1 Variation of complex dielectric permittivity with logarithmic frequency

• **Debye model:**

The resultant graph is a semicircle as shown in fig. 2, and then the system follows the Debye model. The static permittivity and dielectric loss are given by the Debye equation as

$$\epsilon^* = \epsilon_\infty + \frac{(\epsilon_0 - \epsilon_\infty)}{(1 + j\omega\tau)} \quad (2)$$

where ϵ_0 static permittivity, ϵ_∞ is the permittivity at high frequency and τ is the relaxation time. It gives the complex nature of the dielectric permittivity with dispersion. The real part complex permittivity indicates the orientation effect of a dielectric field with polarization and follows the applied electric field, whereas the imaginary part indicates chaotic motion leading to thermal dissipation with opposing the applied field.

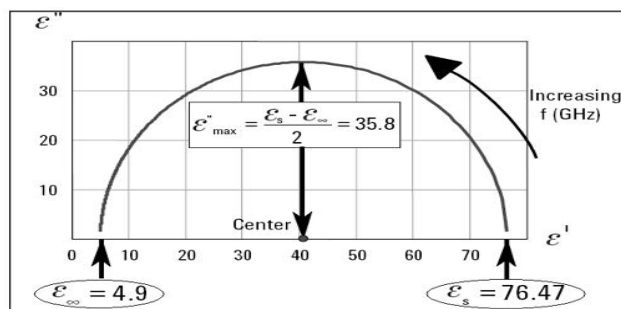


Fig. 2 Debye permittivity spectrum

• **The Cole-Cole Model (CC):**



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For long-chain molecules for which the permanent dipole moment is not aligned with the long molecular axis, these liquids exhibit a broader dispersion curve and lower maximum loss as shown in fig. 3. The Cole-Cole equation is given as [1]

$$\epsilon^*(\omega) = \epsilon_{\infty} + \frac{(\epsilon_0 - \epsilon_{\infty})}{(1 + j\omega\tau)^{1-\alpha}} \text{ with } 0 \leq \alpha \leq 1 \quad (3)$$

where α is the fitting parameter.

A material with multiple relaxation frequencies will be indicated by a semicircle (symmetric distribution) or an arc (non-symmetric distribution) with its center lying between the horizontal $\epsilon''=0$ axis.

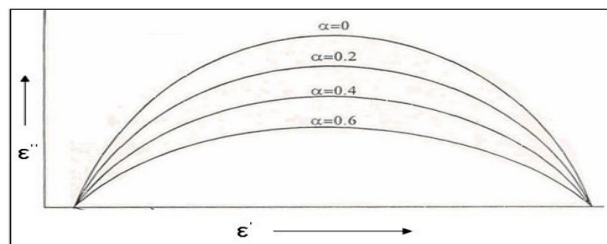


Fig. 3 Cole-Cole model with different values of symmetric distribution parameter (α)

- **The Cole-Davidson model (CD):**

The skewed arc behavior in liquids has been observed and explained in terms of a cooperative phenomenon and multiple relaxation processes. This model describes the asymmetric distribution of relaxation time. Fig 4 represents the Cole-Davidson model.

It describes the asymmetric distribution model. It is corresponding to relaxation time and gives a skewed arc ϵ' (ϵ''). The molecule becomes less rigid with an increase in chain length and maybe relaxes in many ways. The Cole-Davidson model related to the asymmetric distribution of relaxation time. The Cole-Davidson's equation is [2]

$$\epsilon^*(\omega) = \epsilon_{\infty} + [(\epsilon_0 - \epsilon_{\infty}) / (1 + j\omega\tau)^{\beta}] \text{ with } 0 \leq \beta \leq 1 \quad (3)$$

where β is the fitting parameters.



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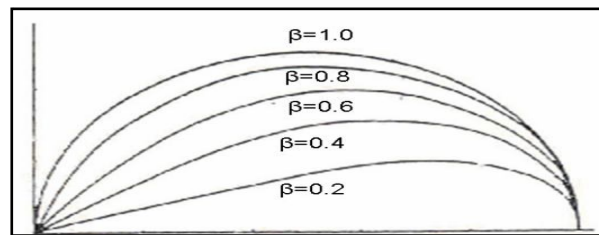


Fig. 4 Cole-Davidson model at different β values

• **The Havriliak –Negami model:**

There are many dielectric behaviors that cannot be explained by the above models. Havriliak-Negami generalized the expression, consisting of both Cole-Cole and Cole-Davidson expression as given below [3].

$$\epsilon^*(\omega) = \epsilon_{\infty} + \frac{(\epsilon_0 - \epsilon_{\infty})}{[1 + (j\omega\tau)^{1-\alpha}]^{\beta}} \quad (4)$$

It generalized expression containing a combination of CC and CD. Separation of real and imaginary parts gives an intricate expression for ϵ' and ϵ'' .

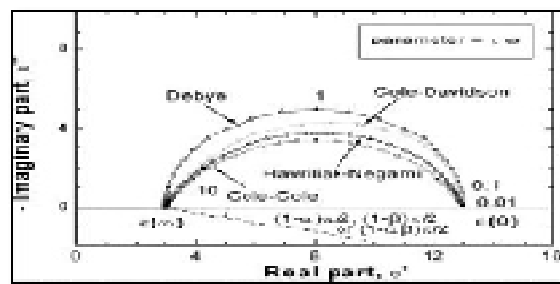


Fig. 5 Complex plane plot of dielectric constant vs dielectric loss in Debye, Cole-Cole, Cole Davidson and Havriliak-Negami model



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II. Experimental Technique

The “Time Domain Reflectometry” is a technique of observing the time-dependent reflection response of the time-dependent electromagnetic signal from the sample under study. Fig. 6 shows the block diagram of time domain reflectometry [4, 5]. Maintaining the integrity of the specifications.

The TDR dielectric measurement system consists of a step generator, which generates a fast rising step pulse of the order of picoseconds. A train of a suitable fast rising pulse is applied to a transmission line by usually a coaxial line with the characteristic impedance of 50Ω . This coaxial line is connected to the sampling device.

Sampling oscilloscope is a very important part of the TDR system. It contains a digitizer, a time base circuit, and a display circuit. The Tektronix contains the state-of-art sampling oscilloscope for communication signal analysis, TDR/TDT/Serial data network Analysis, acquisition and measurement of repetitive ultra fast signal with $80E08$ TDR sampling module with user selectable bandwidth, CDROM and USB port as shown in fig. 7. The DSA8200 is the industry’s highest performance, fully integrated time domain reflectometry (TDR) measurement system. Offering true differential TDR measurements up to 50 GHz bandwidth with 15 ps reflected rise time and 12 ps incident rise time of the applied electromagnetic signal.

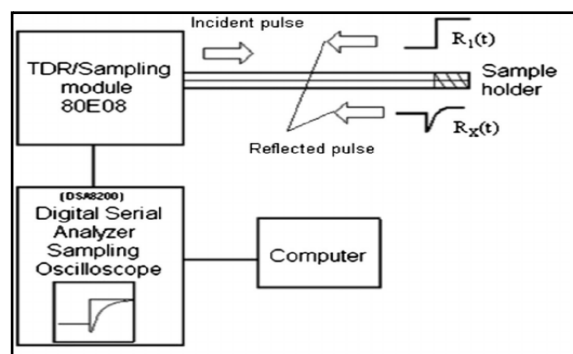


Fig. 6 Block diagram of the Time domain reflectometry technique



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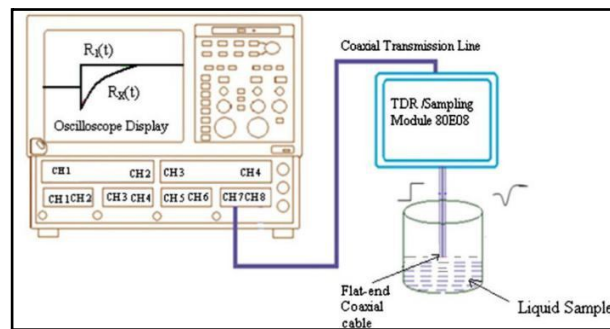


Fig. 7 Tektronix DSA8200 digital serial analyzer sampling oscilloscope

The 80E08 TDR/sampling module [6, 7] contains two oscilloscope measurement channels (CH₁ & CH₂), user selectable bandwidth 20 GHz and 30 GHz. The Sample module 80E08 with the integrated remote sampler is shown in fig. 8. The high bandwidth provides high reliability display and measurement of very high speed waveforms. It is easily capable of performing both single ended TDR/TDT measurements. The TDR rate can be selected manually or automatically for a repetitive rate of the TDR step. The snapshot of the actual TDR experimental setup is shown in fig. 9.



Fig. 8 Sample module 80E08 with the integrated remote sampler

The sample of the liquid under test is placed in the sample hold container as shown in fig. 10. Before starting an experiment, it is very important to know the physical dimensions of the sample cell. The impedance of the sample cell must be matched with the impedance of the coaxial line to which it is connected. If the impedance mismatches then the unwanted reflection may disturb the desired wave, thereby causing errors in the measurements. Fig. 11 represents the coaxial cable.

The time window depends on the desired required frequency range. The minimum noticeable frequency is given as

$$f_{\min} = 1/\text{time window}$$

and the maximum frequency absorbable is

$$f_{\max} = N/2 * \text{time window}$$



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where N is the number of times samples the signal. The proper selection of a time window is very important because the smaller time window causes signal loss and the larger time window includes unwanted reflections. The time window for the present work is 5 ns.



Fig. 9 TDR setup with temperature controlled system

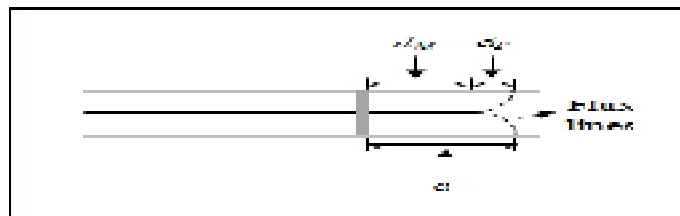


Fig. 10 Sample cell's effective pin length

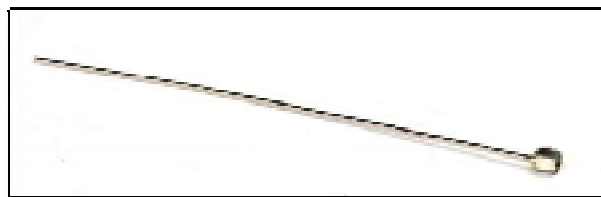


Fig. 11 the slim form of coaxial cable

III. Results and discussion

The reflected pulse without sample $R_1(t)$ and the reflected pulse with sample $R_x(t)$ are shown in fig. 12. These pulses are added and subtracted by using computer software. The subtracted pulses are represented as $p(t)$ i.e., $p(t) = [R_1(t) - R_x(t)]$ and the added pulses are represented as $q(t)$, which is equal to $q(t) = [R_1(t) + R_x(t)]$.



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$(t) + R_x(t)$. These resultant $p(t)$ and $q(t)$ pulses are graphically represented in figs. 13 and 14 respectively.

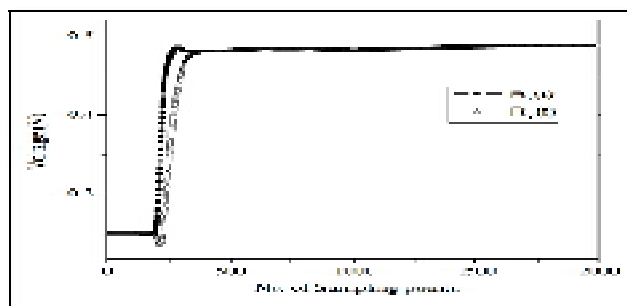


Fig. 12 Reflected pulse with sample $R_x(t)$ and without sample $R_1(t)$ for pure water

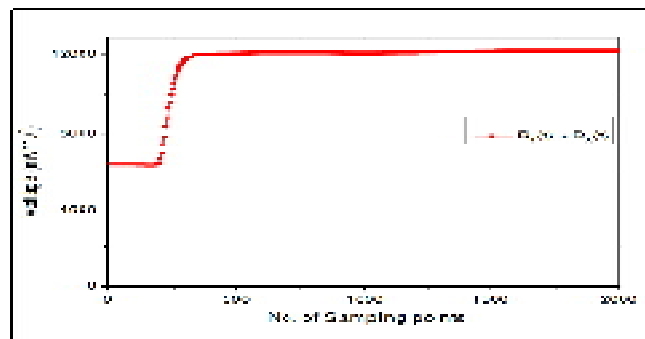


Fig. 13 Sample pulse of $[R_1(t) + R_x(t)]$ for pure water



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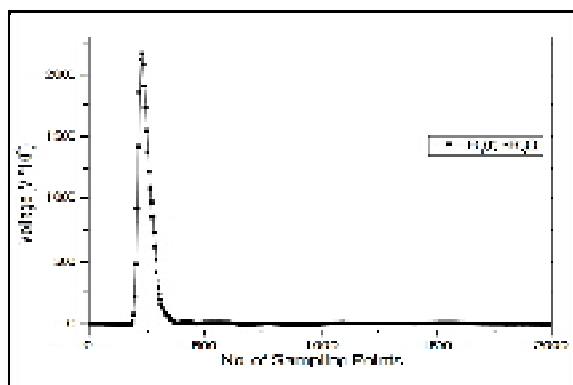


Fig. 14 Sample pulse of $[R_1(t) - R_x(t)]$ for pure water

The dielectric parameters of material are a measure of the extent to which the electric charge distributed in the material when an external electric field is applied to the material.

The values of static dielectric constant (ϵ_0), dielectric constant at high frequency (ϵ_∞) and relaxation time (τ) are received by fitting experimental data in the Debye model. The values of static dielectric constant and relaxation time decrease with increase in temperature as expected, it is due to an increase in the density with a decrease in temperature.

There are various models that can correlate dielectric parameters with molecular activities in liquid. The correlation between dielectric parameters and molecular interaction as well as structural changes in the mixture can be explored by various techniques. In the absence of an exact theory, the available theories with some assumptions provide a trend regarding interaction and structural changes.

The information related to the structural changes of liquid 1 and 2 may be obtained by excess properties of dielectric constant and relaxation time [8].

The excess permittivity ϵ^E is defined as

$$\epsilon^E = (\epsilon_0 - \epsilon_\infty)_m - [(\epsilon_0 - \epsilon_\infty)_1 x_1 + (\epsilon_0 - \epsilon_\infty)_2 x_2] \quad (5)$$

where x is mole fraction and suffices $m, 1, 2$ represents mixture, liquid 1 and 2 respectively.

Similarly, the excess inverse relaxation time is defined as

$$(1/\tau)^E = (1/\tau)_m - [(1/\tau)_1 x_1 - (1/\tau)_2 x_2] \quad (6)$$

where x is mole fraction and suffices $m, 1, 2$ represents mixture, liquid 1 and 2 respectively.



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The inverse relaxation time analogy is taken from the spectra line broadening in the resonant spectroscopy [9].

The excess properties [ϵ^E & $(1/\tau)^E$] as discussed above of binary polar liquids under consideration, prepared at a fixed temperature and are represented by the Redlich-Kister equation [10, 11].

$$A^E = (x_1 x_2) \sum_n B_n (x_1 - x_2)^n \quad (7)$$

where A is either ϵ^E or $(1/\tau)^E$, x_1 and x_2 are a molar fraction of two liquids, the coefficient B_n is a fitting coefficient to be determined by the least square fit method, for $n=0$ to 3.

The physical meanings of B_0 , B_1 , B_2 , and B_3 are correlated with rates for forming multimers as follows:

B_0 represents the rate for forming dimer liquid1-liquid2

B_1 represents rate for forming trimer 2 (liquid1)-liquid2

B_3 represents rate for forming quartermers 2 (liquid1)-2 (liquid2)

B_4 represents rate for forming pentamer 3 (liquid1)-2 (liquid2)

The negative sign of B_n represents the formation of the liquid mixture is more favorable, whereas the positive sign represents the breaking of a liquid mixture is more favorable.

In binary polar liquid 1 & 2, molecules of liquid 1 interact with the molecules of liquid 2, resulting in the formation of multimer-type of structures, resulting in dipolar reorientation [12]. The value of g for pure liquid may be obtained by the expression

$$\frac{4\pi N \mu^2 \rho}{9kTM} g = \frac{(\epsilon_0 - \epsilon_\infty)(2\epsilon_0 + \epsilon_\infty)}{\epsilon_0(\epsilon_\infty + 2)^2} \quad (8)$$

where μ is dipole moment in the gas phase, ρ is the density at temperature T , M is molecular weight, k is Boltzmann constant, N is Avogadro's number.

For the mixture of two polar binary liquids 1 and 2, the equation (8) is modified by Kumbharkhare et al [13] with the following assumptions:

1. Let us assume that for the polar binary liquid mixture, g^{eff} is an effective correlation factor in the mixture. The Kirkwood equation for the mixture may be expressed as

$$\frac{4\pi N}{9kT} \left(\frac{\mu_1^2 \rho_1}{M_1} \phi_1 + \frac{\mu_2^2 \rho_2}{M_2} \phi_2 \right) g^{\text{eff}} = \frac{(\epsilon_{0m} - \epsilon_{\infty m})(2\epsilon_{0m} + \epsilon_{\infty m})}{\epsilon_{0m}(\epsilon_{\infty m} + 2)^2} \quad (9)$$

where g^{eff} is the effective Kirkwood correlation factor for a binary mixture, with ϕ_1 and ϕ_2 as volume percent of liquids 1 and 2 respectively.



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The value of g^{eff} provides structural information related to the dipole orientation in binary liquids as follows:

- The value of $g^{\text{eff}} > 1$ indicates that due to solute-solvent interaction the dipoles get aligned such that the effective dipoles become larger as compared to pure liquids.
- When the molecules prefer an ordering with antiparallel dipoles, the value of $g^{\text{eff}} < 1$.
- The value of $g^{\text{eff}} = 1$ indicates there is no dipolar correlation.

2. Let us assume that the correlation factors for molecules 1 and 2 in the mixture contribute to the effective g proportionally to their pure-liquid values g_1 and g_2 . Under this assumption, the Kirkwood equation for the mixture can be written

$$\frac{4\pi N}{9kT} \left(\frac{\mu_1^2 \rho_1 g_1}{M_1} \phi_1 + \frac{\mu_2^2 \rho_2 g_2}{M_2} \phi_2 \right) g_f = \frac{(\epsilon_{0m} - \epsilon_{\infty m})(2\epsilon_{0m} + \epsilon_{\infty m})}{\epsilon_{0m}(\epsilon_{\infty m} + 2)^2} \quad (10)$$

where g_f is the Kirkwood correlation factor.

The g_f gives information about angular correlation within the molecules of the system.

- When the value of $g_f > 1$ indicates that the effective dipole value in the liquid under study will be higher than the average value in pure liquids.
- When $g_f < 1$ indicates the liquid under consideration will be lower than the average value in pure liquids.
- When $g_f = 1$ then there is no effective dipole.

The thermodynamic parameters like molar enthalpy of activation (ΔH) and molar entropy of activation (ΔS) are determined from the Eyring rate equation [14] utilizing the least square fit method.

$$\tau = \frac{h}{KT} \exp(\Delta H - T\Delta S) / RT \quad (11)$$

In a binary mixture of polar liquids, there is a change in the energy of the system. This change in energy can be interpreted with thermodynamic parameters such as free energy of activation (ΔG), molar enthalpy of activation (ΔH) and molar entropy of activation (ΔS).

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valuable guidance and Dr. S. C. Mehrotra, Ramanujan Chair Professor, Department of Computer Science and IT, Dr. B.A.M. University, Aurangabad for their valuable discussion and suggestions.

Applications

- 1) **Agriculture:** In agriculture, it is found that the dielectric permittivity increases with increasing moisture contents in the seeds and the dielectric permittivity decrease with increasing frequency. At high moisture level and low frequency range, the magnitudes of variation in dielectric permittivity were large. This variation is used to get an idea of the moisture contents in seeds.
- 2) **Moisture measurement:** Accurate measurement of moisture content is of importance in many applications, including agricultural and the food processing industries. Because of the high relative permittivity of water, the dielectric properties of moist material are strongly dependent on their moisture content, these methods rely on calibration curve relating relative permittivity to moisture content, which may be obtained by measuring a range of samples with known moisture level.
- 3) **Medicine:** A controlled dose of microwaves can be made useful for medical diagnosis, therapy, and human comfort. Physical therapy of microwaves has been found effective in curing inflammation, piles, and injury. Microwave treatment of cancer has also been studied. Human comfort and physical health depend upon the energy exchange between man and surrounding.
- 4) **Electrochemical supercapacitors:** Commercially manufactured capacitors typically use a solid dielectric material with high permittivity as the intervening medium between the stored positive and negative charges. This material is often referred to in technical contexts as the "capacitor dielectric".

References

- [1] K. S. Cole and R. H. Cole, Dispersion and absorption in dielectrics I. alternating current characteristics, *J. Chem. Phys.*, **9**, 341 (1941).
- [2] D. W. Davidson and R. H. Cole, Dielectric relaxation in glycerol, propylene glycol, and n-propanol, *J. Chem. Phys.*, **19**, 1484 (1951).
- [3] S. Havriliak and S. Negami, A complex plane analysis of α -dispersions in some polymer systems, *J. Polym. Sci.*, **14**, 99-117 (1966).
- [4] N. E. Hill, W. E. Vaughan, A. H. Price, M. Davies. Dielectric properties and molecular behavior, London: Van Nostrand Reinhold CO.: (1970).
- [5] J. M. Hadi, W. N. Hunter, A. M. North, R. A. Pethrick, M. Towland, *Adv. Mol. Relax. Process.*, **6**, 267 (1975).
- [6] Tektronix DSA8200 Sampling Oscilloscope user's guide.
- [7] 80E08 TDR Plug in Modules user and programmer's guide
- [8] M. Tabellout, P. Lancelot, J. R. Emery, D. Hayward and R. A. Pethrick, *J. Chem. Soc. Faraday Trans.*, **86**(9), 1453 (1990).
- [9] S. C. Mehrotra and J. E. Boggs, *J. Chem. Phys.*, **66**, 5306 (1977).
- [10] M. I. Aralaguppi, T. M. Aminabhavi, R. H. Balundgi and S. S. Joshi, *J. Phys. Chem.*, **95**, 5299 (1991).
- [11] S. F. Al-Azzawi, A. M. Awwad, A. M. Al-Dujaili and M. K. Al-Noori, *J. Chem. Engg. Data.*, **35**, 463 (1990).
- [12] H. Fröhlich, Oxford University press, London (1949).
- [13] A. C. Kunbharkhane, S. M. Puranik and S. C. Mehrotra, *J. Chem. Phys.*, **21**, 201 (1993).
- [14] H. Eyring, *J. Chem. Phys.*, **4**, 283 (1936).



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Role of Internal Quality Assurance Cell in Higher Educational Institutions

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Abstract:

The University Grant Commission (UGC) established the National Assessment and Accreditation Council (NAAC) in 1994 at Bangalore. The prime agenda of NAAC is to Assess and Accredite institutions of higher learning with an objective of helping them to work continuously to improve the quality of education. The role of IQAC has proven as quite significant in all these years to create a kind of positive change in the overall functioning of the colleges/universities. This paper is an attempt to take look into the matter as to how and in what ways IQAC functions and brings quality in the overall development of institutes of higher education and to find out the role of IQAC in terms of quality assurance, sustaining in regard with all the core elements. This paper will also state some of the observations of functioning of the IQAC in the colleges.

Keywords: IQAC, NAAC, Higher educational Institution, UGC.

Introduction

Quality is the back bone of any education system. It is said that quality of a nation is judged by the quality of its citizens. Quality of citizens directly depends on the system of education of the nation which in turn is determined by quality of teachers. Quality in higher education is the most urgent need as India moves towards becoming an educational hub. The quality requires constant



efforts so that it is maintained and sustained thoroughly. As Foster rightly says 'Quality is never an accident' rather it requires 'high intention, sincere effort, intelligent direction and skilful execution' so quality is not come to us accidentally rather it requires a constant efforts for an individual or an institute. All levels of education need a strong vertical knit to ensure quality. Academic institutions opt for quality circles and quality efforts at institutional, national and international levels. In addition, various academic bodies like NAAC, MCI, AICTE, NCTE etc. aim at quality enhancement in higher education.

NAAC has given guidelines to all the accredited institutions to establish an internal quality assurance cell (IQAC) to ensure qualitative growth of the institution. The composition of the cell has been clearly defined so as to be representative of all the constituents of the institution. Internal Quality Assurance Cell (IQAC) is established as a post accreditation quality sustenance measure. Since quality enhancement is a continuous process, the IQAC has become a part of the institution's system and work towards realizing the goals of quality enhancement and sustenance. The prime task of the IQAC is to develop a system for conscious, consistent and catalytic improvement in the performance of institutions. The IQAC has made a significant and meaningful contribution in the post-accreditation phase. During the post-accreditation period, the IQAC has channelized the efforts and sustaining quality in higher education, National Assessment and Accreditation Council (NAAC) has been making constant efforts by introducing new concepts, guiding principles and some measures of developing quality in the institutes of higher learning. measures of an institution towards academic excellence. Therefore in terms of enhancing and sustaining quality in higher education, National Assessment and Accreditation Council (NAAC) has been making constant efforts by introducing new concepts, guiding principles and some measures of developing quality in the institutes of higher learning.

Objectives & Methodology for the Study

The present paper aims at presenting an overview of IQAC's (Internal Quality Assurance Cell) its basic purposes, functions, benefits, activities organised by IQAC etc., in the various



institutions. The data and information is collected from various secondary sources like published journals, research articles, official websites for the present work.

The basic purposes of the IQAC

- a) To ensure continuous improvement in the entire operations of the institution and
- b) To assure stakeholders connected with higher education – namely, students, parents, teachers, staff, would-be employers, funding agencies and society in general - of the accountability of the institution for its own quality and probity

Functions of IQAC As highlighted in the UGC Guidelines, the goals of IQAC shall be: 1)

To develop a quality system for conscious, consistent and catalytic programmed action to improve the academic and administrative performance of the HEIs; and,

2) To promote measures for institutional functioning towards quality enhancement through internalization of quality culture and institutionalization of best practices. To attain these goals, the functions of IQAC shall be:

- Development and application of quality benchmarks/parameters for the various academic and administrative activities of the HEI; Facilitating the creation of a learner-centric environment conducive for quality education and faculty maturation to adopt the required knowledge and technology for participatory teaching and learning process;
- Arrangement for feedback responses from students, parents and other stakeholders on quality-related institutional processes;
- Dissemination of information on the various quality parameters of higher education
Organization of inter and intra institutional workshops, seminars on quality related themes



and promotion of quality circles;

- Documentation of the various programmes/activities of the HEI, leading to quality improvement;
- Acting as a nodal agency of the HEI for coordinating quality-related activities, including adoption and dissemination of good practices;
- Development and maintenance of Institutional database through MIS for the purpose of maintaining /enhancing the institutional quality;

Benefits of IQAC

1. Ensure heightened level of clarity and focus in institutional functioning towards quality enhancement
2. Ensure internalization of the quality culture;
3. Ensure enhancement and integration among the various activities of the institution and institutionalize good practices;
4. Provide a sound basis for decision-making to improve institutional functioning;
5. Act as a dynamic system for quality changes in the HEIs;
6. Build an organized methodology of documentation and internal communication.

Indian Higher Education and Establishment of NAAC

The Indian system of higher education has always been undergone so many changes and tackled with challenges since independence. There were so many challenges to which our educational system has responded positively during all these years. One of such substantial changes came in the form of National Assessment and Accreditation Council (NAAC) which was established by



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the UGC at Bangalore in 1994 in India to ensure and enhance the quality of Indian higher education. As suggested in guiding principles that the functions of NAAC incorporate - performance evaluation, assessment and accreditation and quality up gradation of institutions of higher education. And the prime objective of the accreditation process is to develop a quality conscious system in higher education institutions where excellence, relevance to market needs and participation by all stake holders are ensured

NAAC and Introduction of IQAC in Colleges/Institutes of Higher Education

National Assessment and Accreditation Council (NAAC), Bangalore has introduced Internal Quality Assurance Cell (IQAC) to all the college and institutions as a post-accreditation quality sustenance measure. As quality enhancement is a continuous process, the IQAC has to become an integral part of the institution's system and needs to work towards fulfillment of the goals i.e. quality enhancement and sustenance in almost all the core elements. The major concern of the IQAC is to develop a system for conscious and consistent improvement in the overall performance of institution. This is expected from IQAC in any university or an institution.

Plan of Action

1. To review the performance of the entire array of academic programmes encompassing the faculty, research scholars and students.
2. To promote research in new and advancing fields of relevance. For this Research and Development Cell and University Research board were instituted.
3. Dissemination of information on the activities of the University for the benefit of general public and elite of the society.
4. Constitution of Quality Circles at all the levels of University to involve the entire crosssection of University for the quality improvement.
5. Adoption of a Student Charter in the University to bring awareness among the students of their own responsibilities and the functions of the institution.



6. Obtaining Feedback from the alumni, retired staff and students, and making the analytical data available to the concerned teaching staff and administration

Quality Enhancement Activities in education

1. Academic Activities

Semester System have been introduced. Language labs have been established to impart training to students in communication and soft skill, modernizing the class rooms and laboratory facilities. An Academic Calendar provides the entire academic schedule including the dates for internal tests and external examinations. Examination results published within 2-3 weeks. Implemented the teachers' evaluation by the students which served the teachers to enhance their performance.

(ii) Research Activities

University provided functional autonomy to the faculty by way of simplifying the administrative procedures concerning the execution of research projects. Research in thrust areas like Bio pesticides, for Rural Development. The faculty, who secure major research projects, are provided an incentive. Faculty is encouraged to participate in or organize seminars / conferences/ workshops in India and abroad. Qualified faculty in the affiliated colleges are encouraged to guide the candidates pursuing Ph.D. and M.Phil. Programmes. University Research Board has been constituted to periodically monitor the quality of research work carried out by the research scholars and encourage them to undertake research in potential areas. University has embarked on a proactive strategy of forging collaboration with the industries and research organizations all over the world, keeping in view the challenges of globalization demands of the society. University is bringing out research journals in areas of specialization encompassing major disciplines. **iii) Extension Activities**

University has organized seminars/conferences/workshops to elicit the views of various sections of the society in the form of University-Community interaction, University -



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Industry Partnership and University-Farming Community meet. Students have been actively involved in the community development programmes in the villages adopted by the University. Among various programmes undertaken by the University include health awareness, child labour 1 seminar eradication, family planning drive, environmental protection and literacy campaign. All the students are actively involved in the "Clean and Tidy Programme" in the campus on fourth Saturday of every month. Under the "Open House" concept and Exhibition, University has showcased the activities and potentialities of the University in various fronts for developing awareness among the public and creating interest among students in pursuing higher education. University Law Department offers counselling to the public on legal issues; Psychology department on Psychiatric problems and Home Science on health and Nutrition.

Conclusion

Thus, the role of IQAC is very instrumental in bringing about so many positive changes in and around the college premises. Moreover, IQAC can create a very good academic atmosphere in the premises so that the quality is maintained and enhanced time to time. Finally, it should be remarked that quality assurance is essential for improving institutional efficiency and effectiveness, and also increasing public accountability. Internal Quality Assurance Cell's providing a benchmarking performance in the higher education. Quality assurance activities must be clear and transparent and, more importantly, they must be achievable and able to meet customer expectations. When quality assurance systems and procedures are clear and activities well defined, it is only then, that higher education institutions (HEI's) will be able to meet high quality standards.

References

- 1.Hegde, M.G., (2007). Proceedings of NAAC sponsored seminar on Quest for Quality:
Class room Matters, at kumta, North Kanara, Karnataka, P.10,11



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India. 431 131



2. Hegde, et al., (2006). *Best Practices in Internal Quality Assurance Cell Activities*, NAAC, Bangalore, P.77
3. Hegde, G.A.,(2009). Guest Editorial, *University News Special issue on Quest for Quality: Internal Quality System Matters.*, vol.47 No.16 April 20-26, P.2-5
4. Stella, Antony & Gnanam, A (2004). *Assuring Quality Standard in Higher Education: The Contemporary context & Concerns*, Published by Allied Publisher (p) Limited.
5. NAAC, 1996. *Guidelines for Internal Quality Assurance Cell Operations*, P.57
6. NAAC, 2005. *Guidelines for the creation of the internal Quality Assurance Cell (IQAC) in Accredited Institutions*, P.2-6
7. Department of Higher Education, India, <<http://education.nic.in/sector.asp/>>
8. Ministry of Human Resource Development, India, <<http://education.nic.in/>>
9. Higher Education in India, <http://education.nic.in/higedu.asp/>
10. *Guidelines for the Creation of the Internal Quality Assurance Cell (IQAC) and Submission of Annual Quality Assurance Report (AQAR) in Accredited Institutions.* Retrieved from <http://www.naac.gov.in/AQAR.asp>, p.3-4.