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Studies on some physical properties of pyrazolo-quinazolines

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ABSTRACT

Some new pyrazolo-quinazoline derivatives have been synthesized and their characterization was done by IR, NMR and mass spectra. Further, some physicochemical properties such as density, refractive index, have been studied for these synthesized compounds, in different solvents at 298.15 K, 308.15 K and 318.15 K temperatures. Conductance has been studied for these synthesized compounds, in different solvents at 308.15 K.

***Keywords*:** pyrazolo-quinazoline derivatives, Density, Refractive Index, Conductance, DMF, DMSO, anti cancer, anti inflammatory, anti bacterial, anti viral, anti fungal

1. INTRODUCTION

Pyrazolo-quinazolines are the important class of compounds which exhibits a wide spectrum of pharmacological activities such as anti cancer, anti inflammatory, anti bacterial, anti viral, anti fungal [1-7] etc. The biological properties can be predicted by various theoretical methods for which physic chemical properties are required. Thus, in the present work, some physical properties such as density, refractive index and conductance have been evaluated in different solvents at different temperatures.

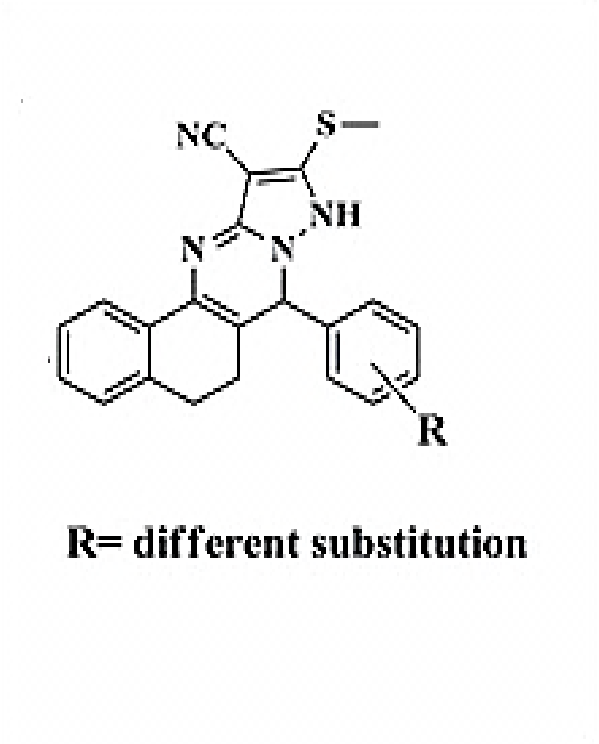
In the present section, the density and refractive index of synthesized compounds were measured in DMF and DMSO solutions at different concentrations at different temperatures (298.15-318.15 K) and conductance of some new pyrazolo-quinazoline derivatives was measured in DMF and DMSO at 298.15 K.

2. EXPERIMENTAL

The DMF and DMSO used ware of AR grade supplied by Spectrochem Pvt. Ltd. (Mumbai, India) and were purified according to the standard procedure [8].

Synthesis:

The detailed synthesis of pyrazolo-quinazolines are reported earlier [9] and the general structure is shown in Figure 1.



where R is:

KC-1 = 4-Cl benzaldehyde
KC-2 = 4-OCH_3 benzaldehyde
KC-3 = 4-F benzaldehyde
KC-4 = 4-Br benzaldehyde
KC-5 = 3,4-di-OCH_3 benzaldehyde
KC-6 = 4-CN benzaldehyde
KC-7 = 3-Cl benzaldehyde
KC-8 = 3-OCH_3 benzaldehyde
KC-9 = 3-Br benzaldehyde
KC-10 = 4-CH_3 benzaldehyde

Figure 1. General structure of synthesized pyrazolo quinazoline derivatives.

Physicochemical studies:

Density and Refractive index:

The density of solutions were measured by Anton Paar density and sound velocity meter (DSC 5000M) at different temperatures (298.15-318.15 K). The Anton Paar automatic refractometer (Abbemat WR) was used for the measurement of refractive index of solutions of synthesized compounds at different temperatures (298.15-318.15 K).

Conductance:

For all the synthesized compounds, conductance is measured in N,N-dimethyl formamide and dimethylsulfoxide solutions at 298.15 K. The conductance of each solution was measured by using Equip-tronics conductivity meter (Model No. 664) having a cell constant 0.93 cm^{-1} at 298.15 K.

3. RESULTS AND DISCUSSION

Spectral data

KC-1:
IR (cm^{-1}, KBr): 3475.85 (-NH (sec.) str.), 3049.56 (Ar-H str.), 2924.18(-CH_2 sym. str.), 2227.86 (-CN str.), 1664.62(C=C str. α,β unsaturated 6-member ring), 1604.83(-NH bending vib. Secondary amine), 1381.08 (-CH bending.), 1315.50(C-N (sec) bending.), 1242-1010(C-H in plane bending, phenyl ring), 767.69 (C-H str. 5-adjecent c atoms), 767.69(C-Cl str.); ^{1}H NMR (DMSO-d_6) δ(ppm): 2.400 (3H, singlet, -CH_3), 1.785-2.750 (4H, multiplet, C-H), 6.068 (1H, singlet, C-H), 7.216-7.704 (8H, multiplet C-H), 10.139 (1H, singlet, -NH); MS: (m/z) = 404; Elemental analysis: %C = 65.29 (65.34), %H = 4.21 (4.20), %N = 13.88 (13.86), %S = 7.92 (7.92).

KC-2:
IR (cm^{-1}, KBr): 3284.83 (-NH (sec.) str.), 3064.99 (Ar-H str.), 2908.75(-CH_2 sym. str.), 2225.93 (-CN str.), 1666.55(C=C str. α,β unsaturated 6-member ring), 1604.83(-NH bending vib. Secondary amine), 1383.01 (-CH bending.), 1336.71(C-N (sec) bending.), 1242-1010 (C-H in plane bending, phenyl ring), 767.69 (C-H str. 5-adjecent c atoms), 731.05(C-H in plane bending); ^{1}H NMR (DMSO-d_6) δ(ppm): 2.443 (3H, singlet,-CH_3), 3.696 (3H, singlet-OCH_3), 1.798-2.757(4H, multiplet, C-H), 5.937 (1H, singlet, C-H), 6.896-7.691 (8H, multiplet C-H), 10.009 (1H, singlet, -NH); MS: (m/z) = 400; Elemental analysis: %C = 68.92 (69.00), %H = 5.06 (5.00), %N = 13.97 (14.00), %S = 8.03 (8.00),%O = 4.02 (4.00).

KC-3:
IR (cm^{-1}, KBr): 3479.70 (-NH (sec.) str.), 3037.99 (Ar-H str.), 2918.40(-CH_2 sym. str.), 2227.86 (-CN str.), 1666.55 (C=C str. α,β unsaturated 6-member ring), 1599.04 (-NH bending vib. Secondary amine), 1381.08 (-CH bending.), 1319.08 (C-N (sec) bending.), 1242-1010(C-H in plane bending, phenyl ring), 1093.67 (C-F str.), 725.26 (C-H str. 5-adjecent c atoms); ^{1}H NMR (DMSO-d_6) δ(ppm): 2.419 (3H, singlet, -CH_3), 1.791-2.767 (4H, multiplet, C-H), 5.987 (1H, singlet, C-H), 7.148-7.684 (8H, multiplet C-H), 10.251 (1H, singlet, -NH); MS: (m/z) = 388; Elemental analysis: %C = 68.07 (68.04), %H = 4.42 (4.38), %N = 14.41 (14.43), %S = 8.25 (8.24).

KC-4:
IR (cm^{-1}, KBr): 3257.88 (-NH (sec.) str.), 3047.63 (Ar-H str.), 2929.97 (-CH_2 sym. str.), 2227.86 (-CN str.), 1653.05 (C=C str. α,β unsaturated 6-member ring), 1604.83 (-NH bending vib. Secondary amine), 1383.01 (-CH bending.), 1315.50 (C-N (sec) bending.), 1242-1010 (C-H in plane bending, phenyl ring), 723.33 (C-H str. 5-adjecent c atoms), 582.52 (C-Br str.); ^{1}H NMR (DMSO-d_6) δ(ppm): 2.422 (3H, singlet, -CH_3), 1.799-2.787 (4H, multiplet, C-H),

5.993 (1H, singlet, C-H), 7.210-7.815 (8H, multiplet C-H), 10.247 (1H, singlet, -NH); MS: (m/z) = 448; Elemental analysis: %C = 58.87 (58.93), %H = 3.79 (3.80), %N = 12.45 (12.50), %S = 7.07 (7.14).

KC-5:
IR (cm^{-1}, KBr): 3236.66 (-NH (sec.) str.), 3007.12 (Ar-H str.), 2929.97 (-CH_2 sym. str.), 2224.40 (-CN str.), 1666.55(C=C str. α,β unsaturated 6-member ring), 1604.83(-NH bending vib. Secondary amine), 1383.09 (-CH bending.), 1334.78 (C-N (sec) bending.), 1242-1010 (C-H in plane bending, phenyl ring), 702.11 (C-H str. 5-adjecent c atoms), 731.05(C-H in plane bending); ^1H NMR (DMSO-d_6) δ(ppm): 2.451 (3H, singlet,-CH_3), 3.708 (3H, singlet-OCH_3), 4.023 (3H, singlet –OCH_3), 1.798-2.757(4H, multiplet, C-H), 5.981 (1H, singlet, C-H), 7.002-7.758 (8H, multiplet C-H), 10.087 (1H, singlet, -NH); MS: (m/z) = 430; Elemental analysis: %C = 66.91 (66.97), %H = 5.21 (5.12), %N = 13.08 (13.02), %S = 7.49 (7.44), %O = 7.31 (7.44).

KC-6:
IR (cm^{-1}, KBr): 3475.85 (-NH (sec.) str.), 3049.56 (Ar-H str.), 2924.18(-CH_2 sym. str.), 2227.86 (-CN str.), 1664.62(C=C str. α, β unsaturated 6-member ring), 1604.83 (-NH bending vib. Secondary amine), 1381.08 (-CH bending.), 1315.50 (C-N (sec) bending.), 1242-1010 (C-H in plane bending, phenyl ring), 767.69 (C-H str. 5-adjecent c atoms), ^1H NMR (DMSO-d_6) δ(ppm): 2.389 (3H, singlet, -CH_3), 1.713-2.796 (4H, multiplet, C-H), 6.170 (1H, singlet, C-H), 7.196-7.936 (8H, multiplet C-H), 10.201 (1H, singlet, -NH), MS: (m/z) = 395

KC-7:
IR (cm^{-1}, KBr): 3284.83 (-NH (sec.) str.), 3064.99 (Ar-H str.), 2908.75(-CH_2 sym. str.), 2225.93 (-CN str.), 1666.55(C=C str. α,β unsaturated 6-member ring), 1604.83(-NH bending vib. Secondary amine), 1383.01 (-CH bending.), 1336.71(C-N (sec) bending.), 1242-1010(C-H in plane bending, phenyl ring), 767.69 (C-H str. 5-adjecent c atoms), 731.05(C-H in plane bending), ^1H NMR (DMSO-d_6) δ(ppm): 2.400 (3H, singlet,-CH_3), 1.785-2.750 (4H, multiplet, C-H), 6.068 (1H, singlet, C-H), 7.216-7.704 (8H, multiplet C-H), 10.139 (1H, singlet, -NH), MS: (m/z) = 404

KC-8:
IR (cm^{-1}, KBr): 3479.70 (-NH (sec.) str.), 3037.99 (Ar-H str.), 2918.40(-CH_2 sym. str.), 2227.86 (-CN str.), 1666.55 (C=C str. α,β unsaturated 6-member ring), 1599.04 (-NH bending vib. Secondary amine), 1381.08 (-CH bending.), 1319.08 (C-N (sec) bending.), 1242-1010(C-H in plane bending, phenyl ring), 1093.67 (C-F str.), 725.26 (C-H str. 5-adjecent c atoms), ^1H NMR (DMSO-d_6) δ(ppm): 2.428 (3H, singlet, -CH_3), 3.687 (3H, singlet-OCH_3), 1.799-2.787 (4H, multiplet, C-H), 6.007 (1H, singlet, C-H), 7.198-7.697 (8H, multiplet C-H), 10.125 (1H, singlet, -NH). (4.00), MS: (m/z) = 400

KC-9:
IR (cm^{-1}, KBr): 3257.88 (-NH (sec.) str.), 3047.63 (Ar-H str.), 2929.97 (-CH_2 sym. str.), 2227.86 (-CN str.), 1653.05 (C=C str. α,β unsaturated 6-member ring), 1604.83 (-NH bending vib. Secondary amine), 1383.01 (-CH bending.), 1315.50 (C-N (sec) bending.), 1242-1010(C-H in plane bending, phenyl ring), 723.33 (C-H str. 5-adjecent c atoms), 582.52 (C-Br str.), ^1H

NMR (DMSO-d_6) δ(ppm): 2.397 (3H, singlet, -CH_3), 1.742-2.795 (4H, multiplet, C-H), 6.057 (1H, singlet, C-H), 7.202-7.740 (8H, multiplet C-H), 10.123 (1H, singlet, -NH), MS: (m/z) = 448

KC-10:
IR (cm^{-1}, KBr): 3236.66 (-NH (sec.) str.), 3007.12 (Ar-H str.), 2929.97 (-CH_2 sym. str.), 2224.40 (-CN str.), 1666.55(C=C str. α, β unsaturated 6-member ring), 1604.83 (-NH bending vib. Secondary amine), 1383.09 (-CH bending), 1334.78 (C-N (sec) bending.), 1242-1010 (C-H in plane bending, phenyl ring), 702.11 (C-H str. 5-adjecent c atoms), 731.05 (C-H in plane bending), ^{1}H NMR (DMSO-d_6) δ(ppm): 2.442 (3H, singlet,-CH_3), 3.023 (3H, singlet –CH_3), 1.788-2.769 (4H, multiplet, C-H), 6.005 (1H, singlet, C-H), 7.102-7.767 (8H, multiplet C-H), 10.189 (1H, singlet, -NH), MS: (m/z) = 384

The density of these compounds was also calculated using the following theoretical equation:

$$\rho = KM/N_A\sum\Delta V_i \qquad (1)$$

where ρ is the density of the compound, K is packing fraction (0.599), M is the molecular weight of the compound, N_A is the Avogadro's number and ΔV_i is the volume increment of the atoms and atomic groups present in the compound.

Table 1 shows the experimental and theoretical values of density. It is observed that there is deviation between experimental and theoretical density values and in different solvents, different density values are observed.

Table 1. Experimental and calculated densities of compounds in DMF and DMSO solutions at 298.15 K, 308.15 K and 318.15 K.

Compound Code	Density ($g \cdot cm^{-3}$) calculated from the plot		Density ($g \cdot cm^{-3}$) calculated from Eq^n. 3.2.2
	DMF	DMSO	
	298.15 K		
KC-1	1.4045	1.6667	1.7142
KC-2	1.3947	1.5949	1.6483
KC-3	1.3459	1.4514	1.7207
KC-4	1.4596	1.7007	1.9427
KC-5	1.2853	1.5060	1.5978
KC-6	1.2870	1.4577	1.7010
KC-7	1.3532	1.5625	1.7142

KC-8	1.2547	1.5244	1.6483
KC-9	1.6051	1.6722	1.9427
KC-10	1.2063	1.4225	1.6009
	308.15 K		
KC-1	1.3928	1.5898	1.7142
KC-2	1.3351	1.6077	1.6483
KC-3	1.2804	1.3736	1.7207
KC-4	1.4368	1.6835	1.9427
KC-5	1.292	1.5175	1.5978
KC-6	1.2953	1.3966	1.7010
KC-7	1.4164	1.5528	1.7142
KC-8	1.3532	1.5152	1.6483
KC-9	1.5898	1.6367	1.9427
KC-10	1.2658	1.4368	1.6009
	318.15 K		
KC-1	1.4164	1.5773	1.7142
KC-2	1.3072	1.5699	1.6483
KC-3	1.3106	1.3850	1.7207
KC-4	1.4471	1.7331	1.9427
KC-5	1.297	1.5291	1.5978
KC-6	1.2771	1.4065	1.7010
KC-7	1.3477	1.5152	1.7142
KC-8	1.3495	1.5221	1.6483
KC-9	1.5723	1.6949	1.9427
KC-10	1.2642	1.4065	1.6009

This difference can be explained on the basis of interactions in solutions. In different solvents, different types of interactions exist with different solutes. This may change the volume thereby affecting the molecular weight of the compound, which ultimately affects the density. Thus, different density values in different solvents and deviation between experimental and theoretical density values suggest the presence of intermolecular interactions between solute and solvent molecules.

The molar refraction of pure solvent $(MRD)_1$ was calculated using the following equation:

$$(MRD)_1 = \left[\frac{n^2-1}{n^2+1}\right]\frac{M}{\rho} \qquad (2)$$

where n, M and ρ are refractive index, molecular weight and density of pure solvent respectively.

For solutions, the eq. (Y) was used to determining molar refraction.

$$(MRD)_{12} = \left[\frac{n_{12}^2-1}{n_{12}^2+1}\right]\left[\frac{X_1M_1+X_2M_2}{\rho_{12}}\right] \qquad (3)$$

where n_{12} and ρ_{12} are refractive index and density of solution respectively. X_1 and X_2 are the mole fractions and M_1 and M_2 are the molecular weight of the solvent and solute respectively. Using these equations, the $(MRD)_2$ and refractive index of compounds in solutions were calculated and are given in Table 2.

The measured conductance of all the compounds in DMF and DMSO was corrected by subtracting the conductance of pure solvent and are given in Tables 3 and 4 respectively. It is observed that conductance increases with concentration for both the solvents.

From these conductance values, equivalent conductance was calculated. Figures 2 and 3 show the plot of equivalent conductance verses √M for DMF and DMSO. It is obvious from these figures that for all the compounds, the equivalent conductance increases uninterruptedly with decreasing concentration. However, the nature of plots suggests that the studied compounds behave as weak electrolytes in studied solvents.

Table 2. Molar refraction $(MRD)_2$ of synthesized compounds in DMF and DMSO at 298.15 K, 308.15 K and 318.15 K.

Compound code	298.15 K	308.15 K	318.15 K	298.15 K	308.15 K	318.15 K
	DMF			DMSO		
KC-1	137.0384	139.3767	140.9523	229.1407	250.8014	218.2764
KC-2	140.0948	144.1340	145.9699	277.7313	283.7924	258.3299
KC-3	144.0828	146.1079	147.4130	247.0365	269.6414	230.3582

KC-4	148.4020	150.5906	152.6798	339.5644	343.1076	310.9113
KC-5	152.2218	153.4101	154.3923	297.8696	315.2973	292.6972
KC-6	149.1776	151.4638	153.215	242.6199	248.0387	214.9625
KC-7	149.284	150.4281	151.0439	218.2708	233.4491	201.8355
KC-8	141.9598	142.8472	143.2705	243.0415	258.8553	228.2215
KC-9	161.2834	152.5540	164.2491	296.8674	309.3141	322.4381
KC-10	152.3914	153.5894	155.7318	277.2200	289.9887	262.4471

Table 3. The conductance (k) and equivalent conductance (λ_m) of synthesized compounds in DMF at 298.15 K.

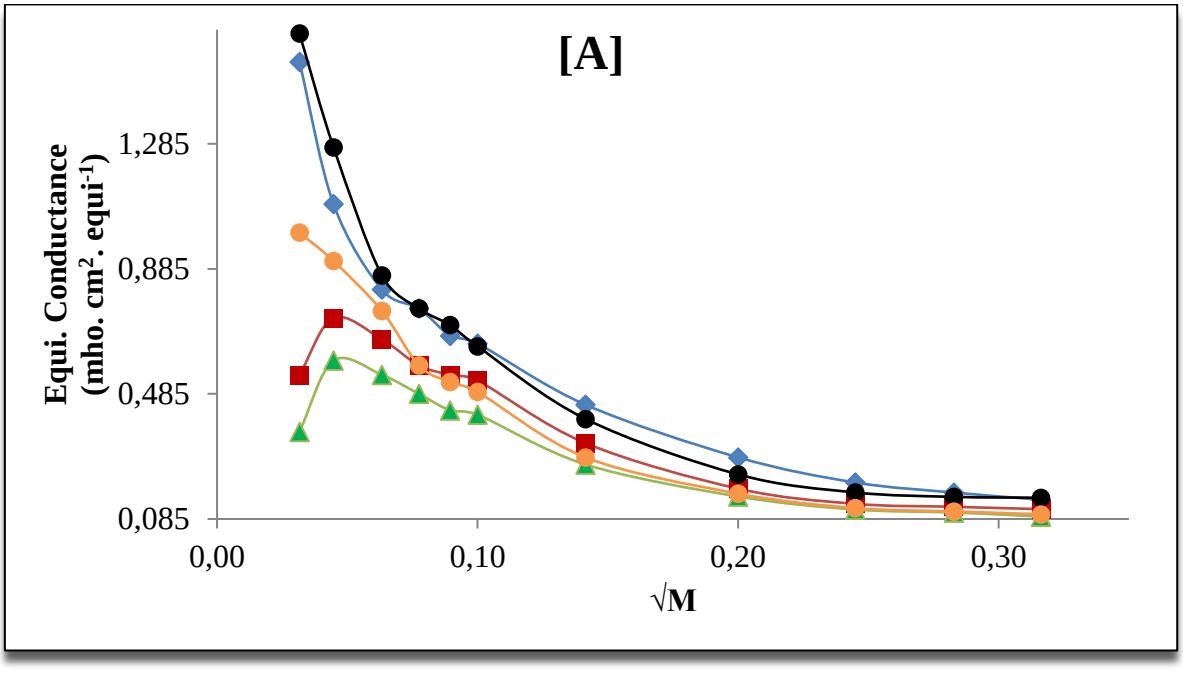
Conc. (M)	**k. 10^{-5} mho**	**λ_m mho·cm^2· equi.$^{-1}$**	**k.10^{-5} mho**	**λ_m mho·cm^2·equi.$^{-1}$**	**k.10^{-5}mho**	**λ_m mho·cm^2· equi.$^{-1}$**	**k. 10^{-5} mho**	**λ_m mho·cm^2· equi.$^{-1}$**	**k. 10^{-5} mho**	**λ_m mho·cm^2· equi.$^{-1}$**
	KC-1		**KC-2**		**KC-3**		**KC-4**		**KC-5**	
0.000	2.50	-	2.50	-	2.50	-	2.50	-	2.50	-
0.001	4.20	1.5470	3.10	0.5460	2.90	0.3640	4.30	1.6380	3.60	1.0010
0.002	4.90	1.0920	4.10	0.7280	3.80	0.5915	5.30	1.2740	4.50	0.9100
0.004	6.10	0.8190	5.40	0.6598	4.90	0.5460	6.30	0.8645	5.80	0.7507
0.006	7.50	0.7583	6.30	0.5763	5.70	0.4850	7.50	0.7583	6.30	0.5763
0.008	8.40	0.6711	7.30	0.5460	6.30	0.4323	8.70	0.7053	7.10	0.5232
0.010	9.60	0.6461	8.30	0.5278	7.10	0.4186	9.50	0.6370	7.90	0.4914
0.020	12.4	0.4505	9.70	0.3276	8.20	0.2594	11.4	0.4049	8.70	0.2821
0.040	14.9	0.2821	10.5	0.1820	9.40	0.1569	12.5	0.2275	9.80	0.1661
0.060	15.8	0.2017	11.3	0.1335	10.1	0.1153	13.7	0.1699	10.4	0.1198
0.080	17.4	0.1695	13.4	0.1240	11.8	0.1058	16.2	0.1558	12.1	0.1092
0.100	18.6	0.1465	15.3	0.1165	12.7	0.0928	19.3	0.1529	13.5	0.1002
	KC-6		**KC-7**		**KC-8**		**KC-9**		**KC-10**	
0.000	2.50	-	2.50	-	2.50	-	2.50	-	2.50	-
0.001	4.10	1.4560	2.90	0.3640	4.10	1.4560	3.60	1.0010	3.80	1.1830

0.002	4.90	1.0920	3.90	0.6370	5.20	1.2285	5.50	1.3650	5.70	1.4560
0.004	5.40	0.6598	5.40	0.6598	6.50	0.9100	7.10	1.0470	7.50	1.1375
0.006	6.30	0.5763	6.60	0.6218	7.10	0.6977	8.40	0.8948	8.70	0.9403
0.008	6.60	0.4664	7.80	0.6029	7.90	0.6143	9.80	0.8304	9.80	0.8304
0.010	7.10	0.4186	8.60	0.5551	8.70	0.5642	10.8	0.7553	10.4	0.7189
0.020	7.80	0.2412	9.80	0.3322	11.4	0.4049	13.5	0.5005	12.5	0.4550
0.040	8.60	0.1388	10.5	0.1820	13.9	0.2594	14.9	0.2821	14.1	0.2639
0.060	9.50	0.1062	12.1	0.1456	14.7	0.1850	16.7	0.2154	15.8	0.2017
0.080	11.1	0.0978	14.1	0.1320	15.2	0.1445	18.9	0.1866	16.8	0.1627
0.100	13.2	0.0974	16.2	0.1247	16.8	0.1301	20.3	0.1619	17.6	0.1374

Table 4. The conductance (k) and equivalent conductance (λ_m) of synthesized compounds in DMSO at 298.15 K.

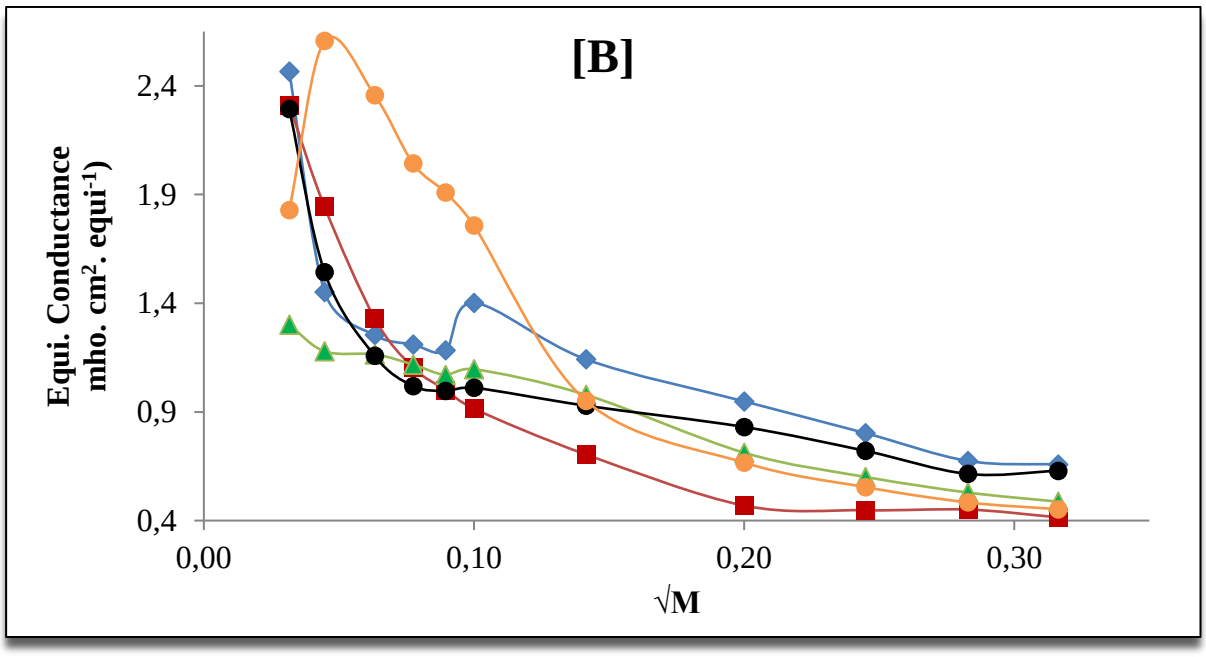
Conc. (M)	**$k \cdot 10^{-5}$ mho**	**λ_m mho·cm^2· equi.$^{-1}$**	**$k \cdot 10^{-5}$ mho**	**λ_m mho·cm^2· equi.$^{-1}$**	**$k \cdot 10^{-5}$ mho**	**λ_m mho·cm^2· equi.$^{-1}$**	**$k \cdot 10^{-5}$ mho**	**λ_m mho·cm^2· equi.$^{-1}$**	**$k \cdot 10^{-5}$ mho**	**λ_m mho·cm^2· equi.$^{-1}$**
	KC-1		**KC-2**		**KC-3**		**KC-4**		**KC-5**	
0.000	0.19	-	0.19	-	0.19	-	0.19	-	0.19	-
0.001	0.47	2.4661	0.27	2.3114	0.20	1.6107	0.27	2.2932	0.22	1.8291
0.002	0.52	1.4515	0.42	1.8428	0.28	1.1785	0.36	1.5425	0.59	2.6072
0.004	0.75	1.2535	0.60	1.3309	0.53	1.1648	0.53	1.1580	1.06	2.3569
0.006	0.99	1.2103	0.75	1.1041	0.76	1.1180	0.69	1.0192	1.37	2.0430
0.008	1.24	1.1830	0.89	1.0010	0.96	1.0704	0.89	0.9965	1.70	1.9099
0.010	1.74	1.4014	1.02	0.9146	1.22	1.0966	1.13	1.0110	1.95	1.7572
0.020	2.71	1.1421	1.57	0.7043	2.17	0.9787	2.06	0.9287	2.11	0.9514
0.040	4.37	0.9487	2.08	0.4689	3.15	0.7123	3.67	0.8306	2.95	0.6668
0.060	5.49	0.8023	2.97	0.4476	3.98	0.6008	4.77	0.7206	3.67	0.5537
0.080	6.13	0.6745	3.98	0.4506	4.67	0.5291	5.422	0.6146	4.27	0.4836
0.100	7.43	0.6579	4.58	0.4151	5.37	0.4869	6.93	0.6289	4.99	0.4524

	KC-6		KC-7		KC-8		KC-9		KC-10	
0.000	0.19	-	0.19	-	0.19	-	0.19	-	0.19	-
0.001	0.39	3.3397	0.33	2.7846	0.25	2.1385	0.30	2.5207	0.28	2.3751
0.002	0.44	1.9292	0.42	1.8291	0.39	1.6744	0.45	1.9611	0.47	2.0521
0.004	0.69	1.5174	0.61	1.3536	0.44	0.9464	0.63	1.3923	0.67	1.4901
0.006	0.87	1.2952	0.82	1.2209	0.54	0.7872	0.82	1.2164	0.76	1.1178
0.008	1.02	1.1386	0.97	1.0829	0.71	0.7906	1.28	1.4344	0.90	0.9976
0.010	1.32	1.1839	1.26	1.1293	0.87	0.7717	1.88	1.6935	1.47	1.3204
0.020	2.47	1.1152	2.14	0.9651	1.36	0.6102	3.15	1.4246	2.23	1.0060
0.040	3.67	0.8306	3.105	0.7021	2.47	0.5576	4.79	1.0854	3.58	0.8101
0.060	5.37	0.8116	4.51	0.6811	3.27	0.4931	6.07	0.9177	4.52	0.6827
0.080	6.42	0.7281	6.21	0.7042	4.24	0.4801	7.79	0.8840	4.98	0.5643
0.100	7.96	0.7226	7.12	0.6462	4.96	0.4496	8.83	0.8018	5.46	0.4951



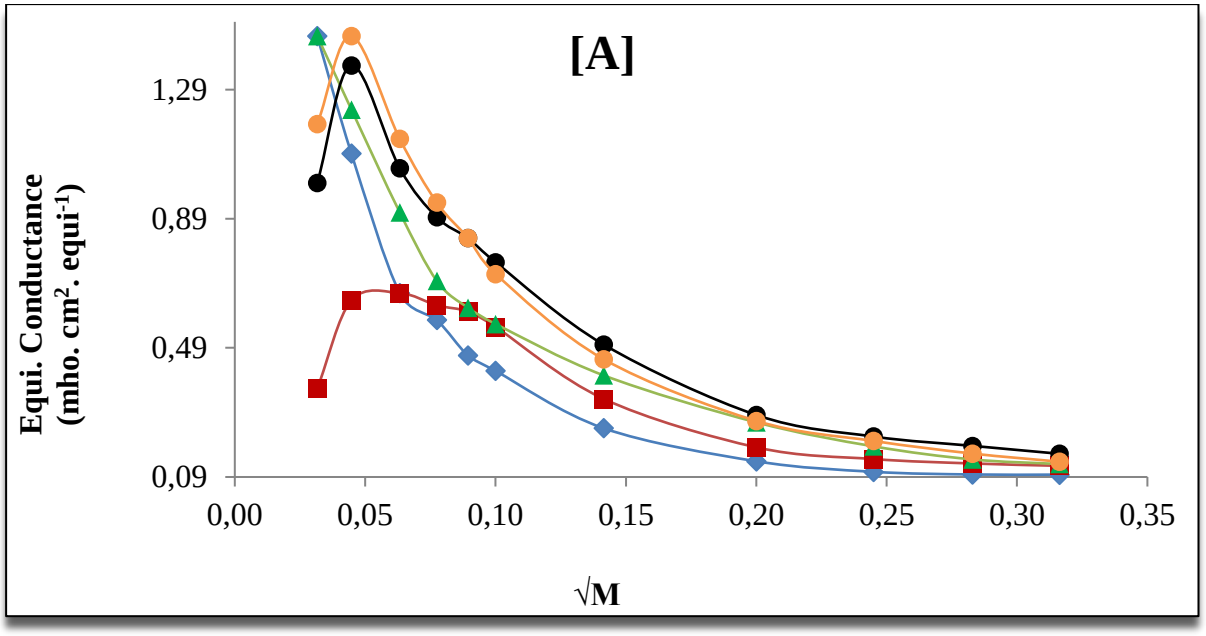
KC-1, (♦); KC-2, (■); KC-3, (▲); KC-4, (●); KC-5, (●);

Figure 2. The variation of equivalent conductance with √M for KC-1 to KC-5 in [A] DMF and [B] in DMSO at 298.15 K.



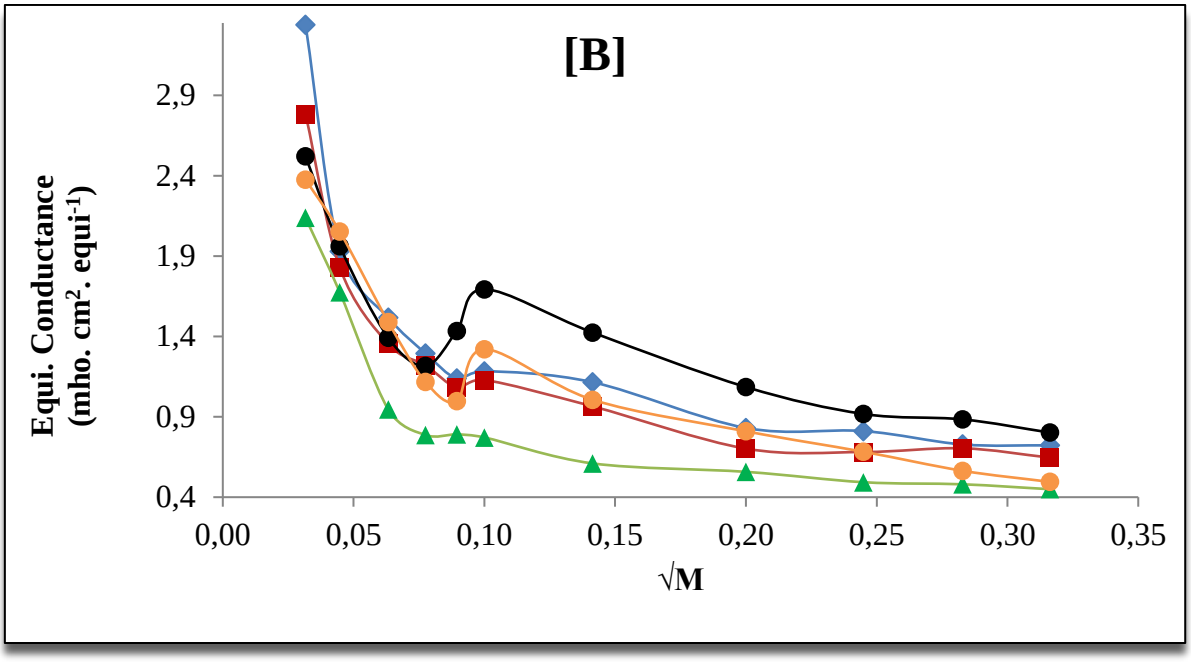
KC-1, (♦); KC-2, (■); KC-3, (▲); KC-4, (●); KC-5, (●);

Figure 2(continue). The variation of equivalent conductance with √M for KC-1 to KC-5 in [A] DMF and [B] in DMSO at 298.15 K.



KC-6, (♦); KC-7, (■); KC-8, (▲); KC-9, (●); KC-10, (●);

Figure 3. The variation of equivalent conductance with √M for KC-6 to KC-10 in [A] DMF and [B] in DMSO at 298.15 K.



KC-6, (♦); KC-7, (■); KC-8, (▲); KC-9, (●); KC-10, (●);

Figure 3. The variation of equivalent conductance with √M for KC-6 to KC-10 in [A] DMF and [B] in DMSO at 298.15 K.

4. CONCLUSION

The refractive index and molar refraction depends not only upon atomic refraction but also upon single, double or triple bonds. These parameters are much affected by the type of interactions taking place in solutions.

Thus, it is concluded that solvent, temperature and concentration affect the studied physical parameters i.e., density, refractive index and molar refraction.

The increase in equivalent conductance with dilution is due to the fact that equivalent conductance is the product of specific conductance (κ) and the volume of solution containing 1 gm equivalent of compound. The decrease in specific conductivity on dilution is more than compensated by the increase in volume. So, equivalent conductance increases with dilution.

In general, the nature of plots equivalent conductance (λ_m) against $\sqrt{M}$ for all the systems studied, suggest that all the synthesized compounds behave as weak electrolytes in both the solvents.

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