International Journal of Basic and Applied Chemical Sciences ISSN: 2277-2073 (Online)
An Open Access, Online International Journal Available at http://www.cibtech.org/jcs.htm
2016 Vol. 6(2) April-June, pp.36-47/Baluja et al.

Research Article

DENSITY, REFRACTIVE INDEX AND CONDUCTANCE OF PYRIMIDINE DERIVATIVES

***Shipra Baluja, Kajal Nandha and Paras Ramavat**
Physical Chemistry Laboratory, Department of Chemistry, Saurashtra University, Rajkot-360005 (Gujarat), India
**Author for Correspondence*

ABSTRACT

Some new pyrimidine 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 1, 4-dioxane and DMF at 298.15 K, 308.15 K and 318.15 K temperatures. Conductance has been studied for synthesized compounds in 1, 4-dioxane and DMF at 308.15 K.

Keywords: *Pyrimidine Derivatives, Density, Refractive Index, Conductance, 1, 4-Dioxane, DMF*

INTRODUCTION

Pyrimidines represent an important class of heterocycles which are of great interest because they constitute an important class of natural and non natural products, many of which exhibit useful biological activities and clinical applications (Kaur *et al.*, 2012; Jain *et al.*, 2006; Brown, 1984; Elderfield, 1957). Pyrimidine skeleton is known to be present in several biological molecules, deoxyribonucleic acid, ribonucleic acid, thymine, cytosine, in some vitamins such as thiamine, riboflavin and folic acid etc (Porter, 1979). The refractive index is one of the most important optical properties that is frequently employed to characterize organic compounds (Finar, 1975). It has been used as an indicator of the purity of organic compounds, but the relationship of refractive index to other optical, electrical, and magnetic properties has more significance. It is also widely used in material science to evaluate material (Bicerano, 1996). Further, it is useful in various industries of food (Kashmiri *et al.*, 2002), beverages (Prasad and Nath, 2000; Sharma *et al.*, 2009), cosmetics (Sun *et al.*, 2003), textiles (Greaves and Microtex, 2009), pharmacy (Cao *et al.*, 2009) etc.

The study of conductance of substances in solutions has received considerable importance due to its varied applications in various electrochemical investigations (Commings *et al.*, 2006; Syal *et al.*, 2005; Rafiti *et al.*, 2008). Conductance measurements have also been used for the determination of dissociation constants (Linde *et al.*, 1969; Levitt, 1981; Niazi, 1993). Further, it is useful to various biological processes (Berezovskaia and Korytnyi, 1968; Canizares *et al.*, 2008) such as protein-protein interaction (Spera *et al.*, 2013), enzymatic degradation of microbial biofilm (Johansen *et al.*, 1999), etc.

In the present work, the density and refractive index of synthesized compounds were measured in 1, 4-dioxane and DMF solutions at different concentrations at different temperatures (298.15 K-318.15 K) and conductance of pyrimidine derivatives was measured in 1, 4-dioxane and DMF at 308.15 K.

MATERIALS AND METHODS

Materials

Different substituted benzaldehydes, isobutyl propionate, urea and phenacyl bromide used for the synthesis, was supplied from Spectrochem Pvt. Ltd. (Mumbai, India) and was used without any treatment. The methanol and acetone used were of AR grade supplied by Spectrochem Pvt. Ltd. (Mumbai, India) whereas 1, 4-dioxane and DMF used were of AR grade supplied by LOBA Pvt. Ltd. All the solvents were purified according to the standard procedure (Riddick *et al.*, 1986).

Synthesis

Synthesis of Dihydropyrimidine Derivatives: A mixture of different substituted aldehyde (0.01mol), isobutyl propionate (0.01mol) and urea (0.012mol) in methanol was refluxed for 16 hrs in presence of copper chloride and concentrated sulphuric acid. The completion of reaction was confirmed by analytical thin layer chromatography (TLC) (Performed on aluminum coated plates Gel $60F_{254}$ (E. Merck)) using (3:2-Hexane: Ethyl acetate) as mobile phase. After the completion of reaction, the reaction mixture was cooled and the resulting solid was filtered. This solid was washed with methanol to remove unreacted reagents and dried under vacuum to give crude product.

Oxidation of Dihydropyrimidine Derivatives: In 60% chilled nitric acid (10 ml), 0.1 mole of above synthesized compound was slowly added and the mixture was stirred at 273.15 K for 30 min. The progress of reaction was monitored by thin layer chromatography. The reaction mixture was poured into cold water and was neutralized with saturated sodium bicarbonate solution. The precipitate was filtered, washed with water and dried. The crude product was directly used for the next step.

Synthesis of Methyl 4-Isopropyl-2-(2-oxo-2-Phenylethoxy)-6-Phenylpyrimidine-5-Carboxylate Derivatives: Equimolar solution of above product and phenacyl bromide in dry acetone was refluxed in presence of dry K_2CO_3 for 1hr. The progress of the reaction was monitored by thin layer chromatography. After completion of the reaction, the solvent was evaporated and reaction mixture was poured into crushed ice to give solid product. The resulting solid was filtered, washed with cold water and dried under vacuum to give crude product.

The reaction scheme is given in Figure 1.

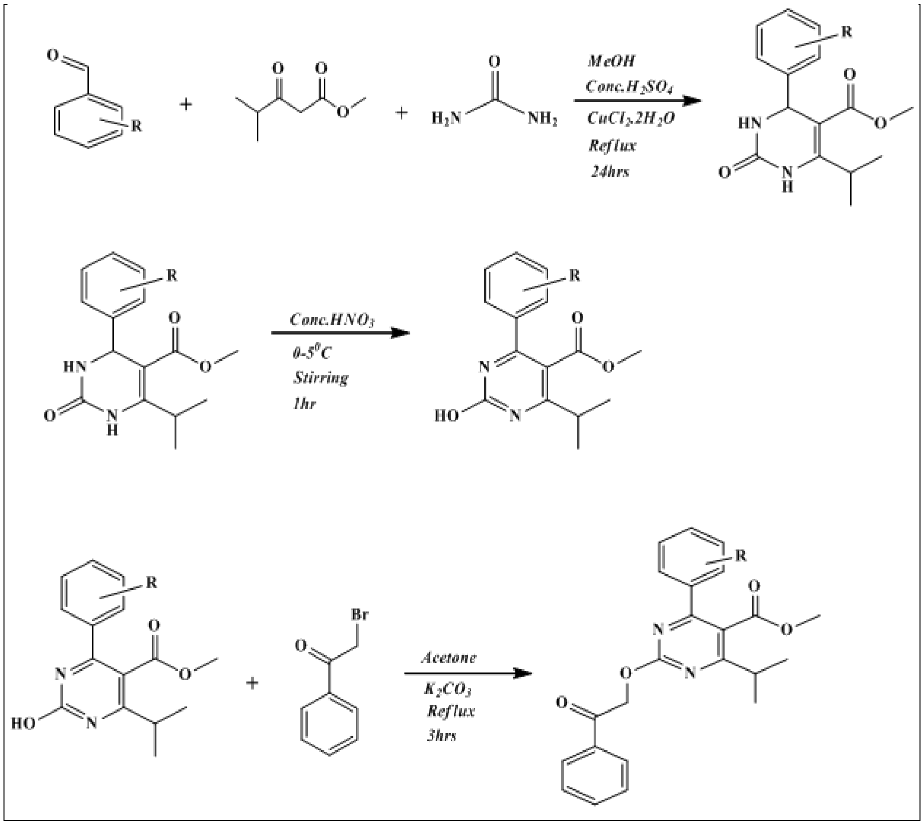

Figure 1: Synthesis Scheme of Pyrimidine Derivatives

Physicochemical Studies

Density and Refractive Index

The density of solutions were measured by Anton Paar density and sound velocity meter (DSA 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 1, 4-dioxane and N, N-dimethylformamide solutions at 308.15 K. The conductance of each solution was measured by using Equip-tronics conductivity meter (Model No. 664) having a cell constant 0.91 cm^{-1} at 308.15 K.

RESULTS AND DISCUSSION

The physical properties of all the synthesized compounds are given in Table 1 with their substitutions. For the compound RPD-1, IR, ^{1}H NMR and mass are shown in Figures 2, 3 and 4 respectively.

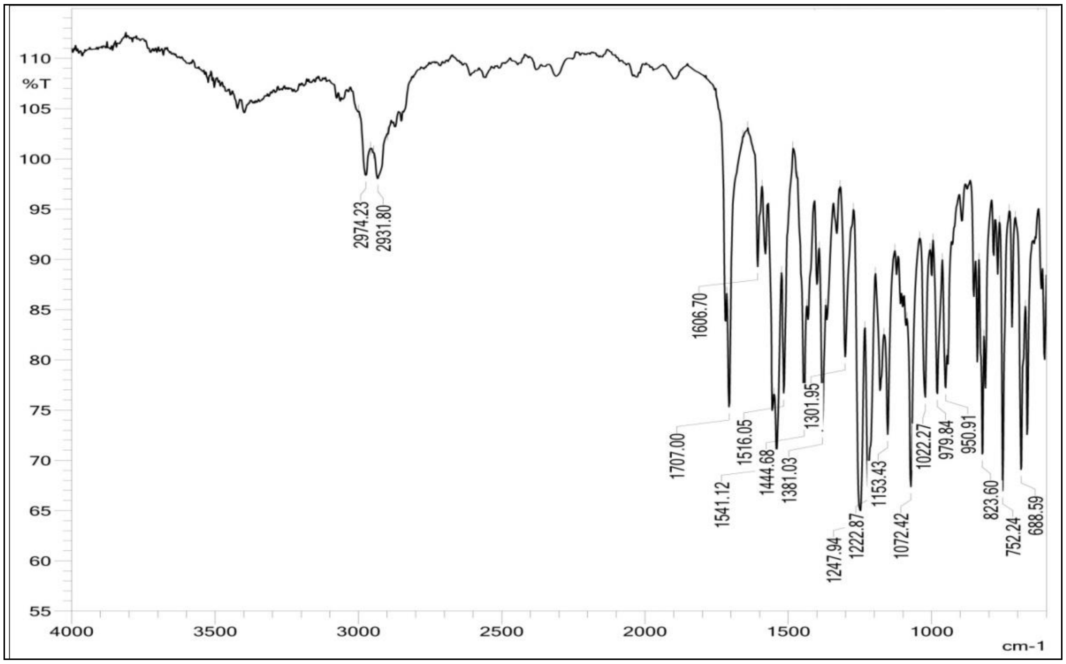

Figure 2: IR Spectra of RPD-1 Compound

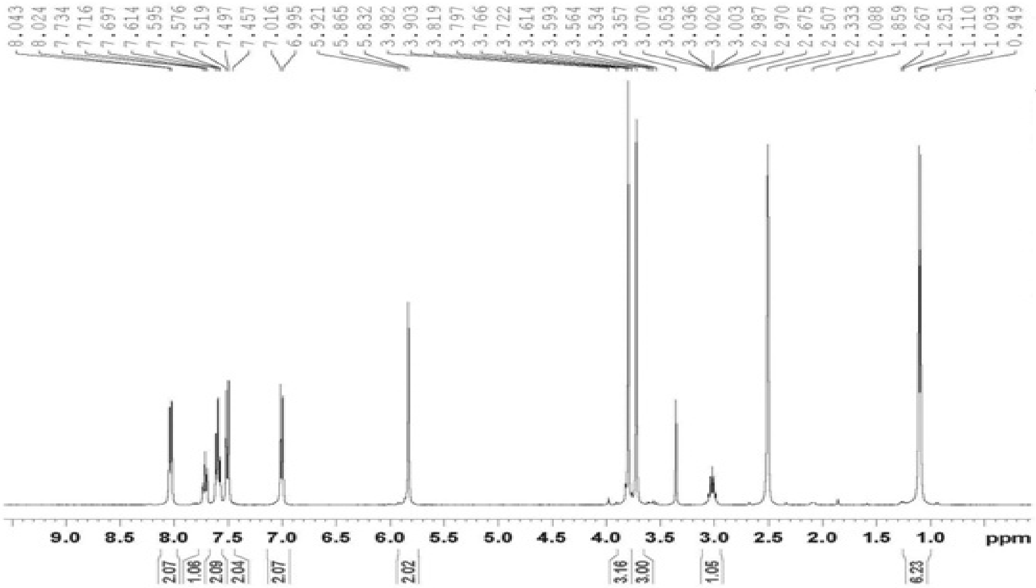

Figure 3 ^{1}H NMR Spectra of RPD-1 Compound

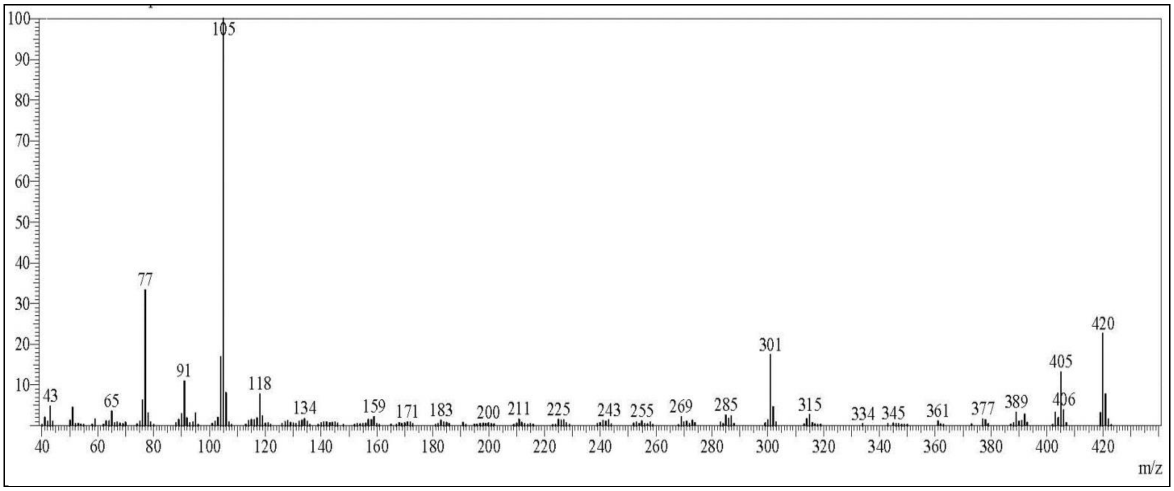

Figure 4: Mass Spectra of RPD-1 Compound

Table 1: Physical Constant of the Synthesized Compounds

Compound Code	Substitution R	M.F.	M.W.	Yield (%)	R_f^* Value
RPD-1	4-OCH_3	$C_{24}H_{24}N_2O_5$	420	85	0.58
RPD-2	-4-CH_3	$C_{24}H_{24}N_2O_4$	404	83	0.56
RPD-3	-H	$C_{23}H_{22}N_2O_4$	390	80	0.52
RPD-4	3-Cl	$C_{23}H_{21}ClN_2O_4$	424	86	0.54
RPD-5	-2,5-di-OCH_3	$C_{25}H_{26}N_2O_6$	450	84	0.59
RPD-6	-4- F	$C_{23}H_{21}FN_2O_4$	408	86	0.53
RPD-7	-4- Br	$C_{23}H_{21}BrN_2O_4$	469	85	0.54
RPD-8	-3,4-di-OCH_3	$C_{25}H_{26}N_2O_6$	450	87	0.59
RPD-9	-3-OCH_3	$C_{24}H_{24}N_2O_5$	420	82	0.58
RPD-10	-4- Cl	$C_{23}H_{21}ClN_2O_4$	424	84	0.54

*0.4:0.6 - Hexane: Ethyl acetate

Spectral Data

RPD-1:

IR (cm^{-1})*:** 1708.00 (carbonyl str. in -$COOCH_3$), 1606.76 (Acyclic carbonyl str.), 1550.82 (Ar-C=C str.), 1384.94 (alkane C-H bending), 1300 (C-O str. of ester), 1026.16 (C-O str. of ether), 840.99 (p-di substituted aromatic ring), ***^{1}H NMR (DMSO-d_6) δ(ppm)*:** 1.251 (6H, doublet, -CH_3 of isopropyl), 3.020 (1H, multiplet, C-H of isopropyl), 3.534 (3H, singlet, -$COOCH_3$), 3.819 (1H, singlet, -OCH_3), 5.865 (2H, singlet, -OCH_2), 7.016 (2H, doublet, Ar-CH), 7.519 (2H, doublet, Ar-CH),7.595 (2H, triplet, Ar-CH),7.734 (1H, triplet, Ar-CH) and 8.043 (2H, doublet, Ar-CH), ***MS*: *(m/z) = 420

RPD-2:

IR (cm^{-1})*:** 1726.35 (carbonyl str. in -$COOCH_3$), 1695.49 (Acyclic carbonyl str.), 1531.53 (Ar-C=C str.), 1369.50 (alkane C-H bending), 1327.07 (C-O str. of ester), 1082.10 (C-O str. of ether), 821.70 (p-di substituted aromatic ring), ***^{1}H NMR (DMSO-d_6) δ(ppm)* :** 1.214 (6H, doublet, -CH_3 of isopropyl), 2.333 (3H,singlet,-CH_3), 3.054 (1H, multiplet, C-H of isopropyl), 3.547 (3H, singlet, -$COOCH_3$), 5.852 (2H, singlet, -OCH_2), 7.268 (3H, singlet, Ar-CH), 7.520 (2H, doublet of doublet, Ar-CH), 7.698 (2H, doublet of doublet, Ar-CH), 8.055 (2H, singlet, Ar-CH), ***MS*: *(m/z) = 404

RPD-3:

IR (cm^{-1})*:** 1725.30 (carbonyl str. in -$COOCH_3$), 1680.84 (Acyclic carbonyl str.), 1549.86 (Ar-C=C str.), 1380.25 (alkane C-H bending), 1330.38 (C-O str. of ester), 1025.88 (C-O str. of ether), ***^{1}H NMR (DMSO-d_6) δ(ppm)* :** 1.234 (6H, doublet, -CH_3 of isopropyl), 3.023 (1H, multiplet, C-H of isopropyl), 3.530 (3H, singlet, -$COOCH_3$), 5.852 (2H, singlet, -OCH_2), 7.481 (1H, multiplet, Ar-CH), 7.585 (5H, multiplet, Ar-CH), 7.803 (2H, doublet, Ar-CH), 7.946 (2H, doublet, ***MS*: *(m/z) = 390

RPD-4:

IR (cm^{-1})*:** 1730.21 (carbonyl str. in $COOCH_3$), 1670.00 (Acyclic carbonyl str.), 1554.68 (Ar-C=C str.), 1383.01 (alkane C-H bending), 1334.78 (C-O str. of ester), 1082.10 (C-O str. of ether), 721.40 and 792.77 (m-di-substituted aromatic ring), ***^{1}H NMR (DMSO-d$_6$) δ(ppm)* :** 1.144 (6H, doublet, -CH_3 of isopropyl), 3.108 (1H, multiplet, C-H of isopropyl), 3.713 (3H, singlet, -$COOCH_3$), 5.981 (2H, singlet, -OCH_2), 7.560 (7H, multiplet, Ar-CH), 8.071 (2H, singlet, Ar-CH), ***MS*: *(m/z) = 424

RPD-5:

IR (cm^{-1})*:** 1728.28(carbonyl str. in $COOCH_3$), 1703.20(Acyclic carbonyl str.), 1554.68 (Ar-C=C str.), 1390.72 (alkane C-H bending), 1307.78 (C-O str. of ester), 1031.95 (C-O str. of ether), ***^{1}H NMR (DMSO-d$_6$) δ(ppm)* :** 1.260 (6H, doublet, -CH_3 of isopropyl), 3.025 (1H, multiplet, C-H of isopropyl), 3.545 (3H, singlet, -$COOCH_3$), 3.828 (6H, singlet, -OCH_3), 5.885 (2H, singlet, -OCH_2), 7.089 (1H, singlet, Ar-CH), 7.135 (1H, doublet, Ar-CH), 7.283 (1H, doublet, Ar-CH), 7.564 (3H, multiplet, Ar-CH), 8.056 (2H, doublet, Ar-CH), ***MS*: *(m/z) = 450

RPD-6:

IR (cm^{-1})*:** 1722.43 (carbonyl str. in $COOCH_3$), 1695.43 (Acyclic carbonyl str.), 1598.99 (Ar-C=C str.), 1390.68 (alkane C-H bending), 1334.78 (C-O str. of ester), 1066.64 (C-O str. of ether), 850.61 (p-di substituted aromatic ring), ***^{1}H NMR (DMSO-d$_6$) δ(ppm)* :**1.250 (6H, doublet, -CH_3 of isopropyl), 3.12 (1H, multiplet, C-H of isopropyl), 3.715 (3H, singlet, -$COOCH_3$), 5.983 (2H, singlet, -OCH_2), 7.017 (2H, doublet, Ar-CH), 7.520 (2H, doublet, Ar-CH), 7.600 (2H, triplet, Ar-CH),7.744 (1H, triplet, Ar-CH) and 8.043 (2H, doublet, Ar-CH), ***MS*: *(m/z) = 408

RPD-7:

IR (cm^{-1})*:** 1722.43 (carbonyl str. in $COOCH_3$), 1695.43 (Acyclic carbonyl str.), 1546.91 (Ar-C=C str.), 1390.68 (alkane C-H bending), 1334.74 (C-O str. of ester), 1066.64 (C-O str. of ether), 850.61 (p-di substituted aromatic ring), ***^{1}H NMR (DMSO-d$_6$) δ(ppm)* :**1.258 (6H, doublet, -CH_3 of isopropyl), 3.129 (1H, multiplet, C-H of isopropyl), 3.716 (3H, singlet, -$COOCH_3$), 5.985 (2H, singlet, -OCH_2), 7.019 (2H, doublet, Ar-CH), 7.528 (2H, doublet, Ar-CH),7.609 (2H, triplet, Ar-CH),7.746 (1H, triplet, Ar-CH) and 8.048 (2H, doublet, Ar-CH), ***MS*: *(m/z) = 469

RPD-8:

IR (cm^{-1})*:** 1722.43 (carbonyl str. in $COOCH_3$), 1695.43 (Acyclic carbonyl str.), 1546.91 (Ar-C=C str.), 1390.68 (alkane C-H bending), 1334.74 (C-O str. of ester), 1008.77 (C-O str. of ether), ***^{1}H NMR (DMSO-d$_6$) δ(ppm)* :** 1.261 (6H, doublet, -CH_3 of isopropyl), 3.026 (1H, multiplet, C-H of isopropyl), 3.546 (3H, singlet, -$COOCH_3$), 3.827 (6H, singlet, -OCH_3), 5.885 (2H, singlet, -OCH_2), 7.014 (1H, doublet, Ar-CH), 7.115 (1H, doublet, Ar-CH), 7.214 (1H, singlet, Ar-CH), 7.598 (2H, triplet, Ar-CH), 7.740 (1H, triplet, Ar-CH), 8.040 (2H, doublet, Ar-CH), ***MS*: *(m/z) = 450

RPD-9:

IR (cm^{-1})*:** 1750.00 (carbonyl str. in -$COOCH_3$), 1541.12 (Acyclic carbonyl str.), 1446.61 (Ar-C=C str.), 1365.60 (alkane C-H bending), 1284.59 (C-O str. of ester), 1026.16 (C-O str. of ether), 840.99 (p-di substituted aromatic ring). 792.77 (m-di-substituted aromatic ring), ***^{1}H NMR (DMSO-d$_6$) δ(ppm)* :**1.260 (6H, doublet, -CH_3 of isopropyl), 3.024 (1H, multiplet, C-H of isopropyl), 3.536 (3H, singlet, -$COOCH_3$), 3.820 (1H, singlet, -OCH_3), 5.861 (2H, singlet, -OCH_2), 7.570 (7H, multiplet, Ar-CH) and 8.062 (2H, doublet, Ar-CH), ***MS*: *(m/z) = 420

RPD-10:

IR (cm^{-1})*:** 1730.21 (carbonyl str. in $COOCH_3$), 1670.00 (Acyclic carbonyl str.), 1554.68 (Ar-C=C str.), 1383.01 (alkane C-H bending), 1334.78 (C-O str. of ester), 1082.10(C-O str. of ether), 721.40 and 792.77 (m-di-substituted aromatic ring), ***^{1}H NMR (DMSO-d$_6$) δ(ppm)* :**1.255 (6H, doublet, -CH_3 of isopropyl), 3.125 (1H, multiplet, C-H of isopropyl), 3.715 (3H, singlet, -$COOCH_3$), 5.984 (2H, singlet, -OCH_2), 7.018 (2H, doublet, Ar-CH), 7.524 (2H, doublet, Ar-CH),7.608 (2H, triplet, Ar-CH),7.745 (1H, triplet, Ar-CH) and 8.047 (2H, doublet, Ar-CH), ***MS*: *(m/z) = 424

IR Spectra

The peaks around 2980-3064 cm^{-1}, 2929-2978 cm^{-1} and 2870-2931 cm^{-1} are of Ar-CH stretching, alkane C-H asymmetric stretching and alkane C-H symmetric stretching respectively. The carbonyl stretching in $-COOCH_3$ and acyclic carbonyl stretching are observed around 1708-1730 cm^{-1} and 1606-1703 cm^{-1} respectively. The Ar-C=C stretching is observed around 1549-1695 cm^{-1} whereas alkane C-H bending is observed around 1369-1390 cm^{-1}. The peaks around 1300-1334 cm^{-1} and 1025-1082 cm^{-1} are of C-O stretching of ester and C-O str. of ether respectively.

^{1}H NMR spectra

The residual peak of DMSO is shown as a singlet at 2.675 δppm. The peak of $-CH_3$ of isopropyl group is shown around 1.251 δppm whereas the proton of –C-H of isopropyl is around 3.020 δppm as multiplet. The protons of $–O-CH_3$ of ester are near about 3.534 δppm as singlet. The peak of $–O-CH_3$ as substitution of aldehyde is shown around 3.819 δppm as singlet. The peak around 5.865 δppm is of $–O-CH_2$ which confirms the condensation of phenolic –OH group with phenacyl bromide. The aromatic protons of two phenyl rings are between 7.016 to 8.043 δppm with their appropriate multiplicity.

All the ^{1}H NMR splitting of peak suggests that compounds are synthesized successfully.

Mass Spectra

From the mass spectra, fragmentations of compounds are proposed which confirms the structure of synthesized compounds.

The molecular formula, molecular weight, melting point, % yield and R_f values along with the solvent systems of all the synthesized compounds are given in Table 1.

Further, 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 2 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. 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 (Lorentz, 1906):

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

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 3.

The measured conductance of all the compounds in 1, 4-dioxane and DMF was corrected by subtracting the conductance of pure solvent and are given in Tables 4 and 5 respectively. It is observed that conductance increases with concentration for both the solvents. Further, conductance is higher in DMF than that in 1, 4-dioxane.

From these conductance values, equivalent conductance was calculated. Figures 5 and 6 show the plot of equivalent conductance verses √M for [A] 1, 4-dioxane and [B] DMF. 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: Experimental and Calculated Densities of Compounds in 1, 4-Dioxane and DMF Solutions at 298.15 K, 308.15 K and 318.15 K

Compound Code	**Density (g.cm^{-3})**		**Density (g.cm^{-3}) Calculated from Eq^{n}. 1**
	1, 4-Dioxae	**DMF**	
	298.15 K		
RPD-1	1.2004	1.2300	1.4299
RPD-2	1.1325	1.1834	1.3881
RPD-3	1.1962	1.2500	1.4592
RPD-4	1.2195	1.3021	1.4787
RPD-5	1.2920	1.3106	1.4056
RPD-6	1.2180	1.2438	1.4755
RPD-7	1.3021	1.3387	1.6652
RPD-8	1.3106	1.3106	1.4056
RPD-9	1.2033	1.2563	1.4299
RPD-10	1.2376	1.2937	1.4787
	308.15 K		
RPD-1	1.1905	1.2180	1.4299
RPD-2	1.1249	1.1737	1.3881
RPD-3	1.1876	1.2376	1.4592
RPD-4	1.2106	1.2853	1.4787
RPD-5	1.2821	1.2970	1.4056
RPD-6	1.2077	1.2180	1.4755
RPD-7	1.2920	1.3550	1.6652
RPD-8	1.3021	1.2953	1.4056
RPD-9	1.1947	1.2392	1.4299
RPD-10	1.2285	1.2821	1.4787
	318.15 K		
RPD-1	1.1820	1.2077	1.4299
RPD-2	1.1173	1.1682	1.3881
RPD-3	1.1778	1.2376	1.4592
RPD-4	1.2019	1.3021	1.4787
RPD-5	1.2739	1.3021	1.4056
RPD-6	1.1976	1.2151	1.4755
RPD-7	1.2837	1.3966	1.6652
RPD-8	1.2937	1.2987	1.4056
RPD-9	1.1848	1.2515	1.4299
RPD-10	1.2180	1.2853	1.4787

Table 3: Molar Refraction *$(MRD)_2$* of Synthesized Compounds in 1, 4-Dioxane and DMF 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
		1,4-Dioxane			DMF	
RPD-1	1023.28.	1905.63	1881.54	2600.23	2576.99	2553.51
RPD-2	972.60	1900.18	1877.51	2598.36	2575.06	2552.36
RPD-3	944.18	1902.69	1878.64	2598.44	2574.74	2550.59
RPD-4	966.80	1900.72	1875.88	2599.02	2575.58	2549.53
RPD-5	961.23	1903.13	1875.47	2601.73	2578.04	2554.59
RPD-6	982.22	1899.78	1877.06	2598.37	2575.17	2551.36
RPD-7	1033.52	1905.74	1883.60	2601.08	2577.53	2554.29
RPD-8	1031.52	1910.33	1885.75	2601.21	2576.63	2554.47
RPD-9	1011.07	1906.04	1883.17	2596.79	2574.08	2550.81
RPD-10	971.84	1903.59	1879.18	2599.56	2575.63	2539.21

Table 4: The Conductance (*k*) and Equivalent Conductance (λ_m) of Synthesized Compounds in 1, 4-Dioxane at 308.15 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.$^{-1}$
	RPD-1		**RPD-2**		**RPD-3**		**RPD-4**		**RPD-5**	
0.000	0.13	-	0.13	-	0.13	-	0.13	-	0.13	-
0.001	0.39	2.3842	0.32	1.7472	0.31	1.6653	0.30	1.5743	0.33	1.8018
0.002	0.48	1.6153	0.43	1.3878	0.43	1.3514	0.40	1.2149	0.46	1.4879
0.004	0.54	0.9282	0.50	0.8486	0.50	0.8327	0.47	0.7803	0.52	0.8804
0.006	0.63	0.7538	0.60	0.7204	0.58	0.6901	0.59	0.6946	0.62	0.7492
0.008	0.72	0.6757	0.71	0.6654	0.70	0.6518	0.70	0.6518	0.72	0.6757
0.010	0.80	0.6070	0.79	0.6024	0.79	0.5988	0.74	0.5587	0.80	0.6070
0.020	1.08	0.4332	0.88	0.3413	0.83	0.3208	0.82	0.3158	0.88	0.3426
0.040	1.20	0.2427	0.96	0.1900	0.93	0.1831	0.96	0.1881	0.99	0.1947
0.060	1.25	0.1706	1.13	0.1512	1.08	0.1438	1.02	0.1347	1.20	0.1620
0.080	1.38	0.1425	1.29	0.1317	1.25	0.1269	1.13	0.1134	1.32	0.1352
0.100	1.62	0.1353	1.36	0.1117	1.30	0.1062	1.20	0.0974	1.39	0.1144
	RPD-6		**RPD-7**		**RPD-8**		**RPD-9**		**RPD-10**	
0.000	0.13	-	0.13	-	0.13	-	0.13	-	0.13	-
0.001	0.23	0.9100	0.32	1.6926	0.40	2.4206	0.38	2.2386	0.31	0.1274
0.002	0.38	1.1603	0.38	1.1557	0.42	1.3059	0.40	1.2422	0.39	0.4095
0.004	0.45	0.7371	0.46	0.7508	0.53	0.9055	0.52	0.8941	0.50	0.4573
0.006	0.51	0.5809	0.54	0.6249	0.62	0.7432	0.62	0.7371	0.59	0.4489
0.008	0.56	0.4869	0.62	0.5631	0.70	0.6529	0.70	0.6472	0.68	0.4323
0.010	0.61	0.4414	0.69	0.5132	0.79	0.6033	0.77	0.5870	0.75	0.4077
0.020	0.82	0.3121	0.90	0.3494	1.03	0.4081	0.87	0.3358	0.81	0.2339
0.040	0.89	0.1720	0.99	0.1952	1.18	0.2389	0.98	0.1945	0.90	0.1360
0.060	0.92	0.1201	1.02	0.1354	1.29	0.1767	1.06	0.1418	0.92	0.0946
0.080	0.98	0.0970	1.15	0.1156	1.46	0.1508	1.25	0.1274	0.98	0.0780
0.100	1.03	0.0819	1.23	0.1000	1.52	0.1269	1.46	0.1208	1.13	0.0754

Table 5: The Conductance (*k*) and Equivalent Conductance (λ_m) of Synthesized Compounds in DMF at 308.15 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.$^{-1}$
	RPD-1		**RPD-2**		**RPD-3**		**RPD-4**		**RPD-5**	
0.000	0.30	-	0.30	-	0.30	-	0.30	-	0.30	-
0.001	0.49	1.7472	0.48	1.6562	0.46	1.4742	0.48	1.6562	0.38	0.7462
0.002	0.65	1.6016	0.59	1.3286	0.53	1.0556	0.58	1.2831	0.56	1.1921
0.004	0.81	1.1648	0.69	0.8918	0.67	0.8463	0.70	0.9146	0.68	0.8691
0.006	0.92	0.9434	0.78	0.7310	0.78	0.7310	0.79	0.7462	0.79	0.7462
0.008	1.01	0.8099	0.91	0.6962	0.88	0.6620	0.89	0.6734	0.90	0.6848
0.010	1.10	0.7298	1.01	0.6479	0.96	0.6024	0.96	0.6024	0.98	0.6206
0.020	1.29	0.4514	1.18	0.4013	1.09	0.3604	1.07	0.3513	1.19	0.4059
0.040	1.47	0.2666	1.31	0.2302	1.22	0.2098	1.18	0.2007	1.32	0.2325
0.060	1.61	0.1990	1.48	0.1793	1.38	0.1641	1.28	0.1489	1.49	0.1808
0.080	1.75	0.1652	1.59	0.1470	1.47	0.1333	1.42	0.1276	1.66	0.1549
0.100	1.86	0.1421	1.76	0.1330	1.66	0.1239	1.54	0.1130	1.78	0.1349
	RPD-6		**RPD-7**		**RPD-8**		**RPD-9**		**RPD-10**	
0.000	0.30	-	0.30	-	0.30	-	0.30	-	0.30	-
0.001	0.31	0.1092	0.44	1.2922	0.51	1.9292	0.45	1.3832	0.32	0.2002
0.002	0.41	0.5096	0.51	0.9646	0.62	1.4651	0.52	1.0101	0.47	0.7826
0.004	0.52	0.5051	0.59	0.6643	0.78	1.0966	0.67	0.8463	0.61	0.7098
0.006	0.62	0.4884	0.66	0.5490	0.91	0.9282	0.81	0.7765	0.69	0.5945
0.008	0.71	0.4687	0.71	0.4687	1.03	0.8327	0.92	0.7075	0.78	0.5483
0.010	0.79	0.4477	0.78	0.4386	1.12	0.7480	1.02	0.6570	0.85	0.5023
0.020	0.98	0.3103	0.89	0.2694	1.25	0.4332	1.19	0.4059	0.96	0.3012
0.040	1.12	0.1870	1.05	0.1711	1.39	0.2484	1.27	0.2211	1.08	0.1779
0.060	1.25	0.1444	1.17	0.1323	1.58	0.1944	1.39	0.1656	1.23	0.1414
0.080	1.34	0.1185	1.34	0.1185	1.74	0.1640	1.52	0.1390	1.37	0.1219
0.100	1.40	0.1003	1.56	0.1148	1.84	0.1403	1.79	0.1358	1.54	0.1130

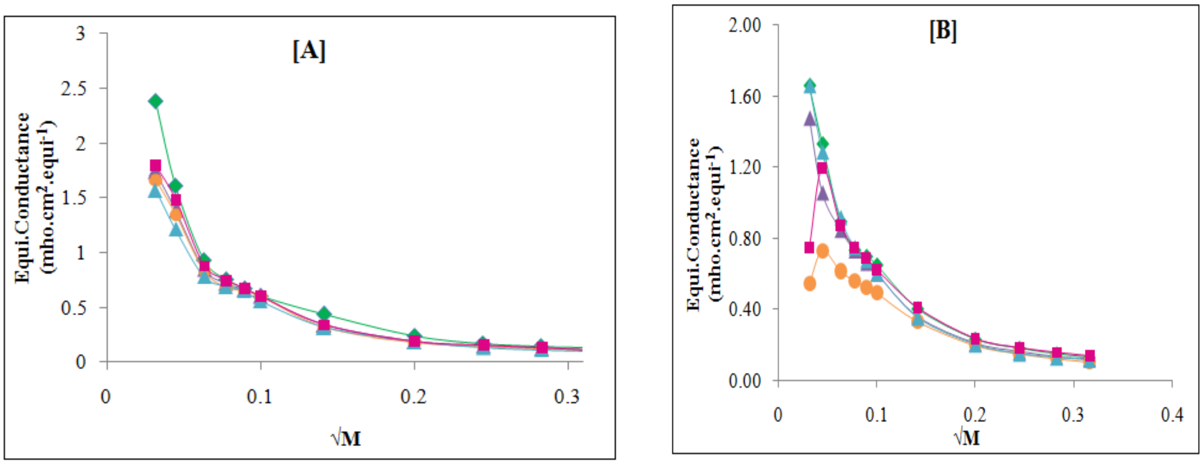

Figure 5: The Variation of Equivalent Conductance with √M for RPD-1 to RPD-5 in [A] 1, 4-Dioxane and [B] DMF at 308.15 K
RPD-1, (♦); RPD-2, (▲); RPD-3, (●); RPD-4, (▲); RPD-5, (■)

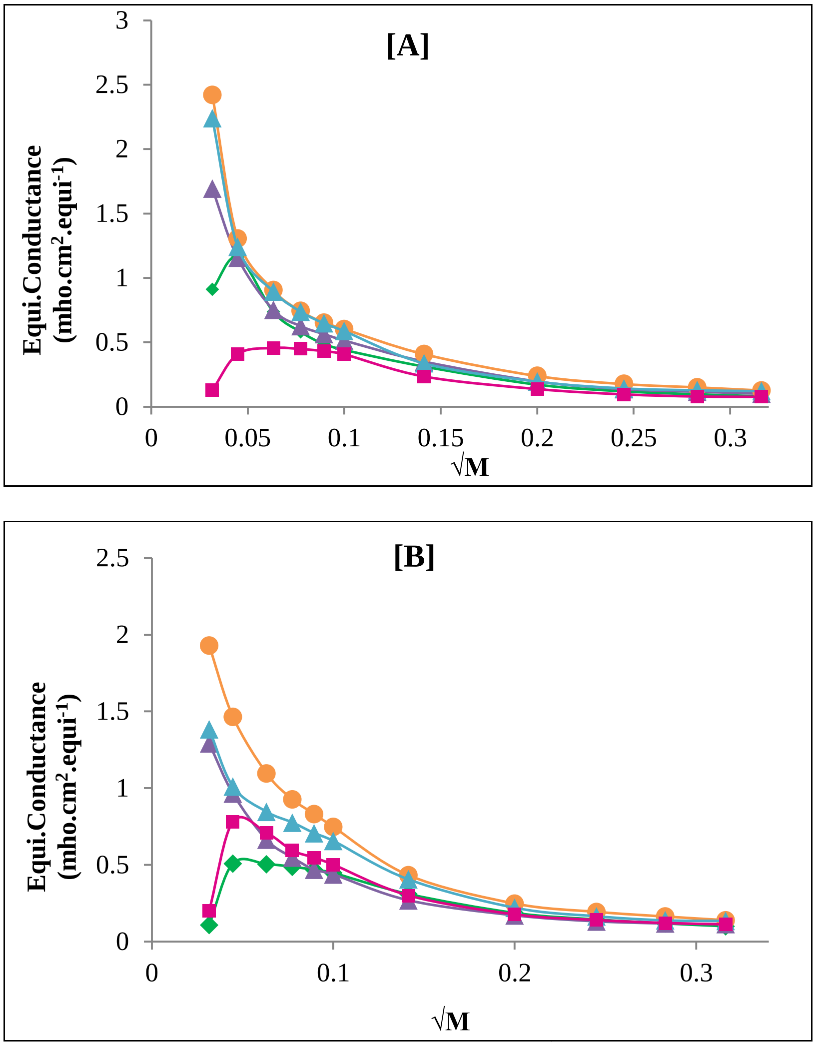

Figure 6: The Variation of Equivalent Conductance with √M for RPD-6 to RPD-10 in [A] 1, 4-Dioxane and [B] DMF at 308.15 K
RPD-6, (♦); RPD-7, (▲); RPD-8, (●); RPD-9, (▲); RPD-10, (■)

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.

REFERENCES

Kaur N, Aggarwal AK, Sharma N and Choudhary B (2012). Synthesis and *In-vitro* antimicrobial activity of pyrimidine derivatives. *International Journal of Pharmaceutical Science and Drug Research* **4** 199-204.

Jain KS, Chitre TS and Miniyar PB (2006). Biological and medicinal significance of pyrimidines. *Current Sciences* **90** 793-803.

Brown DJ (1984). *Comprehensive Heterocyclic Chemistry,* **14**, edited by A. R. Katritzky and C. W. Rees, (Pergamon Press, Oxford, UK).

Elderfield RC (1957). *Heterocyclic Compounds,* **6**, (John Wiley & Sons, New York, USA).

Porter AEA (1979). *Diazines and Benzodiazines,* **14**, (Pregamon Press, Elsevier Science BV, Amsterdam, The Netherlands).

Finar IL (1975). *Organic Chemistry,* 2nd edition; (Longman: London, UK)**.**

Bicerano J (1996). *Prediction of Polymer Properties*, 2nd edition; (Marcel Dekker, Inc.: New York, USA).

Kashmiri M, Nawaz MS, Naz N (2002). Physico-chemical analysis of different honey produced in Pakistan, *Journal of Natural Sciences and Mathematics* **42** 73-78.

Prasad K and Nath N (2000). Estimation of sugar content in commercially available beverages using ultrasonic velocity measurement, *Indian Journal of Physics* **74A**(4) 387-389.

Sharma K, Sharma S and Lahiri S (2009). Novel method for identification and quantification of methanol and ethanol in alcoholic beverages by gas chromatography-Fourier transform infrared spectroscopy and horizontal attenuated total reflectance-Fourier transform infrared spectroscopy. *Journal of AOAC International* **92** 518-526.

Sun J, Erickson M and Parr J (2003). Refractive index matching: principles and cosmetic applications, *Cosmetics & Toiletries* **118** 65-66.

Greaves P and Microtex O (2009). *Alternative and Specialised Textile Fibre Identification Tests. Woodhead Publishing Series in Textiles* **84** 181-202.

Cao X, Hancock B, Leyva N, Becker J and Masterson V (2009). Estimating the refractive index of pharmaceutical solids using predictive methods, *International Journal of Pharmaceutics* **368** 16-23.

Commings C, Barhdadi R, Laurent M and Troupel M (2006). Determination of viscosity ionic conductivity and diffusion coefficients in some binary systems; ionic liquids molecular solvents. *Journal of Chemical & Engineering Data* **51** 680-685.

Syal VK, Chauhan S and Sharma P (2005). Conductance measurements of narcotics analgesic drugs in ethanol-water mixtures at 25°C. *Journal of the Indian Chemical Society* **82** 602-607.

Rafiti AA, Azizian S and Chahardoli M (2008). Conductometric studies of interaction between anionic dyes and cetylpyridinium bromide in water-alcohol mixed solvent. *Journal of Molecular Liquids* **137** 80-87.

Linde WV, Northcott D, Redmond W and Robertson RE (1969). Basic dissociation constant for ethylamine by a convenient conductance method, *Canadian Journal of Chemistry* **47** 279-285.

Levitt LS (1981). Determination of the dissociation constant and limiting equivalent conductance of a weak electrolyte from conductance measurements on the weak electrolyte. *Analytica Chimica Acta* **125** 219-220.

Niazi MSK (1993). Conductivities and Thermodynamic Dissociation Constants for Chloroacetic Acid in Binary Mixed Solvent Systems at 298.15 K. *Journal of Chemical & Engineering Data* **38** 527-530.

Berezovskaia GE and Korytnyi VS (1968). Role of polarization processes near electrodes during the measurement of the electrical conductivity of biological objects, *Biofizika* **13** 524-528.

Canizares P, Beteta A, Saez C, Rodriguez L and Rodrigo MA (2008). Use of electrochemical technology to increase the quality of the effluents of bio-oxidation processes. A case studied, *Chemosphere* **72** 1080-1085.

Spera R, Festa F, Bragazzi NL, Pechkova E, LaBaer J and Nicolini C (2013). Conductometric monitoring of protein-protein interactions. *Journal of Proteome Research* **12** 5535-5547.

Johansen C, Bredtved BK and Moller S (1999). Use of conductance measurements for determination of enzymatic degradation of microbial biofilm. *Methods in Enzymology* **310** 353-361.

Riddick JA, Bunger WB and Sakano T (1986). *Organic Solvents-Physical Properties and Methods of Purification, Techniques of Chemistry*, (John Wiley and Sons, Inc. New York, USA).

Lorentz HA (1906). Lorentz, Theory of electronics, Leipzig, (**1906**).