RESEARCHERID
THOMSON REUTERS

[Saudagar, 5(12): December2018] ISSN 2348 – 8034
DOI- 10.5281/zenodo.2526958 Impact Factor- 5.070

GLOBAL JOURNAL OF ENGINEERING SCIENCE AND RESEARCHES

CONDUCTOMETRIC MEASUREMENTS OF DIFFERENT CHLORO SUBSTITUTED AZETIDIN-2-ONE AT DIFFERENT CONCENTRATION AND TEMPERATURE IN 90% (EtOH+WATER) SOLVENT

Ashfaq Husain M. Saudagar[*1] & Rahimullah S. Shaikh [2]

[*1,]Student, [2]Assistant professor, Department of Chemistry, Govt. Vidarbha Institute of Science and Humanities, Amravati, (M.S.), India

Abstract

In drug diffusion, Conductivity play vital role. Thermodynamic parameters affected by structure's of drug. β-Lactam nucleus containing drugs created their own identity. Thus,conductometrically have been investigated thermodynamic parameters of substituted azetidin-2-one have been studied at different concentrations in 90% ethanol-water mixture at different temperatures. We investigate the Observed conductance (G) Specific conductance (k)Molar conductance(μ) of different chloro substituted azetidin-2-one drugs of different concentration in 90% (EtOH+water) solvent at various temperatures in the present work. conductrometric measurements of chloro substituted azetidin-2-one provided valuable information regarding to solute-solvents, solute–solute and solvent-solvent interaction.

Keywords: *Observed conductance (G) Specific conductance (k)Molar conductance(μ), Dissociation constant, chloro substituted azetidin-2-one.*

I. INTRODUCTION

In drug diffusion, Conductivity play vital role. Conduction of electrolytic solution influenced by number of ions of electrolyte in solution. Conductrometric measurments of electrolytic solution provided valuable information about to solubility and permeability of drugs, which are important biopharmaceutical parameters. Solubility and permibility played an essential role in pharmacodynamics and pharmacokinetics. Thermodynamic study of metal dioctylsulfosuccinate in aqueous solution Conductometrically observed by El-Ailia[1] . Conductometric and volumetric studies of atorvastatin in aqueous solution of arginine from 298.15 to 313.15K was carried out by Affandi et al.[2].Conductomtric study of complex formations between some substituted pyrimidines and some metal ions in acetonitrile and the determination of thermodynamic parameters studied by Nasrabadi et al[3] . Payehghadr et al.[4] investigate of the thermodynamic of complexation of Zn2+, Ni2+, Co2+, Pb2+, Mn2+, Cu2+ ions with 1,13-bis (8-quinolyl)-1,4,7,10,13-pentaoxatridecane in binary solvent mixtures by Conductometrically. Solubility and permibility can be used for correlation in vivo and vitro bioavailability of any drugs [5]. Improvement of solubility and dissolution rate of oral bioavailability of poorly water soluble drugs are still challenging aspects[6]. There are many but one of secure method of solubalisation is hydrotropic solubalisation [7]. Stability of drugs by solubility enhancers (hydrotropic agents) studied by Many researchers [8-9]. Conductometric, spectrophotometric and thermodynamic studies of nickel sulfate in aqueous polyvinyl alcohol + methanol systems at different temperatures investigated by s masood et al. 10 . Alanajjar[11] investigated the determination of o-floxacin and cefixime in their combined dosage by conductometric method. The aqueous solutions of sodium benzoate,sodium salicylate, sodium bromide and nicotinamide with and without nimesulide for its effect on water conductometrically observed by Kay et al[12].Conductometric and spectroscopic studies of sodium dodecyl sulfate in aqueous media in the presence of organic chalcogen studied by Mehta et al[13]. the effect of temperature on the critical micelle concentration of some paraffin-chain salts investigated by Flockhart[14]. Gomma and Jahadalli[15] investigated conductometric studies of ionic association of divalent asymmetric electrolyte Cu(NO3)2 with kryptofix-22 in mixed methanol-DMF solvents at different temperatures. Ternary complexes using quinolone antibiotics as a primary ligand was studied by Imran et al[16].

II. METHOD & MATERIAL

In present investigation used all freshly prepared solution. All A.R. grade chemicals used during experiment. Solvents were purified by standard method. Prepared 0.1M, 0.075M. 0.05M and0.0025M solutions of 3-Chloro-4(4-hydroxyphenyl)-1-(-4-nitrophenyl)azetidin-2-one **(C_1)** and 3-Chloro-1(4-hydroxyphenyl)-4-phenylazetidin-2-one**(C_3)** . Maintain thermal equilibrium (293K to 313K) of drugs solution by using thermostat. To measured conductance after getting thermal equilibrium.

III. RESULT & DISCUSSION

The The conductance of each electrolyte solution of drug was measured at different temperatures with help of Conductivity Bridge. In this investigation 90% mixture of water-ethanol was used for the conductance measurements. 0.1M, 0.075M. 0.05M and0.0025M solutions of 3-Chloro-4(4-hydroxyphenyl)-1-(-4-nitrophenyl)azetidin-2-one **(C_1)** and 3-Chloro-1(4-hydroxyphenyl)-4-phenylazetidin-2-one**(C_3)** was prepared by using 90% mixture of water-ethanol. All the results obtained are computed in **Table 1** and **2**. From the data observed conductance (G), specific conductance (k) and molar conductance (μ) were determined by known literature method. Calculated values of dissociaton constant (K_d), log (K_d) and thermodynamic parameters viz., ($E_a^{\#}$ energy of activation, Free energy change of activation for dissociation ($\Delta G_d^{\#}$), Enthalpy change of activation for dissociation ($\Delta H_d^{\#}$)and Entropy change of activation for dissociation ($\Delta S_d^{\#}$) of 3-Chloro-4(4-hydroxyphenyl)-1-(-4-nitrophenyl)azetidin-2-one (C_1) and 3-Chloro-1(4-hydroxyphenyl)-4-phenylazetidin-2-one(C_3) were calculated by by known literature methods at different temperatures with same concentration(0.1M). Obtained result computed in **Table 3**.

Table 1. Conductometric measurements at different concentraton of 3-Chloro-4(4-hydroxyphenyl)-1-(-4-nitrophenyl)azetidin-2-one (C_1) determination of G, k and μ at different temperatures.

Temp K	Concetration C	Observed conductance (G)	Specific conductance (K_C)	Molar conductance (Λ_m)
293	0.1	0.11	0.13816	1381.6
	0.075	0.091	0.114296	1523.9
	0.05	0.084	0.105504	2110.08
	0.025	0.068	0.085408	3416.32
298	0.1	0.116	0.134444	1344.44
	0.075	0.103	0.119377	1591.69
	0.05	0.537	0.622383	12447.6
	0.025	0.082	0.095038	3801.52
303	0.1	0.127	0.138684	1386.84
	0.075	0.115	0.12558	1674.4
	0.05	0.104	0.113568	2271.36
	0.025	0.094	0.102648	4105.92
308	0.1	0.139	0.147479	1474.79
	0.075	0.121	0.128381	1711.74
	0.05	0.108	0.114588	2291.76
	0.025	0.107	0.113527	4541.08
313	0.1	0.154	0.155078	1550.78
	0.075	0.147	0.148029	1973.72
	0.05	0.132	0.132924	2658.48
	0.025	0.125	0.125875	5035

Table 2: Conductometric measurements at different concentraton of 3-Chloro-1(4-hydroxyphenyl)-4-phenylazetidin-2-one(C_3) determination of G, k and μ at different temperatures.

Temp K	Concetration C	Observed conductance (G)	Specific conductance (K_C)	Molar conductance (Λ_m)
293	0.1	0.041	0.051496	514.96
	0.075	0.034	0.042704	569.38
	0.05	0.019	0.023864	477.28
	0.025	0.001	0.001256	50.24
298	0.1	0.049	0.056791	567.91
	0.075	0.038	0.044042	587.2
	0.05	0.472	0.547048	10940.9
	0.025	0.017	0.019703	788.12
303	0.1	0.062	0.067704	677.04
	0.075	0.058	0.063336	844.48
	0.05	0.039	0.042588	851.76
	0.025	0.027	0.029484	1179.3
308	0.1	0.074	0.078514	785.14
	0.075	0.06	0.06366	848.8
	0.05	0.045	0.047745	954.9
	0.025	0.042	0.044562	1782.48
313	0.1	0.087	0.087609	876.09
	0.075	0.08	0.08056	1074.1
	0.05	0.067	0.067469	1349.38
	0.025	0.06	0.06042	2416.8

Table 3:$E_a^{\#}$ energy of activation, Free energy change of activation for dissociation ($\Delta G_d^{\#}$), Enthalpy change of activation for dissociation ($\Delta H_d^{\#}$)and Entropy change of activation for dissociation ($\Delta S_d^{\#}$) of C_1 and C_3at 0.1 M.

System	$E_a^{\#}$ energy of activation	Free energy change of activation for dissociation ($\Delta G_d^{\#}$)	Enthalpy change of activation for dissociation ($\Delta H_d^{\#}$)	Entropy change of activation for dissociation ($\Delta S_d^{\#}$)
C_1	-5.3421	61133.70236	-2524.4841	-2726.2737
C_3	-60.045	58407.36157	-2579.1874	-2771.8432

IV. CONCLUSION

Table 1 & 2 reveals that the observed conductance (G), specific conductance (k) and molar conductance (μ) decreases along with decreases in concentration . The observed conductance (G), specific conductance (k) and molar conductance (μ) increases along with increase in temperature. The specific conductance increases with increasing temperature. Table 3. reveals that $E_a^{\#}$ energy of activation of C_3 is smaller than C_1 , Free energy change of activation for dissociation ($\Delta G_d^{\#}$), Enthalpy change of activation for dissociation ($\Delta H_d^{\#}$)and Entropy change of activation for dissociation ($\Delta S_d^{\#}$) of C_1 is more than C_3 at 0.1 M.

V. ACKNOWLEDGEMENTS

The authors gratefully acknowledge The Director; Head, Department of Chemistry, Govt. Vidarbha Institute of Science and Humanities, Amravati for providing necessary facilities and help when needed for the work.

REFERENCES

1. *H.J.Y.El-Alia, "Conductometry and thermodynamic study of metal dioctylsulfosuccinate in aqueous solution." J. Dispersion Sci. and Tech., 31(4), 2010,557-562.*
2. *M.M.R. Affandi, M.Tripathy, A.B.A.Majeed, "Conductometric and volumetric studies of atorvastatin in aqueous solution of arginine from 298.15 to 313.15K." J. Adv. Pharm. Technlo. Res., 7(3),2016, 80-86.*
3. *N.R. Nasrabadi, F.Ahmadi, S.M. Pourmortazavi, N.R Ganjali. , K. Alizadeh, "Conductorometric study of complex formation between some substituted pyrimidines and some metal ions in acetonitrile and the determination of thermodynamic parameters." J. of Molecular Liquids, 144(1-2), 2009, 97-101.*
4. *M. Payehghadr, M. Taghdiri, A. Zamani, N. Hesaraki, "Conductometric studies of the thermodynamic of complexation of Zn2+, Ni2+, Co2+, Pb2+, Mn2+, Cu2+ ions with 1,13-bis (8-quinolyl)-1,4,7,10,13-pentaoxatridecane in binary solvent mixtures." Iranian J. of Chemistry and Chemical Engineering, 31(3), 2012, 1-7.*
5. *S. Chakrabarty, D. Shukla, A. Jain, B. Mishra,S.Sing, J. Coll. Int. Sci., 335,2009, 242-249.*
6. *C. W. Pouton, Enhancement of solubility and dissolution rate of oral bioavailability of poorly water soluble drugs are still challenging aspects for pharmaceutical technologists , Euro. J. Pharma. Sci.,2006,29,278-287.*
7. *Drug information for health care professional, 17th Ed. USPDI, 16-46, 1997.*
8. *S. Agrawal, S. S. Pancholi, N. K. Jain ,G. P. Agrawal, Int. J. Pharma,, 2004, 247,149-155.*
9. *G.D. Poochkian, J.C. Gradock, J. Pharma. Sci.,1994,68, 728-732.*
10. *Summyia Masood, Rehana Saeed and Maria Ashfaq "Conductometric, spectrophotometric and thermodynamic studies of nickel sulfate in aqueous polyvinyl alcohol + methanol systems at different temperatures" European Journal of Chemistry 6 (1) ,(2015) 37-43.*
11. *A.O. Alanajjar, "Conductometric technique studied simultaneous determination of ofloxacine and cefixime in their combine dosages." J. Chem. Pharma. Res., 4(4),2012, 2064-2069.*
12. *T. Shedlovasky, R.L. Kay, "Conductometric study of aqueous solution of sodium benzoate, sodium salicylate, sodium bromide and nicotinamide with and without nimesulide for its effect on water." J. Phys. Chem., 60, 1995,151.*
13. *S.K. Mehta, S. Chaudhary, K.K. Bhasin, R. Kumar, M. Aratono, "Conductometric and spectroscopic studies of sodium dodecyl chalcogen." Colloids Surf A: Physicochem Eng. Aspects, 304, 2007, 88-95.*
14. *B.D. Flockhart, "Effect of temperature on the critical micelle concentration of some paraffin chain salt." J. Colloid. Sci., 30, 1969, 482-488.*
15. *E.A. Gomma and Al-Jahadalli, "Conductometric studies of ionic association of divalent asymmetric electrolyte Cu(NO3)2 with kryptofix-22 in mixed methanol-DMF solvents at different temperatures", Am. J. Condensed Matter Physics, 2(1), 2012, 16-21.*
16. *M. Imran, T. Kokab, S. Latif, M. Liviu and Z.Mahmood, Study of ternary complexes using quinolone antibiotics as a primary ligand, J. Chem. Soc. Pak., 32(2), 2010, 223-228.*