Journal of Medicinal Chemistry and Drug Discovery
ISSN: 2347-9027
Special Issue
Analytical Chemistry Teachers And Researchers Association
National Convention/Seminar
18 January 2015

STUDIES IN STABILITY CONSTANTS, VISCOSITY AND REFRACTIVITY INDEX OF CU(II), CO(II)AND NI(II)COMPLEXES WITH 1-(3-BROMO-2-HYDROXY-5-METHYLPHENYL)-3-PHENYLPROPANE-1,3-DIONE (L) AT 0.1M STRENGTH

Noor Mohammad[1], S.A.Quazi[2], D.T.Mahajan[2], M.L.Narwade[2,] Vijay.H.Masand[2], JundeAhmad[2]M.R.Ingle[3]

1) Department of Chemistry, Govt.Vidarbha Institute of Sci. and Humanities, Amravati (M.S) India

2) Department of Chemistry, Vidya Bharti Mahavidyalaya, Amravati (M.S.) India

3) Department of Chemistry, G.S.College, Khamgaon (M.S) India

ABSTRACT

The physical parameters like viscosityand stability constant in 70% dioxane-Water and refractive index and polarazibility constant in different concentration with 1-(3-bromo-2-hydroxy-5-methylphenyl)-3-phenylpropane-1,3-dione (L)305.15^{0}k.Favourable results are obtained of stability constants. By using Calvin Bjerrum Irving Rassoti's method the stability constants of complex formation have been studied, titration is done in an inert atmosphere at 0.1M ionic strength and temp. (305.15^{0}k) pH metrically. Themeasurements of refractive index are done by Abbe's refractometer.In the present investigation, molar refractivity and polarazibility constants of ligands solution havebeen studied. It is found thatmolar refractivity and polarazibity constants are decrease with increase in density of solution.

Key Words:pH metric study, stability constant, refractivity and polarazibity

INTRODUCTION

The viscosity is one of the important physical parameter of liquids which provides valuable information with respect to solute-solute and solvant-solvant interaction in aqueous and non-aqueous solution[1-5].Molecular interactions of mixture is also studied by many workers[6-12]. The Jones-Doles[13]equation for the accounts of viscosity concentration dependence of dilute electrolyte solutions while Breslau Miler[14] and Vand[15] account for the concentration dependence of viscosity in concentrated electrolyte solution. Berry and Irvings[16] have determined viscosities of concentrated aqueous electrolyte solution at various concentrations. Narwade et al[17] have presented the metal ligand stability constant of UO_2 (II) and Cu (II) complexes with some substituted sulphonic acids. Agrawal et al[18] have studied the metal ligand stability constant of Fe(II), Cr(III) and Al(III) metal ions with some substituted pyrazoles and studied viscosity of some substituted flavones, isooxazole and pyrazoles in 70% acetone water mixture. Recently some workers presented the measurement of viscosity, refractivity index and metal -ligand stability constant of substituted ligands of binary complexes by pH metrically. After literature survey it is observed that study viscosity of, refractive index and stability constant have not been reported. So we have selected this scheme for this paper.

EXPERIMENTAL SECTION

Chemicals: All chemicals are analytical reagent (AR) grade with were obtained from Sd Fine chemicals, India which is used as such without further purification. The Cu (II), Ni (II) and Co (II) metal ions and complexes dissolving it in proper solvent.

Ligand: In present investigation the ligand was synthesized in laboratory by standard methods for studying it was checked by M.P, TLC, and structure was established on the basis of elemental analysis, IR and NMR data.

Viscosity: The viscosities were measured by using Oswald's viscometer, whichwas kept in thermostatic water bath (±0.10c) and maintaining each measurement sufficienttime was allowed to maintain the constant temp.

Refractive index: By using Abbe's refractometer the refractive indices of ligands solution were determined.

Stability constants: Metal ligand stability constants of metal complexes are carried out at 0.1ionic strength in 70% dioxane-water mixture using Bjerrium titration Process.

RESULT AND DISCUSSION

By using Irving Rassoti's equation proton ligand stability constant are evaluated by half integral method and pointwise calculation method which are given below table.

Journal of Medicinal Chemistry and Drug Discovery
ISSN: 2347-9027
Special Issue
Analytical Chemistry Teachers And Researchers
Association
National Convention/Seminar
18 January 2015

Table -I. Proton Ligand Stability Constant

System	Half integral method	Point wise calculation method
L-Co(II)	8.20	8.31±0.05
L-Cu(II)	9.80	9.75±0.02
L-Ni(II)	8.60	8.70±0.04

From the above table -I Pk, values of system L-Ni(II) is lesser than pKa values of systems L-Cu(II) and L-Co(II), The change in colors with respect pH during titration process and the deviation between ligand curve and ligand+acid curve also indicate the complex formation $Logk_1$ (metal ligand stability constant for 1:1 complex) and $Logk_2$ (metal ligand stability constant for 1:2 complex) or evaluated using Irving Rassotti's expression which are presented in table -II.

Table -II. Metal Ligand Stability Constant

System	Pk_1	Pk_2
L-Co(II)	7.14362	5.7532
L-Cu(II)	8.9553	7.3642
L-Ni(II)	5.8543	4.8635

The relative viscosities have been analysed by Jones-Dole equation[73].

$$(\eta_r - 1) / \sqrt{C} = A + B\sqrt{C} \qquad \text{.......... (3)}$$

where,C is molar concentration of the ligand solution,A is the viscosity coefficient which measures solute-solute interaction and B is viscosity coefficient which measure solute-solvent interaction. The graphs are plotted between $(\eta_r - 1) / \sqrt{C}$ Vs $\sqrt{C}$. The graph for each system gives linear straight line showing validity of Jones-Dole equation. The slope of straight line gives value of B-coefficient. In the present study, relative viscosity of ligand solutions increases with increase in the concentration of ligand. The increase in viscosity with increase in concentration may be attributed to the increase in solute–solvent interactions. The plots of $(\eta_r - 1) / \sqrt{C}$ Vs $\sqrt{C}$, gives positive B-coefficient values which indicates the presence of solute-solvent interactions. The values of viscosity (η) and relative viscosity (η_r) of system in 70% of dioxane-water mixtures are represented in at difference concentrations are represented in TableIII.

Table -III: Measurement of Viscosity.

Temp. : 305.15 ± 0.01°k medium: 70% dioxane-Water

Conc. Mole dm^{-3}	√C Mole$^{-1/2}$ $dm^{-3/2}$	Density (ρ) $g.cm^{-3}$	Time Flow Sec	Viscosity Cp	Relative Viscosity	Specific Viscosity ηSp $= \eta_r - 1/\sqrt{C}$
0.010	0.1301	1.04313	97.9	1.11761	1.6236	1.6476
0.008	0.1970	0.04320	95.9	1.09488	1.5997	1.5142
0.006	0.09746	0.04341	94.2	1.07664	1.58069	1.37211
0.004	0.09326	1.0456	91.8	1.05071	1.5532	1.19481
0.002	0.07471	1.0469	90.0	1.0181	1.51901	0.7141

The molar refraction of compound is determined as,

$\mathbf{R_{ligand} = R_{mixture} - R_{Dioxane\text{-}Water}}$

Where,

$R_{Dioxane\text{-}Water}$ - The molar refraction of solvent, Dioxane-Water mixture.The molar refractivity of complexes was determined using formula $R_M = n^2 - 1 / n^2 + 2 \times M/d$

$R_M = 4/3 \pi No \alpha$

Table - IV - Molar Refraction and Polarizability Constant at Different Concentrations for 70% of Dioxane-WaterMixture

Ligand	Concentration (M)	Density $Kg.cm^{-1}$	Refractive index (η)	$R_{mixture}$ **($cm^3.mole^{-1}$)**	R_{Ligand} **($cm^3.mole^{-1}$)**	**α x10^{-23} (cm3)**
L	0.1005	1.0241	1.4107	8.8432	0.7881	0.03126
	0.0755	1.0239	1.4087	8.7600	0.7050	0.02799
	0.0565	1.0236	1.4075	8.7034	0.6483	0.02572
	0.0425	1.0233	1.4057	8.6390	0.5834	0.02312

After observing the above tables it can be suggested that, at 305.15°k the temperature of mixture, the molar refractivity and polarizability constant continuously increases with concentration. The higher apparent molarcompressibility value in dioxane solvent making the solution more compressible.

Due to the fact that at this temperature of dioxane, there is increase in dielectric constant of medium with concentration.The polar solute have acquires a partial positive charge on hydrogen atom; there are weak interactions between this positive charge and negative charge on oxygen atom (electronegativity) of dioxane. The weak interaction of the wonder wall's forces isin the solution i.e. specific arrangement of dioxane molecule may be occurring due to attached solute molecule.

REFERENCES

[1] MI Aralaguppi; TM Aminabhavi; RH Balundgi and SS Joshi. *J.Phy Chem.*, 1991, 96, 5299.

[2]TM Aminabhavi; SS Joshi and SS Shukla. *Can.J.Chem.*, 1990,68, 319.

[3]SS Joshi; TM Aminabhavi; RH Balundgi and SS Shukla. *J.Chem.Inorg.Data*, 1990, 35,1185.

[4]RK Wadi and V Kakkar. *Indian J.Chem.*, 2000, 39, 598.

[5]KJ Patil; SM Manwatkar and SS Donge. *Indian J. Chem*., 1994, 33, 4.

[6]UP Kapadi; PP Hankare and SK Chavan. *J. Ind.Chem.Soc.*, 1994, 72, 269.

[7]SS Yadav. *Indian J.Chem.*, 1995, 34, 131.

[8]S Das and D Hazra. *Indian J. Chem.*, 1988, 27, 898.

[9]BK Kalra; KC Singh and U Bhardwaj. *Indian J.Chem.*, 1994, 33, 314.

[10]BR Raut and I Chakravarty. *Indian J. Chem.*, 1994, 33, 303.

[11]JD Pandey; GP Dubey; BP Shukla and SN Dubey. *Indian Chem.Soc.*, 1992, 69, 750.

[12]KN Mehrotra; K Tandon and MK Rawat. *J. Ind.Chem.Soc.*, 1992, 69, 193.

[14] Breslan BR and JF Miller. *J.Phys. Chem.*, 1970, 74, 1956.

[15] V Vand. *J.Phys.Colloid.Chem.*, 1948, 52, 277.

[16] RB Barry and FM Irving. *J.Phys.Chem.*, 1969, 73, 2060.

[17] BG Khobragade and ML Narwade. *Acta Ciencia Indica*, 1983, IX-c, 32.

[18] PB Agrawal and ML Narwade. *Indian J. Chem.*, 2003, 42-A, 1047.

[19] BG Khobragade; ML Narwade; M Raffique and NS Quazi. *Act.Cien.Ind.*, 2007, 33-c, 2,113.

[20] JD Mahale; SC Manoja; NG Belsare and PR Rajput. *Ind. J. Chem.*, 2010, 29 B, 505.

[21] VS Jamode; JC Dadhichi; DD Malkhede and ML Narwade. *J.Ind.Coun.of Chemist*, 2005, 22-2, 35.