INTERNATIONAL 12th ,13th & 14th July 2017

# CONFERENCE

On Sciences and Technology- ICRTS-2017

**INTERNATIONAL CONFERENCE ON RECENT TRENDS IN SCIENCES AND TECHNOLOGY : SUSTAINABLE DEVELOPMENT THROUGH SCIENTIFIC APPROACH**

**Organized By**

**SHRI SHIVAJI EDUCATION SOCIETY'S SCIENCE COLLEGE**

CONGRESS NAGAR, 440012, (M.S.) INDIA

College accreditated 'A' Grade by National Accreditation and Assessment Council Banglore & College of potential excellence identified by University Grants Commission

Website: www.sscnagpur.edu.in



SSC/ Con/23/16

Date : 02/12/2016

**To,**
Principal,
Shri Shivaji College of Arts, Com. & Science.
Akot, Dist. Akola.

**Subject:** Collaboration for Organizing International Conference ICIS-2017 at SSES Science College, Congress Nagar Nagpur-440012 during 12 to 14th July 2017.

**Respected Sir,**

I may be excused for disturbing your extremely studded schedule. I am approaching you through this letter just to appraise that International Conference on **Recent Trends in Science and Technology : Sustainable Development Through Scientific Approach (ICRTS-2017)** is a flagship venture of SSES Science College, Congress Nagpur-12, at SSES Science College, Congress Nagar, Nagpur-12, on dated 12, 13 & 14th of July 2017. Theme of conference will be 'Sustainable Development Through Scientific Approach'.

SSES Science College, Congress Nagar Nagpur is a reputed institution run by Shri Shivaji Education Society Amravati and accreditated with 'A' grade by NAAC and Potential for excellence identified by University Grants Commission. Since last decade college has collaborated with inland and abroad universities, institutions and industries of national and international repute.

The deliberated research material will be published in Scientific Peer Reviewed, Abstracted and indexed Research Journal having **"impact factor 4.935"** (2015-2016) i.e **International Journal of Researches in Biosciences, Agriculture and Technology (ISSN NO 2347-517 X)** and International Journal of Research is Social Sciences and Information Technology. We are expecting gathering of more than 500 Scientists, Researchers, Professors and Research Students from all over the World. This would be a mega event in academic arena and in this regard we are expecting the collaborative gathering.

Looking at the significance of this International Conference we are searching as an advertising partner without any financial involvement so as to perform collaborative event, and in turn, he can advertise his portfolio on a technical counter, just as a promoter of event and with research and advisory backup.

We shall always remain grateful and obliged to you.

With warm regards,

**Sincerely yours**
Convener ICRTS-2017

Dr. D.D. Bobdey

Dr. S.P. Wagh

Pl. return to

INTERNATIONAL 12",13" & 14" July 2017
# CONFERENCE
On Sciences and Technology- ICRTS-2017

**INTERNATIONAL CONFERENCE ON RECENT TRENDS IN SCIENCES AND TECHNOLOGY : SUSTAINABLE DEVELOPMENT THROUGH SCIENTIFIC APPROACH**

**Organized By**

**SHRI SHIVAJI EDUCATION SOCIETY'S SCIENCE COLLEGE**

CONGRESS NAGAR, 440012, (M.S.) INDIA

College accreditated 'A' Grade by National Accreditation and Assessment Council Banglore & College of potential excellence identified by University Grants Commission

Website: www.sscnagpur.edu.in

| Patron- | Chairman – | Convenor – | | Organizing Secretary – |
|---|---|---|---|---|
| Adv. Arunkumar B. Shelke<br>President, Shri Shivaji Education Society, Amravati, India | Dr. D.K.Burghate<br>Principal, SSES Science College, Congress Nagar, Nagpur | Dr.A.D.Bobdey<br>Head Dept. of Zoology<br>SSES Science College, Nagpur | Dr.A.V.Gomase<br>Head, Dept. of Microbiology<br>SSES Science College, Nagpur | Dr. Mrs. P.D.Burghate<br>Department of Chemistry<br>SSES Science College, Nagpur. |

## Memorandum of Understanding

1. Shivaji Science College, Congress Nagar, Nagpur-12 for ***International Conference on Recent Trends in Science and Technology : Sustainable Development Through Scientific Approach.*** ICRTS-2017 at SSES Science College, Congress Nagar, Nagpur-440012, on dated, 12, 13 & 14th of July 2017. is collaborating with -

   **Mr/Dr./Mrs.** Dr. A.L. Kulat, Shri Shivaji College of Art, Com.& Science Akot. Dist. Akola (M.S.) India

2. Dr. A.L. Kulat, Shri Shivaji College of Art Com & Scieve, Principal of the college agree to support the above said conference (ICRTS) 2017, on research support, know how for scrutinizing, peer reviewing and support for publication.

3. Principal or recomended Person would be the chief guest of inaugural function of said conference.

4. Principal of the said College and his Institution/Organization will not be involved nor incurr any profit or loss or not be a claimant for TA/DA in ICRTS-2017 at or outside Nagpur.

5. MOU comes in enforcement on dated ....10 th of December 2016.

6. We both parties agree upon the above given points and will work transparently towards successful completion of event. The above Memorandum of understanding is executed through its authorized signatories as follows.

Principal
Shri Shivaji Arts, Commerce & Science College Akot

Dr./Mr./Mrs. Dr. A.L. Kulat
Shri Shivaji College of Art, Com & Science, Akot.
(M.S.) India

Seal-

Dr. S.P. Wagh

Principal
SSES Science College
Congress Nagar, Nagpur,
(Dr. D.K.Burghate)
&
Chairman, ICRTS-2017

Seal – SEAL

# Memorandum of Understanding

**Between**

**Shri Shivaji Education Society, Amravati**

SHIVAJI COLLEGE OF ARTS COMMERCE AND SCIENCE AKOT (MS)

NAAC Accredited with 'B' Grade

AND

Dnyanopask Shikshan Prasarak Sanstha Manora

M.S. P ARTS, SCIENCE AND K.P.T COMMERCE COLLEGE,

MANORA

**MEMORANDUM OF UNDERSTANDING**

This Memorandum of Understanding (MoU)

Is entered into on

BY AND BETWEEN

DEPARTMENT OF CHEMISTRY

SHRI SHIVAJI COLLEGE OF ARTS, COMMERCE AND SCIENCE AKOT

NAAC Accredited with 'B' Grade

Affiliated to Sant Gadge Baba Amravati University, Amravati

(Hereinafter referred to as SSCACS)

AND

DEPARTMENT CHEMISTRY

M.S.P. ARTS, SCIENCE AND K.P.T. COMMERCE COLLEGE MANORA

Affiliated to Sant Gadge Baba Amravati University, Amravati

(Hereinafter referred to as MSPASKPTC)

1. **Preamble**

It is the need of the hour to work in collaborations to achieve and maintain the education and Research standards any institute. The individual academicians from Shri Shivaji College of Arts, Commerce & Science, Akot and M.S.P. Arts, Science and K.P.T. Commerce college, Manora should join hands in academics and research. This would help to increase the academic standards and students' quality. This also helps in tackling particularly the local problems and work together for the sustainable development of the area.

**DEPARTMENT CHEMISTRY SHRI SHIVAJI COLLEGE OF ARTS, COMMERCE AND SCIENCE AKOT,**

The College is established by Shivaji Education Society Amravati. The objective of society is To bring the intellectual awakening and all round development of society through education. It has 35 other educational units imparting education From UG to Ph.D. The College has research facilities.

**DEPARTMENT CHEMISTRY M.S.P. ARTS, SCIENCE AND K.P.T. COMMERCE COLLEGE, MANORA**

Dnyanopask Shikshan Prasarak Sanstha Manora, the parent body of M.S.P. Arts, Science and K.P.T. Commerce college, Manora was established on 1 July 1986 by shri A.D.Ingole, Ex. Z.P President with objective of bringing about intellectual awakening and all round development of society through education. M.S.P Arts, Science & K.P.T Commerce College is now a leading educational institute in university having Arts and Science disciplines along with YCMOU centre. The teaching faculties are highly qualified, experienced and dedicated. The spectacular success achieved by the college is a creation of unusual foresight, exponentially dynamic leadership and able guidance of the founder A.D Ingole. The

This *Memorandum of Understanding (MoU)*

Is entered between

SHRI SHIVAJI COLLEGE OF ARTS COMMERCE AND SCIENCE AKOT

NAAC Accredited with 'B' Grade

And

M.S. P ARTS, SCIENCE AND K.P.T COMMERCE COLLEGE MANORA

On

Approved by

Principal
Shri Shivaji Arts, Commerce
& Science College, Akot
Dist.Akola (Maharashtra)

Dr. A. L Kulat

Shri Shivaji college of Arts, Commerce
Science, Akot. Dist .Akola

Principal
M. S. P. Arts, Sci. & K. P. T. Comm.
College, Manora Dist. Washim

Dr. N. S Thakare

M.S.P Arts, Science & K.P.T Commerce and
College Manora, Dist. Washim

achievement of academic excellence and Nicole, impressive & pompous infrastructure is gained by the constant efforts of multi-dimensional personality M.S.Thakare, Secretary of society.

The institute has the research centers in Chemistry. 50% teaching staff is doctorate and 37.5% staffs are registered for research. Alumni are placed in various fields for the benefits of the society. The college works on the vision of the parent society to serve for the excellence of society. The college works

On the vision of the parent society to serve for the excellence of society

**2. Collaboration**

Shri Shivaji College of Arts, Commerce & Science, Akot and M.S.P. Arts, Science and K.P.T. Commerce College, Manora have mutually agreed to collaboration with each other in following areas.

- Research in Chemistry
- Students training programs, in Research.
- Joint field work, students training programs etc.

The available facilities and manpower of Chemistry Department of Shri Shivaji College of Arts, Commerce & Science Akot and M.S.P. Arts, Science and K.P.T. Commerce College Manora will be utilized with mutual consent and subject to the feasibility. Both parties agreed to enter into a collaborative understanding on the terms and enumerated in this MoU.

**3. Terms of collaboration**

a) Shree Shivaji College of Arts, Science and Commerce College, Akot and M.S.P. Arts, Science and K.P.T. Commerce college, Manora agree to enter into detailed agreement on case-to-case basis, with a defined objective , specifying the scope of work and mutual obligation , terms and condition, financial agreements, Intellectual Property Rights and similar contractual obligation.

b) Shri Shivaji College of Arts, Commerce & Science, Akot and M.S.P. Arts, Science and K.P.T. Commerce college Manora agree to obtain prior permission from to state in any coaching programme that would be carried out by using the M.S.P. Arts, Science and K.P.T. Commerce college Manora infrastructural facilities.

**4. Disclaimer**

This MoU is not intended by Shri Shivaji College of Arts, Commerce & Science , Akot and M.S.P. Arts, Science and K.P.T. Commerce college, Manora to constitute , create, give effect to , or otherwise recognize a joint venture , agency , partnership , or formal business organization of any kind. Each party here to shall act as an independent entity and neither shall act as an agent of either organization for other purpose. Neither party has the authority to bind the other party.

**5. Non-exclusivity**

The agreement reflected by the provisions of this MoU is non –exclusive in nature and both the parties can enter into co-operative arrangements with other parties to suit their organizational needs.

**6. Confidentiality**

The parties understand that in the course of their association, they shall have access to confidential information provided by the other party. Accordingly, the parties agree that such information which is by its nature, not confidential or which is in the public domain or which the party comes to know about other than through violation of any law of legal obligation, provided that such party may be entitled to disclose such information if legally required to be disclosed to a competent authority. Failure to maintain confidentiality shall entitle the affected party to terminate the MoU.

**7. Validity**

The MoU would remain valid for a period of Five years from the date it is signed by the parties and is renewable on mutual consent for such further period as agreed upon.

**8. Term and Review**

The MoU shall be reviewed at the end of one year from the date of signing of this MoU.

Either party can terminate the MoU after giving one month's notice to the other party subject to fulfillment of commitments already agreed upon.

**9. Amendments**

This MoU constitutes the entire understanding between the parties hereto. Except as otherwise provided herein, no addition, amendment to or modification of this MoU shall be effected unless it is in writing and signed by and on behalf of both parties by their respective authorized signatories.

**10. Any dispute**

Any dispute arising out of this MoU will be settled by mutual negotiations between the two parties. In witness where of each of the parties has caused this MoU to be executed in two originals, one has been retained by Shri Shivaji College of Arts, Commerce and Science Akot, and the other by M.S.P Arts, Science and K.P.T Commerce College Manora, Dist. Washim on this day 30/04/2014

# Project

ON

# "STUDIES IN MEASURMENT OF VISCOSITY OF ANTIPROTOZOAL DRUGS IN DIFFERENT SOLVENTS"

**SUBMITTED**

**TO**

**Department of Science And Technology**


By

**Ku.Shyamal N Bhave**

**Supervisor**

**DR. N.S.Thakare**

M.Sc. Ph.D.

**Department of Chemistry**

**M. S. P. Arts , Science & K. P. T. Commerce College ,Manora ,**

**Dist. Washim**


**JULY-2018**

**DR. N.S.Thakare**
M.Sc. Ph.D
Principal M. S. P. Arts ,
Science & K. P. T.
Commerce College,
Manora , Dist. Washim

# - CERTIFICATE–

I hereby certify that her project entitled, *"STUDIES IN MEASURMENT OF VISCOSITY OF ANTIPROTOZOAL DRUGS IN DIFFERENT SOLVENTS"* "Submitted for the fulfillment of scholarship requirement embodied the results of bonafied research work carried out by Ku.Shyamal N. Bhave, under my supervision in the department of Chemistry of **M. S. P. Arts , Science and** K. P. T. Commerce College ,Manora , Dist. Washim (M.S.) I find the work is comprehensive, duly acknowledged.

Manora:
*Date:* 16/07/2018

**DR.N.S.Thakare**
***Supervisor***
Principal
M.S.P Arts, Sci. & K.P.T. Comm.
College, Manora Dist. Washim

Principal
Shri Shivaji Arts, Commerce
& Science College, Akot
Dist.Akola (Maharashtra)

## -DECLARATION-

I, hereby declare that the work presented in this project is my own work under the supervision of Dr. N.S.Thakare, Principal, M. S. P. Arts , Science And K. P. T. Commerce College ,Manora , Dist. Washim and completed for submission for the award of scholarship.

Manora

Date : 16/07/2018

**Ku.Shyamal Bhave**

Principal
Shri Shivaji Arts, Commerce
& Science College, Akot
Dist.Akola (Maharashtra)

## ACKNOWLEDGMENT

I take an immense pleasure in expressing my gratitude towards my supervisor **Dr. N.S.Thakare,**, Principal, **M. S. P. Arts , Science And** K. P. T. Commerce College ,Manora Dist. Washim , for his scholastic guidance, evincing keen interest & constant encouragement from time to time during the entire work. His efforts proved a milestone in the successful completion of this project.

My sincere thanks are due to **Dr.R.M.Jumle, Associate** Professor, Department of chemistry, Shri shvaji arts,commerce and science college,Akot for their valuable guidance and suggestions during research work.

I must appreciate the co-operation given by Dr. **S.D.Deshmukh**, Project Manager, **Surya H. Organics,Wasai (E), Mumbai** regarding the various Drugs ligands which was really essential during research work.

I am very much thankful to non- teaching staff of the department of chemistry M. S. P. Arts , Science & K. P. T. Commerce College ,Manora , Dist. Washim

Principal
Shri Shivaji Arts, Commerce
& Science College, Akot
Dist.Akola (Maharashtra)

**Ku.Shyamal Bhave**
**Researcher**

**Introduction :**

Viscometry [1-2] is an important tool in order to elucidate the solute – solvent interaction and nature of a solute as a structure maker or a structure breaker. Viscosity provides an insight into the stage of association of the solute and extent of its interaction with solvent. The nature and degree of molecular interaction in different solution depends upon several factors i.e. the nature of the solvent, the structure of the solute and also the extent of solvation taking place in the solution.

Viscosity is one of the physical properties of the liquid and gas as it implies resistance to flow, as fluid exhibit a characteristics property of flowing under applied force, even the force of their own weight, physical properties of liquid and binary mixture have been the subject of interest in research laboratories. [3-5]

The viscosity of liquid depends on its molecular size and shape, the intermolecular attraction, and the liquid structure. Those liquids flow slowly are said to have high viscosity and those which flow readily are said to have low viscosity. The viscous drag can be overcome and a constant velocity gradient between layers can be maintained if an external force is applied in the direction of motion. The relationship between the external force and the gradient of velocity between layers is given by,

$$F = -\eta A \frac{du}{dx}$$

Where η is a constant at a given temperature, depending upon the nature of the liquid and is known as coefficient of viscosity, 'F' is applied force, A is area on which force is exerted and $\frac{du}{dx}$ is velocity gradient, perpendicular to direction of motion.

Viscosity and its parameters provide valuable information regarding the shapes and size of molecules.[6] Grouping of solvents into classes often is based on the nature of the intermolecular forces because the manner where by solute and solvent molecules are associated with one another brings about a marked effect on the resulting properties. The measurement of viscosities of electrolyte

in solution provides an excellent method of obtaining data on solute solvent and solute solute interaction.

Viscosity is a principal parameter when any flow measurements of fluid, such as liquid, semisolids, gases and even solids are made. Viscosity measurement is made in conjunction with product quality and efficiency.

Viscosity is the measure of the internal friction of a fluid. This friction becomes apparent when layer of fluid is made to move in relation to another layer. The greater the friction, greater the amount of force required to cause this movement, which is called shear. Poiseuille[7] has great contribution in the research on viscosity. He found that some salt increase the viscosity of water whereas other decreases the viscosity. The very first viscosity study report on $BaCl_2$ as an electrolyte was put forward by Sprung.[8] Further Arrhenius[9] observed that at low concentration the change in viscosity is proportional to the concentration but at moderate concentration viscosity increases fastly.

Solute-solvent interaction in aqueous and non-aqueous solution has studied many workers.[10-12] After the introduction of the concept of ionization power of solvents[13], much work has been devoted to the solvent effect on the rate and equilibrium processes.[14] Because of the close connection between liquid structure and macroscopic properties, determination of volumetric and viscometric properties is a valuable tool to learn the liquid state.[15]

Mohanty et. al.[16] has studied the molecular interaction of potassium iodide in Dioxane - water mixture at various temperatures.

Ankan Choudhary et. al.[17] has studied the viscosity deviation of binary mixture of tetrahydrofuran (THF) with some hydrocarbon at different temperatures.

Viscosities of concentrate aqueous electrolyte solution at various concentrations have been determined by Bary and Irving.[18]

Viscosities and densities of aqueous binary electrolyte solution of different molalites have been measured by Pandey and Yesmin.[19]

Viscosity and density study of Sucrose and Maltose in aq. $NH_4Cl$ at different temperatures have been studied by Nikam et. al.[20]

Moulik and Bisal[21] have studied the solute – solvent interactions in aqueous PEG solution.

The interaction studies of glycine, adenosine, uridine and alanine in aqueous solution of nickel sulphate as well as vanadium sulphate at different temperatures have been carried out by Rohankar.[22]

Many attempts have been made to study viscosities of binary mixtures but no satisfactory results seems to have been obtained, especially for ligand systems showing appreciable departure from ideal behavior.[23] The present study deals with the study of molecular interaction in terms of B- coefficient of Metronidazol , Secnidazole , diclofenac drugs in different organic solvents – water mixture in different concentration at different temperatures.

Drug action has been widely recognized to be the ultimate consequence of physicochemical interaction between the drugs and functionally important molecules in the living organism known as receptor. Drug receptor interaction is like hydrophobic interaction[24-26] like ionic and covalent bonding interaction. It is to be noted that drug action can be achieved with a small amount of drug as high concentration of rarely achieved in vivo, therefore drug transport and ion solvent interaction are the controlling forces in dilute solution where ion-ion interaction are absent. It is natural to believe that the solvent modifies the structure of drug or even the structure of solvent may be modified by the drugs. Thus the information regarding the transport property of drugs and the ion-solvent interaction may be obtained from viscosity measurement. A resulting data may be helpful for a possible correlation between drugs activities and viscosities.

The present study deals with the study of following drugs :

1) 2 – methyl -5-nitroimidazole- 1- ehanol

(Metronidazole)

Metronidazole is an antiprotozoal and antibacterial drug . It is commonly used to treat a condition called amebiasis . Amebiasis can cause diarrhea in people with HIV/AIDS. Another intestinal conditions called giardiasis is also treated with metronidazole. Other conditions that this drug may be prescribed to treate are trichomoniasis , anaerobic bacterial infections , bacterial vaginosis , antibiotic associated diarrhea and colitis.

Molecular Formula : C6H9N3O3

Molecular weight :171.2 g

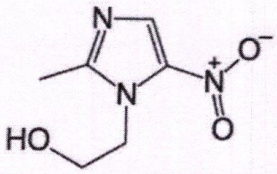


**Figure 1a:** Chemical structure of Metronidazole (MTR).

2) 1-(2- methyl – 5- nitro -1H – imidazole – 1 – yl ) propan -2-ol

( Secnidazole)

Secnidazole is a second generation 5- nitroimidazole antimicrobial that is structurally related to other 5- nitroimidazoles including Metronidazole and Tinidazole , but displays improved oral absorption and longer terminal elimination half – life than antimicrobial agents in this class . Secnidazole is selective against many anerobic gram positive and gram negative bacteria and protozoa.

Molecular Formula : C7 H11 N3O3

Molecular Weight : 185.183 g

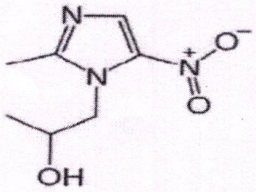
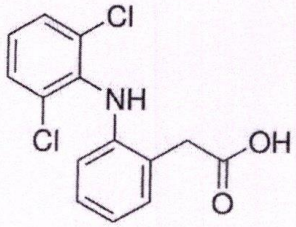


Fig . Chemical structure of Secnidazole

3) [o-(2,6-dichloroanilino) – phenyl)] acetic acid

Molecular Formula : C14H11Cl2NO2

Molecular Weight : 296.147 g




[o-(2,6-dichloroanilino) – phenyl)] acetic acid is a antiprotozoal drug . It is broadly used under name of Diclofenac . It is nonsteroidal analgesic anti-inflammatory agent .

**Experimental:**

The drugs used were collected from elsewhere. Doubly distilled water and A.R. grade solvents were used. Weighing was done on digital balance (Readability + 0.001g).

Densities of solutions were determined by a density bottle. The viscosities were measured by means of Ostwald's viscometer ( $\pm 0.11\% kgm^{-1}s^{-1}$) which was kept in equilibrium which elite thermostatic water both ( $\pm 0.1c^{0}$). Ligand solutions of different concentration were prepared in Aqueous , 20% methanol - water and 20 % Dioxane- water etc. . For each measurement sufficient time was allowed to attain thermal equilibrium in thermostat.

**Viscosities, Relative Viscosity, Sp. Viscosity, Densities at 26 $^0$c**

**Table-1 System- *2-methyl-5-nitroimidazole-1-ethanol ($L_1$)* in aqueous medium at 299 K**

| Conc. mol dm-1 | Density x$10^3$ Kg $m^{-3}$ | Time flow in sec | Viscosity x$10^{-3}$ $Nsm^{-2}$ | Relative Viscosity | Sp Viscosity |
|---|---|---|---|---|---|
| 0.02 | 1.0000 | 75.4 | 0.93060 | 1.08905 | 0.62975 |
| 0.04 | 1.0003 | 76.1 | 0.93945 | 1.09942 | 0.49712 |
| 0.06 | 1.0005 | 76.9 | 0.94958 | 1.11128 | 0.45430 |
| 0.08 | 1.0010 | 77.6 | 0.95870 | 1.12194 | 0.43114 |
| 0.1 | 1.0012 | 78.1 | 0.96501 | 1.12933 | 0.40898 |

**Table-2 System- *2-methyl-5-nitroimidazole-1-ethanol ($L_1$)* in aqueous medium At 303K**

| Conc. mol dm-1 | Density x$10^3$ Kg $m^{-3}$ | Time flow in sec | Viscosity x$10^{-3}$ $Nsm^{-2}$ | Relative Viscosity | Sp. Viscosity |
|---|---|---|---|---|---|
| 0.02 | 0.9991 | 71.6 | 0.815281 | 1.132334 | 0.93574 |
| 0.04 | 0.9993 | 72.2 | 0.82230 | 1.142086 | 0.71043 |
| 0.06 | 0.9995 | 72.7 | 0.82816 | 1.150225 | 0.61329 |
| 0.08 | 0.9998 | 73.1 | 0.83295 | 1.156878 | 0.55469 |
| 0.1 | 1.0001 | 73.5 | 0.83773 | 1.163522 | 0.51710 |

**Table-3 System- *2-methyl-5-nitroimidazole-1-ehtanol* in 20% Methanol-Water medium At 299 K**

| Conc. mol dm-1 | Density x$10^3$ Kg $m^{-3}$ | Time flow in sec | Viscosity x$10^{-3}$ $Nsm^{-2}$ | Relative Viscosity | Sp Viscosity |
|---|---|---|---|---|---|
| 0.02 | 0.99395 | 75.1 | 1.03456 | 1.07807 | 0.40782 |
| 0.04 | 0.99403 | 75.4 | 1.03878 | 1.08247 | 0.30992 |
| 0.06 | 0.99415 | 75.8 | 1.04441 | 1.08834 | 0.27658 |
| 0.08 | 0.99432 | 76.2 | 1.05011 | 1.09427 | 0.26009 |
| 0.1 | 0.99458 | 76.5 | 1.05451 | 1.09887 | 0.24689 |

**Table-4 System- *2-methyl-5-nitroimidazole-1-ehtanol* in 20% Methanol-Water medium At 303 K**

| Conc. mol dm-1 | Density $x10^3$ Kg $m^{-3}$ | Time flow in sec | Viscosity $x10^{-3}$ $Nsm^{-2}$ | Relative Viscosity | Sp. Viscosity |
|---|---|---|---|---|---|
| 0.02 | 1.00012 | 74.1 | 1.02187 | 1.13101 | 0.77658 |
| 0.04 | 1.00089 | 74.5 | 1.02817 | 1.13799 | 0.58338 |
| 0.06 | 1.00105 | 74.8 | 1.03248 | 1.14275 | 0.49541 |
| 0.08 | 1.00158 | 74.2 | 1.03855 | 1.14947 | 0.45235 |
| 0.1 | 1.00211 | 74.7 | 1.04601 | 1.15773 | 0.43021 |

**Table-5 System-*2-methyl-5-nitroimidazole-1-ehtanol* in 20% Dioxane-Water medium at 299**

| Conc. mol dm-1 | Density $x10^3$ Kg $m^{-3}$ | Time flow in sec | Viscosity $x10^{-3}$ $Nsm^{-2}$ | Relative Viscosity | Sp Viscosity |
|---|---|---|---|---|---|
| 0.02 | 1.03304 | 78.1 | 1.19896 | 1.16545 | 1.34042 |
| 0.04 | 1.03323 | 78.5 | 1.20533 | 1.17182 | 0.98037 |
| 0.06 | 1.03359 | 78.8 | 1.21035 | 1.17679 | 0.82116 |
| 0.08 | 1.03402 | 79.2 | 1.21700 | 1.18291 | 0.73324 |
| 0.1 | 1.03415 | 79.6 | 1.22330 | 1.18761 | 0.67100 |

**Table-6 System-*2-methyl-5-nitroimidazole-1-ehtanol* in 20% Dioxane-Water medium at 303K**

| Conc. mol dm-1 | Density $x10^3$ Kg $m^{-3}$ | Time flow in sec | Viscosity $x10^{-3}$ $Nsm^{-2}$ | Relative Viscosity | Sp. Viscosity |
|---|---|---|---|---|---|
| 0.02 | 1.03209 | 76.8 | 1.17061 | 1.20969 | 1.64575 |
| 0.04 | 1.03216 | 77.1 | 1.17526 | 1.21450 | 1.18822 |
| 0.06 | 1.03266 | 77.6 | 1.18346 | 1.22297 | 1.00541 |
| 0.08 | 1.03294 | 77.9 | 1.18835 | 1.22803 | 0.88894 |
| 0.1 | 1.03315 | 78.3 | 1.19470 | 1.23458 | 0.81622 |

**Viscosities, Relative Viscosity, Sp. Viscosity, Densities at 299K**

**Table- 7 System- 1-(2-methyl-5-nitro-1H-imidazole-1-yl) propan-2-ol ($L_2$) in aqueous medium**

| Conc. mol $dm^{-1}$ | Density $x10^3$ Kg $m^{-3}$ | Time flow in sec | Viscosity $x10^{-3}$ $Nsm^{-2}$ | Relative Viscosity | Sp Viscosity |
|---|---|---|---|---|---|
| 0.02 | 0.99883 | 81.6 | 1.00586 | 1.17713 | 1.25255 |
| 0.04 | 0.99891 | 81.9 | 1.00964 | 1.18156 | 0.90780 |
| 0.06 | 0.99912 | 82.1 | 1.01232 | 1.18469 | 0.75401 |
| 0.08 | 0.99954 | 82.3 | 1.01521 | 1.18807 | 0.66496 |
| 0.1 | 0.99978 | 82.6 | 1.01915 | 1.19269 | 0.60936 |

**Table- 8 System- 1-(2-methyl-5-nitro-1H-imidazole-1-yl)propan-2-ol ($L_2$) in aqueous medium at 303K**

| Conc. mol $dm^{-1}$ | **Density $x10^3$ Kg $m^{-3}$** | **Time flow in sec** | **Viscosity $x10^{-3}$ $Nsm^{-2}$** | **Relative Viscosity** | **Sp. Viscosity** |
|---|---|---|---|---|---|
| **0.02** | 0.99865 | 80.6 | 0.97687 | 1.22492 | 1.59044 |
| **0.04** | 0.99898 | 80.9 | 0.98083 | 1.22988 | 1.14944 |
| **0.06** | 0.9991 | 81.1 | 0.98337 | 1.23307 | 0.9512 |
| **0.08** | 0.99934 | 81.3 | 0.98604 | 1.23641 | 0.83585 |
| **0.1** | 0.99951 | 81.5 | 0.98863 | 1.23966 | 0.75789 |

**Table-9 System-1-(2-methyl-5-nitro-1H-imidazole-1-yl) propan-2-ol in 20% Methanol-Water medium At 299K**

| Conc. mol dm-1 | Density $x10^3$ Kg $m^{-3}$ | Time flow in sec | Viscosity $x10^{-3}$ $Nsm^{-2}$ | Relative Viscosity | Sp Viscosity |
|---|---|---|---|---|---|
| 0.02 | 1.00008 | 71.8 | 1.04094 | 1.03706 | 0.45394 |
| 0.04 | 1.00031 | 75.3 | 1.04395 | 1.08786 | 0.33638 |
| 0.06 | 1.00058 | 75.5 | 1.04701 | 1.09104 | 0.28740 |
| 0.08 | 1.00107 | 75.7 | 1.05030 | 1.09447 | 0.26078 |
| 0.1 | 1.00121 | 75.9 | 1.05322 | 1.09752 | 0.24270 |

**Table-10 System-1-(2-methyl-5-nitro-1H-imidazole-1-yl)propan-2-ol in 20% Methanol-Water medium At 303K**

| Conc. mol dm-1 | Density $x10^3$ Kg $m^{-3}$ | Time flow in sec | Viscosity $x10^{-3}$ $Nsm^{-2}$ | Relative Viscosity | Sp. Viscosity |
|---|---|---|---|---|---|
| 0.02 | 0.99991 | 72.9 | 1.02570 | 1.11246 | 0.80598 |
| 0.04 | 1.00003 | 73.2 | 1.03004 | 1.11717 | 0.59351 |
| 0.06 | 1.00016 | 73.8 | 1.03862 | 1.12647 | 0.52263 |
| 0.08 | 1.00028 | 74.4 | 1.04719 | 1.13577 | 0.48552 |
| 0.1 | 1.00051 | 74.9 | 1.05447 | 1.14366 | 0.45926 |

**Table-11 System- 1-(2-methyl-5-nitro-1H-imidazole-1-yl) propan-2-ol in 20% Dioxane- Water medium** At 299K

| Conc. mol dm-1 | Density $x10^3$ Kg $m^{-3}$ | Time flow in sec | Viscosity $x10^{-3}$ $Nsm^{-2}$ | Relative Viscosity | Sp Viscosity |
|---|---|---|---|---|---|
| 0.02 | 0.99651 | 85.4 | 1.09460 | 1.26467 | 1.80555 |
| 0.04 | 0.99716 | 85.6 | 1.09742 | 1.26846 | 1.29287 |
| 0.06 | 0.99739 | 85.8 | 1.00131 | 1.27172 | 1.06830 |
| 0.08 | 0.99752 | 86.1 | 1.10419 | 1.27633 | 0.94167 |
| 0.1 | 0.99772 | 86.3 | 1.10542 | 1.27955 | 0.84669 |

**Table-12 System- 1-(2-methyl-5-nitro-1H-imidazole-1-yl)propan-2-ol in 20% Dioxane-Water medium** At 303K

| Conc. mol dm-1 | Density $x10^3$ Kg $m^{-3}$ | Time flow in sec | Viscosity $x10^{-3}$ $Nsm^{-2}$ | Relative Viscosity | Sp. Viscosity |
|---|---|---|---|---|---|
| 0.02 | 0.99502 | 84.6 | 1.24319 | 1.28469 | 2.18617 |
| 0.04 | 0.99611 | 84.8 | 1.24749 | 1.28914 | 1.56852 |
| 0.06 | 0.99623 | 85 | 1.25058 | 1.29233 | 1.29399 |
| 0.08 | 0.996635 | 85.1 | 1.25220 | 1.29401 | 1.12666 |
| 0.1 | 0.996649 | 85.3 | 1.25552 | 1.29744 | 1.01877 |

**Viscosities, Relative Viscosity, Sp. Viscosity, Densities at different temperatures**

**Table-13 System-[o-(2,6-dichloroanilino)-phenyl]acetic acid (DCAPAA) in Aqueous medium at 299K [L3]**

| Conc. mol dm-1 | Density $x10^3$ Kg $m^{-3}$ | Time flow in sec | Viscosity $x10^{-3}$ $Nsm^{-2}$ | Relative Viscosity | Sp Viscosity |
|---|---|---|---|---|---|
| 0.02 | 0.99932 | 75.2 | 0.94767 | 1.08534 | 0.45824 |
| 0.04 | 0.99944 | 75.4 | 0.95031 | 1.08836 | 0.33882 |
| 0.06 | 0.99954 | 75.6 | 0.95292 | 1.09135 | 0.28864 |
| 0.08 | 0.99958 | 75.8 | 0.95548 | 1.09428 | 0.26014 |
| 0.1 | 0.99962 | 75.9 | 0.95678 | 1.09577 | 0.23729 |

**Table-14 System-[o-(2,6-dichloroanilino)-phenyl]acetic acid (DCAPAA) in Aqueous medium at 303K**

| Conc. mol dm-1 | Density $x10^3$ Kg $m^{-3}$ | Time flow in sec | Viscosity $x10^{-3}$ $Nsm^{-2}$ | Relative Viscosity | Sp. Viscosity |
|---|---|---|---|---|---|
| 0.02 | 0.99922 | 74.8 | 0.89320 | 1.14607 | 0.84359 |
| 0.04 | 0.99935 | 74.9 | 0.89451 | 1.14234 | 0.60472 |
| 0.06 | 0.99942 | 75 | 0.89577 | 1.14394 | 0.50018 |
| 0.08 | 0.99948 | 75.3 | 0.89940 | 1.148593 | 0.44928 |
| 0.1 | 0.99959 | 75.5 | 0.90189 | 1.15177 | 0.41171 |

**Viscosities, Relative Viscosity, Sp. Viscosity, Densities at 299K**

**Table-15 System-[o-(2,6-dichloroanilino)-phenyl]acetic acid (DCAPAA) in 20% Methanol-Water medium**

| **Conc. mol $dm^{-1}$** | **Density $x10^3$ Kg $m^{-3}$** | **Time flow in sec** | **Viscosity $x10^{-3}$ $Nsm^{-2}$** | **Relative Viscosity** | **Sp Viscosity** |
|---|---|---|---|---|---|
| 0.02 | 0.99932 | 75.2 | 0.94767 | 1.08534 | 0.45824 |
| 0.04 | 0.99944 | 75.4 | 0.95031 | 1.08836 | 0.33882 |
| 0.06 | 0.99954 | 75.6 | 0.95292 | 1.09135 | 0.28864 |
| 0.08 | 0.99958 | 75.8 | 0.95548 | 1.09428 | 0.26014 |
| 0.1 | 0.99962 | 75.9 | 0.95678 | 1.09577 | 0.23729 |

**Table-16 System-[o-(2,6-dichloroanilino)-phenyl]acetic acid (DCAPAA) in 20% Methanol-Water medium at 303 k**

| Conc. mol $dm^{-1}$ | Density $x10^3$ Kg $m^{-3}$ | Time flow in sec | Viscosity $x10^{-3}$ $Nsm^{-2}$ | Relative Viscosity | Sp. Viscosity |
|---|---|---|---|---|---|
| 0.02 | 0.99922 | 74.8 | 0.89320 | 1.14607 | 0.84359 |
| 0.04 | 0.99935 | 74.9 | 0.89451 | 1.14234 | 0.60472 |
| 0.06 | 0.99942 | 75 | 0.89577 | 1.14394 | 0.50018 |
| 0.08 | 0.99948 | 75.3 | 0.89940 | 1.148593 | 0.44928 |
| 0.1 | 0.99959 | 75.5 | 0.90189 | 1.15177 | 0.41171 |

**Viscosities, Relative Viscosity, Sp. Viscosity, Densities at 299K**

**Table-17 System-[o-(2,6-dichloroanilino)-phenyl]acetic acid (DCAPAA) in 20% Dioxane-Water medium at 299 k**

| **Conc. mol $dm^{-1}$** | **Density $x10^3$ Kg $m^{-3}$** | **Time flow in sec** | **Viscosity $x10^{-3}$ $Nsm^{-2}$** | **Relative Viscosity** | **Sp Viscosity** |
|---|---|---|---|---|---|
| 0.02 | 1.01436 | 89 | 1.18738 | 1.30709 | 2.36273 |
| 0.04 | 1.016884 | 89.1 | 1.18899 | 1.30886 | 1.67972 |
| 0.06 | 1.01711 | 89.3 | 1.19491 | 1.31538 | 1.3986444 |
| 0.08 | 1.019892 | 89.7 | 1.20398 | 1.32536 | 1.24730 |
| 0.1 | 1.023052 | 89.9 | 1.19642 | 1.31704 | 1.08875 |

**Table-18 System-[o-(2,6-dichloroanilino)-phenyl]acetic acid (DCAPAA) in 20% Dioxane-Water medium at 303K**

| Conc. mol dm-1 | Density $x10^3$ Kg $m^{-3}$ | Time flow in sec | Viscosity $x10^{-3}$ $Nsm^{-2}$ | Relative Viscosity | Sp. Viscosity |
|---|---|---|---|---|---|
| 0.02 | 1.011845 | 88.7 | 1.11387 | 1.36972 | 2.79893 |
| 0.04 | 1.01265 | 88.9 | 1.11727 | 1.37391 | 2.00048 |
| 0.06 | 1.01386 | 89.1 | 1.12113 | 1.37865 | 1.65310 |
| 0.08 | 1.01434 | 89.3 | 1.12417 | 1.38240 | 1.44512 |
| 0.1 | 1.01564 | 89.5 | 1.12814 | 1.38727 | 1.30827 |

**GRAPHS**

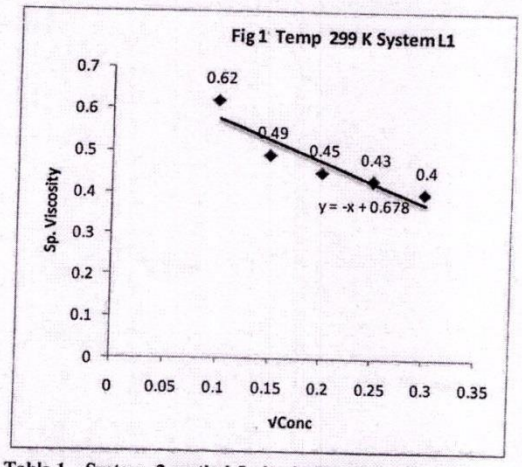



**Table-1 System- 2-methyl-5-nitroimidazole-1-ethanol ($L_1$) in aqueous medium at 299 K**

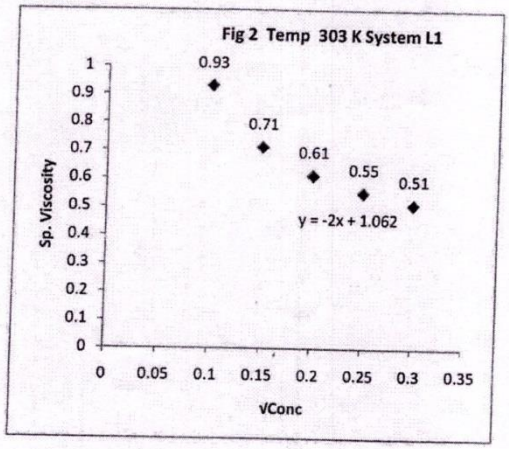



**Table-2 System- 2-methyl-5-nitroimidazole-1-ethanol ($L_1$) in aqueous medium At 303 k**

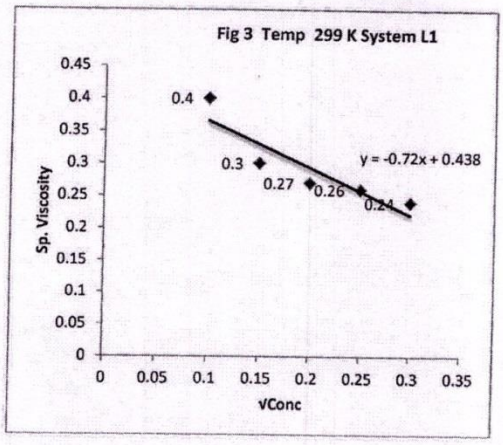



**Table-3 System- 2-methyl-5-nitroimidazole-1-ethanol in 20% Methanol-Water medium At 299 K**

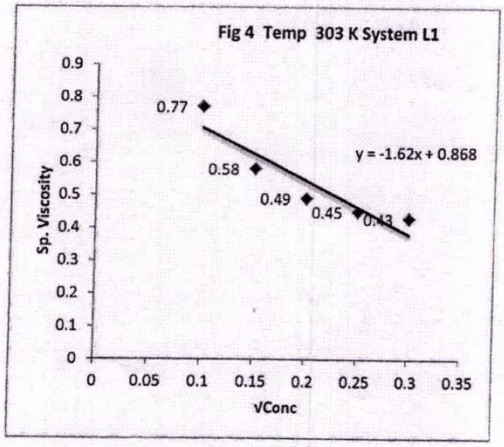



**Table-4 System- 2-methyl-5-nitroimidazole-1-ethanol in 20% Methanol-Water medium At 303 K**

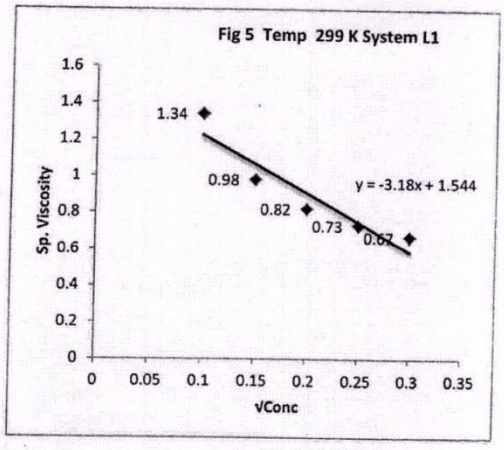



Table-5 System-2-methyl-5-nitroimidazole-1-ethanol in 20% Dioxane-Water medium at 299 k

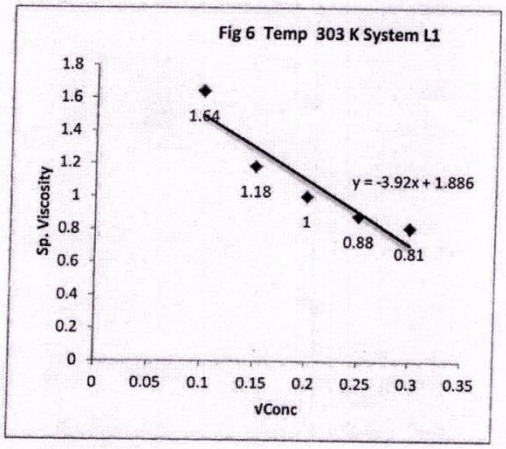



Table-6 System-2-methyl-5-nitroimidazole-1-ethanol in 20% Dioxane-Water medium at 303 k

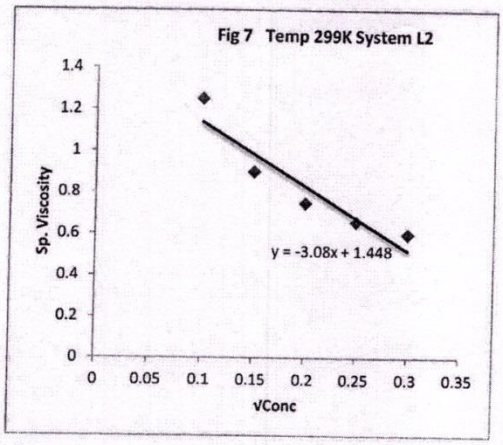



**Table- 7 System- 1-(2-methyl-5-nitro-1H-midazole-1-yl)propan-2-ol ($L_2$) in aqueous medium**

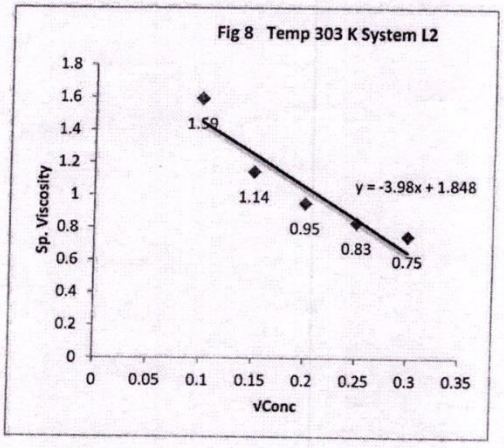



**Table- 8 System- 1-(2-methyl-5-nitro-1H-midazole-1-yl)propan-2-ol($L_2$) in aqueous medium at 303 k**

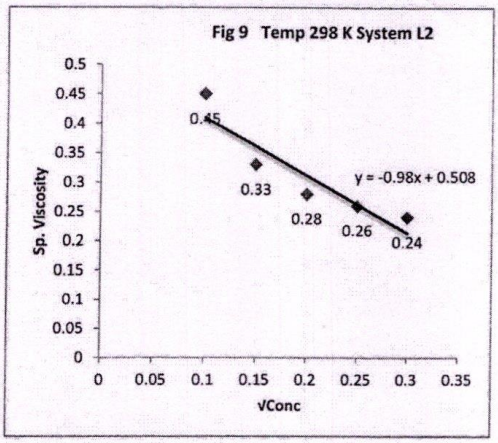



**Table-9 System-1-(2-methyl-5-nitro-1H-midazole-1-yl) propan-2-ol in 20% Methanol-Water medium At 298K**

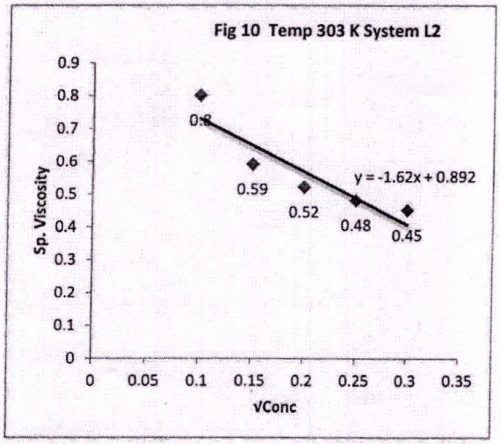



**Table-10 System-1-(2-methyl-5-nitro-1H-midazole-1-yl)propan-2-ol in 20% Methanol-Water medium At 303K**

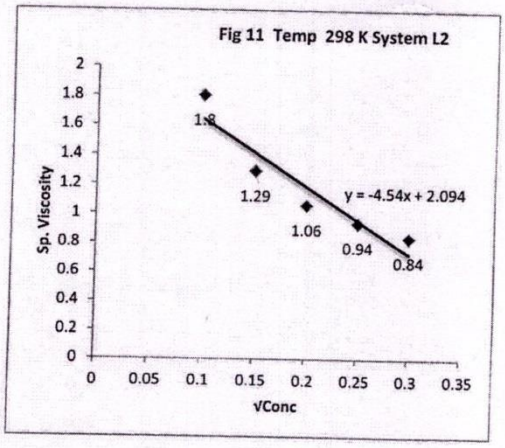



**Table-11 System- 1-(2-methyl-5-nitro-1H-midazole-1-yl)propan-2-ol in 20% Dioxane- Water medium** At 298K

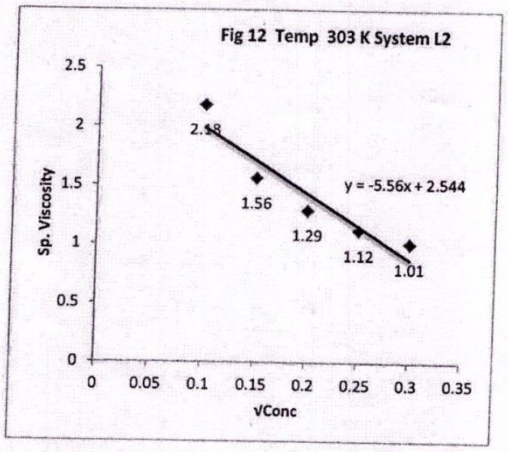



**Table-12 System- 1-(2-methyl-5-nitro-1H-midazole-1-yl)propan-2-ol in 20% Dioxane- Water medium** At 303

**DCAPAA SYSTEM**

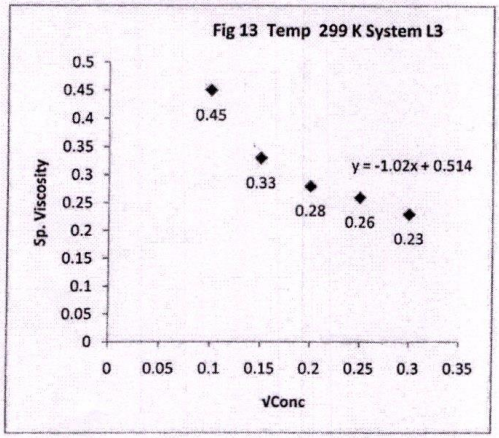



**Table-13** System-[o-(2,6-dichloroanilino)-phenyl]acetic acid (DCAPAA) in Aqueous medium at 299K [L3]

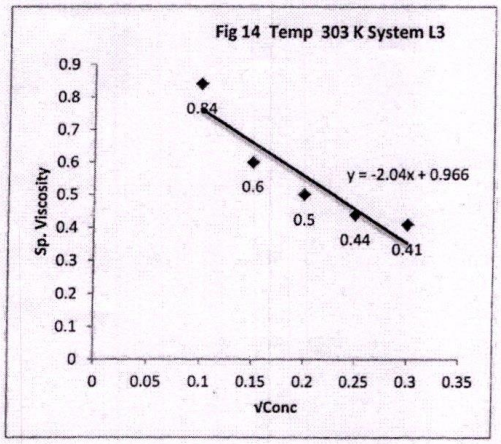



**Table-14** System-[o-(2,6-dichloroanilino)-phenyl]acetic acid (DCAPAA) in Aqueous medium at 303K

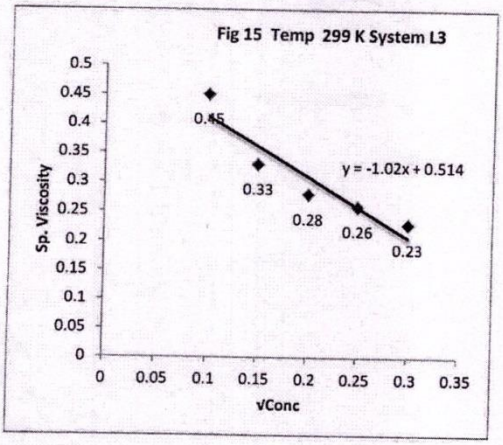



**Table-15** System-[o-(2,6-dichloroanilino)-phenyl]acetic acid (DCAPAA) in 20% Methanol-Water medium at 299 k

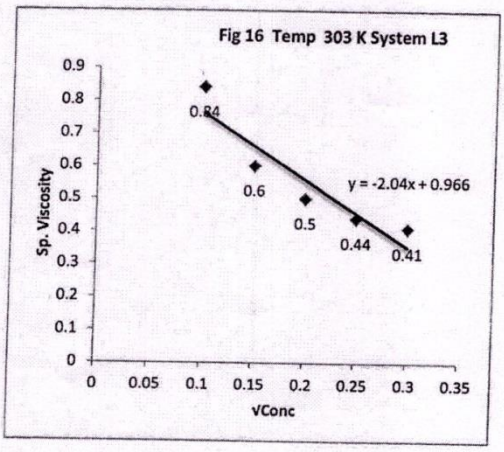



**Table-16** System-[o-(2,6-dichloroanilino)-phenyl]acetic acid (DCAPAA) in 20% Methanol-Water medium AT 303 k

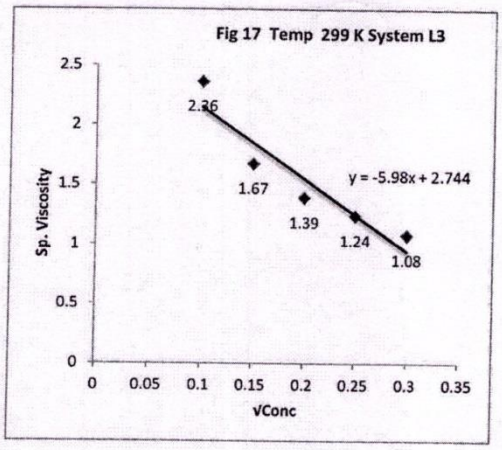



**Table-17** System-[o-(2,6-dichloroanilino)-phenyl]acetic acid (DCAPAA) in 20% Dioxane-Water medium at 299 k

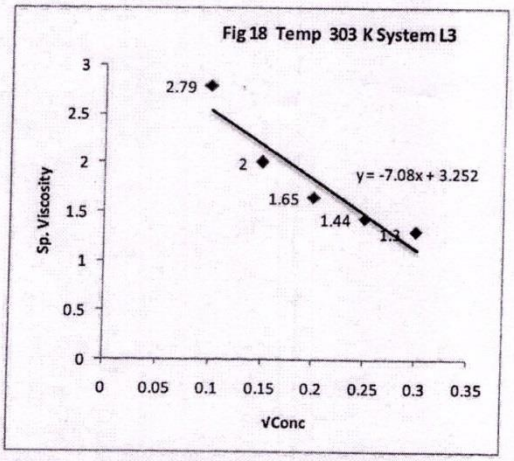



**Table-18** System-[o-(2,6-dichloroanilino)-phenyl]acetic acid (DCAPAA) in 20% Dioxane-Water medium at 303 k

**Table no. 19 - Values of Falkenhagen coefficient A, Jones – Dole coefficient B, at different temperatures in different Solvent mixtures System- ($L_1$) –**

| Temp T (K) | | 303 K | 299 K |
|---|---|---|---|
| Aqueous medium | A | 1.062 | 0.678 |
| | B | -2 | -1 |
| 20%Methanol-Water medium | A | 0.868 | 0.438 |
| | B | -1.62 | -0.72 |
| 20% Dioxane-Water medium | A | 1.886 | 1.544 |
| | B | -3.92 | -3.18 |

**Table no.20 - Values of Falkenhagen coefficient A, Jones – Dole coefficient B, at different temperaturesin different Solvent mixtures System- ($L_2$) –**

| Temp T (K) | | 303 k | 299 K |
|---|---|---|---|
| Aqueous medium | A | 1.848 | 1.448 |
| | B | -3.98 | -3.08 |
| 20%Methanol-Water medium | A | 0.892 | 0.508 |
| | B | -1.62 | -0.98 |
| 20% Dioxane-Water medium | A | 2.544 | 2.094 |
| | B | -5,56 | -4.54 |

Table no 21 - **Values of Falkenhagen coefficient A, Jones – Dole coefficient B, at different temperatures in different Solvent mixtures System- ($L_3$) –**

| Temp T (K) | | 303 k | 299 k K |
|---|---|---|---|
| Aqueous medium | A | 0.966 | 0.514 |
| | B | -2.44 | -1.02 |
| 20%Methanol-Water medium | A | 0.966 | 0.514 |
| | B | -2.04 | -1.02 |
| 20% Dioxane-Water medium | A | 3.252 | 2.744 |
| | B | -7.08 | -5.98 |

***Results and discussion:***

The time and density are measured and the viscosity of a test liquid relative to that of a reference liquid in the same viscometer is determined from the relationship

$$\eta = \frac{t \times d}{t_0 \times d_o} \eta_0 \quad \text{--------- (2)}$$

Where η = Viscosity of ligand solution, d & $d_0$ = Density of ligand and solvent

t & $t_0$= Time flow for ligand and solvent.

The relative viscosity of a solution is expressed as

$$\eta r = \frac{\eta}{\eta_0} = \frac{t \times d}{t_0 \times d_o} \quad \text{----------(3)}$$

Where η and $\eta_0$ are the viscosities of solution and solvent respectively.

The relative increase in viscosity due to the presence of the solute is called the specific viscosity and is defined by

$$\eta_{sp} = \eta_r - 1 \text{---------- (4)}$$

The specific viscosity is a function of the concentration C of the solute, the size and shape of the solute molecules and the strength of the solute-solvent interactions.

$$\frac{\eta_{sp}}{C} = [\eta] + K[\eta^2] \times C \quad \text{---------- (5)}$$

The viscosity B-Co-efficient has been derived from Jones-Dole equation[27] (c > 0.1m)

$$\frac{\eta_r - 1}{\sqrt{c}} = A + B\sqrt{c} \quad \text{---------- (6)}$$

Where $\eta_r$ is the relative viscosity. A and B are the characteristics of the solute and solvent. A is Falkenhagen coefficient represent the contributor from solute-solute interaction and B is Jones Dole coefficient known to depend on the size of the solute particle and on the interaction between solute and solvent.

They were obtained by a least – squares treatment as intercept and slope of the linear plot of $\frac{\eta_r - 1}{\sqrt{c}}$ vs $\sqrt{c}$ .The graph for each system given linear straight line showing validity of Jones-Dole equation. The slope of straight line gives value of B co-efficient. The plot of

$\frac{\eta_r - 1}{\sqrt{c}}$ Vs $\sqrt{c}$ for each system shown in figure 1- 40

The densities and viscosities of *2-methyl-5-nitroimidazole-1-ethanol* ($L_1$) ,

*1-(2-methyl-5-nitro-1H-midazole-1-yl)propan-2-ol* ($L_2$),

*[o-(2,6-dichloroanilino)-phenyl]acetic acid (DCAPAA)(L3)*

in aqueous medium, 20% methanol –water, 20% Dioxane- water, at 299, 303 K have been measured in the concentration range 0.02 to 0.1 mol/dm$^3$. The viscosity data were analyzed for A and B coefficients using Jones – Dole equation. The viscosity A and B coefficients have been computed by the least squares method from the plot of ($\eta r$ -1/ $\sqrt{c}$) vs $\sqrt{c}$ . A is measure of ion-ion interactions and B is measure of solute-solvent interaction has been calculated and listed in table 19 - 21.

Inspection of the data in table no 19 – 21 shows that the viscosity A- coefficients in few cases are found to be negative. The viscosity A coefficient represent the ion- ion interactions and negative values have shown some physical significance. However negative A values have also been reported to be in other solvents in some studies.[28-31]

The large and small value of 'A' shows the stronger and weaker solute – solute interactions respectively. When solute is introduced in to solvent of organic-water mixture it will interfere with the ordered structure of water in the solutes co-sphere. As only one solute is present so such variation in the values of A can be explained.

In the present study viscosity of liquid solutions decreases with decrease in concentration of antipsychotic drugs salts solution in aqueous, 20% methanol -water ,20% Dioxane -water, mixture. The increase in viscosity with increase in concentration may be attributed to the increase in solute solvent interactions.

It is evident from table 19 - 21 that the B coefficient is an adjustable parameter, which may be either positive or negative and it is a measure of the effective hydrodynamic volume of solute which accounts for the solute solvent interactions. Viscosity B coefficients have been established to arise

from ion- solvent interactions and are responsible for introducing order or disorder in the structure of the solvent. Solute with negative B Coefficient is characterized as structure breakers indicating weak solute -solvent interactions. Such type of results is also shown by Eyring et al.[32] From table 19 - 21 it is seen that the B – coefficient values slightly decreases with temperature.

It is observed from data obtained that density of ligand solutions decreases with increasing temperature. Density of ligand solution in general increases with increase in concentration of 20% Dioxane -water, 20% MeOH-water, aqueous water medium. Thus due to the addition of bulky solvent density increase with concentration for Dioxane, which is due to shrinkage in the volume which in turn is due to the presence of solute molecules.

The values of viscosity A and B coefficients responsible for solute - solute and solute - solvent interactions are presented in table 19 - 21 in different solvent mixtures at different temperatures and its order is given below –

B- Coefficient for L1 ,L2 , L3 shows the order 20% MeOH- water > aqueous medium > 20% Dioxane-water. It shows that the interaction between non-polar and polar solvents increases with increasing temperature. This may be due to the effect of interaction of polar- polar solvent as compared to non polar-polar solvent (Dioxane-water).

The B coefficient of the salts in different solvents has been found to be low. The values of B coefficient at determined for better understanding of the structure making and structure breaking properties. Solutes with positive B coefficient are characterized as structure former and will impose a new order by reorientation of the adjacent water molecules indicating strong solute solvent interaction. Solute with negative viscosity B coefficient is characterized as structure breakers indicating weak solute solvent interactions. Negative values of B – coefficient are associated with a structure breaking effect of the solution. Such type of results are also shown by several workers.[33-34]

The increase in concentration of solute in solution contributes positively to the viscosity B – Coefficient on other hand, the breaking of the solvent structure by solutes causes a decrease in the viscosity. Thus B – coefficient is the resultant of these two opposite forces.[35] Therefore the molecule or ions exhibiting negative B – coefficients have been assumed to exert a structure breaking effect.

References:


1. Hagenmuller P., Preparative methods in Solid State Chemistry (Academic Press, London) 367 **(1972).**
2. Chaimers B., Principals of Solidification (John Valey, New York) 194 **(1964).**
3. Joshi S.S., Aminabhai, T.H., Balandgi R.H. and Shukla S.S.;J of Chem..Ing. Data 35, 1185 **(1990).**
4. Aminabhai T.M., Joshi S.S., and Shukla S.S.; Can.J.Chem, 68, 319 **(1990).**
5. Aralaguppi M.I., Aminabhai T.M., Balundgi R.H. and Joshi S.S.; J.Phys.Chem. 95, 5299 **(1991).**
6. Stokes R.H. and Mills R,; Viscosity of electrolytes and related properties (Pergamon, London) **(1965).**
7. Poiseuille; Ann Chem Phys, 21, 76 **(1847).**
8. Sprung; Ann Phys Chem, I, 285 **(1887).**
9. Arrhenius S.; J Phys Chem, I, 285 **(1887).**
10. Patil K.J., Manwatkar S.M. and Donge S.S.; Ind.J.Chem. 33, 4 **(1994).**
11. Karia F., Baluja S.; Asian J.Chem. 39(6), 593 **(2000).**
12. Wadi R.K. and Vinita Kakkar.; Ind J.Chem. 39 (6), 598 **(2000).**
13. Millero F.J.; in "structure and transport process in water and Aqueous solutions", ed. R.A.Horne, New York, **(1972).**
14. Gurney R.W.; Ionic process in solution, Mc Graw Hill, New York **(1952).**
15. Roy M.N. and Hazra D.K.; North Bengal Univ. Rev. 8, 54 **(1997).**
16. Mohanty P.C., Hati K.C.and Nanda B.; J of Indian Council of Chemist Vol 21 No -1, PP 17-20, **(2004).**
17. Ankan Chaudhary, Mousami Das & Mahendra Nath Roy,; J Indian Chem. Soc. Vol 82, PP 625-631 **(July 2005).**
18. Bary R.B. and Irving F.M.; J Phys. Chem. 74, 1056 **(1970).**

19. Pande J.D., Yasmin A. and Sharma A.K.; Indian J. Chem. Vol 37A, 1094 **(1998).**

**20.** Nikam P.S.; Ansari H.R. and Mehdi Hasan ; J. Ind. Chem. Soc.; 76 **(1999).**

**21.** Moulik S.P. and Bisal S. R.; J. Ind Chem. Soc. 70, 279 **(1993).**

**22.** Rohankar P. G.; Ph. D. Thesis Amravati University **(2001).**

**23.** Prakash O.Shrivastava, Anita and Sheo Prakash,; Ind. J. Pure Appl.Phys.24,306 **(1986).**

**24.** Goldsteon A., Ar Onow L.and kalman S.M.; Principals of Drug action 2nd ed. Wiley, New York p-1 **(1974).**

**25.** Stenlake J.B.; Fundamentals of molecular pharmacology,Althone,London,Vol 2 **(1975).**

**26.** Korolkowas A.; Essentials of Medicinal Chemistry, 2nd ed. Wiley, New York Chap.3 **(1988).**

**27.** Jones G and Dole M. ; J Am Chem. Soc. 51, 2950 **(1929).**

**28.** Yao N.. P and Bennion D.N. ; J Phys Chem, 77,1894 **(1973).**

29. Sacco A, Petrella G & Castagnolo M.; J Phys Chem, 749

**30.** Gill D. S. and Sharma A.; J Chem. Soc. Faraday Trans 475 **(1982)**

**31.** Jauhar S.P., Parmar J.S., Nakhasi S. and Narula S.P. ;Phys Chem. (NF), 134, 9 **(1983).**

**32.** Eyring H. and Kincaid J.F.; J of Chem Phys 43,1 pp 37-40 **(1939).**

**33.** Agrawal P.S.; European Journal of Scientific Research Vol 45 (3), pp 470-475 **(2010).**

**34.** Pandey J.D., Akhtar Y. and Sharma A.K.; Ind. J Chem. 334, 1094 **(1998).**

**35.** Mason L,S Kampmeyer P. M. & Robinson A L; J Am Chem. Soc. 74, 1287 **(1952).**

**36.** Tamaki K., Othara Y. and Isomura Y.N.; Bull Chem. Soc. (Japan), 46,289 **(1973).**

**37.** Chinchard K. and Skinner J.F.; J. Phys. Chem. 73, 2060 **(1969).**

38. Kaminsky M. ;Disc Farade, Soc. 21, 171 **(1957).**

**39.** Tyrrell H. J. V. and Kennerly M. J. ; Chem. Soc. A, 2724 **(1968).**

**40.** Banipal T. S., Guleria N., B.S. Lark; Indian J. Chem,Sec, A, 275-282 **(2001).**

**41.** Subramanyam Naidu P. and Ravindra Prasad K.; J.Pure Appl. Ultrason, 18, 30-35 **(1996).**

**42.** Patil K.J.; Proc. Indian Acad Sci. 109, 289 **(1997).**

**43.** Mehrotra K.N,,Jondon K,and Rawat M.K.; J Ind.Chem Soc,69 (4),193 **(1992).**

**44.** Das S.and Hazra D.; Ind.J.Chem 27, 898 **(1988).**

45. Kapadi U.P., Hankare,P.P. and Chavan S.K.; J Ind Chem Soc.72 (5), 269 **(1994).**

46. Yadava S.S.; Ind J.Chem.34, 131 **(1995).**

47. Pande J.D.,Dubey G.P. and Shukla B.P.; J Ind. Chem.Soc. 69, 750 **(1992).**

48. Kalra B.K., Singh K, C., and Bharadwaj U.; Ind J.Chem.33, 314 **(1994).**

49. Ali A., Sabir S., Shahajahan Hyder S.; Chinese Journal of chemistry; 24, 1547-1553 **(2006).**

50. Jones G.and Dole M.; J Am. Chem.Soc.51, 2950 **(1929).**

51. Jahagirdar D.V., Arbad B.R., Smt..Patil C.S and Shankawar A.G.; J of Pure & Applied Physics, 645-650 **(2000).**

52. Rita Mehra & Hema Sajnani,; Indian J of Pure & Applied Physics, Vol 38, 762-765, **(2000).**

53. Waris B.N.; Hassan U. and Shrivastav N.; Indian J of Chem.Vol-40A, 1218-1221 **(2001).**

54. Jauhar P. S., Gupta C.M. and Kapila V.P.; Ind J of Chemistry, Vol 40A, 188-190 **(2001).**

55. Agrawal P. B., Burghate A.S., Idress M. and Narwade M. L.; Oriental J. Chem. 17(1), 147 **(2001).**

56. Wadi R.K. and Goyal R.K.; J Soln chem.. 21(2),163 **(1992).**

57. Bhattacharya A.K. and Lahiri S.C.; J Ind Chem Soc. 72, 791 **(1995).**

58. Pandey J.D. Misra K., Mushran V.; Acoust. Lett. 17, 51 **(1993).**

59. Singh S. P., Yadav O.P.; J Indian Chem Soc. 75, 443 **(1998).**

SHRI. SHIVAJI ARTS, COMMERCE AND SCIENCE COLLEGE,

AKOT, DIST. AKOLA, MAHARASHTRA

# CERTIFICATE

This is to certify that,

Ku. Jayashri Narayanrao Bavane

Research Student of Dr. R. B. Mohod

Department of Chemistry, Shri. Shivaji Arts, Commerce and Science College, Akola had performed his / her research activity in under supervision of Dr. S. P. Wagh at Research laboratory of Department of Chemistry, Shri. Shivaji Arts, Commerce and Science College, Akot under the Research Student Exchange Program During 2016 to 2019

Principal
Shri. Shivaji Arts, Commerce & Science College, Akot

Shri Shivaji Arts, Commerce & Science College, Akot Dist.Akola (Maharashtra)

Head
Department of Chemistry
Shri. Shivaji Arts, Commerce and Science College, Akot

H.O.D. Deptt. of Chemistry Shri Shivaji College, Akot

SHRI. SHIVAJI ARTS, COMMERCE AND SCIENCE COLLEGE,

AKOT, DIST. AKOLA, MAHARASHTRA

# CERTIFICATE

This is to certify that,

Dr. R. B. Mohod

Department of Chemistry, Shri. Shivaji Arts, Commerce and Science College, Akola had visited to Department of Chemistry, Shri. Shivaji Arts, Commerce and Science College, Akot and guided the research students Mr. Ganesh Babanrao Andhale Under Research Faculty Exchange Program During 2016 to 2019.

Principal
Shri. Shivaji Arts, Commerce & Science College, Akot

Shri Shivaji Arts, Commerce & Science College, Akot Dist.Akola (Maharashtra)

Head
Department of Chemistry
Shri. Shivaji Arts, Commerce and Science College, Akot

H.O.D. Deptt. of Chemistry Shri Shivaji College, Akot

SHRI. SHIVAJI ARTS, COMMERCE AND SCIENCE COLLEGE,

AKOLA, DIST. AKOLA, MAHARASHTRA

# CERTIFICATE

This is to certify that,

Dr. S. P. Wagh

Department of Chemistry, Shri. Shivaji Arts, Commerce and Science College, Akot had visited to Department of Chemistry, Shri. Shivaji Arts, Commerce and Science College, Akola and guided the research students Ku. Jayashri Narayanrao Bavane Under Research Faculty Exchange Program During 2015 to 2017.

PRINCIPAL
Shri. Shivaji Arts, Commerce and Science College,
Akola

PRINCIPAL
Shri Shivaji College of Arts,
Commerce &Science,AKOLA.

Associate/Assistant Professor
Shri Shivaji College, AKOLA.
AGRADE C.GPA.3.24.,BY NAAC

Head
Department of Chemistry
Shri. Shivaji Arts, Commerce and Science College,
Akola

HEAD
Department of Chemistry,
Shri Shivaji College of
Arts, Commerce & Science
AKOLA

SHRI. SHIVAJI ARTS, COMMERCE AND SCIENCE COLLEGE,

AKOLA, DIST. AKOLA, MAHARASHTRA

# CERTIFICATE

This is to certify that,

Mr. Ganesh Babanrao Andhale

Research Student of Prof. Dr. S. P. Wagh

Department of Chemistry, Shri. Shivaji Arts, Commerce and Science College, Akot had performed his / her research activity in under supervision of Dr. R. B. Mohod at Research laboratory of Department of Chemistry, Shri. Shivaji Arts, Commerce and Science College, Akola under the Research Student Exchange Program During 2016 to 2019

PRINCIPAL
Shri. Shivaji Arts, Commerce and Science College,
Akola

PRINCIPAL
Shri Shivaji College of Arts,
Commerce &Science,AKOLA.

Associate/Assistant Professor
Shri Shivaji College, AKOLA.
AGRADE C.GPA.3.24.,BY NAAC

Head
Department of Chemistry
Shri. Shivaji Arts, Commerce and Science College,
Akola

HEAD
Department of Chemistry,
Shri Shivaji College of
Arts, Commerce & Science
AKOLA