Online ISSN: 2249-4626
Print ISSN: 0975-5896

Global Journal

of Science Frontier Research: B

Chemistry



Kinetic Study of Ni

Spatial Variation of Water

Highlights

Water Quality Index

Water Partition Coefficients

Discovering Thoughts, Inventing Future

VOLUME 15 ISSUE 6 VERSION 1.0

© 2001-2015 by Global Journal of Science Frontier Research , USA

Volume 15 Issue 50 was originally issued as B6

Global Journal of Science Frontier Research: B
Chemistry

Volume 15 Issue 50
Originally issued as B6

Global Journal of Science Frontier Research: B
Chemistry

Volume 15 Issue 6 (Ver. 1.0)

Open Association of Research Society

© Global Journal of Science Frontier Research. 2015.

All rights reserved.

This is a special issue published in version 1.0 of "Global Journal of Science Frontier Research." By Global Journals Inc.

All articles are open access articles distributed under "Global Journal of Science Frontier Research"

Reading License, which permits restricted use. Entire contents are copyright by of "Global Journal of Science Frontier Research" unless otherwise noted on specific articles.

No part of this publication may be reproduced or transmitted in any form or by any means, electronic or mechanical, including photocopy, recording, or any information storage and retrieval system, without written permission.

The opinions and statements made in this book are those of the authors concerned. Ultraculture has not verified and neither confirms nor denies any of the foregoing and no warranty or fitness is implied.

Engage with the contents herein at your own risk.

The use of this journal, and the terms and conditions for our providing information, is governed by our Disclaimer, Terms and Conditions and Privacy Policy given on our website http://globaljournals.us/terms-and-condition/menu-id-1463/

By referring / using / reading / any type of association / referencing this journal, this signifies and you acknowledge that you have read them and that you accept and will be bound by the terms thereof.

All information, journals, this journal, activities undertaken, materials, services and our website, terms and conditions, privacy policy, and this journal is subject to change anytime without any prior notice.

Incorporation No.: 0423089
License No.: 42125/022010/1186
Registration No.: 430374
Import-Export Code: 1109007027
Employer Identification Number (EIN):
USA Tax ID: 98-0673427

Global Journals Inc.

*(A Delaware USA Incorporation with "Good Standing"; **Reg. Number: 0423089**)*

Sponsors: Open Association of Research Society
Open Scientific Standards

Publisher's Headquarters office

Global Journals Headquarters
301st Edgewater Place Suite, 100 Edgewater Dr.-Pl,
Wakefield MASSACHUSETTS, Pin: 01880,
United States of America
USA Toll Free: +001-888-839-7392
USA Toll Free Fax: +001-888-839-7392

Offset Typesetting

Global Journals Incorporated
2nd, Lansdowne, Lansdowne Rd., Croydon-Surrey,
Pin: CR9 2ER, United Kingdom

Packaging & Continental Dispatching

Global Journals
E-3130 Sudama Nagar, Near Gopur Square,
Indore, M.P., Pin:452009, India

Find a correspondence nodal officer near you

To find nodal officer of your country, please email us at *local@globaljournals.org*

eContacts

Press Inquiries: *press@globaljournals.org*
Investor Inquiries: *investors@globaljournals.org*
Technical Support: *technology@globaljournals.org*
Media & Releases: *media@globaljournals.org*

Pricing (Including by Air Parcel Charges):

For Authors:
22 USD (B/W) & 50 USD (Color)
Yearly Subscription (Personal & Institutional):
200 USD (B/W) & 250 USD (Color)

Integrated Editorial Board
(Computer Science, Engineering, Medical, Management, Natural Science, Social Science)

John A. Hamilton,"Drew" Jr.,
Ph.D., Professor, Management
Computer Science and Software Engineering
Director, Information Assurance Laboratory
Auburn University

Dr. Henry Hexmoor
IEEE senior member since 2004
Ph.D. Computer Science, University at Buffalo
Department of Computer Science
Southern Illinois University at Carbondale

Dr. Osman Balci, Professor
Department of Computer Science
Virginia Tech, Virginia University
Ph.D.and M.S.Syracuse University, Syracuse, New York
M.S. and B.S. Bogazici University, Istanbul, Turkey

Yogita Bajpai
M.Sc. (Computer Science), FICCT
U.S.A.Email:
yogita@computerresearch.org

Dr. T. David A. Forbes
Associate Professor and Range Nutritionist
Ph.D. Edinburgh University - Animal Nutrition
M.S. Aberdeen University - Animal Nutrition
B.A. University of Dublin- Zoology

Dr. Wenying Feng
Professor, Department of Computing & Information Systems
Department of Mathematics
Trent University, Peterborough,
ON Canada K9J 7B8

Dr. Thomas Wischgoll
Computer Science and Engineering,
Wright State University, Dayton, Ohio
B.S., M.S., Ph.D.
(University of Kaiserslautern)

Dr. Abdurrahman Arslanyilmaz
Computer Science & Information Systems Department
Youngstown State University
Ph.D., Texas A&M University
University of Missouri, Columbia
Gazi University, Turkey

Dr. Xiaohong He
Professor of International Business
University of Quinnipiac
BS, Jilin Institute of Technology; MA, MS, PhD,. (University of Texas-Dallas)

Burcin Becerik-Gerber
University of Southern California
Ph.D. in Civil Engineering
DDes from Harvard University
M.S. from University of California, Berkeley & Istanbul University

Dr. Bart Lambrecht
Director of Research in Accounting and FinanceProfessor of Finance
Lancaster University Management School
BA (Antwerp); MPhil, MA, PhD (Cambridge)

Dr. Carlos García Pont
Associate Professor of Marketing
IESE Business School, University of Navarra
Doctor of Philosophy (Management), Massachusetts Institute of Technology (MIT)
Master in Business Administration, IESE, University of Navarra
Degree in Industrial Engineering, Universitat Politècnica de Catalunya

Dr. Fotini Labropulu
Mathematics - Luther College
University of ReginaPh.D., M.Sc. in Mathematics
B.A. (Honors) in Mathematics
University of Windso

Dr. Lynn Lim
Reader in Business and Marketing
Roehampton University, London
BCom, PGDip, MBA (Distinction), PhD, FHEA

Dr. Mihaly Mezei
ASSOCIATE PROFESSOR
Department of Structural and Chemical Biology, Mount Sinai School of Medical Center
Ph.D., Etvs Lornd University
Postdoctoral Training,
New York University

Dr. Söhnke M. Bartram
Department of Accounting and FinanceLancaster University Management SchoolPh.D. (WHU Koblenz)
MBA/BBA (University of Saarbrücken)

Dr. Miguel Angel Ariño
Professor of Decision Sciences
IESE Business School
Barcelona, Spain (Universidad de Navarra)
CEIBS (China Europe International Business School).
Beijing, Shanghai and Shenzhen
Ph.D. in Mathematics
University of Barcelona
BA in Mathematics (Licenciatura)
University of Barcelona

Philip G. Moscoso
Technology and Operations Management
IESE Business School, University of Navarra
Ph.D in Industrial Engineering and Management, ETH Zurich
M.Sc. in Chemical Engineering, ETH Zurich

Dr. Sanjay Dixit, M.D.
Director, EP Laboratories, Philadelphia VA Medical Center
Cardiovascular Medicine - Cardiac Arrhythmia
Univ of Penn School of Medicine

Dr. Han-Xiang Deng
MD., Ph.D
Associate Professor and Research
Department Division of Neuromuscular Medicine
Davee Department of Neurology and Clinical NeuroscienceNorthwestern University
Feinberg School of Medicine

Dr. Pina C. Sanelli
Associate Professor of Public Health
Weill Cornell Medical College
Associate Attending Radiologist
NewYork-Presbyterian Hospital
MRI, MRA, CT, and CTA
Neuroradiology and Diagnostic Radiology
M.D., State University of New York at Buffalo,School of Medicine and Biomedical Sciences

Dr. Roberto Sanchez
Associate Professor
Department of Structural and Chemical Biology
Mount Sinai School of Medicine
Ph.D., The Rockefeller University

Dr. Wen-Yih Sun
Professor of Earth and Atmospheric SciencesPurdue University Director
National Center for Typhoon and Flooding Research, Taiwan
University Chair Professor
Department of Atmospheric Sciences, National Central University, Chung-Li, TaiwanUniversity Chair Professor
Institute of Environmental Engineering, National Chiao Tung University, Hsin-chu, Taiwan.Ph.D., MS The University of Chicago, Geophysical Sciences
BS National Taiwan University, Atmospheric Sciences
Associate Professor of Radiology

Dr. Michael R. Rudnick
M.D., FACP
Associate Professor of Medicine
Chief, Renal Electrolyte and Hypertension Division (PMC)
Penn Medicine, University of Pennsylvania
Presbyterian Medical Center, Philadelphia
Nephrology and Internal Medicine
Certified by the American Board of Internal Medicine

Dr. Bassey Benjamin Esu
B.Sc. Marketing; MBA Marketing; Ph.D Marketing
Lecturer, Department of Marketing, University of Calabar
Tourism Consultant, Cross River State Tourism Development Department
Co-ordinator , Sustainable Tourism Initiative, Calabar, Nigeria

Dr. Aziz M. Barbar, Ph.D.
IEEE Senior Member
Chairperson, Department of Computer Science
AUST - American University of Science & Technology
Alfred Naccash Avenue – Ashrafieh

President Editor (HON.)

Dr. George Perry, (Neuroscientist)
Dean and Professor, College of Sciences
Denham Harman Research Award (American Aging Association)
ISI Highly Cited Researcher, Iberoamerican Molecular Biology Organization
AAAS Fellow, Correspondent Member of Spanish Royal Academy of Sciences
University of Texas at San Antonio
Postdoctoral Fellow (Department of Cell Biology)
Baylor College of Medicine
Houston, Texas, United States

Chief Author (HON.)

Dr. R.K. Dixit
M.Sc., Ph.D., FICCT
Chief Author, India
Email: authorind@computerresearch.org

Dean & Editor-in-Chief (HON.)

Vivek Dubey(HON.)
MS (Industrial Engineering),
MS (Mechanical Engineering)
University of Wisconsin, FICCT
Editor-in-Chief, USA
editorusa@computerresearch.org

Sangita Dixit
M.Sc., FICCT
Dean & Chancellor (Asia Pacific)
deanind@computerresearch.org

Suyash Dixit
(B.E., Computer Science Engineering), FICCTT
President, Web Administration and
Development , CEO at IOSRD
COO at GAOR & OSS

Er. Suyog Dixit
(M. Tech), BE (HONS. in CSE), FICCT
SAP Certified Consultant
CEO at IOSRD, GAOR & OSS
Technical Dean, Global Journals Inc. (US)
Website: www.suyogdixit.com
Email:suyog@suyogdixit.com

Pritesh Rajvaidya
(MS) Computer Science Department
California State University
BE (Computer Science), FICCT
Technical Dean, USA
Email: pritesh@computerresearch.org

Luis Galárraga
J!Research Project Leader
Saarbrücken, Germany

Contents of the Issue

i. Copyright Notice
ii. Editorial Board Members
iii. Chief Author and Dean
iv. Contents of the Issue

1. 1-Octanol/Water Partition Coefficients of Dialkylated Methylimidazolium Halide Salts. *1-6*
2. Seasonal and Spatial Variation of Water Quality Index of Bassi Tehsil of District Jaipur, Rajasthan, India. *7-19*
3. Adsorption and Kinetic Study of Ni(II) Ions from Aqueous Solution using Natural Syrian Zeolite. *21-29*

v. Fellows
vi. Auxiliary Memberships
vii. Process of Submission of Research Paper
viii. Preferred Author Guidelines
ix. Index

Global Journal of Science Frontier Research: B
Chemistry
Volume 15 Issue 6 Version 1.0 Year 2015
Type : Double Blind Peer Reviewed International Research Journal
Publisher: Global Journals Inc. (USA)
Online ISSN: 2249-4626 & Print ISSN: 0975-5896

1-Octanol/Water Partition Coefficients of Dialkylated Methylimidazolium Halide Salts

By Marissa K. Gard, Elliot G. Ennis & John H. Summerfield
Missouri Southern State University, United States

Abstract- Dialkylated methylimidazolium halide salts are a current research topic. The 1-octanol/water partition coeffcient for these salts has come to signify the tendency of a charged organic molecule to cross a biological membrane, be sequested in soil, and indicate the lethal dose of the chemical. The purpose of this work is to add to existing data for the 1-octanol/water partition coeffcient for these salts. The novelty of this work is that dialkylated methylimidazolium salts are investigated.

Keywords: *ionic liquids, partition functions.*

GJSFR-B Classification : *FOR Code: 860602*



Strictly as per the compliance and regulations of :

© 2015. Marissa K. Gard, Elliot G. Ennis & John H. Summerfield. This is a research/review paper, distributed under the terms of the Creative Commons Attribution-Noncommercial 3.0 Unported License http://creativecommons.org/licenses/by-nc/3.0/), permitting all non commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

1-Octanol/Water Partition Coefficients of Dialkylated Methylimidazolium Halide Salts

Marissa K. Gard [α], Elliot G. Ennis [σ] & John H. Summerfield [ρ]

Abstract- Dialkylated methylimidazolium halide salts are a current research topic. The 1-octanol/water partition coeffcient for these salts has come to signify the tendency of a charged organic molecule to cross a biological membrane, be sequested in soil, and indicate the lethal dose of the chemical. The purpose of this work is to add to existing data for the 1-octanol/water partition coeffcient for these salts. The novelty of this work is that dialkylated methylimidazolium salts are investigated.

Keywords: ionic liquids, partition functions.

I. Introduction

Green chemistry is founded on guidelines that are designed to prevent and reduce the waste associated with the production of chemicals. Any modifications to existing processes as well as the creation of new processes that lead to more efficient and recyclable solvents, safer reactions, and renewable feedstocks are successes.[1]

Ionic liquids or molten salts are molecules composed wholly of ions and occur in the liquid state. An inorganic salts such as NaCl is an ionic liquid above its melting point. Due to their high melting point many inorganic salts are of little use in daily life. Instead, chemists have turned to imidazolium-based ionic liquids. These organic salts are current candidates for green solvents. They can be highly soluble, can have high ionic conductivity, are generally inflammable, have high thermal and chemical stability, and relatively low vapor pressures compared to cyclohexane, benzene, and acetone. Typically the imidazoliumsaltsunder investigation are alkylmethylimidazolium compounds. The novelty of this work is that dialkylated methylimidazolium salts are investigated.[2]

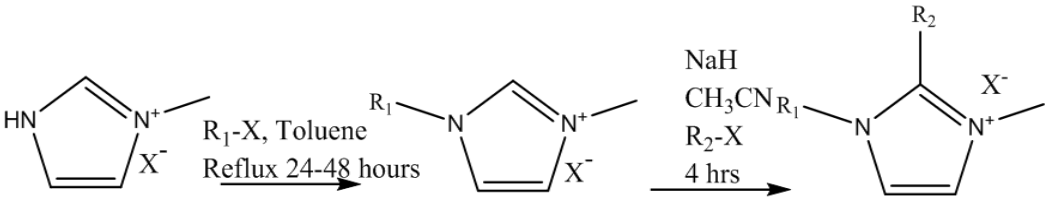
Trisubstituted imidazolium salts are a current research topic. They have been investigated as a solvent, an electrolyte solution additive, a reaction initiator, a product precursor, a molecular aggregator, and a composite material.[3]

The 1-octanol/water partition coefficient (K_{OW}) for these salts has come to signify the tendency of a charged organic molecule to cross a biological membrane,[4] and as an estimate to the salt's environmental impact before widespread use. The purpose of this work is to add to existing data for the 1-octanol/water partition coefficient for these salts.[5, 6]

II. Materials and Methods

a) Synthesis

The synthesis is shown below (Scheme 1). It is outlined in the literature.[7]



Scheme 1 : Two R groups are added to the 3-methyl-1*H*-imidazol-3-ium ion

The chemicals used in the syntheses, the CAS numbers, sources and grades are below. The proton NMR was performed on a Bruker AV-III 300 MHz spectrometer. The solvent was DSMO and the standard was $Si(CH_3)_4$. The peak assignments are below.

1-methyl-3-octyl-1H-imidazol-3-ium bromide

3-methyl-1*H*-imidazol-3-ium (1-methylimidazole 616-47-7, Aldrich, 99%, 25.00 mL), 1-bromoctane (111-83-1, Aldrich, 99%, 71.00 mL), and toluene (108-88-3, Aldrich, 99.8%, 40.00 mL) were mixed. The solution was refluxed for two days. The resulting mixture was frozen and the excess toluene was decanted. The product was thawed and washed with ethyl acetate (141-78-6, Aldrich, 99.8%). The solution was evaporated to dryness. The product was frozen and the excess reagents were decanted. δH(300 MHz; DMSO; $Si(CH_3)_4$) 8.90 (1 H, s, 2-H), 7.91 (1 H, d, 5-H), 7.78 (1 H, d, 4-H), 5.00 (2 H, t NH), 3.75 (3 H, s, NCH_3), 2.00 (2 H, qt, CH_2), 1.30 (10 H, s, CH_2) 0.91 (3 H, br, CH_3)) The x-ray photoelectric spectroscopy, FTIR, and ^{1}H NMR markers are also in the literature.[8, 9].

Author α σ ρ: Department of Chemistry and Physical Sciences, Missouri Southern State University, 3950 Newman Rd. Joplin.
e-mail: summerfield-j@mssu.edu.

© 2015 Global Journals Inc. (US)

1,2-dimethyl-3-octyl-1H-imidazol-3-ium iodide

To a stirred solution of 1-methyl-3-octyl-*1H*-imidazol-3-ium bromide (10.00 g) in acetonitrile (75-05-8, Aldrich, 99.8%, 175.00 mL) was added NaH (7646-69-7, Aldrich, 60% in mineral oil, 2.00 g). After allowing the mixture to stir four hours, iodomethane (74-88-4, Aldrich, 99%, 6.90 mL) was added and the reaction was stirred for 12 hours. The solution was filtered to remove any precipitated NaI. The resulting oil as washed with ethyl acetate (141-78-6, Aldrich, 99.8%, 3x75.00 mL) and the residual volatiles were then removed under vacuum. The residual nonvolatiles were removed by freezing and decantation. δH(300 MHz; DMSO; $Si(CH_3)_4$) 7.91 (1 H, d, 5-H), 7.78 (1 H, d, 4-H), 5.00 (2 H, t NH), 3.75 (3 H, s, NCH_3), 2.85 (3 H, s, 2-CH_3) 2.00 (2 H, qt, CH_2), 1.30 (10 H, s, CH_2) 0.91 (3 H, br, CH_3)) The ^{1}H NMR markers are in the literature.[10, 11]

Workers find the IUPAC nomenclature wearisome. This paper will represent the 1-methylimidazolium fragment as mim. The molecule 1-methyl-3-*o*ctyl-*1H*-imidazol-3-ium bromide is shortened to [omim]Br. Similarly, 1,2-di*m*ethyl-3-*o*ctyl-1*H*-imidazol-3-ium iodide becomes [momim]I. The two letters hx will refer to the hexyl group.

[bomim]Cl

2-butyl-1-methyl-3-*o*ctyl-*1H*-imidazol-3-ium chloride was prepare in the same manner as [momim]I with the exception that 1-chlorobutane (109-69-3, Aldrich, 99.5%, 11.6 mL) was used instead of iodomethane. δH(300 MHz; DMSO; $Si(CH_3)_4$) 7.91 (1 H, d, 5-H), 7.78 (1 H, d, 4-H), 5.00 (2 H, t NH), 3.75 (3 H, s, NCH_3), 2.50 (2 H, t, CH_2), 2.00 (2 H, qt, CH_2), 1.61 (2 H, qt, CH_2) 1.30 (12 H, s, CH_2) 0.91 (6 H, br, CH_3))

[pomim]Cl

1-methyl-3-*o*ctyl-2-pentyl-*1H*-imidazol-3-ium chloride was prepare in the same manner as [momim]I with the exception that 1-chloropentane (543-59-5, Aldrich, 99%, 13.4 mL) was used instead of iodomethane. δH(300 MHz; DMSO; $Si(CH_3)_4$) 7.91 (1 H, d, 5-H), 7.78 (1 H, d, 4-H), 5.00 (2 H, t NH), 3.75 (3 H, s, NCH_3), 2.50 (2 H, t, CH_2), 2.00 (2 H, qt, CH_2), 1.61 (2 H, qt, CH_2) 1.30 (14 H, s, CH_2) 0.91 (6 H, br, CH_3))

[oomim]Cl

1-methyl-2, 3-dioctyl-1*H*-imidazol-3-ium chloride was prepare in the same manner as [momim]I with the exception that chlorooctane (111-85-3, Aldrich, 99%, 18.9 mL) was used instead of iodomethane. δH(300 MHz; DMSO; $Si(CH_3)_4$) 7.91 (1 H, d, 5-H), 7.78 (1 H, d, 4-H), 5.00 (2 H, t NH), 3.75 (3 H, s, NCH_3), 2.50 (2 H, t, CH_2), 2.00 (2 H, qt, CH_2), 1.61 (2 H, qt, CH_2) 1.30 (20 H, s, CH_2) 0.91 (6 H, br, CH_3))

[domim]Cl

2-decyl-3-methyl-2-octyl-1*H*-imidazol-3-ium chloride was prepare in the same manner as [momim]I with the with the exception that chlorodecane (1002-69-3, Aldrich, 98%, 22.6 mL) was used instead of iodomethane. δH(300 MHz; DMSO; $Si(CH_3)_4$) 7.91 (1 H, d, 5-H), 7.78 (1 H, d, 4-H), 5.00 (2 H, t NH), 3.75 (3 H, s, NCH_3), 2.50 (2 H, t, CH_2), 2.00 (2 H, qt, CH_2), 1.61 (2 H, qt, CH_2) 1.30 (22 H, s, CH_2) 0.91 (6 H, br, CH_3))

[bbmim]Cl

3-methyl-1*H*-imidazol-3-ium (1-methylimidazole 616-47-7, Aldrich, 99%, 25.00 mL), 1-chlorobutane (109-69-3 Aldrich, 99.5%, 43.00 mL), and toluene (108-88-3, Aldrich, 99.8%, 40.00 mL) were mixed. The solution was refluxed for two days. The resulting mixture was frozen and the excess toluene was decanted. The product was thawed and washed with ethyl acetate (141-78-6, Aldrich, 99.8%). The solution was evaporated to dryness. The product was frozen and the excess reagents were decanted. To a stirred solution of 1-methyl-3-octyl-*1H*-imidazol-3-ium bromide (10.00 g) in acetonitrile (75-05-8, Aldrich, 99.8%, 150.00 mL) was added NaH (7646-69-7, Aldrich, 60% in mineral oil, 2.67 g) After allowing the mixture to stir four hours, 1-chlorobutane (109-69-3 Aldrich, 99.5%, 17.8 mL) was added and the reaction was stirred for 12 hours. The solution was filtered to remove any precipitated NaCl. The resulting oil as washed with ethyl acetate (141-78-6, Aldrich, 99.8%, 3x75.00 mL) and the residual volatiles were then removed under vacuum. The residual nonvolatiles were removed by freezing and decantation. δH(300 MHz; DMSO; $Si(CH_3)_4$) 7.91 (1 H, d, 5-H), 7.78 (1 H, d, 4-H), 5.00 (2 H, t NH), 3.75 (3 H, s, NCH_3), 2.50 (2 H, t, CH_2), 2.00 (2 H, qt, CH_2), 1.61 (2 H, qt, CH_2) 1.30 (4 H, sx, CH_2) 0.91 (6 H, t, CH_3))

[pbmim]Cl

2-butyl-1-methyl-3-pentyl-1*H*-imidazol-3-ium chloride was prepare in the same manner as [bbmim]Cl with the exception that 1-chloropentane (543-59-9, Aldrich, 99%, 20.7 mL) was used instead of 1-chlorobutane. δH(300 MHz; DMSO; $Si(CH_3)_4$) 7.91 (1 H, d, 5-H), 7.78 (1 H, d, 4-H), 5.00 (2 H, t NH), 3.75 (3 H, s, NCH_3), 2.50 (2 H, t, CH_2), 2.00 (2 H, qt, CH_2), 1.61 (2 H, qt, CH_2) 1.30 (6 H, sx, CH_2) 0.91 (6 H, t, CH_3))

[hxbmim]Cl

2-butyl-3-hexyl-1-methyl-1*H*-imidazol-3-ium chloride was prepare in the same manner as [bbmim]Cl with the exception that 1-chlorohexane (544-10-5, Aldrich, 99%, 23.5 mL) was used instead of 1-chlorobutane. δH(300 MHz; DMSO; $Si(CH_3)_4$) 7.91 (1 H, d, 5-H), 7.78 (1 H, d, 4-H), 5.00 (2 H, t NH), 3.75 (3 H, s, NCH_3), 2.50 (2 H, t, CH_2), 2.00 (2 H, qt, CH_2), 1.61 (2 H, qt, CH_2) 1.30 (8 H, br, CH_2) 0.91 (6 H, t, CH_3))

[dbmim]Cl

2-butyl-3-decyl-1-methyl-1*H*-imidazol-3-ium chloride was prepare in the same manner as [bbmim]Cl with the exception that 1-chlorodecane (1002-69-3,

© 2015 Global Journals Inc. (US)

Aldrich, 98%, 34.8 mL) was used instead of 1-chlorobutane. δH(300 MHz; DMSO; $Si(CH_3)_4$) 7.91 (1 H, d, 5-H), 7.78 (1 H, d, 4-H), 5.00 (2 H, t NH), 3.75 (3 H, s, NCH_3), 2.50 (2 H, t, CH_2), 2.00 (2 H, qt, CH_2), 1.61 (2 H, qt, CH_2) 1.30 (16 H, br, CH_2) 0.91 (6 H, t, CH_3))

The UV/Vis spectra were produced on a Beckman DU-640B UV/Vis spectrophotometer. The salt, its phase, the λ_{max}, and the corresponding absorbance are shown in the Results and Discussion section. The maximum absorbance is in the neighborhood of 265.0 nm, which indicates the imidazolium ring.[12]

The compound [oomim]Cl was excluded. The spectrum was simply noise. This may indicate a very similar blank and sample. The difference between the two---the UV/Vis spectrum---is noise.[13]

The compound [momim]I shows negative absorbance. Negative absorbance has no physical meaning except that the blank absorbs more light than the [momim]I.

This work finds the 1-octanol/water partition coefficient by the slow-stirring method.[14–18] The salt was added to a solution of 1-octanol saturated with water. Each solution was stirred for 45 days at 21℃. This was done slowly to prevent emulsification.

For this work initially 5.0 μg of the organic salt was added to 5.0 mL of a saturated 1-octanol/water solution. When an emulsion formed, the solution was stirred for six hours and left to rest overnight. This removed the emulsion. Serial dilutions were done to keep the absorption values between –0.150 and 1.000. The aqueous layer was drawn off and compared to a saturated solution of 1-octanol. One extraction was done for each compound. The K_{OW} value was then calculated using

$$K_{OW} = \frac{\left(A_i \cdot df_i - A_f \cdot df_f\right) \cdot V_{water}}{A_f \cdot df_f \cdot V_{octanol}} \quad (1)$$

where A_i and A_f are the absorbances of the aqueous layer before and after extraction. V_{water} and $V_{octanol}$ are the volumes of the water and 1-octanol phases. The symbols df_i and df_f are the dilution factors used to find A_i and A_f.[19,20]

III. Results and Discussion

The UV/Vis data, the experimental log K_{OW} values, the calculated log K_{OW} values, and the absolute difference between them are shown below in Table 1.

Compound in water phase	λ_{max} in nm	Absorbance at λ_{max}	Exp. Log K_{OW}	Calc. Log K_{OW}	$\lvert\Delta$Log $K_{OW}\rvert$
[momim]I	248.0	–0.1459	–0.62	–.8850	0.27
[bomim]Cl	269.0	0.4209	1.1	0.5020	0.6
[pomim]Cl	265.0	0.21450	0.98	1.031	0.051
[domim]Cl	263.0	0.1249	5.1	3.676	1.4
[bbmim]Cl	264.0	0.6850	–1.3	–1.614	0.31
[pbmim]Cl	264.0	0.6413	–0.93	–1.085	0.16
[hxbmim]Cl	259.0	0.1866	–0.31	–0.5560	0.25
[dbmim]Cl	232.0	0.2346	1.9	1.560	0.3

Table 1: UV/Vis data, experimental log K_{OW} values, calculated log K_{OW} values, and the absolute difference between them. The calculated values were determined by the group contribution method rather than the linear free energy relation scheme.[5, 21]

Using the cLog P program[22] the calculated log K_{OW} values in Table 1 were found. The expectation is 85% of the calculated log K_{OW} values will be in error by less than 0.5, 10% by 0.5 to 1.0, and 5% by more than 1.0.[23] For this work, the values are 75%, 13%, and 13% respectively. The clog P program is best suited for molecules with typical fragments.[24] The charged five-membered ring and the long hydrocarbon chains may be misrepresented in this group additive method or the small sample size may explain the discrepancies.

The toxicity of organic solvents in animal tissue, in soil, and in water is an ongoing concern. In this work we examine three toxicity indicators that are linked to the 1-octanol/ water partition coefficients. Positive value log K_{OW} values indicate the octanol phase is favored. These compounds are candidates for tissue storage. That is, candidates for the calculated of a bioconcentration factor (BCF). The soil sorption coefficient (K_{OC}) is the ratio of the mass of a chemical absorbed per weight of carbon in a soil to the concentration of the chemical in water. The lethal concentration of a chemical is defined as the lethal dose for half the population (LC_{50}).[25]

Two BCF models are shown in Figure 1. The lower dashed line is log(BCF) = 0.85 log(K_{OW}) – 0.70. The upper dashed line is log(BCF) = 0.79 log(K_{OW}) – 0.40.[25] The log(BCF) for benzene from these models is 1.3 and 1.1, respectively.[2]

© 2015 Global Journals Inc. (US)

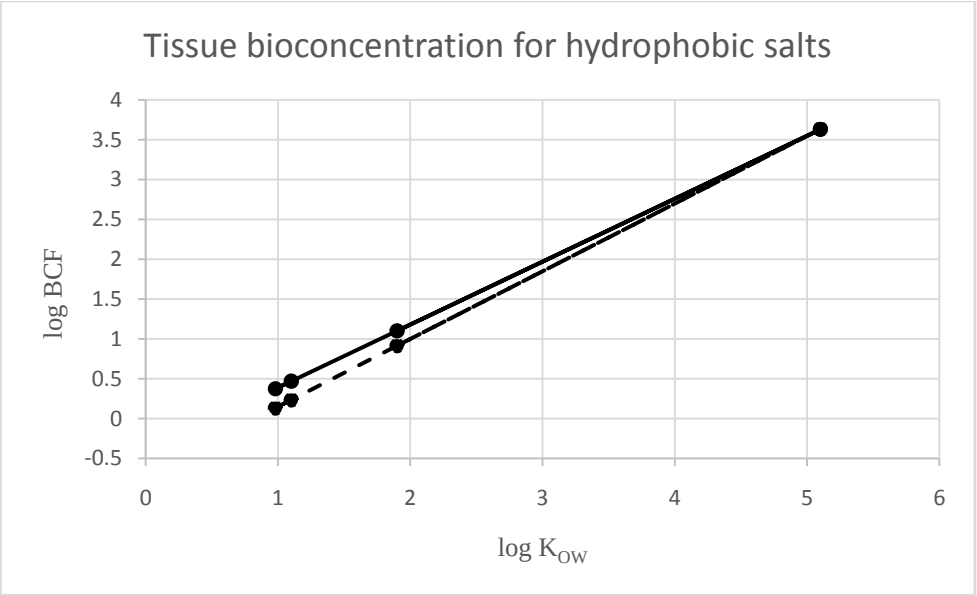


Figure 1 : Log of the tissue bio concentration for the positive log(K_{OW}) salts. The lower dashed line is log(BCF) = 0.85 log(K_{OW}) – 0.70. The upper dashed line is log(BCF) = 0.79 log(K_{OW}) – 0.40.

Three K_{OC} models are shown below in Figure 2. The lower solid line is log(K_{OC}) = 0.989 log(K_{OW}) – 0.364. The middle line is log(K_{OC}) = 679 log(K_{OW}) + 0.663.The top dashed line is log(K_{OC}) = 0.544 log(K_{OW}) + 1.377.[25] The log(K_{OC}) for benzene for these three models are 1.7, 2.1, and 2.5, respectively.[2]

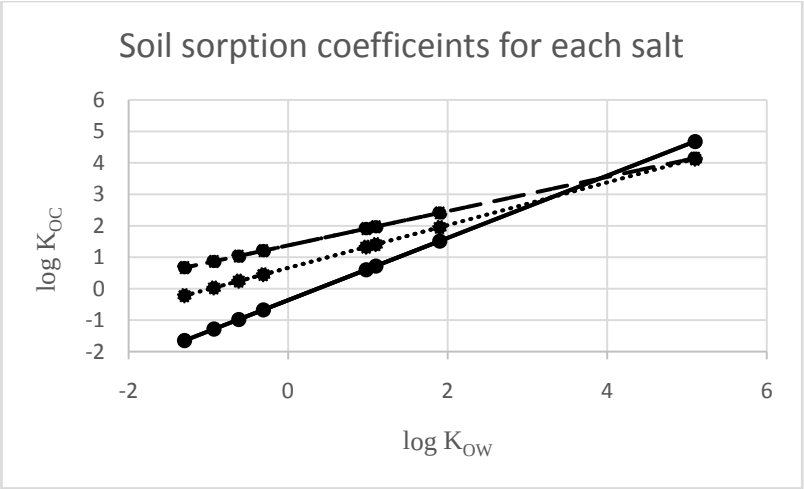


Figure 2 : Log of soil sorption coefficients for all the salts. The lower solid line is log(K_{OC}) = 0.989 log(K_{OW}) – 0.364. The middle line is log(K_{OC}) = 679 log(K_{OW}) + 0.663.The top dashed line is log(K_{OC}) = 0.544 log(K_{OW}) + 1.377

Figure 3 shows the log of the inverse lethal concentrations (1/LC_{50}) for each salt. The top line is log(1/LC_{50}) = 0.629 log(K_{OW}) – 0.489. The middle dotted line is log(1/LC_{50}) = 0.854 log(K_{OW}) – 1.74. The solid line is log(1/LC_{50}) = 0.89 log(K_{OW}) – 1.75.[25] The log(1/LC_{50}) for benzene from these models are 0.85, 0.079, 0.15, respectively.[2]

© 2015 Global Journals Inc. (US)

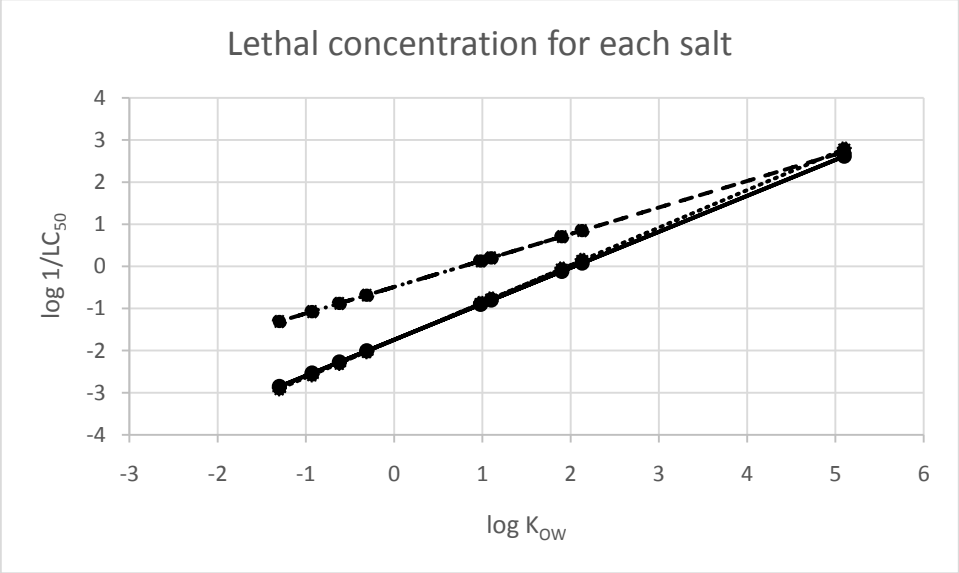


Figure 3 : The log of the inverse lethal concentrations ($1/LC_{50}$) for each salt. The top line is $\log(1/LC_{50}) = 0.629 \log(K_{OW}) - 0.489$. The middle dotted line is $\log(1/LC_{50}) = 0.854 \log(K_{OW}) - 1.74$. The solid line is $\log(1/LC_{50}) = 0.89 \log(K_{OW}) - 1.75$

IV. Conclusions

Green chemistry has taken a winding road in its search for benign solvents. Some, such as CO_2, have become firmly established.[26] Others, such as imidazolium salts, continue to be under investigation.[27–32]A physical quantity that continues to be of interest is the 1-octanol/water partition coefficients. One reason is their direct link to the environmental impact of the salts.[33, 34]

Dialkylated methylimidazolium salts have low vapor pressure compared to typical solvents such as benzene. This work shows they can be synthesized to be water soluble or lipophilic. This work also shows that every imidazolium salt is not "green". The salts with octyl and/or decyl substituents have comparable toxicity to benzene. It has recently been shown that cholinium alkanoates may provide a set of molecules that are more ecologically friendly.[35]

Conflict of Interests

The authors declare that there is no conflict of interests regarding the publication of this paper.

References Références Referencias

1. United States Environmental Protection Agency. http://epa.gov/
2. L. Ropel, L.S. Belvèze, S. Aki et al., "1-octanol-water Partition Coefficients of Imidazolium-based Ionic Liquids", Green Chem., vol. 2005, no. 2, pp. 83-90, 2005.
3. F. Hernat and H. Yu, J. Liq. Chrom. and Rel. Tech., "Ion Chromatography of Tri-Substituted Imidazolium Ionic Liquid Cations: Method and Application for Octanol–Water Partition Coefficient (K_{OW}) Determination", vol.38, no. 13, pp. 1267-1272, 2015.
4. V. Levin, "Relationship of 1-octanol/ Water Partition Coefficient and Molecular Weight to Rat Brain Capillary Permeability," J. Med. Chem., vol. 23, no. 6, pp.692-684, 1980.
5. C. Cho, C. Jungnickel, J. Arning et al., "Ionic Liquids: Predictions of Physicochemical Properties with Experimental and/or DFT-calculated LFER Parameters to Understand Molecular Interactions in Solution", J. Phys. Chem. B vol. 115, no. 9, pp.6040-6050, 2011.
6. U. Domańska, M. Królikowski, A, Pobudkowska, et al., "Solubility of Ionic Liquids in Water and Octan-1-ol and Octan-1-ol/water, or 2-phenylethyanol/water Partition Coefficients", J. Chem. Thermo., vol. 55, pp. 225-233, 2012.
7. E. Ennis and S. Handy, "A Facile Route to C2-Substituted Imidazolium Ionic Liquids", Molecules, vol. 14, no. 6, pp. 2235-2245, 2009.
8. T. Cremer, C. Kolbeck, K. Lovelock et al., "Towards a Molecular Understanding of Cation–Anion Interactions—Probing the Electronic Structure of Imidazolium Ionic Liquids by NMR Spectroscopy, X-ray Photoelectron Spectroscopy and Theoretical Calculations", Chem.: A Eur J. vol. 16, no. 30, pp. 9018-9033, 2010.
9. W. Awad, J. Gilman, M. Nyden et al., "Thermal degradation studies of alkyl-imidazolium salts and their application in nanacomposites", Thermo. Acta, vol. 409, pp. 3-11, 2004.
10. S. Handy and M. Okello, "The 2-Position on Imidazolium Ionic Liquids: Substitution and Exchange" JOC, vol. 70, no. 5, pp. 1915-1918, 2005.

© 2015 Global Journals Inc. (US)

11. T. Endo and K. Nishikawa, "Effects of Methylation at Position 2 of Cation Ring on Rotational Dynamics of Imidazolium-Based Ionic Liquids Investigated by NMR Spectroscopy: [C(4)mim]Br vs [C(4)C(1)mim]Br", J. Phys. Chem. B, vol. 114, no. 28, pp. 9201-9208, 2010.
12. Q. Lin, F. Huang, M. Liu et al. "Imidazolium-salt-based Fluorescent Chemosensor for Cu(II), Zn(II), and Co(II)", Sensors and Materials, vol. 20, no. 3, pp.143-150, 2008.
13. P. Sassi, M, Paolantoni, R. Cataliotti, et al., "Water/Alcohol Mixtures: A Spectroscopic Study of the Water-saturated 1-octanol Solution", J. Phys. Chem. B vol. 108, no. 50, pp.19557-19565, 2004.
14. J. DeBruijn, F. Busser, W. Seinen et al., "Determination of 1-octanol/water Partition Coefficients for Hydrophobic Organic Chemicals with the Slow-stirring Method", Envir. Chem., vol. 8, pp. 499-512, 2009.
15. G. Veith, N. Austin, R. Morris, "A Rapid Method for Estimating log P for Organic Chemicals", Water Res., vol. 13, pp. 43-47, 1979.
16. R. Rapaport, R. Eisenrelch, "Chromatographic Determination of 1-octanol-water Partition Coefficients (K_{OW}'s) for 58 PCB Polychlorinated biphenyl congeners", Environ. Sci. Technol. Vol. 18, pp. 163-170, 1984.
17. US EPA, "Product Properties Test Guidelines: Partition Coefficients (*n*-1-octanol/water), Estimation by Liquid Chromatography", OPPTS 830.7570, EPA 712-C-96-040, 1996.
18. H. DeVoe, M. Miller, S. Wasik, Generator Columns and High Pressure Liquid Chromatography for Determining Aqueous Solubilities and 1-octanol-water Partition Coefficients of Hydrophobic Substances", J. Res. NBS, vol. 86, no.4, pp. 361-366, 1981.
19. M. Harris, J. Logan, "Determination of log K_{OW} Values for Four Drugs", J. Chem. Ed. vol. 91, 915-918, 2014.
20. http://chemwiki.ucdavis.edu/Analytical_Chemistry/Analytical_Chemistry_2.0/07%3A_Collecting_and_Preparing_Samples/7G%3A_Liquid%E2%80%93Liquid_Extractions.(accessed October, 2015).
21. T. Cheng, Y. Zhao, X. Li et al., "Computation of 1-octanol-water Partition Coefficients by Guiding an Additive Method with Knowledge", J. Chem. Info, and Mod., vol. 47, no. 6, pp.2140-2148.
22. D. Evans and S. Rubenstein, ChemDraw Professional (Revision 15) Perkin-Elmer, Waltham, MA, 2015.
23. K van Leeuwen, *Technical Guidance Document on Risk Assessment*, European Communities, Rome, 2003.
24. Sussex Drug Discovery Centre, sussexdrug discovery.wordpress.com/2015/02/03/not-all-logps-are-calculated-equal-clogp-and-other-short-stories/, (accessed October 2015).
25. M. Montalbán, M. Collado-González, R. Trigo et al., "Experimental Measurements of Octanol–Water Partition Coefficients of Ionic Liquids", J. Ad. Chem Eng., vol. 5, no. 3, pp. 1-8, 2015.
26. D. Hâcu, E. Beckman, "Generation of hydrogen peroxide directly from H_2 and O_2 Using CO_2 as the solvent", "Green Chemistry", vol. 3, no. 2, pp.80-86, 2001.
27. C. Margulis, H. Stern, B. Berne, "Computer Simulation of a Green Chemistry Room-temperature Ionic Solvent", J. Phys. Chem. B, vol. 106, no. 46, pp.12017-12021, 2002.
28. A. Chapeaux, L. Simoni, M. Stadther, et al. "Liquid Phase Behavior of Ionic Liquids with Water and 1-octanol/water Partition Coefficients", J. Chem. Eng. Data, vol. 52, no. 6, pp.2462-2467, 2007
29. S. Katkevica, A. Zicmanis, P. Mekss, Imidazolium and Pyridinium Salts---Solvents Influencing the Rate and Direction of the Fries, Beckmann, and Claisen Rearrangements", Chem. Hetero. Comp., vol. 46, no. 2, pp.195-208, 2010
30. A. Cláudio, M. Freire, C. Freire, et al., "Extraction of Vanillin using Ionic-liquid-based Aqueous Two-phase Systems", Sep. and Pur. Tech. vol. 75, pp.39-47, 2010.
31. M. Freire, I. Marrucho, J. Coutinho, "High-performance extraction of Alkaloids Using Aqueous Two-phase systems with Ionic Liquids." Green Chem., vol. 12, pp.1715-1718, 2010.
32. Y. Deng, P. Besse-Hoggan, M. Sanceime et al., "Influence of Oxygen Functionalities on the Environmental Impact of Imidazolium Based Ionic Liquids," J. Haz. Mat., vol. 198, no. 30, pp165-174, 2011.
33. D Mackay, A. Bobra, W. Shiu, et al., "Relationships between Aqueous Solubilities and Octanol-water Partition Coefficients", Chemosphere, vol. 9, no. 11, pp.701-711, 1980.
34. S. Banerjee, S. Yalkowsky, S. Valvani, "Water Solubility and Octanol/water Partition Coefficients of Organics. Limitations of the Solubility-partition Coefficient Correlation", Environ. Sci. and Tech. vol. 14, no. 10, pp.1227-1229, 1980.
35. D. Hartmann, K. Shimizu, F. Siopa, et al., "Plasma Membrane Permeability by Ionic Liquids: A matter of Charge", Green Chem., vol. 17, pp.4587-4598, 2015.

© 2015 Global Journals Inc. (US)

Global Journal of Science Frontier Research: B
Chemistry
Volume 15 Issue 6 Version 1.0 Year 2015
Type : Double Blind Peer Reviewed International Research Journal
Publisher: Global Journals Inc. (USA)
Online ISSN: 2249-4626 & Print ISSN: 0975-5896

Seasonal and Spatial Variation of Water Quality Index of Bassi Tehsil of District Jaipur, Rajasthan, India

By Swati Saxena, Umesh Saxena & A. K. Sinha
Suresh Gyan Vihar University, India

Abstract- The present study was intended to calculate the water quality index (WQI) of Bassi Tehsil of district Jaipur, Rajasthan, India in order to assess its suitability for drinking purpose. For this ground water samples from 71 sampling sites of 50 villages of study area were collected from tube wells and hand pumps of varying depths in pre and post monsoon seasons and analyzed for ten physico-chemical parameters namely pH, Total Alkalinity, Total Hardness, Calcium, Magnesium, Chloride, Nitrate, Fluoride, Total Dissolved Solid and Electrical Conductivity. Analysis of results showed that almost all parameters were exceeding the permissible limits prescribed by BIS, ICMR and WHO. Assessment of water quality index (WQI) showed remarkable variation of water quality as WQI values ranged from 13.53 to 1052.2 in pre-monsoon and 25.72 to 1024.6 in post monsoon season. The study also revealed that drinking water of Bassi tehsil is not potable and there is an instant need to take ameliorative steps in this region to prevent the population from adverse health effects as 61.97% and 63.38% ground water samples were classified under “unsuitable for drinking” category in accordance with their WQI values in pre and post monsoon seasons, respectively.

Keywords: groundwater quality, physico-chemical parameters, water quality index, bassi tehsil and rajasthan.

GJSFR-B Classification : FOR Code: 090508



Strictly as per the compliance and regulations of :

© 2015. Swati Saxena, Umesh Saxena & A. K. Sinha. This is a research/review paper, distributed under the terms of the Creative Commons Attribution-Noncommercial 3.0 Unported License http://creativecommons.org/licenses/by-nc/3.0/), permitting all non commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

Seasonal and Spatial Variation of Water Quality Index of Bassi Tehsil of District Jaipur, Rajasthan, India

Swati Saxena [α], Umesh Saxena [σ] & A. K. Sinha [ρ]

Abstract- The present study was intended to calculate the water quality index (WQI) of Bassi Tehsil of district Jaipur, Rajasthan, India in order to assess its suitability for drinking purpose. For this ground water samples from 71 sampling sites of 50 villages of study area were collected from tube wells and hand pumps of varying depths in pre and post monsoon seasons and analyzed for ten physico-chemical parameters namely pH, Total Alkalinity, Total Hardness, Calcium, Magnesium, Chloride, Nitrate, Fluoride, Total Dissolved Solid and Electrical Conductivity. Analysis of results showed that almost all parameters were exceeding the permissible limits prescribed by BIS, ICMR and WHO. Assessment of water quality index (WQI) showed remarkable variation of water quality as WQI values ranged from 13.53 to 1052.2 in pre-monsoon and 25.72 to 1024.6 in post monsoon season. The study also revealed that drinking water of Bassi tehsil is not potable and there is an instant need to take ameliorative steps in this region to prevent the population from adverse health effects as 61.97% and 63.38% ground water samples were classified under "unsuitable for drinking" category in accordance with their WQI values in pre and post monsoon seasons, respectively.

Keywords: groundwater quality, physico-chemical parameters, water quality index, bassi tehsil and rajasthan.

I. Introduction

"Jalam Jeevamrutham" Water is one of the five elements described in "shastra" to life. It is also one of the most important commodities which Man has exploited than any other resource for sustenance of his life. Potable safe water is absolutely essential and is the basic need of all human beings on the earth. Due to modern civilization, rapid urbanization, and industrialization, subsequent contamination of surface and ground water sources, water conservation and water quality management has now a day's assumed a very complex shape. Attention on contamination and its management has become a need of the hour, because of its far reaching impact on human health.

Author α: Research Scholar, Department of Chemistry, Suresh Gyan Vihar University, Jaipur, Rajasthan, (India).
e-mail: swati.snigdha11@gmail.com,
Author σ: Principal and Professor, Department of Chemistry and Environmental Science, Chanakya Technical Campus, Jaipur, Rajasthan, (India). e-mail: saxenaumesh@yahoo.com
Author ρ: Dean Research and Director, Center of Excellence for Climate Change & Water Research, Suresh Gyan Vihar University, Jaipur, Rajasthan, (India). e-mail: ak.sinha@mygyanvihar.com

In India so many factors contribute to pollution of ground water such as; scarcity of water resources, uncontrolled population, urbanization, poverty, lack of education, lack of political commitment etc. Groundwater quality is highly dependent on the nature of the aquifers and on the surrounding climatic conditions (Chand, 2013; Dhok et al., 2011).

Assessment of the groundwater quality has always been important in the field of environmental quality management. One of the most effective tools for the assessment and management of the water quality is Water quality index; it offers a simple, stable, reproducible unit of measure and communicates information of water quality to the concerned citizens and policy makers (Chauhan and Singh, 2010). The water quality is difficult to evaluate from a large number of samples, each containing concentrations of many parameters. WQI is a mathematical instrument used to transform large quantities of water quality data into a single number which represents the water quality level while eliminating the subjective assessments of water quality and biases of individual water quality experts (Yogendra and Puttaaiah, 2008; Chowdhury et al., 2012; Khwakaram et al., 2012; Hussain et al., 2014).

II. Study Area

Rajasthan is known as "the land of king" and it is the largest state of the republic of India in terms of geographical spread. It is situated in the North- Western part of India having total area is around 3,42,239 Sq. Km. Which represents 10.41 % of total area of the country and population of 6.86 Crores spread over in 44,672 villages, which is 5.67 % of nations population but being just available 1% of the total water resources of the country. The state has extreme climatic and geographical condition and it suffers both the problems of quantity and quality of water (Bhalla and Bhalla, 2013; Yadav et al., 2010).

Jaipur, the capital of Rajasthan, has a total area of 11,117 sq. Km covering the 3.23% of the total area of the state, administered by 13 tehsils or sub-divisions. Our focused area of study is Bassi tehsil, out of the 13 tehsils of Jaipur district. The area of tehsil is 654.69 sq.km, located at $26^0$96' N latitude and $75^0$62'E longitude. In Bassi Tehsil there are 210 villages (famous for their

© 2015 Global Journals Inc. (US)

leather footwear and Embroidery beading). In the study area there are no major surface water sources however; main sources of drinking water are open wells, hand pumps and bore wells (Singh et al., 2012; CGWB, 2007; JDA, 2012).

In Bassi Tehsil 84 villages are reported having fluoride concentration more than 1.5 ppm, 78 villages are exhibiting nitrate concentration more than 45 ppm and 30 villages are having Electrical conductivity more than 3000 micromhos/cm (CGWB, 2007; Mathur, 2007).

Review of literature reveals that no studies have been made to scientifically investigate the ground water contamination of the study area. The present study aims to calculate the Water Quality Index (WQI) in most rural habitations of Bassi Tehsil of Jaipur, Rajasthan, India in order to assess the suitability of ground water for human uses and it also deals with the necessity of restoring the water quality.

III. Materials and Methods

a) Sample Collection

Ground water samples from a total of 71sampling sites of 50 villages of Bassi Tehsil were collected in pre-cleaned and rinsed polyethene bottles of two litre capacity with necessary precautions (Brown et al. 1974). The total water collection in the year of 2013 is divided in to two seasons, one is pre monsoon and another one is post monsoon. The sampling is carried out, during April 2013 for pre monsoon season and in September-October 2013 for post monsoon season from manually operated tube wells and hand pumps of varying depth.

b) Physico-chemical Analysis

All the samples were analyzed for the following Physico-chemical parameters; pH, Total Alkalinity (TA), Total Hardness (TH), Calcium hardness (Ca H), Magnesium hardness (Mg H), Chloride, Nitrate, Fluoride, Total Dissolved Solid (TDS) and Electrical Conductivity (EC). The analysis of water samples were out carried in accordance to standard analytical methods (APHA, 2005). All the chemicals used were of AR grade and double distilled water used for preparation of solutions. Details of the analysis methods are summarized in Table 1.

Table 1 : Parameters and methods employed in the physicochemical examination of water samples

S.No.	Parameters	Unit	Method Employed
1.	pH	-	Digital pH-meter
2.	Total Alkalinity	Mg/L	Titrimetric method (With H_2SO_4)
3.	Total Hardness (as $CaCO_3$)	Mg/L	Titrimetric method (with EDTA)
4.	Calcium Hardness (as $CaCO_3$)	Mg/L	Titrimetric method
5.	Magnesium Hardness (as $CaCO_3$)	Mg/L	Titrimetric method
6.	Chloride (as Cl^-)	Mg/L	Titrimetric method (With $AgNO_3$)
7.	Nitrate (as NO_3^-)	Mg/L	Spectrophotometric method
8.	Fluoride (as F^-)	Mg/L	Ion Selective Electrode
9.	Total Dissolved Solids	Mg/L	Digital TDS-meter
10.	Electrical Conductivity	μmhos/cm	Digital Conductivity-meter

c) Water Quality Index (WQI) Calculation

The calculation of WQI was made using weighed arithmetic index method (Brown et al., 1972) in the following steps-

Step I- Calculation of sub index of quality rating (qn)- Let there be n water quality parameters where the quality rating or sub index (*qn*) corresponding to the nth parameter is a number reflecting the relative value of this parameter in the polluted water with respect to its standard permissible value. The value of *qn* is calculated using the following expression.

$$qn = 100[(Vn - Vio) / (Sn - Vio)]$$

where,

qn = quality rating for the nth water quality parameter.

Vn = estimated value of the nth parameter at a given sampling station.

Sn = standard permissible value of nth parameter

Vio = ideal value of *n*th parameter in pure water.

All the ideal values (*Vio*) are taken as zero for drinking water except for pH=7.0 and dissolved oxygen=14.6mg/L.

Calculation of quality rating for pH

For pH the ideal value is 7.0 (for natural water) and a permissible value is 8.5 (for polluted water). Therefore, the quality rating for pH is calculated from the following relation:

$$qpH = 100\ [(VpH - 7.0)/(8.5 - 7.0)]$$

where

VpH = observed value of pH during the study period.

Calculation of quality rating for dissolved oxygen

The ideal value (*VDO*) for dissolved oxygen is 14.6 mg/L and standard permitted value for drinking water is 5 mg/L. Therefore, quality rating is calculated from following relation:

$$qDO = 100\ [(VDO - 14.6)/(5 - 14.6)]$$

Where,

© 2015 Global Journals Inc. (US)

VDO = measured value of dissolved oxygen

Step II- Calculation of unit weight (Wn)

Calculation of unit weight (*Wn*) for various water quality parameters are inversely proportional to the recommended standards for the corresponding parameters.

$$Wn = K/Sn$$

Where,

Wn = unit weight for nth parameters

Sn = standard value for nth parameters

K = constant for proportionality

The value of 'K' can be determined by-

$$K = \frac{1}{\frac{1}{S1}+\frac{1}{S2}+\cdots\ldots\frac{1}{Sn}} = \frac{1}{\frac{1}{\sum Sn}}$$

Step III-Calculation of WQI

WQI is calculated from the following equation-

$$WQI = \Sigma\, q_n Wn \,/\, \Sigma\, Wn$$

Table 2 : Water Quality Index (WQI) range and Quality Status of Water

Water Quality Index	Description
0-25	Excellent Water Quality
26-50	Good
51-75	Poor
76-100	Very poor
>100	Unsuitable for drinking

(Brown et al., 1972; Hariharan, 2007; Yogendra and Puttaiah, 2008; Chowdhury et al., 2012; Eugene et al., 2014; Sisodia and Moundiotiya, 2006; Rao et al., 2010)

IV. Result and Discussion

a) Physico-chemical Parameters

The respective values of all observed water quality parameters of groundwater samples in pre and post monsoon seasons are illustrated in Table 3 and 5 respectively. Statistical Parameters of groundwater samples of study area in both seasons are summarized in Table 4 and 6.

b) Quality Assessment using WQI

Water quality parameters mentioned in Table 3 and 5 are considered for calculating the WQI values using the above mentioned method. The water quality weightings used in the formula are mentioned in Table 7.

i. *Seasonal Variation of WQI*

Lower WQI values indicate that water is free from impurities at the sampling site, while WQI values more than 100 represents the polluted nature of water and its unsuitability for drinking purpose. Water Quality Index values for pre and post monsoon seasons are calculated and presented in Table 8. Developed Pie-diagrams (Figure 1 and 3) states the percentage variations of different qualities of waters in pre and post monsoon seasons, while Figure 2 and 4 represents the number of sampling sites classified on the basis of WQI values. From the results, it is seen that the WQI values in pre and post monsoon seasons are in the range of 13.53 to 1052.2 and 25.72 to 1024.6 respectively. The graphical representation of WQI values of ground water samples in Pre and Post monsoon seasons depicts that there is not any significant change in WQI values with respect to water quality.

© 2015 Global Journals Inc. (US)

Table 3 : Physico Chemical Characteristics of Groundwater Samples– Pre Monsoon Season

S.No.	Village	Source	Sample No.	Colour	Odour	pH	Alkalinity	TH	CaH	Ca^{+2} ions	MgH	Mg^{+2} ions	Cl^-	NO_3^-	F^-	TDS	EC
1	Akhepura	HP	S1	UO	UO	7.9	411	529	237	94.8	292	70.95	400	56	0.71	2216	3165
		TW	S2	UO	UO	8.4	305	115	43	17.2	72	17.49	31	15	1.44	778	1111
2	Anantpura	HP	S3	UO	UO	7.9	748	360	151	60.4	209	50.78	278	22	0.37	2100	3000
		TW	S4	UO	UO	8.3	462	161	67	26.8	94	22.84	176	18	1.8	1470	2100
3	Banskho	HP	S5	UO	UO	7.5	651	516	172	68.8	344	83.59	137	28	2.12	1696	2422
		TW	S6	UO	UO	8.4	396	105	40	16	65	15.79	123	12	1.99	1298	1855
4	Barala	HP	S7	UO	UO	7.5	586	192	78	31.2	114	27.7	333	78	2.05	2146	3065
5	Bassi	HP	S8	UO	UO	8.4	258	158	64	25.6	94	22.84	202	86	1.14	1590	2271
		TW	S9	UO	UO	7.8	333	156	67	26.8	89	21.62	163	44	0.79	1191	1701
6	Benada	HP	S10	UO	UO	7.6	435	732	336	134.4	396	96.22	315	131	0.93	1740	2486
7	Bharampur	HP	S11	UO	UO	7.7	368	188	78	31.2	110	26.73	176	20	0.42	920	1314
8	Chainpuriya	HP	S12	UO	UO	7.7	562	115	46	18.4	69	16.76	80	12	1.3	1034	1477
9	Chapariya	HP	S13	UO	UO	7.7	426	163	70	28	93	22.59	60	70	1.13	760	1085
10	Charangarh	HP	S14	UO	UO	7.4	243	264	121	48.4	143	34.74	33	29	0.71	792	1131
11	Chatarpura	HP	S15	UO	UO	7.6	707	112	45	18	67	16.28	65	19	4.67	1200	1714
12	Danau Kalan	HP	S16	UO	UO	8.2	582	46	22	8.8	24	5.83	20	22	1.4	1055	1507
13	Danau Khurd	HP	S17	UO	UO	7.7	409	568	206	82.4	362	87.96	484	8	0.9	2644	3777
		TW	S18	UO	UO	8.2	458	284	121	48.4	163	39.6	140	22	2.9	1680	2400
14	Garh	HP	S19	UO	UO	8.1	651	108	44	17.6	64	15.55	361	118	1	1962	2803
15	Ghasipura	HP	S20	UO	UO	8.4	344	88	32	12.8	56	13.6	20	38	0.03	847	1210
		TW	S21	UO	UO	8.3	766	74	33	13.2	41	9.96	51	26	11.4	1613	2304
16	Ghata	HP	S22	UO	UO	7.1	402	437	198	79.2	239	58.07	601	11	0.86	2593	3704
		TW	S23	UO	UO	7.3	467	632	297	118.8	335	81.4	468	14	0.7	2171	3101
17	Gudha Meena	HP	S24	UO	UO	7.8	423	160	66	26.4	94	22.84	23	18	0.27	980	1400
18	Gumanpura	HP	S25	UO	UO	7.8	460	317	128	51.2	189	45.92	380	16	0.88	2310	3300
		TW	S26	UO	UO	7.9	595	528	238	95.2	290	70.47	259	72	1.4	1764	2520
19	Gwalini	HP	S27	UO	UO	7.9	520	374	171	68.4	203	49.32	22	8	1.8	1333	1904
20	Hans Mahal	HP	S28	UO	UO	7.6	157	424	187	74.8	237	57.59	220	7	0.32	1182	1688
21	Hanumanpura	HP	S29	UO	UO	7.7	552	123	51	20.4	72	17.49	83	27	0.8	967	1381
		TW	S30	UO	UO	8.2	784	67	23	9.2	44	10.69	95	24	12.5	1473	2104
22	Jhajhwar	HP	S31	UO	UO	7.4	523	668	283	113.2	385	93.55	1430	58	0.41	4235	6050
		TW	S32	UO	UO	8.4	254	109	45	18	64	15.55	107	45	0.8	980	1400
23	Jhar	HP	S33	UO	UO	7.9	412	233	102	40.8	131	31.83	44	37	0.65	960	1371
24	Kalyanpura	HP	S34	UO	UO	8.5	527	89	36	14.4	53	12.87	28	34	1.3	1122	1603
		TW	S35	UO	UO	8.2	530	65	22	8.8	43	10.44	41	16	1.8	1190	1700
25	Kaneta	HP	S36	UO	UO	7.8	286	364	144	57.6	220	53.46	1424	6	0.11	4762	6802
		TW	S37	UO	UO	8.4	564	77	34	13.6	43	10.44	40	14	0.7	1050	1500
26	Kaneti	HP	S38	UO	UO	7.5	586	867	322	128.8	545	132.43	1075	236	1.06	4890	6985
27	Kanota	HP	S39	UO	UO	8.3	409	203	90	36	113	27.45	296	33	0.62	1835	2621
		TW	S40	UO	UO	8.4	741	91	36	14.4	55	13.36	225	8	1.7	1983	2833
28	Kashipura	HP	S41	UO	UO	7.5	695	105	40	16	65	15.79	90	21	3.2	1305	1864
29	Keshopura	HP	S42	UO	UO	7.6	555	350	140	56	210	51.03	644	5	0.75	2520	3600
30	Kuthada Kalan	HP	S43	UO	UO	7.1	233	66	25	10	41	9.96	20	22	0.77	709	1013
31	Lalgarh	HP	S44	UO	UO	7.6	510	284	122	48.8	162	39.36	230	15	1.42	1240	1771
32	Mundali	HP	S45	UO	UO	7.7	482	117	46	18.4	71	17.25	55	12	4.2	1321	1887
		TW	S46	UO	UO	8.2	734	90	34	13.6	56	13.6	152	26	3.38	1682	2404
33	Nagal Karna	HP	S47	UO	UO	7.4	371	154	57	22.8	97	23.57	60	11	4.35	1295	1850
		TW	S48	UO	UO	8.1	795	73	32	12.8	41	9.96	80	26	5.9	1610	2300
34	Parasoli	HP	S49	UO	UO	7.7	412	774	397	158.8	377	91.61	320	2	1.17	2146	3065
		TW	S50	UO	UO	8.4	464	78	35	14	43	10.44	60	23	2.2	1050	1500
35	Parempura	HP	S51	UO	UO	7.8	431	641	283	113.2	358	86.99	444	18	1.15	3474	4963
36	Patan	HP	S52	UO	UO	7.1	655	622	264	105.6	358	86.99	885	10	0.52	3535	5050
37	Peepalabai	HP	S53	UO	UO	7.2	160	374	209	83.6	165	40.09	266	82	1.84	1680	2400
		TW	S54	UO	UO	8.2	435	400	185	74	215	52.24	65	26	8.95	1505	2150
38	Peipura	HP	S55	UO	UO	7.8	532	267	118	47.2	149	36.2	250	11	1.35	1750	2500
		TW	S56	UO	UO	8.4	435	110	40	16	70	17.01	35	28	1.5	875	1250
39	Rajwas	HP	S57	UO	UO	7.6	648	463	205	82	258	62.69	551	52	1.33	2306	3295
40	Ramser	HP	S58	UO	UO	7.3	520	254	103	41.2	151	36.69	60	18	3.8	1050	1500
		TW	S59	UO	UO	8.4	464	118	44	17.6	74	17.98	50	25	2	1053	1504
41	Ratanpura	HP	S60	UO	UO	7.9	532	299	135	54	164	39.85	80	32	1.02	1435	2050

© 2015 Global Journals Inc. (US)

S.No.	Village	Source	Sample No.	Colour	Odour	pH	Alkalinity	TH	CaH	Ca^{+2} ions	MgH	Mg^{+2} ions	Cl^-	NO_3^-	F^-	TDS	EC
		TW	S61	UO	UO	8.4	552	88	35	14	53	12.87	60	19	1.07	1129	1613
42	Roopura	HP	S62	UO	UO	7.5	263	107	42	16.8	65	15.79	130	24	1.44	1113	1590
		TW	S63	UO	UO	8.1	415	430	200	80	230	55.89	81	25	8.75	1610	2300
43	Sambhariya	HP	S64	UO	UO	7.4	314	232	96	38.4	136	33.04	58	14	0.07	356	508
44	Shankarpura	HP	S65	UO	UO	7.6	588	134	53	21.2	81	19.68	58	6	4.2	1028	1469
45	Siya Ka Bas	HP	S66	UO	UO	7.7	235	234	98	39.2	136	33.04	62	91	0.85	1225	1750
46	Tehda	HP	S67	UO	UO	8.2	276	145	62	24.8	83	20.16	221	20	1.4	1478	2111
47	Tekchandpura	HP	S68	UO	UO	7.8	328	306	133	53.2	173	42.03	40	14	0.2	563	804
48	Tilpatti	HP	S69	UO	UO	7.8	642	194	81	32.4	113	27.45	80	14	0.9	1280	1828
49	Todabhata	HP	S70	UO	UO	8.5	328	65	22	8.8	43	10.44	52	24	2	984	1405
50	Tunga	HP	S71	UO	UO	7.6	36	38	16	6.4	22	5.34	15	10	0.1	63	86

Where- TA = Total Alkalinity, TH = Total Hardness, CaH = Calcium Hardness, MgH = Magnesium Hardness, Cl = Chloride, NO_3 = Nitrate, F^- = Fluoride, TDS = Total Dissolved Solids, EC = Electrical Conductivity.

All parameters are expressed in mg/L except pH and EC. EC is expressed in µmhos/cm.

Ca^{+2} = Ca mg/L (as $CaCO_3$), Mg^{+2} = Mg mg/L (as $CaCO_3$).

UO = Unobjectionable, HP = Hand Pump, TW = Tube Well.

Table 4 : Minimum, Maximum and Average Characteristics of Groundwater Sampling Stations – Pre Monsoon Season

S.No.	Parameter	Minimum	Maximum	Average	Standard Deviation
1.	pH	7.1	8.5	7.86	0.39
2.	Total Alkalinity (mg/L)	36	795	469.47	162.55
3.	Total Harness (mg/L)	38	867	260.19	201.90
4.	Calcium Hardness (mg/L)	16	397	111.23	90.30
5.	Ca^{+2} Ions (mg/L)	6.4	158.8	44.49	36.12
6.	Magnesium Hardness (mg/L)	22	545	148.95	113.86
7.	Mg^{+2} Ions (mg/L)	5.34	132.43	36.19	27.66
8.	Chloride (mg/L)	15	1430	222.01	290.48
9.	Nitrate (mg/L)	2	236	32.16	35.64
10.	Fluoride (mg/L)	0.03	12.5	1.96	2.41
11.	TDS (mg/L)	63	4890	1589.88	899.48
12.	EC (µmhos/cm)	86	6985	2271.05	1285.04

Table 5 : Physico-Chemical Characteristics of Groundwater Samples – Post Monsoon Season

S. No.	Village	Source	Sample No.	Colour	Odour	pH	Alkalinity	TH	CaH	Ca^{+2} ions	MgH	Mg^{+2} ions	Cl^-	NO_3^-	F^-	TDS	EC
1	Akhepura	HP	S1	UO	UO	8.1	410	406	180	72	226	54.91	306	102	1.36	1581	2259
		TW	S2	UO	UO	8.6	294	82	32	12.8	50	12.15	22	21	1.94	616	880
2	Anantpura	HP	S3	UO	UO	7.7	607	284	122	48.8	162	39.36	194	15	0.85	1493	2132
		TW	S4	UO	UO	7.7	517	540	245	98	295	71.68	417	29	0.73	2074	2962
3	Banskho	HP	S5	UO	UO	7.8	580	478	173	69.2	305	74.11	193	31	0.92	1630	2328
		TW	S6	UO	UO	8.5	363	98	41	16.4	57	13.85	98	14	1.54	1207	1724
4	Barala	HP	S7	UO	UO	7.7	484	110	45	18	65	15.79	118	7	1.8	668	954
5	Bassi	HP	S8	UO	UO	7.6	459	161	68	27.2	93	22.59	171	94	0.81	1274	1820
		TW	S9	UO	UO	7.4	255	187	80	32	107	26	113	56	0.51	1356	1937
6	Benada	HP	S10	UO	UO	8.5	838	254	111	44.4	143	34.74	107	59	0.98	1612	2303
7	Bharampur	HP	S11	UO	UO	7.8	482	364	163	65.2	201	48.84	146	21	0.6	1044	1491
8	Chainpuriya	HP	S12	UO	UO	7.7	703	261	113	45.2	148	35.96	118	11	1	1206	1723
9	Chapariya	HP	S13	UO	UO	7.7	282	211	88	35.2	123	29.88	28	27	0.9	424	605
10	Charangarh	HP	S14	UO	UO	7.7	168	220	92	36.8	128	31.1	40	27	0.32	432	617
11	Chatarpura	HP	S15	UO	UO	7.6	698	147	63	25.2	84	20.41	60	18	2.6	956	1365
12	Danau Kalan	HP	S16	UO	UO	7.6	454	159	66	26.4	93	22.59	34	24	1.17	712	1018

© 2015 Global Journals Inc. (US)

S. No.	Village	Source	Sample No.	Colour	Odour	pH	Alkalinity	TH	CaH	Ca^{+2} ions	MgH	Mg^{+2} ions	Cl^-	NO_3^-	F^-	TDS	EC
13	Danau Khurd	HP	S17	UO	UO	7.2	312	660	237	94.8	423	102.8	103	106	0.45	910	1300
		TW	S18	UO	UO	7.8	382	337	151	60.4	186	45.19	84	29	2.6	1478	2111
14	Garh	HP	S19	UO	UO	7.8	422	777	392	156.8	385	93.55	355	94	1.02	1685	2407
15	Ghasipura	HP	S20	UO	UO	7.7	365	127	51	20.4	76	18.46	21	13	0.55	640	914
		TW	S21	UO	UO	7.9	817	92	37	14.8	55	13.36	54	19	11.9	1271	1816
16	Ghata	HP	S22	UO	UO	7.9	443	313	140	56	173	42.03	246	14	1.43	1414	2020
		TW	S23	UO	UO	7.7	514	501	217	86.8	284	69.01	367	17	0.96	1669	2384
17	Gudha Meena	HP	S24	UO	UO	7.6	403	199	88	35.2	111	26.97	20	19	0.4	642	917
18	Gumanpura	HP	S25	UO	UO	7.7	384	208	89	35.6	119	28.91	103	8	2	808	1154
		TW	S26	UO	UO	7.8	509	404	181	72.4	223	54.18	183	53	2.5	1205	1721
19	Gwalini	HP	S27	UO	UO	7.7	510	270	125	50	145	35.23	80	6	1.4	891	1273
20	Hans Mahal	HP	S28	UO	UO	7.6	476	1100	423	169.2	677	164.5	1455	20	2.08	5434	7763
21	Hanumanpura	HP	S29	UO	UO	7.1	560	316	144	57.6	172	41.79	507	95	1.6	2196	3137
		TW	S30	UO	UO	7.5	812	92	33	13.2	59	14.33	148	37	12.2	1837	2624
22	Jhajhwar	HP	S31	UO	UO	7.9	575	440	190	76	250	60.75	436	41	1.1	2204	3149
		TW	S32	UO	UO	8.6	278	76	31	12.4	45	10.93	154	38	1.08	647	924
23	Jhar	HP	S33	UO	UO	7.8	488	271	118	47.2	153	37.17	63	32	0.41	926	1322
24	Kalyanpura	HP	S34	UO	UO	7.8	256	307	134	53.6	173	42.03	30	18	0.8	487	696
		TW	S35	UO	UO	7.8	318	83	29	11.6	54	13.12	52	13	1.2	607	867
25	Kaneta	HP	S36	UO	UO	7.7	223	268	105	42	163	39.6	57	14	0.5	804	1148
		TW	S37	UO	UO	8.2	459	56	26	10.4	30	7.29	34	21	0.39	651	930
26	Kaneti	HP	S38	UO	UO	7.4	674	347	129	51.6	218	52.97	80	2	0.14	918	1312
27	Kanota	HP	S39	UO	UO	7.5	415	361	148	59.2	213	51.75	342	40	1.3	1436	2051
		TW	S40	UO	UO	7.8	689	134	61	24.4	73	17.73	266	11	2.3	1606	2294
28	Kashipura	HP	S41	UO	UO	7.6	411	161	64	25.6	97	23.57	86	19	1.35	910	1301
29	Keshopura	HP	S42	UO	UO	7.6	330	227	92	36.8	135	32.8	80	26	0.49	1333	1904
30	Kuthada Kalan	HP	S43	UO	UO	7.6	785	262	110	44	152	36.93	42	21	0.5	800	1142
31	Lalgarh	HP	S44	UO	UO	7.7	505	185	80	32	105	25.51	105	49	0.9	1042	1488
32	Mundali	HP	S45	UO	UO	7.8	600	106	42	16.8	64	15.55	92	21	5.6	1131	1616
		TW	S46	UO	UO	8.3	822	77	31	12.4	46	11.17	206	32	4.02	1951	2787
33	Nagal Karna	HP	S47	UO	UO	7.7	389	119	43	17.2	76	18.46	148	2	1.9	608	869
		TW	S48	UO	UO	8.5	859	53	21	8.4	32	7.77	112	19	3.25	822	1174
34	Parasoli	HP	S49	UO	UO	7.8	440	553	280	112	273	66.33	326	15	1.43	1322	1889
		TW	S50	UO	UO	8.5	516	48	22	8.8	26	6.31	56	34	1.8	693	990
35	Parempura	HP	S51	UO	UO	7.8	403	520	200	80	320	77.76	475	13	0.8	2880	4114
36	Patan	HP	S52	UO	UO	7.7	535	479	199	79.6	280	68.04	652	18	1.22	2468	3526
37	Peepalabai	HP	S53	UO	UO	7.8	206	228	123	49.2	105	25.51	58	25	0.5	408	583
		TW	S54	UO	UO	7.7	513	248	99	39.6	149	36.2	38	16	5.3	723	1033
38	Peipura	HP	S55	UO	UO	7.7	700	242	106	42.4	136	33.04	446	24	1.23	1946	2780
		TW	S56	UO	UO	8.2	504	97	34	13.6	63	15.3	47	41	1.3	1016	1451
39	Rajwas	HP	S57	UO	UO	7.6	704	428	183	73.2	245	59.53	320	27	1.3	2883	4118
40	Ramser	HP	S58	UO	UO	7.3	540	210	85	34	125	30.37	100	13	1.3	1040	1485
		TW	S59	UO	UO	8.3	483	89	27	10.8	62	15.06	66	21	1.06	924	1320
41	Ratanpura	HP	S60	UO	UO	7.8	860	260	113	45.2	147	35.72	193	8	1.13	1600	2286
		TW	S61	UO	UO	7.9	871	190	75	30	115	27.94	130	19	2.65	1440	2057
42	Roopura	HP	S62	UO	UO	7.8	353	243	110	44	133	32.31	60	30	1.4	722	1031
		TW	S63	UO	UO	8.4	511	627	283	113.2	344	83.59	58	28	8.49	1159	1656
43	Sambhariya	HP	S64	UO	UO	7.6	425	145	60	24	85	20.65	30	30	2.25	920	1314
44	Shankarpura	HP	S65	UO	UO	7.8	540	197	85	34	112	27.21	80	2	3.6	1125	1607
45	Siya Ka Bas	HP	S66	UO	UO	7.6	313	179	73	29.2	106	25.75	56	71	1.13	773	1104
46	Tehda	HP	S67	UO	UO	7.7	425	174	72	28.8	102	24.78	172	24	1.55	1140	1629
47	Tekchandpura	HP	S68	UO	UO	7.8	254	292	130	52	162	39.36	40	12	0.25	529	756
48	Tilpatti	HP	S69	UO	UO	7.8	633	366	153	61.2	213	51.75	114	22	0.76	1306	1867

© 2015 Global Journals Inc. (US)

S. No.	Village	Source	Sample No.	Colour	Odour	pH	Alkalinity	TH	CaH	Ca^{+2} ions	MgH	Mg^{+2} ions	Cl^-	NO_3^-	F^-	TDS	EC
49	Todabhata	HP	S70	UO	UO	7.8	550	129	54	21.6	75	18.22	63	20	1.8	1043	1490
50	Tunga	HP	S71	UO	UO	7.8	290	780	395	158	385	93.55	288	309	0.65	1604	2291

Table 6 : Minimum, Maximum and Average Characteristics of Groundwater Sampling Stations – Post Monsoon Season

S.No.	Parameter	Minimum	Maximum	Average	Standard Deviation
1.	pH	7.1	8.6	7.80	0.31
2.	Total Alkalinity (mg/L)	168	871	495.04	174.15
3.	Total Harness (mg/L)	48	1100	276.26	195.79
4.	Calcium Hardness (mg/L)	21	423	118.38	87.05
5.	Ca^{+2} Ions (mg/L)	8.4	169.2	47.35	34.82
6.	MagnesiumHardness (mg/L)	26	677	157.88	111.31
7.	Mg^{+2} Ions (mg/L)	6.31	164.51	38.36	27.05
8.	Chloride (mg/L)	20	1455	171.04	206.72
9.	Nitrate (mg/L)	2	309	32.77	40.60
10.	Fluoride (mg/L)	0.14	12.2	1.82	2.20
11.	TDS (mg/L)	408	5434	1252.28	746.36
12.	EC (μmhos/cm)	583	7763	1788.87	1066.23

Table 7 : Unit Weightage of parameters for Drinking Water based on standard values

S.No.	Parameter	Standard Value (Sn)	Recommending Agency	Ideal Value (V_{id})	Unit Weight (Wn= K/Sn)
1.	pH	8.5	BIS/ICMR/WHO	7.0	0.097427
2.	Total Alkalinity	120	ICMR/WHO	0	0.006901
3.	Total Hardness	300	BIS/ICMR	0	0.002760
4.	Calcium	75	BIS/ICMR/WHO	0	0.011042
5.	Magnesium	30	BIS/ICMR/WHO	0	0.027604
6.	Chloride	250	BIS/ICMR	0	0.003313
7.	Nitrate	45	BIS/ICMR/WHO	0	0.018403
8.	Fluoride	1.0	BIS/ICMR/WHO	0	0.828133
9.	Total Dissolved Solids	500	BIS/ICMR/WHO	0	0.001656
10.	Electrical Conductivity	300	ICMR/WHO	0	0.002760

(All values are in mg/l except pH and EC)

Table 8 : Calculated WQI values and quality rating of water in the study area in Pre and Post Monsoon Seasons

S. No.	Village	Source	Sample No.	Pre- Monsoon		Post- Monsoon	
				WQI Value	Quality Rating	WQI Value	Quality Rating
1	Akhepura	HP	S1	81.883	VP	135.79	Unsuitable
		TW	S2	134.0011	Unsuitable	176.02	Unsuitable
2	Anantpura	HP	S3	51.405	Poor	86.357	VP
		TW	S4	166.1971	Unsuitable	81.65	VP
3	Banskho	HP	S5	195.8513	Unsuitable	97.203	VP
		TW	S6	180.74	Unsuitable	143.66	Unsuitable
4	Barala	HP	S7	186.73	Unsuitable	159.75	Unsuitable
5	Bassi	HP	S8	114.01	Unsuitable	82.41	VP
		TW	S9	79.036	VP	54.006	Poor
6	Benada	HP	S10	103.56	Unsuitable	105.01	Unsuitable
7	Bharampur	HP	S11	47.101	Good	66.214	Poor

© 2015 Global Journals Inc. (US)

S. No.	Village	Source	Sample No.	Pre- Monsoon		Post- Monsoon	
				WQI Value	Quality Rating	WQI Value	Quality Rating
8	Chainpuriya	HP	S12	119.65	Unsuitable	98.208	VP
9	Chapariya	HP	S13	107.41	Unsuitable	86	Poor
10	Charangarh	HP	S14	69.478	Poor	37.48	Good
11	Chatarpura	HP	S15	399.4	Unsuitable	228	Unsuitable
12	Danau Kalan	HP	S16	130.45	Unsuitable	108.21	Unsuitable
13	Danau Khurd	HP	S17	96.57	VP	57.788	Poor
		TW	S18	259.05	Unsuitable	231.79	Unsuitable
14	Garh	HP	S19	104.02	Unsuitable	110.81	Unsuitable
15	Ghasipura	HP	S20	18.051	Ex	55.921	Poor
		TW	S21	961.89	Unsuitable	1000.5	Unsuitable
16	Ghata	HP	S22	86.605	VP	135.02	Unsuitable
		TW	S23	77.189	VP	99.02	VP
17	Gudha Meena	HP	S24	35.005	Good	44.383	Good
18	Gumanpura	HP	S25	90.947	VP	177.55	Unsuitable
		TW	S26	139.77	Unsuitable	225.97	Unsuitable
19	Gwalini	HP	S27	166.34	Unsuitable	129.46	Unsuitable
20	Hans Mahal	HP	S28	40.613	Good	209.21	Unsuitable
21	Hanumanpura	HP	S29	78.8	VP	149.53	Unsuitable
		TW	S30	1052.2	Unsuitable	1024.6	Unsuitable
22	Jhajhwar	HP	S31	61.684	Poor	113.24	Unsuitable
		TW	S32	82.195	VP	105.51	Unsuitable
23	Jhar	HP	S33	68.938	Poor	49.235	Good
24	Kalyanpura	HP	S34	125.18	Unsuitable	79.435	VP
		TW	S35	163.72	Unsuitable	109.45	Unsuitable
25	Kaneta	HP	S36	32.02	Good	53.715	Poor
		TW	S37	73.891	Poor	45.58	Good
26	Kaneti	HP	S38	128.4	Unsuitable	25.72	Good
27	Kanota	HP	S39	70.143	Poor	123.71	Unsuitable
		TW	S40	159.55	Unsuitable	205.19	Unsuitable
28	Kashipura	HP	S41	277.16	Unsuitable	123.14	Unsuitable
29	Keshopura	HP	S42	80.245	VP	53.505	Poor
30	Kuthada Kalan	HP	S43	68.973	Poor	56.335	Poor
31	Lalgarh	HP	S44	131.98	Unsuitable	88.828	VP
32	Mundali	HP	S45	359.84	Unsuitable	477.01	Unsuitable
		TW	S46	297.49	Unsuitable	352.15	Unsuitable
33	Nagal Karna	HP	S47	370.28	Unsuitable	167.46	Unsuitable
		TW	S48	505.31	Unsuitable	286.99	Unsuitable
34	Parasoli	HP	S49	119.32	Unsuitable	137.63	Unsuitable
		TW	S50	197.94	Unsuitable	165.13	Unsuitable
35	Parempura	HP	S51	120.21	Unsuitable	88.47	VP
36	Patan	HP	S52	65.009	Poor	122.19	Unsuitable
37	Peepalabai	HP	S53	166.33	Unsuitable	52.83	Poor
		TW	S54	761.36	Unsuitable	452.44	Unsuitable
38	Peipura	HP	S55	127.99	Unsuitable	119.09	Unsuitable
		TW	S56	140.35	Unsuitable	123.45	Unsuitable
39	Rajwas	HP	S57	131.82	Unsuitable	128.82	Unsuitable
40	Ramser	HP	S58	326.39	Unsuitable	118.57	Unsuitable
		TW	S59	182.23	Unsuitable	103.09	Unsuitable
41	Ratanpura	HP	S60	101.89	Unsuitable	111.12	Unsuitable
		TW	S61	105.06	Unsuitable	236.81	Unsuitable
42	Roopura	HP	S62	128.8	Unsuitable	129.5	Unsuitable
		TW	S63	744.64	Unsuitable	728.18	Unsuitable
43	Sambhariya	HP	S64	15.25	Ex	197.83	Unsuitable
44	Shankarpura	HP	S65	359.35	Unsuitable	311.65	Unsuitable
45	Siya Ka Bas	HP	S66	85.941	VP	106.48	Unsuitable
46	Tehda	HP	S67	131.22	Unsuitable	141.3	Unsuitable
47	Tekchandpura	HP	S68	30.129	Good	33.43	Good

© 2015 Global Journals Inc. (US)

S. No.	Village	Source	Sample No.	Pre- Monsoon		Post- Monsoon	
				WQI Value	Quality Rating	WQI Value	Quality Rating
48	Tilpatti	HP	S69	89.386	VP	80.97	VP
49	Todabhata	HP	S70	181.07	Unsuitable	162.15	Unsuitable
50	Tunga	HP	S71	13.535	Ex	88.001	VP

Where- VP = Very Poor, Ex = Excellent

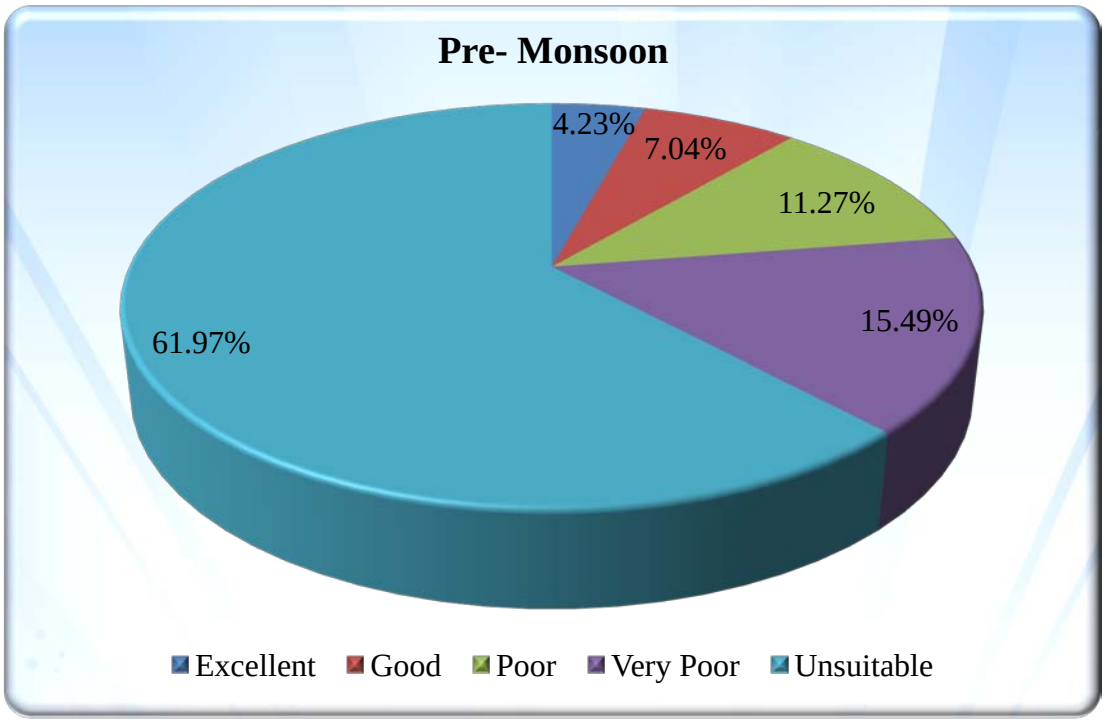


Figure 1 : Percentage representation of WQI classification in Pre monsoon season

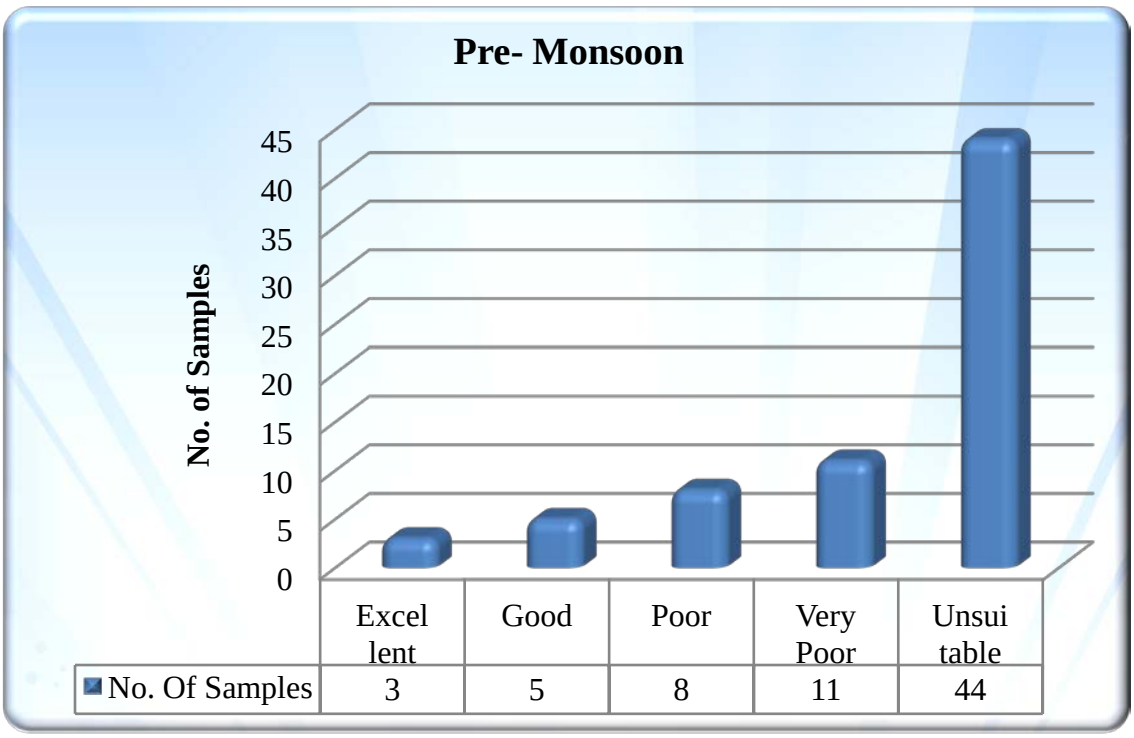


Figure 2 : Number of Villages classified on the basis of WQI values in Pre monsoon season

© 2015 Global Journals Inc. (US)

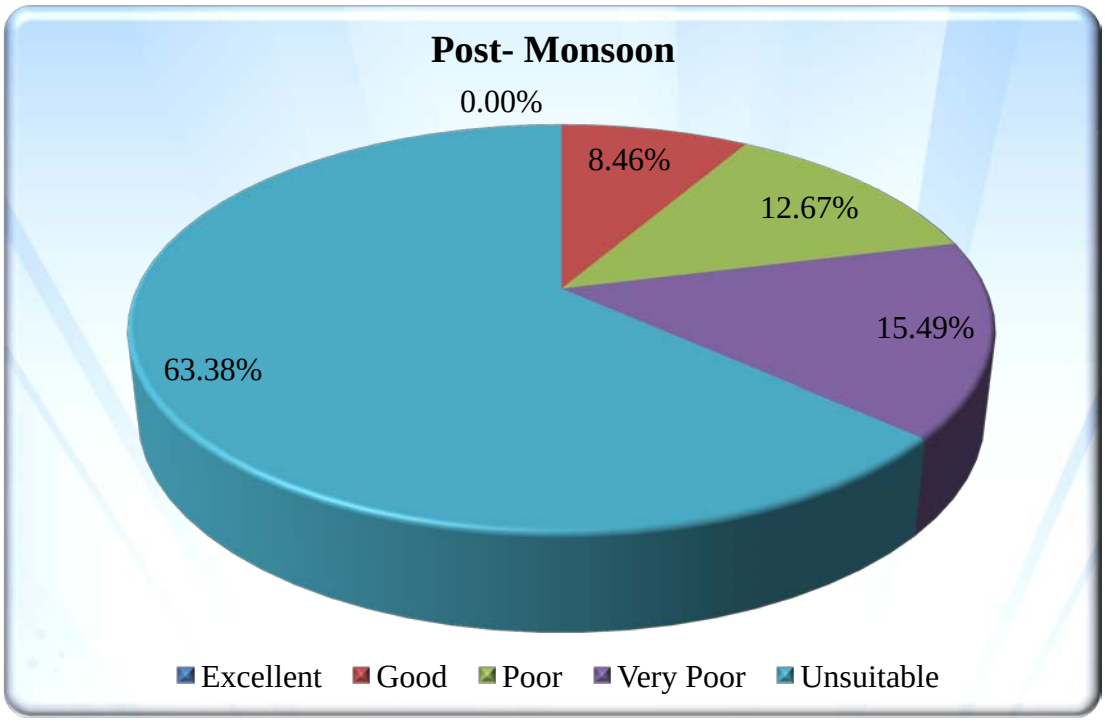


Figure 3 : Percentage representation of WQI classification in Post monsoon season

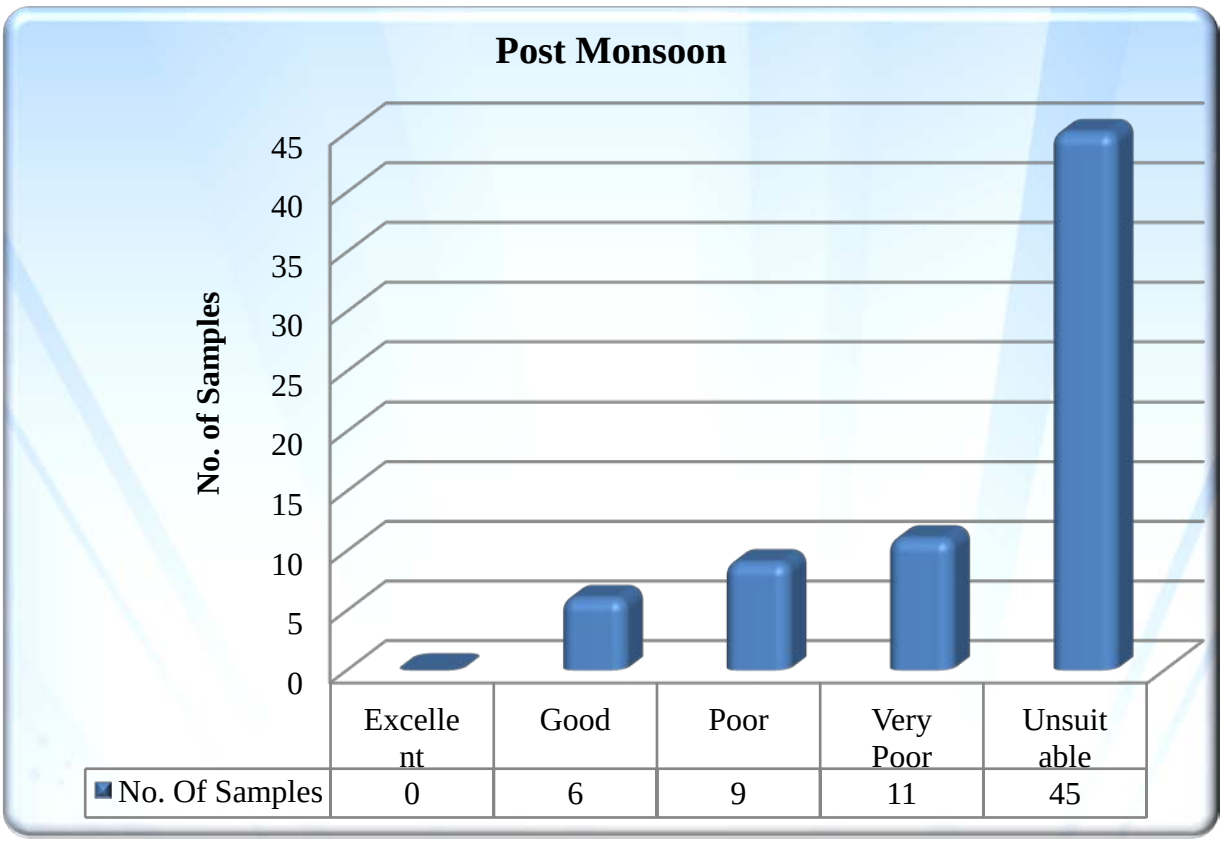


Figure 4 : Number of Villages classified on the basis of WQI values in Post monsoon season

© 2015 Global Journals Inc. (US)

ii. *Spatial Variation of WQI*

According to the results, it is revealed that in pre-monsoon season only three sampling sites namely *Ghasipura* (HP), *Sambhariya* and *Tunga* exhibit excellent groundwater quality for drinking, and five sampling sites namely *Bharampuri, Gudha Meena, Hans Mahal, Kaneta (HP)* and *Tekchandpura* indicate good ground water quality for drinking. The remaining 63 sampling sites are not directly suitable for potability because they are classified as poor, very poor and unfit categories as per the WQI ranges.

In post monsoon season there is not even a single sampling site under the excellent category and only six sampling sites namely *Charangarh, Gudha Meena, Jhar, Kaneta (TW), Kaneti,* and *Tekchandpura* fall in the category good for drinking. The rest 65 sampling sites are not suitable for potability as according to their WQI ranges they are classified as poor, very poor and unfit for drinking purposes. Graph (Figure 5) depicts the spatial variation of the WQI in the study area for the pre and post monsoon seasons both.

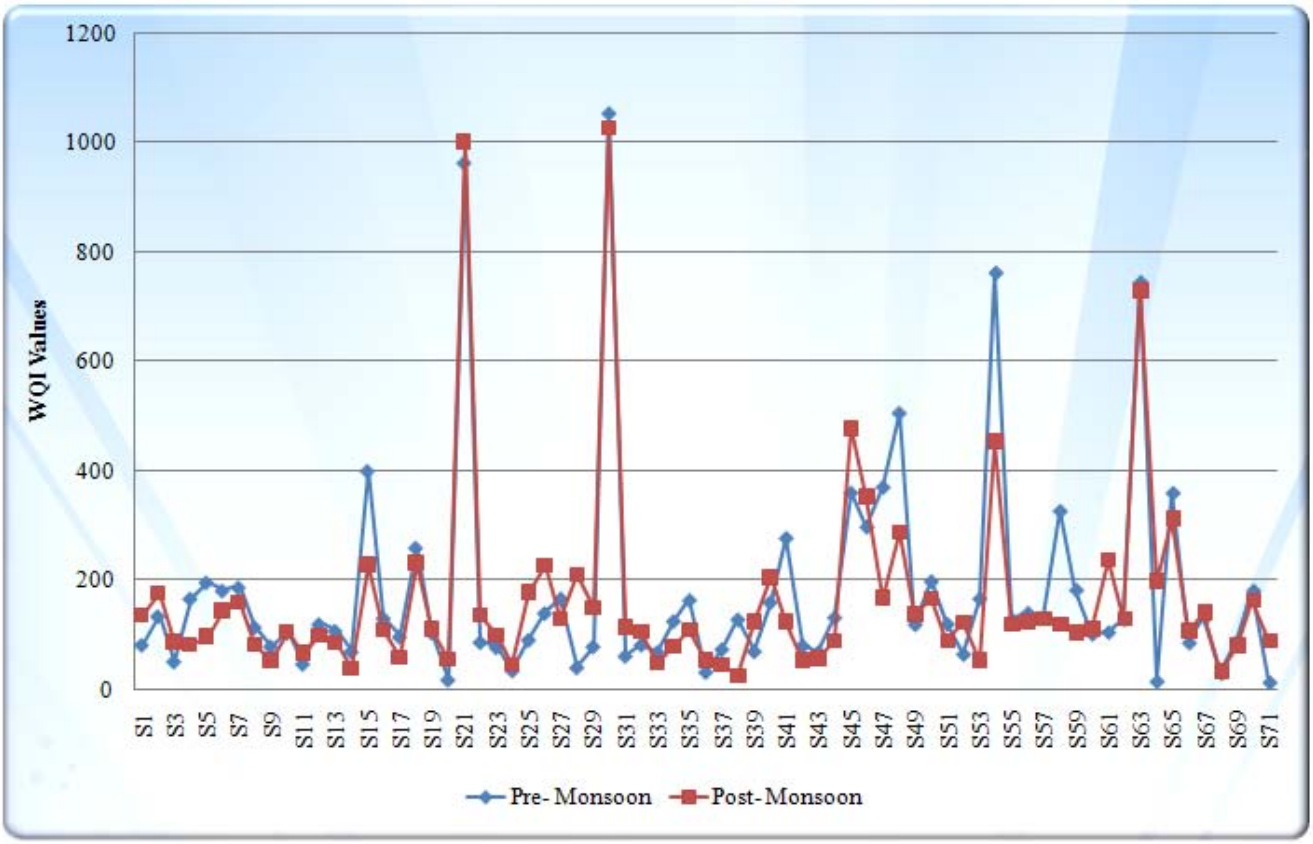


Figure 5 : Comparative graphical representation of WQI of groundwater at different Locations in the study area in pre and post monsoon seasons

Most of the stations are having groundwater of very poor and unsuitable categories with water quality ranging from 75 to 100 and >100 respectively. Table 9 and 10 contains the information about the various sampling sites in the study area with varying values of WQI in pre and post monsoon season respectively. These tables provide the appropriate information to take necessary steps in treatment of groundwater in the study area.

© 2015 Global Journals Inc. (US)

Table 9 : Classifications of groundwater in the Study area with respect to WQI in Pre Monsoon Season

Name of the Sampling Site	No. of Samples	WQI Range	Quality Category
Ghasipura (HP), Sambhariya, Tunga.	03	0-25	Excellent
Bharampuri, Gudha Meena, Hans Mahal, Kaneta (HP), Tekchandpura.	05	26-50	Good
Anantpura (HP), Charangarh, Jhajhwar (HP), Jhar, Kaneta (TW), Kanota (HP), Kuthada Kalan, Patan.	08	51-75	Poor
Akhepura (HP), Bassi (TW), Danau Khurd (HP), Ghata (both), Gumanpura (HP), Hanumanpura (HP), Jhajhwar (TW), Keshopura, Siya Ka Bas, Tilpatti.	11	76-100	Very Poor
Akhepura (TW), Anantpura (TW), Banskho (HP and TW), Barala, Bassi (HP), Benada, Chainpuriya, Chapariya, Chatarpura, Danau Kalan, Danau Khurd (TW), Garh, Ghasipura (TW), Gumanpura (TW), Gwalini, Hanumanpura (TW), Kalyanpura (HP and TW), Kaneti, Kanota (TW), Kashipura, Lalgarh, Mundali (HP and TW), Nagal Karna (HP and TW), Parasoli (HP and TW), Parempura, Peepalabai (HP and TW), Peipura (HP and TW), Rajwas, Ramser (HP and TW), Ratanpura (HP and TW), Roopura (HP and TW), Shankarpura, Tehda, Todabhata.	44	Above 100	Unsuitable for Drinking

Table 10 : Classifications of groundwater in the Study area with respect to WQI in Post Monsoon Season

Name of the Sampling Site	No. of Samples	WQI Range	Quality Category
Nil	00	0-25	Excellent
Charangarh, Gudha Meena, Jhar, Kaneta (TW), Kaneti, Tekchandpura.	06	26-50	Good
Bassi (TW), Bharampuri, Chapariya, Danau Khurd (HP), Ghasipura (HP), Kaneta (HP), Keshopura, Kuthada Kalan, Peepalabai (HP).	09	51-75	Poor
Anantpura (HP and TW), Banskho (HP), Bassi (HP), Chainpuriya, Ghata (TW), Kalyanpura (HP), Lalgarh, Parempura, Tilpatti, Tunga.	11	76-100	Very Poor
Akhepura (HP and TW), Banskho (TW), Barala, Benada, Chatarpura, Danau Kalan, Danau Khurd (TW), Garh, Ghasipura (TW), Ghata (HP), Gumanpura (HP and TW), Gwalini, Hans Mahal, Hanumanpura (HP and TW), Jhajhwar (HP and TW), Kalyanpura (TW), Kanota (HP and TW), Kashipura, Mundali (HP and TW), Nagal Karna (HP and TW), Parasoli (HP and TW), Patan, Peepalabai (TW), Peipura (HP and TW), Rajwas, Ramser (HP and TW), Ratanpura (HP and TW), Roopura (HP and TW), Sambhariya, Shankarpura, Siya Ka Bas, Tehda, Todabhata.	45	Above 100	Unsuitable for Drinking

V. Conclsions

WQI values of groundwater samples analyzed for pre and post monsoon seasons depict that there exists an uncertain and narrow change in the WQI values which is not very significant with reference to potability and groundwater quality.

The results of current study revealed that ground water, used by the people residing in villages of Bassi Tehsil, is not suitable for drinking purpose. So, there is a need of continuous monitoring of water quality and proper environment management plan must be adopted to control drinking water pollution immediately. Based on these results and analysis of water samples, it is also recommended to use water only after boiling and filtering or by Reverse Osmosis treatment for drinking purpose by the individuals to prevent adverse health effects.

References Références Referencias

1. APHA. Standard Methods for the Examination of Water and Waste Water (21st Ed.). Washington DC: American Public Health Association (2005).
2. Bhalla L R and Bhalla K "Contemporary Rajasthan" 8th Edition, Kuldeep Publication India (2013).
3. Brown E, Skougstad M W and Fishman M J. Method for collection and analysis of water sample for dissolved minerals for dissolved minerals and gases (Book No. 5). Washington, DC: US Department of Interior (1974).
4. Brown R M, McCleiland N J, Deininger R A and O'Connor M F. A water quality index - crossing the psychological barrier (Jenkis, S.H. ed.) *Proceedings of International Conference on Water Pollution Resesrch, Jerusalem*, 6,787-797(1972).
5. Central Ground Water Board, Ministry of Water Resources, Government of India, Ground Water Scenario, Jaipur District, Rajasthan, CGWB, Jaipur (2007).
6. Chand T "General Studies", Tata McGraw-Hill Education Private Limited New Delhi (2013).
7. Chauhan A and Singh S "Evaluation of Ganga Water for Drinking Purpose by Water Quality Index At Rishikesh, Uttarakhand, India." *Report and Opinion*, 2(9), 53-61(2010).

© 2015 Global Journals Inc. (US)

8. Chowdhury R M, Muntasir S Y and Hossain M M "Water quality index of water bodies along Faridpur-Barisal road in Bangladesh". *Global Engineers & Technologists Review*, 2(3), 1-8(2012).
9. Dhok R P, Patil A S and Ghole V S, "Quality of Ground Water and its Suitability for drinking Purpose" *Water Research and Develpoment*, 1(1), 27-35 (2011).
10. Eugene Lamare R, Shylla R and Singh O P "Assessment of ground water quality from dug wells in west Jaintia hills district, Meghalaya, India" International Journal of Environmental Sciences, 5(3), 544-552 (2014).
11. Hariharan A V L N S H "Determination of water quality of coastal area Visakhapatnam" *Current World Environment,* 2(2), 217-220 (2007).
12. Hussain H M, Al-Haidarey M J S, Al-Ansari N and Knutsson N "Evaluation and Mapping Ground Water Suitability for irrigation using GIS in Najaf Governorate, Iraq" *Journal of Environmental Hydrology*, 22, 1-16 (2014).
13. "Jaipur Development Authority", Master Development Plan-2025, Jaipur Region (Vol. 1), JDA, Jaipur(2012).
14. Khwakaram A I, Majid S N and Hama N Y "Determination of water quality index (WQI) for Qalyasanstream in Sulaimani city/Kurdistan region of Iraq". *International Journal of Plant, Animal and Environmental Sciences,* 2(4), 148-157(2012).
15. Mathur L N, "Ground Water Scenario of Jaipur-Water Challenges and Solutions: Center for media research and development" 1st Edition Manan Design and Publication, India (2007).
16. Rao C S, Rao B S, Hariharan A V L N S H and Bharathi N M " Determination of water quality index of some areas in Guntur District, Andhra Pradesh" *International Journal of Applied Biology and Pharmaceutical Technology,* 1(1), 79-86 (2010).
17. Singh O P, Singh S S and Kumar S, "Rainfall Profile of Jaipur" report of Meteorological Centre, Jaipur, India Meteorological Department, Ministry of Earth Sciences, Government of India, New Delhi (2012).
18. Yadav A K, Khan P and Sharma S K " Water Quality Index Assessment of Ground water in Todarai Singh Tehsil of Rajasthan State, India –A Greener Approach" *E – Journal of Chemistry,*7 (SI) S428-S432 (2010).
19. Yogendra K and Puttaaiah E T "Determination of Water Quality Index and suitability of an Urban water body in Shimoga Town, Karnataka." *Proceedings of Taal 2007: The 12th World Lake Conference*, 342-346(2008).

© 2015 Global Journals Inc. (US)

This page is intentionally left blank

© 2015 Global Journals Inc. (US)

Global Journal of Science Frontier Research: B
Chemistry
Volume 15 Issue 6 Version 1.0 Year 2015
Type : Double Blind Peer Reviewed International Research Journal
Publisher: Global Journals Inc. (USA)
Online ISSN: 2249-4626 & Print ISSN: 0975-5896

Adsorption and Kinetic Study of Ni(II) Ions from Aqueous Solution using Natural Syrian Zeolite

By Dr. Ibrahim Raheb
Tishreen university, Syrian Arab Republic

Abstract- Adsorption of Ni(II) ions from aqueous solution using natural Syrian zeolite has been studied. Batch shaking adsorption experiments were performed in order to determined the effects of contact time, pH and initial concentration on removal process. The experimental equilibrium data were tested for the Langmuir and Freundlish isotherms. It was determined that removal of Ni(II) ions was well fitted by pseudo-first order kinetic model. The adsorption involves a film diffusion, an intra-particle diffusion and a chemical ion-exchange between Na^{+} ions of adsorbent and the Ni^{2+} ions. The adsorption is endothermic and spontaneous process under studied conditions.

Keywords: *adsorption, zeolite, Ni(II) ions.*

GJSFR-B Classification : *FOR Code: 030703*



Strictly as per the compliance and regulations of :

© 2015. Dr. Ibrahim Raheb. This is a research/review paper, distributed under the terms of the Creative Commons Attribution-Noncommercial 3.0 Unported License http://creativecommons.org/licenses/by-nc/3.0/), permitting all non commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

Adsorption and Kinetic Study of Ni(II) Ions from Aqueous Solution using Natural Syrian Zeolite

Dr. Ibrahim Raheb

Abstract- Adsorption of Ni(II) ions from aqueous solution using natural Syrian zeolite has been studied. Batch shaking adsorption experiments were performed in order to determined the effects of contact time, pH and initial concentration on removal process. The experimental equilibrium data were tested for the Langmuir and Freundlish isotherms. It was determined that removal of Ni(II) ions was well fitted by pseudo-first order kinetic model. The adsorption involves a film diffusion, an intra-particle diffusion and a chemical ion-exchange between Na^+ ions of adsorbent and the Ni^{2+} ions. The adsorption is endothermic and spontaneous process under studied conditions.

Keywords: *adsorption, zeolite, Ni(II) ions.*

I. Introduction

Environmental preservation is nowadays mater of deep concern. Heavy metals release in wastewaters is on of most worrying pollution causes, as it effects on life may be particularly serious, either referring to plants and animals, or to man, reached indirectly by the toxic through food chain. Heavy metals are well-known toxic substances and therefore their removal from wastewater is require prior to discharge into receiving water[1,2].

Ions of heavy metals like copper, nickel, zinc, cadmium, lead, chromium and mercury as a significant impact on the environment since they are often detected in industrial wastewaters. Many techniques are using to removal of heavy ions. Conventional methods involve the use of processes such as coagulation, precipitation, ion-exchange, electrochemical methods, membrane processes, extraction biosorption, adsorption, etc [3-6].

Adsorption and ion-exchange methods are widely using for removal of the heavy ions from aqueous solutions because of simple and low coast of these methods.

Natural zeolite is generally regarded as the suitable material for using as a adsorbent and exchanger for wastewater treatment. Zeolites are widely used in ion-exchange applications, where they exchange cations from there structure with dissolved ones. The most important property of zeolite is the ion-exchange capacity expressing the ability of the material to take up cations. It also important that Zeolites are environmentally friendly materials[3,7,8].

Author: *Professor-Dep. of chemistry, Tishreen University-Latakia-Syria. e-mail: raheb6@gmail.com*

The present study discusses the possibility of the Syrian natural zeolite for removing nickel ions from aqueous solution. Also, the effect of different parameters on ion-exchange process were investigated. Some kinetic parameters were calculated for determination of adsorption mechanism. It is thought that results of this study can be useful for treatment processes of sectors containing heavy metal in their wastewaters.

II. Eperimental

a) *Materials*

All chemicals used in this study were analytical grade reagents. The natural zeolite ore using in this work collected from Omm'Ozen region in Syria. It was crushed and then sieved to different fractions, of which 100-200μ, was used in this study. This adsorbent is containing different zeolite phases (analcim, philipsite and shabazite) [9]. A certain amount of natural zeolite washed with distilled water tree times to avoid any effects from dissolved salts in the equilibrium solution. The adsorbent was then dried at 120°C for 24h and named Z. Modified zeolite with Na ions was prepared as following: 20g of Z sample was added to 500ml of NaCl(1M) solution, agitated at room temperature for 24h filtrated and washed by distilled water and then dried at 120°C for 24h.and named Z-Na sample. The stock solution of Ni(II)(1000mg/l) was prepared by dissolving a weighed quantity of $NiCl_2.6H_2O$ salt in bi-distilled water. The stock solution was used to prepare different solutions with Ni(II) concentration ranging (100, 200, 400, 700, 1000mg/l). Before adding the adsorbent, the pH of each solution adjusted to the required value by adding (0.1 M NaOH or 0.1 M HNO_3).

b) *Equilibrium Studies*

The batch ion-exchange experiments performed in a wide variety of conditions including contact time, pH, temperature and initial concentration. Effects of each factor were determined keeping other variables constant. In the experiments 0.3g of adsorbent was added to 50ml of Ni(II) solutions. Solutions were shacked for predetermined period. At the end of the experiment, solution filtered and the metal contents in solution determined by Atomic Absorption Spectroscopy method. In these experiments, the averages of three tested samples reported.

© 2015 Global Journals Inc. (US)

c) Isotherm Studies

The adsorption capacity was calculated using following formula:

$$q_e = (C_0 - C_e).\frac{V}{m} \quad (1)$$

Where q_e(mg/g) is the equilibrium adsorption capacity, C_0 and C_e are the initial and equilibrium concentration(mg/L), respectively, V(L) is the volume and m(g) is the amount of the adsorbent.

The nickel removal percentage was calculated using the formula:

$$\text{Re}\,moval(\%) = \frac{C_0 - C_e}{C_0}.100 \quad (2)$$

The data obtained were applied to Langmuir isotherm using the following liner expression of this model [10]:

$$\frac{1}{q_e} = \frac{1}{q_{\max}} + \frac{1}{q_{\max}.K_L}.\frac{1}{C_e} \quad (3)$$

Where q_{max}(mg/g) and K_L(L/mg) the Langmuir constants related to the ion-exchange capacity and energy of ion-exchange, respectively. Another isotherm, the Freundlish isotherm also used, which expressed as follows [10]:

$$Log\ q_e = Log\ K_f + \frac{1}{n} Log\ C_e \quad (4)$$

Where K_f and n are the Freundlish constants.

d) Kinetic and Thermodynamic studies

Kinetic experiments were performed by using 50ml of nickel solution of various concentrations (100, 200, 400mg/L). To these solutions, we added 0.3g of modified zeolite Z-Na and shacked. Samples were taken at different time intervals (0-480 min) and different temperatures (298,313, 333 K) and remaining metal concentrations were determined. The rate constants were calculated using tow reaction-based kinetic models, the pseudo-first rate equation whose integrated form is given by formula [11].

$$\log(q_e - q_t) = \log q_e - \frac{k_1}{2.303} t \quad (5)$$

Where q_e and q_t are the amount of Ni(II) adsorbed(mg/g) at equilibrium and at the time t, respectively, and k_1(min^{-1}) is the rate constant. The integrated form of the pseudo-second order rate reaction also was used [11].

$$\frac{t}{q_t} = \frac{1}{k_2.q_e^2} + \frac{1}{q_e} t \quad (6)$$

Where k_2($g.mg^{-1}.min^{-1}$) is the rate constant of the pseudo-second order adsorption.

The effect of the temperature on the removal of Ni(II) by Z-Na adsorbent was studied and the activated energy was calculated using Arrhenius equation:

$$Ln\ k = Ln\ A - \frac{E_a}{R}.\frac{1}{T} \quad (7)$$

Thermodynamic parameters such as enthalpy ΔH^0, entropy change ΔS^0 and Gibbs free energy ΔG^0 for the adsorption of Ni(II) were calculated using the equations[12]:

$$Ln\ K_d = \frac{\Delta S^0}{R} - \frac{\Delta H^0}{RT} \quad (8)$$

$$\Delta G^0 = -RT\ LnK_d \quad (9)$$

Where R is the general gas constant, 8.314 J/mol.K and T is the adsorption absolute temperature, K_d(ml/g) is the distribution coefficient which is obtained by the following equation:

$$K_d = \frac{q_e}{C_e} = \frac{C_0 - C_e}{C_e}.\frac{V}{m} \quad (10)$$

III. Results and Discussion

a) Effect of contact time

Due to equilibrium nature of the removal process of Ni(II) by the modified zeolite Z-Na, it seen that the contact time affect the removal efficiency of the used adsorbent. Hence, the effect of contact time on the removal of Ni(II) by the Z-Na was studied in the batch experiment. The corresponding results are given in Fig.1. It cam be seen that the removal of Ni(II) ions from aqueous solution using The Z-Na increased during time and reached to nearly constant amount at equilibrium conditions after 360min. This obtained time was selected for the next adsorption experiments. The variation in the time of adsorption may also be due to the fact that initially all sites on the surface of Z-Na were vacant and the Ni(II) ion concentration gradient was relatively high. After 360min the adsorbent surface becomes saturated with respective metal and the removal efficiency becomes almost constant.

© 2015 Global Journals Inc. (US)

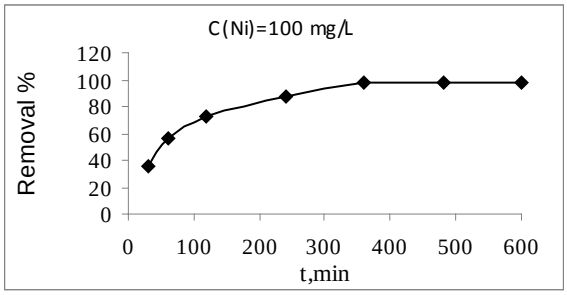


Fig.1 : Effect of contact tine on Ni(II) removal by Z-Na

$C_{Ni(II)}$=100mg/L, V=50mL, m=0.3g, T=298K, pH=6

b) Effect of pH solution

The effect of pH on the ion-exchange of Ni(II) by the Z-Na is presented in Fig.2. The pH of aqueous solution was an important parameter that controlled the ion-exchange process.

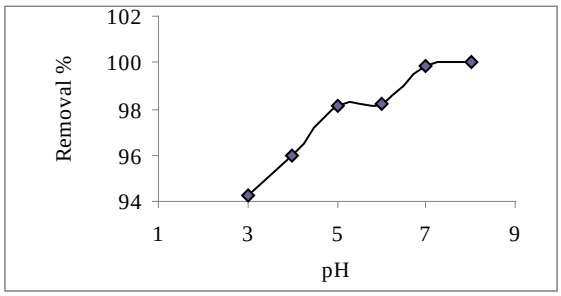


Fig.2 : Effect of pH on the removal of Ni(II)

$C_{Ni(II)}$=100mg/L, V=50mL, m=0.3g, T=298K, t=360min

Adsorption of Ni(II) increased with increasing pH to a pH in range 5-6, then increased up to pH 7-8 where beginning the precipitation process. Under acidic conditions the Z-Na surface will be completely covered with H^+ ions and the Ni(II) ions cannot compete with them. However, with increasing pH, the competition from the $H^=$ ions decreases and the positively charged Ni(II) ions can be exchanged and be also adsorbed at the negatively charged sites on the Z-Na. At pH higher 8 the precipitation process $Ni(OH)_2$ will accurse[13]. Based on these results, Z-Na exhibited a good capacity for removing Ni(II) from solution at a range of pH values from 5-8. The maximum removal about 98% was at pH=5.

c) Adsorption isotherm

Adsorption equilibrium measurements were used to determine the maximum adsorption capacity and the obtained data were formulated into the most commonly models include Langmuir and Freundlish isotherms[14].

The adsorption capacity was calculated using formula (1). Fig.3 shows the adsorption isotherm for Ni(II) on adsorbent Z and Z-Na zeolite.

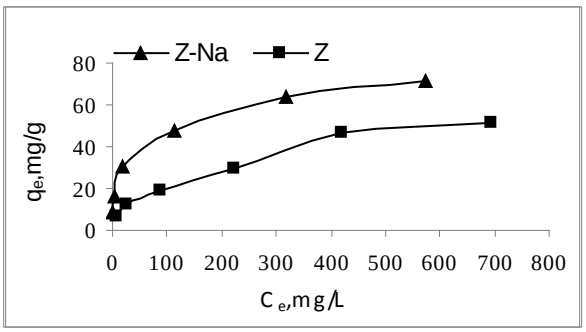


Fig.3 : The adsorption isotherm for Ni(II) on Z and Z-Na zeolite

V=50mL, m=0.3g, T=298K, t=360min

It is seen from Fig.3 that the adsorption capacity of both Z and Z-Na zeolite increases with the Ni(II) solution concentration. The equilibrium data from Fig.3 have been analyzed according to equation (3) and (4).

© 2015 Global Journals Inc. (US)

The Langmuir isotherm is a commonly applied model for adsorption on a completely homogeneous surface. The model assumes uniform adsorption energies onto the surface. The Freundlish model is shown to be consistent with exponential distribution of active sites, characteristic of heterogeneous surfaces. The values of the Langmuir constants K_L and q_{max} and Freundlish constants K_f and n were determined from the slope, intercept in Fig.4(a) and Fig.4(b) respectively and the results presented in table (1).

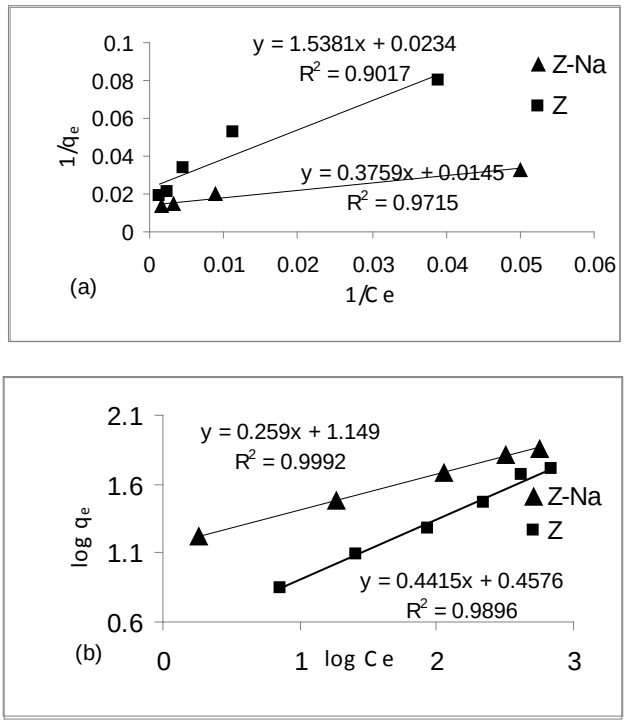


Fig.4 : Langmuir (a) and Freundlish (b) adsorption isotherms of Ni(II)

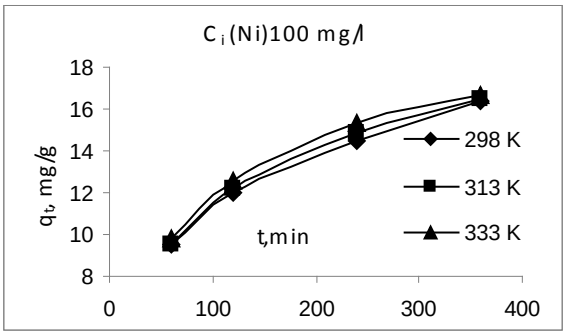
Table(1) : Isotherm Parameters Calculated for Ni(II) Removal on Adsorbent Z and Z-Na

	Langmuir model			Freundlish model		
	q_{max}	K_L	R^2	K_f	n	R^2
Z	43.48	0.0149	0.901	2.86	2.27	0.989
Z-Na	71.43	0.0373	0.971	14.1	3.86	0.999

Comparing of R^2 values of tow isotherm models, confirms that the Freundlish model is the best to describe the adsorption data. On the other hand, a competitive adsorption of Ni(II) accurse on the surface because the value of n>1. From the Langmuir isotherm, the maximum ion-exchange capacity q_{max} was 43.48 and 71.43 mg/g for Z and Z-Na adsorbents, respectively. It was seen the important of the modification process of zeolite for the removal of heavy metals ions from the aqueous solutions.

d) kinetic studies

In order to determined the ion-exchange kinetics of Ni(II) on the modified Z-Na, the pseudo-first order and pseudo-second order kinetics models were examined. On the other hand some of the thermodynamic parameters were determined. The Ni(II) adsorption dependence on time was studied at 298, 313, 333K for solutions with C_0=100,200 and 400mg/L. The uptake values for removal of Ni(II) from solution are shown in Fig.5.



© 2015 Global Journals Inc. (US)

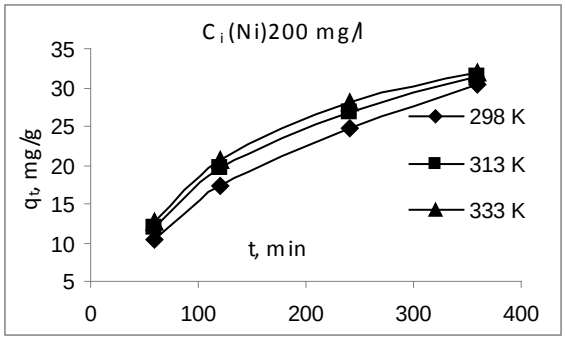
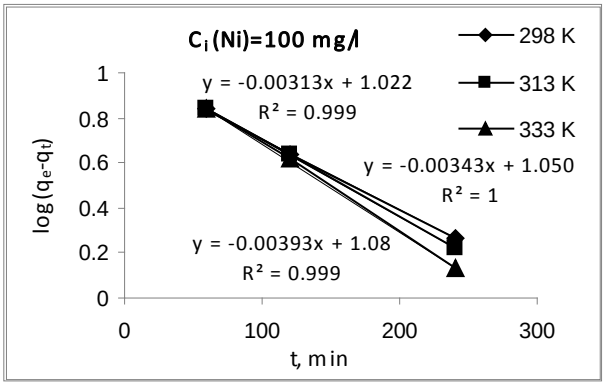
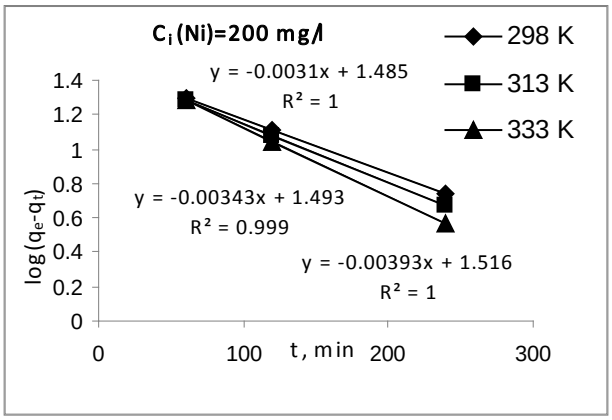


Fig. 5 : Adsorption kinetics for Ni(II) on Z-Na for different initial Ni(II) concentrations

It is seen from the Fig.5 that the adsorption takes place in tow steps. The first step accurse at the beginning stages(i.e. apporx. in the first 50-250 min), when the Ni(II) uptake increases. After these periods adsorption process exhibit slower rate and reach equilibrium after 360min. Similar behavior was found in other systems[15]. The data from Fig.5 were analyzed using (5,6) equations and presented in Fig. 6 and 7. Calculated rate constants k_1, k_2 and correlation coefficients R^2 were summarized in table 2.





© 2015 Global Journals Inc. (US)

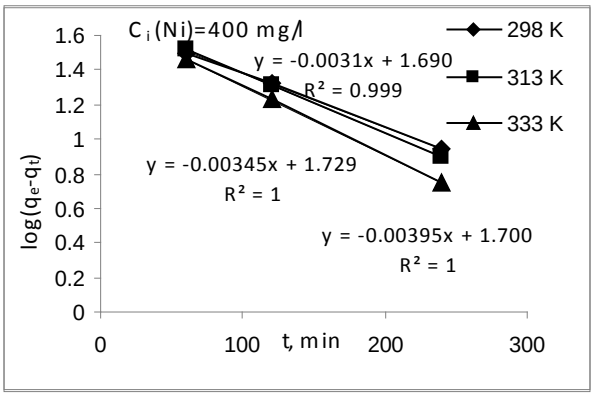
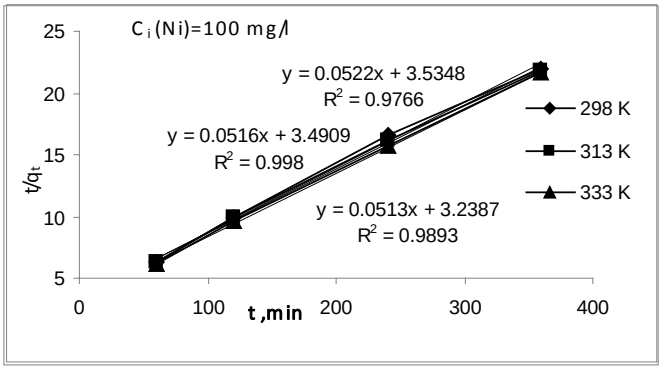
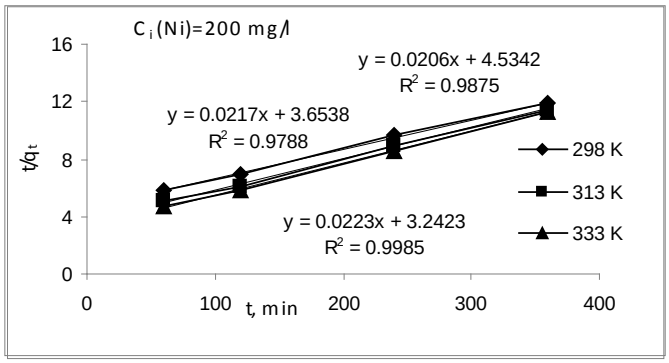


Fig.6 : Pseudo-first order reaction kinetics for the adsorption of Ni(II) onto Z-Na





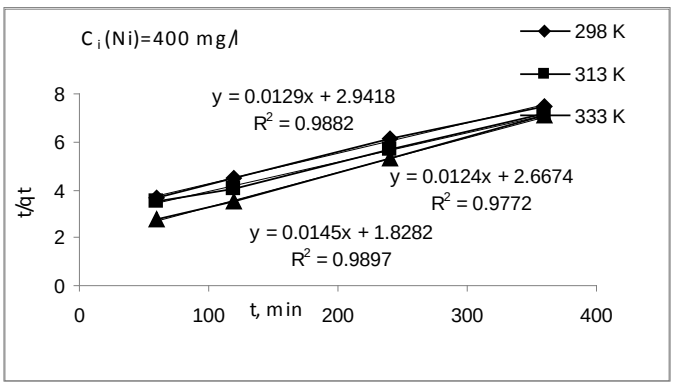


Fig.7 : Pseudo-second order reaction kinetics for the adsorption of Ni(II) onto Z-Na

© 2015 Global Journals Inc. (US)

Table 2 : Rate constants and R^2 values for the pseudo first-and second order reaction kinetics and activation energy of the removal of Ni(II) onto Z-Na

C_0,mg/L	T,K	$k_1.10^3$ min^{-1}	R^2	$k_2.10^3$ g/mg/min	R^2	E_a kJ/mol
100	298	7.2	0.999	0.765	0.976	5.32
	313	7.8	1	0.745	0.998	
	333	9	0.999	0.803	0.989	
200	298	7.1	1	0.088	0.987	5.64
	313	7.8	0.999	0.120	0.978	
	333	9	1	0.149	0.998	
400	298	7.1	0.999	0.049	0.988	5.62
	313	7.9	1	0.054	0.977	
	333	9	1	0.107	0.989	

As seen from table 3 the values of correlation coefficients for pseudo-first order are higher than R^2 for pseudo-second order and the k_1 rate constant increases quite slightly with temperature. The k_2 rate constant variables when initial concentration is increasing. The studied adsorption is better described by the pseudo-first order model. From the results in table 3 we can say, that the process accurse according to the film diffusion and interaction particles diffusion mechanisms[16].

The variation of k_1 with temperature in the 298-333K region was used for the calculation of the activation energy(E_a) of the adsorption. The activation energy was calculated using Arrhenius equation(7) as shown in Fig.8.

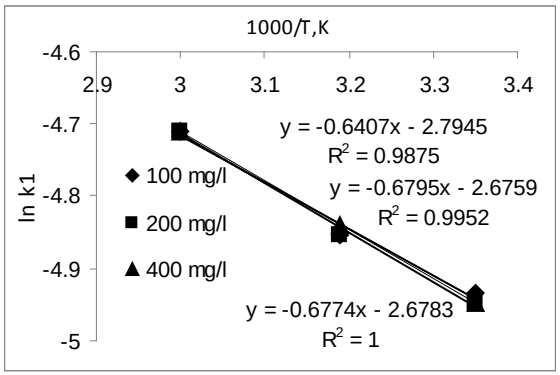


Fig. 8 : The Arrhenius plot using rate constant values from table 3 for the pseudo-first order

The values of the activation energy in table 2 are quite small and change only slightly for different initial concentrations. In general a low E_a value means that the adsorption involved is physisorption[17].

The data obtained from the adsorption experiments at 298, 313 and333K and the initial Ni(II) concentrations of 100, 200 and 400 mg/L, were used for the calculation of thermodynamic properties using (8-10) equations. The plot of ln K_d vs 1/T in Fig.9. gave a strait line, and the values of ΔH^0 and ΔS^0 can obtained from the intercept and slope, respectively. The thermodynamic parameters are presented in table 3.

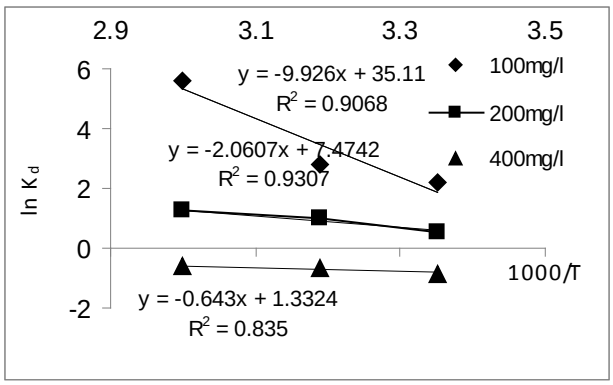


Fig. 9 : The plot of ln K_d vs 1/T for different initial Ni(II) concentrations

© 2015 Global Journals Inc. (US)

Table 3 : Thermodynamic parameters for the Ni(II) adsorption on Z-Na

C_0 mg/L	T,K	LnK_d	ΔG^0 kJ/mol	ΔH^0 kJ/mol	ΔS^0 $J/K.mol$	R^2
100	298	2.207	-5.48	82.4	291.4	0.906
	313	2.803	-7.29			
	333	5.626	-15.50			
200	298	0.509	-1.26	17.12	62.14	0.930
	313	1.014	-2.64			
	333	1.240	-3.43			
400	298	-0.853	2.11	5.34	11.07	0.835
	313	-0.661	1.72			
	333	-0.623	1.72			

The ΔG^0 values in table 4 show that, the adsorption of Ni(II) on Z-Na accurse spontaneously in the 298-333K temperature range and the spontaneity slightly decrease with temperature. The Ni(II) adsorption is endothermic($\Delta H^0 > 0$). It is also evident that the spontaneity as well as the ΔH^0 and ΔS^0 values all decreases as the initial Ni(II) concentration increases. The similar behavior has also been reported for so0me other adsorbents[18]. The positive ΔS^0 values reflect the fact that the adsorption involves the liberation of tow Na^+ when one Ni^{2+} ion is bound to the adsorbent.

IV. Conclusion

The Syrian natural zeolite is effective in removing the nickel(II) ions from aqueous solutions by adsorption.

The Ni(II) ions distributed inside the Z-Na adsorbent indicating that the removal process from water solutions is mainly an ion-exchange. The adsorption kinetics is described by the pseudo-first order model. The activation energy ~ 5kJ/mol. The adsorption involves a combination of the film and interaction particle diffusions, and chemical cation-exchange between Na^+ ions of zeolite and the Ni^{2+} ions. The process is endothermic and spontaneous in the 298-333K temperature range.

References Références Referencias

1. Pansini.M, Colella.C and De Gennaro.M, (1991), Chromium removal from water by ion exchange using zeolite, Desalination, 83, 145-157.
2. Vassilis J.Inglezakis, Maria Loizidov.M , and Helen Grigoropovlou.P,(2004), Ion exchange studies on natural and modified zeolites and the concept of exchange site accessibility, J. of Colloid and Interface Science, 275, 570-576.
3. Nevenka Rajic, Djordje Stojakovic, Mina Jovanovic, Natsa Zabukovec Logar, Matgas Mazag, Venceslav Kavcic, (2010), Removal of nickel (II) ions from aqueous solutions using the natural clinoptilolite and preparation of nano-NiO on the exhausted clinoptilolite, Applied Surface Science, 257, 1524-1532.
4. Sousa.F.W, Oliveria.A.C, Riberio.J.P, Rosa.M.F, Keukeleire.D, Nascimento.R.E, (2010), Green coconut shells applied as adsorbent for removal of toxic metal using fixed-bed column technology, J.Environ.Manage, 91, 1634-1640.
5. Ambashta.R.D, Sillanpaa.M, (2010), Water purification using magnetic assistance : a review, J.Hazard. Mater., 180, 38-49.
6. Shalback.A, Kruchinina.N.E, Raheb.I, (2010), Removal of colors for aqueous reactive dyes solutions by coagulation – flocculation process, J. of Aleppo Univer.Researchers, Basic Science Series, 71 .
7. Vassilis Inglezakis.J, (2005), The concept of capacity in zeolite ion-exchange systems., J. of Colloid and Inter. Scie, 281, 68-79.
8. Alireza Nezamadeh-Ejhieh, Mehdi Kabiri-Samani, (2013), Effective of removal of Ni(II) from aqueous solutions by modification of nano particles of clinopfilolite with dimethyglyoxime., J. of Harad. Mater. , 260 , 339-349.
9. Ibrahem Raheb, Husam Al-dien Kawass, (2005), Characterization of Syrian ores containing zeolite from om'ozen area., Tishreen Univers . J. for Studies and Scientific Sesearch., Basic Science Series, 27, 69-78.
10. Mehmet Emin Argun, (2008), Use of clinoptilolite for the removal of nickel ions from water: kinetics and thermodynamic, J. of Hazard . Mater, 150, 587-595.
11. Zhang.H, yu.X, Chen.L, Jing.Y, (2010), Study of Ni adsorption on NKF-6 zeolite. J Environ. Radioact, 101,1061-1069.
12. Nibou.D, Markatel.H, Amokrane.S, Barkar.M, Trari.M, (2010) , Adsorption of Zn^{2+} ions on to NaA and NaX zeolites: kinetic equilibrium and thermodynamic studies, J. Hazard. .Mater., 173, 637-646.
13. Gupta.S.S, Bhattacharya.K.G, (2006), Adsorption of Ni(II) on clays., J.Colloid. Inter. Sci, 295, 21-32.
14. Ibrahim.H.S, Jamal.T.S, Hegazy.E.Z, (2010), Application of zeolite prepared from Egyption kaolin

© 2015 Global Journals Inc. (US)

for the removal of heavy metals., J.Hazard. Mater., 182, 842-847.
15. Dal Basco.S.M, Jimenez.R.S, Carvalho.W.A , (2005), Removal of toxic metals from wastewater by Brazillian natural scolecite, J. Colloid Inter. Sci , 281, 424-431.
16. Coonly.E.L, Booker.A, Shallcross.D, Stevens.G.W, (1999), Ammonia removal from wastewater using natural Australian zeolite .II. pilot scale study using continuous packed process Separation Sci. Technol., 34, 2741-2760.
17. Argun.M.E, (2008), Use of clinoptilolite for the removal of nickel ions from water : kinetics and the thermodynamics, J. Hazard. Mater., 150, 587-595.
18. Yavuz.O, Altunkaynak.Y, Guzel.F, (2003), Removal of copper, nickel, cobalt and manganese from aqueous solution by kaolinite, Water Res, 37, 948-952.

© 2015 Global Journals Inc. (US)

Global Journals Inc. (US) Guidelines Handbook 2015

www.GlobalJournals.org

FELLOWS

FELLOW OF ASSOCIATION OF RESEARCH SOCIETY IN SCIENCE (FARSS)

Global Journals Incorporate (USA) is accredited by Open Association of Research Society (OARS), U.S.A and in turn, awards "FARSS" title to individuals. The 'FARSS' title is accorded to a selected professional after the approval of the Editor-in-Chief/Editorial Board Members/Dean.



- The "FARSS" is a dignified title which is accorded to a person's name viz. Dr. John E. Hall, Ph.D., FARSS or William Walldroff, M.S., FARSS.

FARSS accrediting is an honor. It authenticates your research activities. After recognition as FARSB, you can add 'FARSS' title with your name as you use this recognition as additional suffix to your status. This will definitely enhance and add more value and repute to your name. You may use it on your professional Counseling Materials such as CV, Resume, and Visiting Card etc.

The following benefits can be availed by you only for next three years from the date of certification:

FARSS designated members are entitled to avail a 40% discount while publishing their research papers (of a single author) with Global Journals Incorporation (USA), if the same is accepted by Editorial Board/Peer Reviewers. If you are a main author or co-author in case of multiple authors, you will be entitled to avail discount of 10%.

Once FARSB title is accorded, the Fellow is authorized to organize a symposium/seminar/conference on behalf of Global Journal Incorporation (USA). The Fellow can also participate in conference/seminar/symposium organized by another institution as representative of Global Journal. In both the cases, it is mandatory for him to discuss with us and obtain our consent.





You may join as member of the Editorial Board of Global Journals Incorporation (USA) after successful completion of three years as Fellow and as Peer Reviewer. In addition, it is also desirable that you should organize seminar/symposium/conference at least once.

We shall provide you intimation regarding launching of e-version of journal of your stream time to time.This may be utilized in your library for the enrichment of knowledge of your students as well as it can also be helpful for the concerned faculty members.



© Copyright by Global Journals Inc.(US) | Guidelines Handbook

The FARSS can go through standards of OARS. You can also play vital role if you have any suggestions so that proper amendment can take place to improve the same for the benefit of entire research community.



As FARSS, you will be given a renowned, secure and free professional email address with 100 GB of space e.g. johnhall@globaljournals.org. This will include Webmail, Spam Assassin, Email Forwarders,Auto-Responders, Email Delivery Route tracing, etc.



The FARSS will be eligible for a free application of standardization of their researches. Standardization of research will be subject to acceptability within stipulated norms as the next step after publishing in a journal. We shall depute a team of specialized research professionals who will render their services for elevating your researches to next higher level, which is worldwide open standardization.



The FARSS member can apply for grading and certification of standards of their educational and Institutional Degrees to Open Association of Research, Society U.S.A.
Once you are designated as FARSS, you may send us a scanned copy of all of your credentials. OARS will verify, grade and certify them. This will be based on your academic records, quality of research papers published by you, and some more criteria. After certification of all your credentials by OARS, they will be published on your Fellow Profile link on website https://associationofresearch.org which will be helpful to upgrade the dignity.

The FARSS members can avail the benefits of free research podcasting in Global Research Radio with their research documents. After publishing the work, (including published elsewhere worldwide with proper authorization) you can upload your research paper with your recorded voice or you can utilize chargeable services of our professional RJs to record your paper in their voice on request.



The FARSS member also entitled to get the benefits of free research podcasting of their research documents through video clips. We can also streamline your conference videos and display your slides/ online slides and online research video clips at reasonable charges, on request.

© Copyright by Global Journals Inc.(US)| Guidelines Handbook



The FARSS is eligible to earn from sales proceeds of his/her researches/reference/review Books or literature, while publishing with Global Journals. The FARSS can decide whether he/she would like to publish his/her research in a closed manner. In this case, whenever readers purchase that individual research paper for reading, maximum 60% of its profit earned as royalty by Global Journals, will be credited to his/her bank account. The entire entitled amount will be credited to his/her bank account exceeding limit of minimum fixed balance. There is no minimum time limit for collection. The FARSS member can decide its price and we can help in making the right decision.

The FARSS member is eligible to join as a paid peer reviewer at Global Journals Incorporation (USA) and can get remuneration of 15% of author fees, taken from the author of a respective paper. After reviewing 5 or more papers you can request to transfer the amount to your bank account.



MEMBER OF ASSOCIATION OF RESEARCH SOCIETY IN SCIENCE (MARSS)

The ' MARSS ' title is accorded to a selected professional after the approval of the Editor-in-Chief / Editorial Board Members/Dean.



The "MARSS" is a dignified ornament which is accorded to a person's name viz. Dr. John E. Hall, Ph.D., MARSS or William Walldroff, M.S., MARSS.

MARSS accrediting is an honor. It authenticates your research activities. After becoming MARSS, you can add 'MARSS' title with your name as you use this recognition as additional suffix to your status. This will definitely enhance and add more value and repute to your name. You may use it on your professional Counseling Materials such as CV, Resume, Visiting Card and Name Plate etc.

The following benefitscan be availed by you only for next three years from the date of certification.



MARSS designated members are entitled to avail a 25% discount while publishing their research papers (of a single author) in Global Journals Inc., if the same is accepted by our Editorial Board and Peer Reviewers. If you are a main author or co-author of a group of authors, you will get discount of 10%.

As MARSS, you will be given a renowned, secure and free professional email address with 30 GB of space e.g. johnhall@globaljournals.org. This will include Webmail, Spam Assassin, Email Forwarders,Auto-Responders, Email Delivery Route tracing, etc.



© Copyright by Global Journals Inc.(US) | Guidelines Handbook



We shall provide you intimation regarding launching of e-version of journal of your stream time to time.This may be utilized in your library for the enrichment of knowledge of your students as well as it can also be helpful for the concerned faculty members.

The MARSS member can apply for approval, grading and certification of standards of their educational and Institutional Degrees to Open Association of Research, Society U.S.A.





Once you are designated as MARSS, you may send us a scanned copy of all of your credentials. OARS will verify, grade and certify them. This will be based on your academic records, quality of research papers published by you, and some more criteria.

It is mandatory to read all terms and conditions carefully.

© Copyright by Global Journals Inc.(US)| Guidelines Handbook

AUXILIARY MEMBERSHIPS

Institutional Fellow of Global Journals Incorporation (USA)-OARS (USA)

Global Journals Incorporation (USA) is accredited by Open Association of Research Society, U.S.A (OARS) and in turn, affiliates research institutions as "Institutional Fellow of Open Association of Research Society" (IFOARS).



The "FARSC" is a dignified title which is accorded to a person's name viz. Dr. John E. Hall, Ph.D., FARSC or William Walldroff, M.S., FARSC.

The IFOARS institution is entitled to form a Board comprised of one Chairperson and three to five board members preferably from different streams. The Board will be recognized as "Institutional Board of Open Association of Research Society"-(IBOARS).

The Institute will be entitled to following benefits:

The IBOARS can initially review research papers of their institute and recommend them to publish with respective journal of Global Journals. It can also review the papers of other institutions after obtaining our consent. The second review will be done by peer reviewer of Global Journals Incorporation (USA) The Board is at liberty to appoint a peer reviewer with the approval of chairperson after consulting us.

The author fees of such paper may be waived off up to 40%.

The Global Journals Incorporation (USA) at its discretion can also refer double blind peer reviewed paper at their end to the board for the verification and to get recommendation for final stage of acceptance of publication.





The IBOARS can organize symposium/seminar/conference in their country on behalf of Global Journals Incorporation (USA)-OARS (USA). The terms and conditions can be discussed separately.

The Board can also play vital role by exploring and giving valuable suggestions regarding the Standards of "Open Association of Research Society, U.S.A (OARS)" so that proper amendment can take place for the benefit of entire research community. We shall provide details of particular standard only on receipt of request from the Board.



The board members can also join us as Individual Fellow with 40% discount on total fees applicable to Individual Fellow. They will be entitled to avail all the benefits as declared. Please visit Individual Fellow-sub menu of GlobalJournals.org to have more relevant details.

© Copyright by Global Journals Inc.(US) | Guidelines Handbook

We shall provide you intimation regarding launching of e-version of journal of your stream time to time. This may be utilized in your library for the enrichment of knowledge of your students as well as it can also be helpful for the concerned faculty members.



After nomination of your institution as "Institutional Fellow" and constantly functioning successfully for one year, we can consider giving recognition to your institute to function as Regional/Zonal office on our behalf.
The board can also take up the additional allied activities for betterment after our consultation.

The following entitlements are applicable to individual Fellows:



Open Association of Research Society, U.S.A (OARS) By-laws states that an individual Fellow may use the designations as applicable, or the corresponding initials. The Credentials of individual Fellow and Associate designations signify that the individual has gained knowledge of the fundamental concepts. One is magnanimous and proficient in an expertise course covering the professional code of conduct, and follows recognized standards of practice.

Open Association of Research Society (US)/ Global Journals Incorporation (USA), as described in Corporate Statements, are educational, research publishing and professional membership organizations. Achieving our individual Fellow or Associate status is based mainly on meeting stated educational research requirements.



Disbursement of 40% Royalty earned through Global Journals : Researcher = 50%, Peer Reviewer = 37.50%, Institution = 12.50% E.g. Out of 40%, the 20% benefit should be passed on to researcher, 15 % benefit towards remuneration should be given to a reviewer and remaining 5% is to be retained by the institution.

We shall provide print version of 12 issues of any three journals [as per your requirement] out of our 38 journals worth $ 2376 USD.

Other:

The individual Fellow and Associate designations accredited by Open Association of Research Society (US) credentials signify guarantees following achievements:

- The professional accredited with Fellow honor, is entitled to various benefits viz. name, fame, honor, regular flow of income, secured bright future, social status etc.

© Copyright by Global Journals Inc.(US)| Guidelines Handbook

- In addition to above, if one is single author, then entitled to 40% discount on publishing research paper and can get 10%discount if one is co-author or main author among group of authors.
- The Fellow can organize symposium/seminar/conference on behalf of Global Journals Incorporation (USA) and he/she can also attend the same organized by other institutes on behalf of Global Journals.
- The Fellow can become member of Editorial Board Member after completing 3yrs.
- The Fellow can earn 60% of sales proceeds from the sale of reference/review books/literature/publishing of research paper.
- Fellow can also join as paid peer reviewer and earn 15% remuneration of author charges and can also get an opportunity to join as member of the Editorial Board of Global Journals Incorporation (USA)
- • This individual has learned the basic methods of applying those concepts and techniques to common challenging situations. This individual has further demonstrated an in–depth understanding of the application of suitable techniques to a particular area of research practice.

Note :

"

- In future, if the board feels the necessity to change any board member, the same can be done with the consent of the chairperson along with anyone board member without our approval.
- In case, the chairperson needs to be replaced then consent of 2/3rd board members are required and they are also required to jointly pass the resolution copy of which should be sent to us. In such case, it will be compulsory to obtain our approval before replacement.
- In case of "Difference of Opinion [if any]" among the Board members, our decision will be final and binding to everyone.

"

Process of submission of Research Paper

The Area or field of specialization may or may not be of any category as mentioned in 'Scope of Journal' menu of the GlobalJournals.org website. There are 37 Research Journal categorized with Six parental Journals GJCST, GJMR, GJRE, GJMBR, GJSFR, GJHSS. For Authors should prefer the mentioned categories. There are three widely used systems UDC, DDC and LCC. The details are available as 'Knowledge Abstract' at Home page. The major advantage of this coding is that, the research work will be exposed to and shared with all over the world as we are being abstracted and indexed worldwide.

The paper should be in proper format. The format can be downloaded from first page of 'Author Guideline' Menu. The Author is expected to follow the general rules as mentioned in this menu. The paper should be written in MS-Word Format (*.DOC,*.DOCX).

The Author can submit the paper either online or offline. The authors should prefer online submission.Online Submission: There are three ways to submit your paper:

(A) (I) First, register yourself using top right corner of Home page then Login. If you are already registered, then login using your username and password.

(II) Choose corresponding Journal.

(III) Click 'Submit Manuscript'. Fill required information and Upload the paper.

(B) If you are using Internet Explorer, then Direct Submission through Homepage is also available.

(C) If these two are not conveninet , and then email the paper directly to dean@globaljournals.org.

Offline Submission: Author can send the typed form of paper by Post. However, online submission should be preferred.



© Copyright by Global Journals Inc.(US)| Guidelines Handbook

Preferred Author Guidelines

MANUSCRIPT STYLE INSTRUCTION (Must be strictly followed)

Page Size: 8.27" X 11'"

- Left Margin: 0.65
- Right Margin: 0.65
- Top Margin: 0.75
- Bottom Margin: 0.75
- Font type of all text should be Swis 721 Lt BT.
- Paper Title should be of Font Size 24 with one Column section.
- Author Name in Font Size of 11 with one column as of Title.
- Abstract Font size of 9 Bold, "Abstract" word in Italic Bold.
- Main Text: Font size 10 with justified two columns section
- Two Column with Equal Column with of 3.38 and Gaping of .2
- First Character must be three lines Drop capped.
- Paragraph before Spacing of 1 pt and After of 0 pt.
- Line Spacing of 1 pt
- Large Images must be in One Column
- Numbering of First Main Headings (Heading 1) must be in Roman Letters, Capital Letter, and Font Size of 10.
- Numbering of Second Main Headings (Heading 2) must be in Alphabets, Italic, and Font Size of 10.

You can use your own standard format also.
Author Guidelines:

1. General,

2. Ethical Guidelines,

3. Submission of Manuscripts,

4. Manuscript's Category,

5. Structure and Format of Manuscript,

6. After Acceptance.

1. GENERAL

Before submitting your research paper, one is advised to go through the details as mentioned in following heads. It will be beneficial, while peer reviewer justify your paper for publication.

Scope

The Global Journals Inc. (US) welcome the submission of original paper, review paper, survey article relevant to the all the streams of Philosophy and knowledge. The Global Journals Inc. (US) is parental platform for Global Journal of Computer Science and Technology, Researches in Engineering, Medical Research, Science Frontier Research, Human Social Science, Management, and Business organization. The choice of specific field can be done otherwise as following in Abstracting and Indexing Page on this Website. As the all Global

Journals Inc. (US) are being abstracted and indexed (in process) by most of the reputed organizations. Topics of only narrow interest will not be accepted unless they have wider potential or consequences.

2. ETHICAL GUIDELINES

Authors should follow the ethical guidelines as mentioned below for publication of research paper and research activities.

Papers are accepted on strict understanding that the material in whole or in part has not been, nor is being, considered for publication elsewhere. If the paper once accepted by Global Journals Inc. (US) and Editorial Board, will become the copyright of the Global Journals Inc. (US).

Authorship: The authors and coauthors should have active contribution to conception design, analysis and interpretation of findings. They should critically review the contents and drafting of the paper. All should approve the final version of the paper before submission

The Global Journals Inc. (US) follows the definition of authorship set up by the Global Academy of Research and Development. According to the Global Academy of R&D authorship, criteria must be based on:

1) Substantial contributions to conception and acquisition of data, analysis and interpretation of the findings.

2) Drafting the paper and revising it critically regarding important academic content.

3) Final approval of the version of the paper to be published.

All authors should have been credited according to their appropriate contribution in research activity and preparing paper. Contributors who do not match the criteria as authors may be mentioned under Acknowledgement.

Acknowledgements: Contributors to the research other than authors credited should be mentioned under acknowledgement. The specifications of the source of funding for the research if appropriate can be included. Suppliers of resources may be mentioned along with address.

Appeal of Decision: The Editorial Board's decision on publication of the paper is final and cannot be appealed elsewhere.

Permissions: It is the author's responsibility to have prior permission if all or parts of earlier published illustrations are used in this paper.

Please mention proper reference and appropriate acknowledgements wherever expected.

If all or parts of previously published illustrations are used, permission must be taken from the copyright holder concerned. It is the author's responsibility to take these in writing.

Approval for reproduction/modification of any information (including figures and tables) published elsewhere must be obtained by the authors/copyright holders before submission of the manuscript. Contributors (Authors) are responsible for any copyright fee involved.

3. SUBMISSION OF MANUSCRIPTS

Manuscripts should be uploaded via this online submission page. The online submission is most efficient method for submission of papers, as it enables rapid distribution of manuscripts and consequently speeds up the review procedure. It also enables authors to know the status of their own manuscripts by emailing us. Complete instructions for submitting a paper is available below.

Manuscript submission is a systematic procedure and little preparation is required beyond having all parts of your manuscript in a given format and a computer with an Internet connection and a Web browser. Full help and instructions are provided on-screen. As an author, you will be prompted for login and manuscript details as Field of Paper and then to upload your manuscript file(s) according to the instructions.



To avoid postal delays, all transaction is preferred by e-mail. A finished manuscript submission is confirmed by e-mail immediately and your paper enters the editorial process with no postal delays. When a conclusion is made about the publication of your paper by our Editorial Board, revisions can be submitted online with the same procedure, with an occasion to view and respond to all comments.

Complete support for both authors and co-author is provided.

4. MANUSCRIPT'S CATEGORY

Based on potential and nature, the manuscript can be categorized under the following heads:

Original research paper: Such papers are reports of high-level significant original research work.

Review papers: These are concise, significant but helpful and decisive topics for young researchers.

Research articles: These are handled with small investigation and applications

Research letters: The letters are small and concise comments on previously published matters.

5.STRUCTURE AND FORMAT OF MANUSCRIPT

The recommended size of original research paper is less than seven thousand words, review papers fewer than seven thousands words also.Preparation of research paper or how to write research paper, are major hurdle, while writing manuscript. The research articles and research letters should be fewer than three thousand words, the structure original research paper; sometime review paper should be as follows:

Papers: These are reports of significant research (typically less than 7000 words equivalent, including tables, figures, references), and comprise:

(a)Title should be relevant and commensurate with the theme of the paper.

(b) A brief Summary, "Abstract" (less than 150 words) containing the major results and conclusions.

(c) Up to ten keywords, that precisely identifies the paper's subject, purpose, and focus.

(d) An Introduction, giving necessary background excluding subheadings; objectives must be clearly declared.

(e) Resources and techniques with sufficient complete experimental details (wherever possible by reference) to permit repetition; sources of information must be given and numerical methods must be specified by reference, unless non-standard.

(f) Results should be presented concisely, by well-designed tables and/or figures; the same data may not be used in both; suitable statistical data should be given. All data must be obtained with attention to numerical detail in the planning stage. As reproduced design has been recognized to be important to experiments for a considerable time, the Editor has decided that any paper that appears not to have adequate numerical treatments of the data will be returned un-refereed;

(g) Discussion should cover the implications and consequences, not just recapitulating the results; conclusions should be summarizing.

(h) Brief Acknowledgements.

(i) References in the proper form.

Authors should very cautiously consider the preparation of papers to ensure that they communicate efficiently. Papers are much more likely to be accepted, if they are cautiously designed and laid out, contain few or no errors, are summarizing, and be conventional to the approach and instructions. They will in addition, be published with much less delays than those that require much technical and editorial correction.

The Editorial Board reserves the right to make literary corrections and to make suggestions to improve briefness.

It is vital, that authors take care in submitting a manuscript that is written in simple language and adheres to published guidelines.

Format

Language: The language of publication is UK English. Authors, for whom English is a second language, must have their manuscript efficiently edited by an English-speaking person before submission to make sure that, the English is of high excellence. It is preferable, that manuscripts should be professionally edited.

Standard Usage, Abbreviations, and Units: Spelling and hyphenation should be conventional to The Concise Oxford English Dictionary. Statistics and measurements should at all times be given in figures, e.g. 16 min, except for when the number begins a sentence. When the number does not refer to a unit of measurement it should be spelt in full unless, it is 160 or greater.

Abbreviations supposed to be used carefully. The abbreviated name or expression is supposed to be cited in full at first usage, followed by the conventional abbreviation in parentheses.

Metric SI units are supposed to generally be used excluding where they conflict with current practice or are confusing. For illustration, 1.4 l rather than 1.4 × 10-3 m3, or 4 mm somewhat than 4 × 10-3 m. Chemical formula and solutions must identify the form used, e.g. anhydrous or hydrated, and the concentration must be in clearly defined units. Common species names should be followed by underlines at the first mention. For following use the generic name should be constricted to a single letter, if it is clear.

Structure

All manuscripts submitted to Global Journals Inc. (US), ought to include:

Title: The title page must carry an instructive title that reflects the content, a running title (less than 45 characters together with spaces), names of the authors and co-authors, and the place(s) wherever the work was carried out. The full postal address in addition with the e-mail address of related author must be given. Up to eleven keywords or very brief phrases have to be given to help data retrieval, mining and indexing.

Abstract, used in Original Papers and Reviews:

Optimizing Abstract for Search Engines

Many researchers searching for information online will use search engines such as Google, Yahoo or similar. By optimizing your paper for search engines, you will amplify the chance of someone finding it. This in turn will make it more likely to be viewed and/or cited in a further work. Global Journals Inc. (US) have compiled these guidelines to facilitate you to maximize the web-friendliness of the most public part of your paper.

Key Words

A major linchpin in research work for the writing research paper is the keyword search, which one will employ to find both library and Internet resources.

One must be persistent and creative in using keywords. An effective keyword search requires a strategy and planning a list of possible keywords and phrases to try.

Search engines for most searches, use Boolean searching, which is somewhat different from Internet searches. The Boolean search uses "operators," words (and, or, not, and near) that enable you to expand or narrow your affords. Tips for research paper while preparing research paper are very helpful guideline of research paper.

Choice of key words is first tool of tips to write research paper. Research paper writing is an art.A few tips for deciding as strategically as possible about keyword search:

- One should start brainstorming lists of possible keywords before even begin searching. Think about the most important concepts related to research work. Ask, "What words would a source have to include to be truly valuable in research paper?" Then consider synonyms for the important words.
- It may take the discovery of only one relevant paper to let steer in the right keyword direction because in most databases, the keywords under which a research paper is abstracted are listed with the paper.
- One should avoid outdated words.

Keywords are the key that opens a door to research work sources. Keyword searching is an art in which researcher's skills are bound to improve with experience and time.

Numerical Methods: Numerical methods used should be clear and, where appropriate, supported by references.

Acknowledgements: Please make these as concise as possible.

References

References follow the Harvard scheme of referencing. References in the text should cite the authors' names followed by the time of their publication, unless there are three or more authors when simply the first author's name is quoted followed by et al. unpublished work has to only be cited where necessary, and only in the text. Copies of references in press in other journals have to be supplied with submitted typescripts. It is necessary that all citations and references be carefully checked before submission, as mistakes or omissions will cause delays.

References to information on the World Wide Web can be given, but only if the information is available without charge to readers on an official site. Wikipedia and Similar websites are not allowed where anyone can change the information. Authors will be asked to make available electronic copies of the cited information for inclusion on the Global Journals Inc. (US) homepage at the judgment of the Editorial Board.

The Editorial Board and Global Journals Inc. (US) recommend that, citation of online-published papers and other material should be done via a DOI (digital object identifier). If an author cites anything, which does not have a DOI, they run the risk of the cited material not being noticeable.

The Editorial Board and Global Journals Inc. (US) recommend the use of a tool such as Reference Manager for reference management and formatting.

Tables, Figures and Figure Legends

Tables: Tables should be few in number, cautiously designed, uncrowned, and include only essential data. Each must have an Arabic number, e.g. Table 4, a self-explanatory caption and be on a separate sheet. Vertical lines should not be used.

Figures: Figures are supposed to be submitted as separate files. Always take in a citation in the text for each figure using Arabic numbers, e.g. Fig. 4. Artwork must be submitted online in electronic form by e-mailing them.

Preparation of Electronic Figures for Publication

Even though low quality images are sufficient for review purposes, print publication requires high quality images to prevent the final product being blurred or fuzzy. Submit (or e-mail) EPS (line art) or TIFF (halftone/photographs) files only. MS PowerPoint and Word Graphics are unsuitable for printed pictures. Do not use pixel-oriented software. Scans (TIFF only) should have a resolution of at least 350 dpi (halftone) or 700 to 1100 dpi (line drawings) in relation to the imitation size. Please give the data for figures in black and white or submit a Color Work Agreement Form. EPS files must be saved with fonts embedded (and with a TIFF preview, if possible).

For scanned images, the scanning resolution (at final image size) ought to be as follows to ensure good reproduction: line art: >650 dpi; halftones (including gel photographs) : >350 dpi; figures containing both halftone and line images: >650 dpi.

Color Charges: It is the rule of the Global Journals Inc. (US) for authors to pay the full cost for the reproduction of their color artwork. Hence, please note that, if there is color artwork in your manuscript when it is accepted for publication, we would require you to complete and return a color work agreement form before your paper can be published.

Figure Legends: Self-explanatory legends of all figures should be incorporated separately under the heading 'Legends to Figures'. In the full-text online edition of the journal, figure legends may possibly be truncated in abbreviated links to the full screen version. Therefore, the first 100 characters of any legend should notify the reader, about the key aspects of the figure.

6. AFTER ACCEPTANCE

Upon approval of a paper for publication, the manuscript will be forwarded to the dean, who is responsible for the publication of the Global Journals Inc. (US).

6.1 Proof Corrections

The corresponding author will receive an e-mail alert containing a link to a website or will be attached. A working e-mail address must therefore be provided for the related author.

Acrobat Reader will be required in order to read this file. This software can be downloaded

(Free of charge) from the following website:

www.adobe.com/products/acrobat/readstep2.html. This will facilitate the file to be opened, read on screen, and printed out in order for any corrections to be added. Further instructions will be sent with the proof.

Proofs must be returned to the dean at dean@globaljournals.org within three days of receipt.

As changes to proofs are costly, we inquire that you only correct typesetting errors. All illustrations are retained by the publisher. Please note that the authors are responsible for all statements made in their work, including changes made by the copy editor.

6.2 Early View of Global Journals Inc. (US) (Publication Prior to Print)

The Global Journals Inc. (US) are enclosed by our publishing's Early View service. Early View articles are complete full-text articles sent in advance of their publication. Early View articles are absolute and final. They have been completely reviewed, revised and edited for publication, and the authors' final corrections have been incorporated. Because they are in final form, no changes can be made after sending them. The nature of Early View articles means that they do not yet have volume, issue or page numbers, so Early View articles cannot be cited in the conventional way.

6.3 Author Services

Online production tracking is available for your article through Author Services. Author Services enables authors to track their article - once it has been accepted - through the production process to publication online and in print. Authors can check the status of their articles online and choose to receive automated e-mails at key stages of production. The authors will receive an e-mail with a unique link that enables them to register and have their article automatically added to the system. Please ensure that a complete e-mail address is provided when submitting the manuscript.

6.4 Author Material Archive Policy

Please note that if not specifically requested, publisher will dispose off hardcopy & electronic information submitted, after the two months of publication. If you require the return of any information submitted, please inform the Editorial Board or dean as soon as possible.

6.5 Offprint and Extra Copies

A PDF offprint of the online-published article will be provided free of charge to the related author, and may be distributed according to the Publisher's terms and conditions. Additional paper offprint may be ordered by emailing us at: editor@globaljournals.org .



Before start writing a good quality Computer Science Research Paper, let us first understand what is Computer Science Research Paper? So, Computer Science Research Paper is the paper which is written by professionals or scientists who are associated to Computer Science and Information Technology, or doing research study in these areas. If you are novel to this field then you can consult about this field from your supervisor or guide.

TECHNIQUES FOR WRITING A GOOD QUALITY RESEARCH PAPER:

1. Choosing the topic: In most cases, the topic is searched by the interest of author but it can be also suggested by the guides. You can have several topics and then you can judge that in which topic or subject you are finding yourself most comfortable. This can be done by asking several questions to yourself, like Will I be able to carry our search in this area? Will I find all necessary recourses to accomplish the search? Will I be able to find all information in this field area? If the answer of these types of questions will be "Yes" then you can choose that topic. In most of the cases, you may have to conduct the surveys and have to visit several places because this field is related to Computer Science and Information Technology. Also, you may have to do a lot of work to find all rise and falls regarding the various data of that subject. Sometimes, detailed information plays a vital role, instead of short information.

2. Evaluators are human: First thing to remember that evaluators are also human being. They are not only meant for rejecting a paper. They are here to evaluate your paper. So, present your Best.

3. Think Like Evaluators: If you are in a confusion or getting demotivated that your paper will be accepted by evaluators or not, then think and try to evaluate your paper like an Evaluator. Try to understand that what an evaluator wants in your research paper and automatically you will have your answer.

4. Make blueprints of paper: The outline is the plan or framework that will help you to arrange your thoughts. It will make your paper logical. But remember that all points of your outline must be related to the topic you have chosen.

5. Ask your Guides: If you are having any difficulty in your research, then do not hesitate to share your difficulty to your guide (if you have any). They will surely help you out and resolve your doubts. If you can't clarify what exactly you require for your work then ask the supervisor to help you with the alternative. He might also provide you the list of essential readings.

6. Use of computer is recommended: As you are doing research in the field of Computer Science, then this point is quite obvious.

7. Use right software: Always use good quality software packages. If you are not capable to judge good software then you can lose quality of your paper unknowingly. There are various software programs available to help you, which you can get through Internet.

8. Use the Internet for help: An excellent start for your paper can be by using the Google. It is an excellent search engine, where you can have your doubts resolved. You may also read some answers for the frequent question how to write my research paper or find model research paper. From the internet library you can download books. If you have all required books make important reading selecting and analyzing the specified information. Then put together research paper sketch out.

9. Use and get big pictures: Always use encyclopedias, Wikipedia to get pictures so that you can go into the depth.

10. Bookmarks are useful: When you read any book or magazine, you generally use bookmarks, right! It is a good habit, which helps to not to lose your continuity. You should always use bookmarks while searching on Internet also, which will make your search easier.

11. Revise what you wrote: When you write anything, always read it, summarize it and then finalize it.

12. Make all efforts: Make all efforts to mention what you are going to write in your paper. That means always have a good start. Try to mention everything in introduction, that what is the need of a particular research paper. Polish your work by good skill of writing and always give an evaluator, what he wants.

13. Have backups: When you are going to do any important thing like making research paper, you should always have backup copies of it either in your computer or in paper. This will help you to not to lose any of your important.

14. Produce good diagrams of your own: Always try to include good charts or diagrams in your paper to improve quality. Using several and unnecessary diagrams will degrade the quality of your paper by creating "hotchpotch." So always, try to make and include those diagrams, which are made by your own to improve readability and understandability of your paper.

15. Use of direct quotes: When you do research relevant to literature, history or current affairs then use of quotes become essential but if study is relevant to science then use of quotes is not preferable.

16. Use proper verb tense: Use proper verb tenses in your paper. Use past tense, to present those events that happened. Use present tense to indicate events that are going on. Use future tense to indicate future happening events. Use of improper and wrong tenses will confuse the evaluator. Avoid the sentences that are incomplete.

17. Never use online paper: If you are getting any paper on Internet, then never use it as your research paper because it might be possible that evaluator has already seen it or maybe it is outdated version.

18. Pick a good study spot: To do your research studies always try to pick a spot, which is quiet. Every spot is not for studies. Spot that suits you choose it and proceed further.

19. Know what you know: Always try to know, what you know by making objectives. Else, you will be confused and cannot achieve your target.

20. Use good quality grammar: Always use a good quality grammar and use words that will throw positive impact on evaluator. Use of good quality grammar does not mean to use tough words, that for each word the evaluator has to go through dictionary. Do not start sentence with a conjunction. Do not fragment sentences. Eliminate one-word sentences. Ignore passive voice. Do not ever use a big word when a diminutive one would suffice. Verbs have to be in agreement with their subjects. Prepositions are not expressions to finish sentences with. It is incorrect to ever divide an infinitive. Avoid clichés like the disease. Also, always shun irritating alliteration. Use language that is simple and straight forward. put together a neat summary.

21. Arrangement of information: Each section of the main body should start with an opening sentence and there should be a changeover at the end of the section. Give only valid and powerful arguments to your topic. You may also maintain your arguments with records.

22. Never start in last minute: Always start at right time and give enough time to research work. Leaving everything to the last minute will degrade your paper and spoil your work.

23. Multitasking in research is not good: Doing several things at the same time proves bad habit in case of research activity. Research is an area, where everything has a particular time slot. Divide your research work in parts and do particular part in particular time slot.

24. Never copy others' work: Never copy others' work and give it your name because if evaluator has seen it anywhere you will be in trouble.

25. Take proper rest and food: No matter how many hours you spend for your research activity, if you are not taking care of your health then all your efforts will be in vain. For a quality research, study is must, and this can be done by taking proper rest and food.

26. Go for seminars: Attend seminars if the topic is relevant to your research area. Utilize all your resources.



© Copyright by Global Journals Inc.(US)| Guidelines Handbook

27. Refresh your mind after intervals: Try to give rest to your mind by listening to soft music or by sleeping in intervals. This will also improve your memory.

28. Make colleagues: Always try to make colleagues. No matter how sharper or intelligent you are, if you make colleagues you can have several ideas, which will be helpful for your research.

29. Think technically: Always think technically. If anything happens, then search its reasons, its benefits, and demerits.

30. Think and then print: When you will go to print your paper, notice that tables are not be split, headings are not detached from their descriptions, and page sequence is maintained.

31. Adding unnecessary information: Do not add unnecessary information, like, I have used MS Excel to draw graph. Do not add irrelevant and inappropriate material. These all will create superfluous. Foreign terminology and phrases are not apropos. One should NEVER take a broad view. Analogy in script is like feathers on a snake. Not at all use a large word when a very small one would be sufficient. Use words properly, regardless of how others use them. Remove quotations. Puns are for kids, not grunt readers. Amplification is a billion times of inferior quality than sarcasm.

32. Never oversimplify everything: To add material in your research paper, never go for oversimplification. This will definitely irritate the evaluator. Be more or less specific. Also too, by no means, ever use rhythmic redundancies. Contractions aren't essential and shouldn't be there used. Comparisons are as terrible as clichés. Give up ampersands and abbreviations, and so on. Remove commas, that are, not necessary. Parenthetical words however should be together with this in commas. Understatement is all the time the complete best way to put onward earth-shaking thoughts. Give a detailed literary review.

33. Report concluded results: Use concluded results. From raw data, filter the results and then conclude your studies based on measurements and observations taken. Significant figures and appropriate number of decimal places should be used. Parenthetical remarks are prohibitive. Proofread carefully at final stage. In the end give outline to your arguments. Spot out perspectives of further study of this subject. Justify your conclusion by at the bottom of them with sufficient justifications and examples.

34. After conclusion: Once you have concluded your research, the next most important step is to present your findings. Presentation is extremely important as it is the definite medium though which your research is going to be in print to the rest of the crowd. Care should be taken to categorize your thoughts well and present them in a logical and neat manner. A good quality research paper format is essential because it serves to highlight your research paper and bring to light all necessary aspects in your research.

Informal Guidelines of Research Paper Writing

Key points to remember:

- Submit all work in its final form.
- Write your paper in the form, which is presented in the guidelines using the template.
- Please note the criterion for grading the final paper by peer-reviewers.

Final Points:

A purpose of organizing a research paper is to let people to interpret your effort selectively. The journal requires the following sections, submitted in the order listed, each section to start on a new page.

The introduction will be compiled from reference matter and will reflect the design processes or outline of basis that direct you to make study. As you will carry out the process of study, the method and process section will be constructed as like that. The result segment will show related statistics in nearly sequential order and will direct the reviewers next to the similar intellectual paths throughout the data that you took to carry out your study. The discussion section will provide understanding of the data and projections as to the implication of the results. The use of good quality references all through the paper will give the effort trustworthiness by representing an alertness of prior workings.

Writing a research paper is not an easy job no matter how trouble-free the actual research or concept. Practice, excellent preparation, and controlled record keeping are the only means to make straightforward the progression.

General style:

Specific editorial column necessities for compliance of a manuscript will always take over from directions in these general guidelines.

To make a paper clear

· Adhere to recommended page limits

Mistakes to evade

- Insertion a title at the foot of a page with the subsequent text on the next page
- Separating a table/chart or figure - impound each figure/table to a single page
- Submitting a manuscript with pages out of sequence

In every sections of your document

· Use standard writing style including articles ("a", "the," etc.)

· Keep on paying attention on the research topic of the paper

· Use paragraphs to split each significant point (excluding for the abstract)

· Align the primary line of each section

· Present your points in sound order

· Use present tense to report well accepted

· Use past tense to describe specific results

· Shun familiar wording, don't address the reviewer directly, and don't use slang, slang language, or superlatives

· Shun use of extra pictures - include only those figures essential to presenting results

Title Page:

Choose a revealing title. It should be short. It should not have non-standard acronyms or abbreviations. It should not exceed two printed lines. It should include the name(s) and address (es) of all authors.



© Copyright by Global Journals Inc.(US)| Guidelines Handbook

Abstract:

The summary should be two hundred words or less. It should briefly and clearly explain the key findings reported in the manuscript--must have precise statistics. It should not have abnormal acronyms or abbreviations. It should be logical in itself. Shun citing references at this point.

An abstract is a brief distinct paragraph summary of finished work or work in development. In a minute or less a reviewer can be taught the foundation behind the study, common approach to the problem, relevant results, and significant conclusions or new questions.

Write your summary when your paper is completed because how can you write the summary of anything which is not yet written? Wealth of terminology is very essential in abstract. Yet, use comprehensive sentences and do not let go readability for briefness. You can maintain it succinct by phrasing sentences so that they provide more than lone rationale. The author can at this moment go straight to shortening the outcome. Sum up the study, with the subsequent elements in any summary. Try to maintain the initial two items to no more than one ruling each.

- Reason of the study - theory, overall issue, purpose
- Fundamental goal
- To the point depiction of the research
- Consequences, including definite statistics - if the consequences are quantitative in nature, account quantitative data; results of any numerical analysis should be reported
- Significant conclusions or questions that track from the research(es)

Approach:

- Single section, and succinct
- As a outline of job done, it is always written in past tense
- A conceptual should situate on its own, and not submit to any other part of the paper such as a form or table
- Center on shortening results - bound background information to a verdict or two, if completely necessary
- What you account in an conceptual must be regular with what you reported in the manuscript
- Exact spelling, clearness of sentences and phrases, and appropriate reporting of quantities (proper units, important statistics) are just as significant in an abstract as they are anywhere else

Introduction:

The **Introduction** should "introduce" the manuscript. The reviewer should be presented with sufficient background information to be capable to comprehend and calculate the purpose of your study without having to submit to other works. The basis for the study should be offered. Give most important references but shun difficult to make a comprehensive appraisal of the topic. In the introduction, describe the problem visibly. If the problem is not acknowledged in a logical, reasonable way, the reviewer will have no attention in your result. Speak in common terms about techniques used to explain the problem, if needed, but do not present any particulars about the protocols here. Following approach can create a valuable beginning:

- Explain the value (significance) of the study
- Shield the model - why did you employ this particular system or method? What is its compensation? You strength remark on its appropriateness from a abstract point of vision as well as point out sensible reasons for using it.
- Present a justification. Status your particular theory (es) or aim(s), and describe the logic that led you to choose them.
- Very for a short time explain the tentative propose and how it skilled the declared objectives.

Approach:

- Use past tense except for when referring to recognized facts. After all, the manuscript will be submitted after the entire job is done.
- Sort out your thoughts; manufacture one key point with every section. If you make the four points listed above, you will need a least of four paragraphs.

- Present surroundings information only as desirable in order hold up a situation. The reviewer does not desire to read the whole thing you know about a topic.
- Shape the theory/purpose specifically - do not take a broad view.
- As always, give awareness to spelling, simplicity and correctness of sentences and phrases.

Procedures (Methods and Materials):

This part is supposed to be the easiest to carve if you have good skills. A sound written Procedures segment allows a capable scientist to replacement your results. Present precise information about your supplies. The suppliers and clarity of reagents can be helpful bits of information. Present methods in sequential order but linked methodologies can be grouped as a segment. Be concise when relating the protocols. Attempt for the least amount of information that would permit another capable scientist to spare your outcome but be cautious that vital information is integrated. The use of subheadings is suggested and ought to be synchronized with the results section. When a technique is used that has been well described in another object, mention the specific item describing a way but draw the basic principle while stating the situation. The purpose is to text all particular resources and broad procedures, so that another person may use some or all of the methods in one more study or referee the scientific value of your work. It is not to be a step by step report of the whole thing you did, nor is a methods section a set of orders.

Materials:

- Explain materials individually only if the study is so complex that it saves liberty this way.
- Embrace particular materials, and any tools or provisions that are not frequently found in laboratories.
- Do not take in frequently found.
- If use of a definite type of tools.
- Materials may be reported in a part section or else they may be recognized along with your measures.

Methods:

- Report the method (not particulars of each process that engaged the same methodology)
- Describe the method entirely
- To be succinct, present methods under headings dedicated to specific dealings or groups of measures
- Simplify - details how procedures were completed not how they were exclusively performed on a particular day.
- If well known procedures were used, account the procedure by name, possibly with reference, and that's all.

Approach:

- It is embarrassed or not possible to use vigorous voice when documenting methods with no using first person, which would focus the reviewer's interest on the researcher rather than the job. As a result when script up the methods most authors use third person passive voice.
- Use standard style in this and in every other part of the paper - avoid familiar lists, and use full sentences.

What to keep away from

- Resources and methods are not a set of information.
- Skip all descriptive information and surroundings - save it for the argument.
- Leave out information that is immaterial to a third party.

Results:

The principle of a results segment is to present and demonstrate your conclusion. Create this part a entirely objective details of the outcome, and save all understanding for the discussion.

The page length of this segment is set by the sum and types of data to be reported. Carry on to be to the point, by means of statistics and tables, if suitable, to present consequences most efficiently.You must obviously differentiate material that would usually be incorporated in a study editorial from any unprocessed data or additional appendix matter that would not be available. In fact, such matter should not be submitted at all except requested by the instructor.



© Copyright by Global Journals Inc.(US)| Guidelines Handbook

Content

- Sum up your conclusion in text and demonstrate them, if suitable, with figures and tables.
- In manuscript, explain each of your consequences, point the reader to remarks that are most appropriate.
- Present a background, such as by describing the question that was addressed by creation an exacting study.
- Explain results of control experiments and comprise remarks that are not accessible in a prescribed figure or table, if appropriate.
- Examine your data, then prepare the analyzed (transformed) data in the form of a figure (graph), table, or in manuscript form.

What to stay away from

- Do not discuss or infer your outcome, report surroundings information, or try to explain anything.
- Not at all, take in raw data or intermediate calculations in a research manuscript.
- Do not present the similar data more than once.
- Manuscript should complement any figures or tables, not duplicate the identical information.
- Never confuse figures with tables - there is a difference.

Approach

- As forever, use past tense when you submit to your results, and put the whole thing in a reasonable order.
- Put figures and tables, appropriately numbered, in order at the end of the report
- If you desire, you may place your figures and tables properly within the text of your results part.

Figures and tables

- If you put figures and tables at the end of the details, make certain that they are visibly distinguished from any attach appendix materials, such as raw facts
- Despite of position, each figure must be numbered one after the other and complete with subtitle
- In spite of position, each table must be titled, numbered one after the other and complete with heading
- All figure and table must be adequately complete that it could situate on its own, divide from text

Discussion:

The Discussion is expected the trickiest segment to write and describe. A lot of papers submitted for journal are discarded based on problems with the Discussion. There is no head of state for how long a argument should be. Position your understanding of the outcome visibly to lead the reviewer through your conclusions, and then finish the paper with a summing up of the implication of the study. The purpose here is to offer an understanding of your results and hold up for all of your conclusions, using facts from your research and generally accepted information, if suitable. The implication of result should be visibly described. Infer your data in the conversation in suitable depth. This means that when you clarify an observable fact you must explain mechanisms that may account for the observation. If your results vary from your prospect, make clear why that may have happened. If your results agree, then explain the theory that the proof supported. It is never suitable to just state that the data approved with prospect, and let it drop at that.

- Make a decision if each premise is supported, discarded, or if you cannot make a conclusion with assurance. Do not just dismiss a study or part of a study as "uncertain."
- Research papers are not acknowledged if the work is imperfect. Draw what conclusions you can based upon the results that you have, and take care of the study as a finished work
- You may propose future guidelines, such as how the experiment might be personalized to accomplish a new idea.
- Give details all of your remarks as much as possible, focus on mechanisms.
- Make a decision if the tentative design sufficiently addressed the theory, and whether or not it was correctly restricted.
- Try to present substitute explanations if sensible alternatives be present.
- One research will not counter an overall question, so maintain the large picture in mind, where do you go next? The best studies unlock new avenues of study. What questions remain?
- Recommendations for detailed papers will offer supplementary suggestions.

Approach:

- When you refer to information, differentiate data generated by your own studies from available information
- Submit to work done by specific persons (including you) in past tense.
- Submit to generally acknowledged facts and main beliefs in present tense.

Please carefully note down following rules and regulation before submitting your Research Paper to Global Journals Inc. (US):

Segment Draft and Final Research Paper: You have to strictly follow the template of research paper. If it is not done your paper may get rejected.

- The **major constraint** is that you must independently make all content, tables, graphs, and facts that are offered in the paper. You must write each part of the paper wholly on your own. The Peer-reviewers need to identify your own perceptive of the concepts in your own terms. NEVER extract straight from any foundation, and never rephrase someone else's analysis.

- Do not give permission to anyone else to "PROOFREAD" your manuscript.

- Methods to avoid Plagiarism is applied by us on every paper, if found guilty, you will be blacklisted by all of our collaborated research groups, your institution will be informed for this and strict legal actions will be taken immediately.)
- To guard yourself and others from possible illegal use please do not permit anyone right to use to your paper and files.



© Copyright by Global Journals Inc.(US)| Guidelines Handbook

Criterion for Grading a Research Paper (Compilation) by Global Journals Inc. (US)

Please note that following table is only a Grading of "Paper Compilation" and not on "Performed/Stated Research" whose grading solely depends on Individual Assigned Peer Reviewer and Editorial Board Member. These can be available only on request and after decision of Paper. This report will be the property of Global Journals Inc. (US).

Topics	Grades		
	A-B	**C-D**	**E-F**
Abstract	Clear and concise with appropriate content, Correct format. 200 words or below	Unclear summary and no specific data, Incorrect form Above 200 words	No specific data with ambiguous information Above 250 words
Introduction	Containing all background details with clear goal and appropriate details, flow specification, no grammar and spelling mistake, well organized sentence and paragraph, reference cited	Unclear and confusing data, appropriate format, grammar and spelling errors with unorganized matter	Out of place depth and content, hazy format
Methods and Procedures	Clear and to the point with well arranged paragraph, precision and accuracy of facts and figures, well organized subheads	Difficult to comprehend with embarrassed text, too much explanation but completed	Incorrect and unorganized structure with hazy meaning
Result	Well organized, Clear and specific, Correct units with precision, correct data, well structuring of paragraph, no grammar and spelling mistake	Complete and embarrassed text, difficult to comprehend	Irregular format with wrong facts and figures
Discussion	Well organized, meaningful specification, sound conclusion, logical and concise explanation, highly structured paragraph reference cited	Wordy, unclear conclusion, spurious	Conclusion is not cited, unorganized, difficult to comprehend
References	Complete and correct format, well organized	Beside the point, Incomplete	Wrong format and structuring

INDEX

A

Acetonitrile · 3, 4
Arrhenius · 27, 30

B

Biases · 11

C

Chlorobutane · 3, 4, 5
Cholinium · 8

F

Freundlish · 25, 27, 29

H

Halide · 1

I

Imidazolium · 1, 5, 8, 9

L

Langmuir · 25, 27, 29

M

Methylimidazolium · 1, 3, 8

P

Pseudo · 25, 27, 29, 30, 31

T

Thawed · 2, 4
Toluene · 2, 4



Global Journal of Science Frontier Research

Visit us on the Web at www.GlobalJournals.org | www.JournalofScience.org
or email us at helpdesk@globaljournals.org

ISSN 9755896



© Global Journals