

**RESEARCH PAPER PUBLISHED**  
**(2017-2018)**

Sr. No.	Title of Research Paper	Journal	Authors	Year of Publication	ISSN No.
1.	To monitor Physiochemical parameters of well water villages in Roha Tahsil, District- Raigad, Maharashtra	International Journal of Scientific research	D.V. Bhagat, S.S. Take S. B. Shirke	2017-18	2277-8179
2	Synthesis and Characterization and antibacterial studies on mixed Ligand Cu (II)	International Journal of Scientific research	D.V. Bhagat, V.V. Vaidya	2017-18	2277-8179
3	Highly Efficient Synthesis and Antibacterial of 1, 5- Benzodiazepines under Microwave Irradiation	International Journal of applied chemistry	S. D. Tupare	2017-18	0973-1792
4	Amine Exchange Reactions of Mannish Bases	Scholarly Research Journal for Interdisciplinary Studies	S.D. Patil	2017-18	2278-8808
5	Phisico chemical studies of sea water at Dharamtar creek near Dolvi village	International journal of science & Engineering	V. R. Jadhavar	2017-18	2456-3293
6	Assessment of Physico chemical parameters of well water of Villages in Roha Tahashil Raigad	Inter. J. Of A. & Pure Science	Bhagat D. V. Take S. S. Shirke S. B.	2017-18	2394-823X
7	Studies and Synthesis of Biological active mixed ligand Zn (II) complexes	International J. of Scientific Research	Bhagat D. V.	2017-18	2277-8179
8	Natural Biosurfactant for pseudo multicomponent synthesis of 2-aryl -1- aryl methyl 1H Benzimidazoles	Benthum Science Publication	Smita Morbale Sachin K. Shinde Suresh Patil	2017-18	1570-1786
9.	Characterization of Tin substituted Fe <sub>2</sub> TiO <sub>5</sub> Based Materials	J. of Advances and scholarly Researches in Allied Education	Sandesh S. Gurav	2017-18	2230-7540



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## SYNTHESIS, CHARACTERIZATION &amp; ANTIBACTERIAL STUDIES ON MIXED LIGAND Cu (II) COMPLEXES WITH POLYDENTATE LIGANDS



Chemistry

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## ABSTRACT

Mixed ligand Cu (II) complexes of the type  $[M(Q)(L)_2 \cdot 2H_2O]$  have been synthesized using 8-hydroxyquinoline (HQ) as a primary ligand and N- and/or O-donor amino acids (HL) such as L-valine, L-asparagine, L-glutamine, L-arginine and L-methionine as a secondary ligands. The metal complexes have been characterized on the basis of elemental analysis, electrical conductance, room temperature, magnetic susceptibility measurements, spectral and thermal studies. The electrical conductance studies of the complexes in DMSO (dimethyl sulphoxide) in 10<sup>-3</sup> M concentration indicate their non-electrolytic nature. Room temperature magnetic susceptibility measurements revealed paramagnetic nature of the complexes. Electronic absorption spectra of the complexes show intra-ligand, charge transfer transition & d-d transition. The thermal analysis data of the complexes indicate the presence of crystallized water molecules. The agar cup method & tube dilution method have been used to study the antibacterial activity of the complexes against the pathogenic bacteria *S. aureus*, *C. diphtheriae*, *S. typhi* & *E. coli*. The results have been compared with those of control tetracycline, which was screened simultaneously & indicated mild antibacterial activity of the complexes.

## KEYWORDS

Mixed ligand copper complexes, synthesis, antibacterial study.

Many researchers have studied characterization, antimicrobial & toxicological activity of mixed ligand complexes of transition metal (1-6). The role of mixed ligand complexes in biological process has been well recognized (7, 8). It has been found that a majority of the metal complexes with 8-hydroxyquinoline possess biological activity (9-11). Amino acids are well known for their tendency to form complexes with metals having biological significance & metabolic enzymatic activities (12). Antitumor activity of some mixed ligand complexes has also been reported (13, 14). The antibacterial & antifungal properties of a range of copper (II) complexes have been evaluated against several pathogenic bacteria & fungi (15-16).

Therefore, it was considered to study the complexation & to determine the biological activity copper complexes. The present paper reports synthesis, characterization & antibacterial studies of the mixed ligand Cu (II) complexes prepared with 8-hydroxyquinoline (HQ) as a primary ligand & amino acids (HL) such as L-valine, L-asparagine, L-glutamine, L-arginine and L-methionine as a secondary ligands. The metal complexes have been characterized by elemental analysis & various physico-chemical techniques such as molar conductance, magnetic susceptibility, electronic spectra, IR spectra and thermal studies.

## EXPERIMENTAL

## Materials

Analytical grade copper (II) chloride dehydrate was used as such without further purification L-valine, L-asparagine, L-glutamine, L-arginine and L-methionine & 8-hydroxyquinoline were obtained from S.D. Fine chemicals, Mumbai, India. Solvents like, ethanol, dimethyl sulphoxide & laboratory grade chemicals, whenever used were distilled & purified according to standard procedures (17,19).

## Preparation of Mixed ligand Complexes

Mixed ligand Cu (II) were prepared from copper (II) chloride dihydrate, 8-hydroxyquinoline (HQ) as a primary ligand & different amino acids (HL) such as L-valine, L-asparagine, L-glutamine, L-arginine and L-methionine as a secondary ligands.

To an aqueous solution (10cm<sup>3</sup>) of copper (II) chloride dehydrate (170mg, 1mmol) was mixed with ethanolic solution (10cm<sup>3</sup>) of 8-hydroxyquinoline (145mg, 1mmol) was added. The mixture was stirred and kept in boiling waterbath for 10 min. To this hot solution, an aqueous solution (10cm<sup>3</sup>) of amino acids (1mmol) was added with constant stirring. The mixture was again heated in a water bath. The complexes were obtained by raising p<sup>H</sup> of the reaction mixture by adding diluted ammonia solution. The mixture was cooled and solid complex obtained was filtered, washed with water followed by ethanol. The complexes thus prepared were dried under vacuum.

## Instrumentation

The complexes were analyzed for C, H, N & S contents on Thermo Finnigan Elemental Analyzer, Model No. FLASH EA 1112 Series at Department of Chemistry, I.I.T., Mumbai. Metal content was estimated complexometrically by standard procedure (20, 21).

The Molar Conductance values were measured in DMSO (10<sup>-3</sup>M) on an Equiptronics Autoranging Conductivity Meter Model No. EQ-667 with a dip type conductivity cell fitted with platinum electrodes (cell constant= 1.0cm<sup>-1</sup>).

The room temperature magnetic susceptibility measurements of the complexes reported in the present study were made by the Guoy's method using Hg [Co(SCN)<sub>4</sub>] as calibrant at Department of Chemistry, I.I.T., Mumbai.

The electronic absorption spectra of all the complexes in DMSO solution (10<sup>-3</sup>M) in the ultraviolet & visible region were recorded on Shimadzu UV/VIS-160 spectrometer using a quartz cell of 1cm optical path at GNIRD, Mumbai.

Infrared spectra of all the ligands & their metal complexes were recorded in KBr disc on a Perkin-Elmer FTIR spectrophotometer model 1600 in the region 4000-400 cm<sup>-1</sup> at Department of Chemistry, I.I.T., Mumbai. The pellets were prepared taking necessary precautions to avoid moisture. The instrument calibration with respect to wave number and percent transmission was confirmed by recording the spectrum of standard polystyrene film. From the spectra, the characteristic groups were assigned the respected frequencies (22).

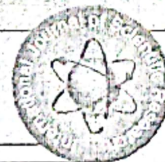
The Thermogravimetric (TG) & Differential Thermal Analysis (DTA) measurements were carried out in controlled nitrogen atmosphere on a Perkin-Elmer Diamond TG-DTA instrument at the Department of Chemistry, I.I.T., Mumbai by recording the change in weight of the complexes on increasing temperature up to 900°C at heating rate of 10°C/min.

## Antibacterial screening

## Agar cup method

In the Agar cup method, a single compound can be tested against number of organisms or a given organism against different concentrations of the same compound. The method was found suitable for semisolid or liquid samples and was used in the present work. In the Agar cup method, a plate of sterile nutrient agar with the desired test strain was poured to a height of about 8 mm diameter was cut from the center of the plate with a sterile cork borer. Thereafter, the cup was filled with the sample solution of known concentration & the plate was incubated at 37°C for 24h. The extent of growth inhibition from the

## TO MONITOR PHYSICO-CHEMICAL PARAMETERS OF WELL WATER OF VILLAGES IN ROHA TAHSIL, DIST-RAIGAD (MAHARASHTRA)



Chemistry

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### ABSTRACT

Assessment of physicochemical parameters of well water in the six villages of Roha Tahsil has been carried out during the year 2015-16 for instance water moving through underground rocks and soils may pick up natural contaminants, even with no human activity or pollution in the area. In addition to nature's influence, water is also polluted by human activities, such as open defecation, dumping garbage, poor agricultural practices, and chemical spills at industrial sites.

The present study was undertaken for six villages of Roha taluka, viz. Khamb, Shiravali, Nadavali, Talavali, Chilhe and Devkhane where the well water is the second source of drinking water. The water analysis was performed for the selected parameters such as Temperature, pH, Total Dissolved Solids, Total Suspended Solids, Sulphates, Iron, COD, etc. It was concluded from the study that the well water can be used for the drinking purpose after a suitable treatment.

### KEYWORDS:

Khamb, Shiravali, COD, pH, Sulphates,

#### Introduction:

Having safe drinking water and basic sanitation is a human need and right for every man, woman and child. People need clean water and sanitation to maintain their health and dignity. Having better water and sanitation is essential in breaking the cycle of poverty since it improves people's health, strength to work, and ability to go to school. Yet 884 million people around the world live without improved drinking water and 2.5 billion people still lack access to improved sanitation, including 1.2 billion who do not have a simple latrine at all (WHO/UNICEF, 2008). Many of these people are among those hardest to reach: families living in remote rural areas and urban slums, and families living in the poverty-disease trap, for whom improved sanitation and drinking water could offer a way out.

The World Health organization (WHO) estimates that 88% of diarrheal disease is caused by unsafe water, inadequate sanitation and poor hygiene. As a result, more than 4,500 children die every day from diarrhea and other diseases. For every child that dies, countless others, including older children and adults, suffer from poor health and missed opportunities for work and education. To safeguard the long term sustainability of well water and ground water resources, the quality of water needs to be continuously monitored (NEERI 1981).

#### Study area:

Roha is a small city and taluka in the Raigad district of the Maharashtra state of India. It is located 120 km southeast of Mumbai. It is the starting point of kankan railways and end point of central railways. Raigad is one of the industrially developed districts in the Maharashtra state. It lies at the bank of Arabian Sea. The geometrical position of it has latitude 18.450 and 73.120 longitude. Hilly area is one of the silent features of this area. The present investigation was carried out at the six selected villages in the Roha tahsil between March 2015 to June 2016 by considering the different physico-chemical parameters.

#### Materials and Methods:

For the purpose of study of well water quality in some selected rural villages, the samples were collected quarterly, in early morning hours, in clean plastic carboy of 2 litres capacity. Air temperature, water temperature was recorded on the spot. Other parameters such as Temperature, pH, Total Solids, Sulphates, Iron, COD etc., were analysed as per the methods describe in the standard methods (APHA, 1990); Trivedi and Goel (1984) and Kodarkar (1992).

#### Result and discussion:

The variations in analysed physical and chemical characteristics are tabulated along with the standard values in the Table No. 1 to 8.

#### Water Temperature

The surface water temperature depends on air temperature, wind, turbulence in water and biological activities taking place in the water. During the present study the water temperature ranged from 19 to 25.70C (Table No. 2). The minima was noted in the month of December 15. The maximum temperature was in March 2016 corresponding to air temperature.

#### pH

It is important to determine pH because most of the plants and animals can survive within a narrow range of pH from slightly acidic to slightly alkaline (Pawar and Pulley, 2005). pH also governs the distribution, transport and fate of heavy metals in aquatic ecosystems (Manna and Das, 2004).

The average pH values during the present study show water was slightly alkaline except in the village Khamb- S1. (Table No. 3). Alkalinity of pH is seen at every site except S1 due to unknown reason. Eutrophication and Sewage inflow are few of the causes of increased pH as stated by Ghavzan et al.(2005) and Chatterjee and Raziuddin, (2001)

#### Total Solids

The amount of total solids depend on various parameters such as geological character of the water shed, rainfall and the amount of surface run off (Akuskar and Gaikwad, 2006). The highest total solids elevate the density of water and such medium increases the stress on aquatic biota (Verma et al. 1978).

The present study indicates total solids ranging from 570 mg to 1100 mg/l (Table No. 4). The ISI-limit for total solids is 1000 mg/l. Present study indicates values crossing the permissible limit during some period of the year( March-15 to June-16), especially at Chilhe and Devkhane.

#### Total Suspended Solids

The amount of particles that suspended in a water sample is called total suspended solids (TSS). It is mentioned as mg/l. Total Suspended Solids (TSS), also known as non-filterable residue, are those solids (minerals and organic material) that remain trapped on a 1.2µm filter (U.S.EPA, 1998). TSS has no drinking water standard. Therefore, data in this report are compared to the general standards for surface water discharge of effluents that indicate the value 100mg/L.

The present study reveals that the suspended particles were found to be very noticeable (Table No. 5) for most of the period, however, it was found to be ranging between 100 and 310mg/l. Chatterjee and Raziuddin (2003) noted high values in monsoon. However such seasonal trend was not noted during the present study.

## Highly Efficient Synthesis and Antibacterial of 1, 5-Benzodiazepines under Microwave Irradiation

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### Abstract

The chemistry and pharmacology of thiazoles and diazoles have of great importance. These are of great interest to medicinal chemists nowadays, because they are known to possess a wide range of pharmacological properties in the field of clinical research. Many methods of synthesis are found in literature. Literature survey promoted us to prepare simple, rapid and highly efficient synthesis of benzodiazepines under microwave irradiation using environmentally benign solvent methoxyethanol. The clean reactions, shorter reaction time and high yields and purity of product. All compounds were screened for their antibacterial. Among the synthesized compounds, the compounds were found to be the most active against bacterial human pathogens.

**Keywords:** benzodiazepines, o-phenylene diamine, Microwave irradiation, antibacterial activity.

### INTRODUCTION:

Benzodiazepines and benzodiazepines have been attracted as an important class of heterocyclic compounds in the field of clinical research. These compounds are widely used as anticonvulsant<sup>1</sup>, Antibacterial and antifungal<sup>2-4</sup> properties of 2, 4-diaryl, 2,3-dihydro-1,5-benzodiazepines have been reported. They also possess a wide range of pharmacological properties.<sup>5-6</sup> including anti-HIV<sup>7</sup>, anticoagulant<sup>8</sup> and anti-allergenic<sup>9</sup>. The 1, 5 – benzodiazepines moiety is a privileged class of pharamacophore, as compounds bearing this structural unit possess a broad spectrum of biological activities. The common strategy for synthesis of the 1, 5 – benzodiazepines moiety is the reaction of Chalcones with o-phenylene diamine<sup>10</sup>. The various methods of synthesis involve use of ethanol as a solvent. Some methodologies

## AMINE EXCHANGE REACTIONS OF MANNICH BASES WITH AROMATIC AMINES IN IONIC LIQUIDS

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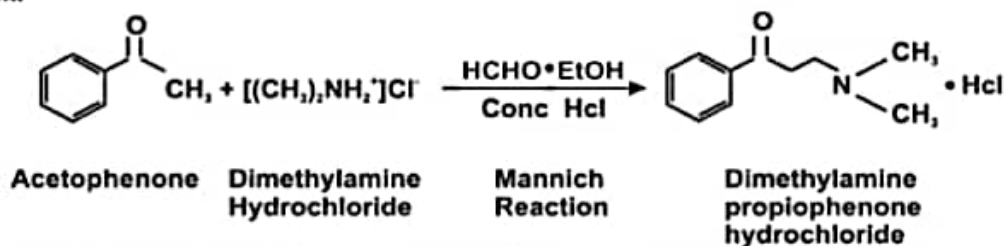
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### Abstract

Mannich reaction has found to have wide range of applications in synthetic and pharmaceutical fields. The efficiency of a chemical synthesis can be nowadays measured, not only by parameters like selectivity and overall yield, but also by its raw material, time, human resources and energy requirements, as well as the toxicity and hazard of the chemicals and the protocols involved. The use of ionic liquids as a medium for organic reactions instead hazardous chemicals contribute to the development of environmentally friendly processes. In the present study, amine exchange reactions of Mannich bases with aromatic amines in room temperature ionic liquids were carried out to form aromatic amine Mannich bases with high yields.

**Keywords:** MannichBase, Ionic liquids, Amine Exchange

**INTRODUCTION:** The condensation of compound containing active hydrogen and ammonia or primary or secondary amines usually as their hydrochlorides (HCl being used as catalyst) to form amino methyl or substituted amino methyl derivatives is known as Mannich reaction. The base called Mannichbase, is usually isolated as its hydrochloride. Aryl amines do not normally respond to this reaction.



Many important natural products, especially alkaloids have been synthesized by this reaction. A classical example is Robinson's synthesis of tropinone by a double Mannich condensation and subsequent synthesis of atropine. Tactacaine, a commercially useful anesthetic is prepared by this reaction. The amino acid, tryptophan is synthesized from the quaternary salt of gramine and acetamidomalonic ester.

Besides the common alkyl amines employed ever since the early work of Carl Mannich, more recent research in the synthesis of Mannich bases has proved that less common alkyl amines (mainly used with a view to creating pharmacologically active products), amino acids or phthalimide can be successfully used as amine components in direct amino methylation reactions. The amine exchange reaction between an alkyl amine Mannich bases and aryl amines also offers easy access to aryl amine Mannich bases in high yield under mild reaction conditions. This method, firstly introduced by Singh and later improved by Cymerman- Craig still is in spite of recent progress, a valuable preparative way for obtaining aryl amine Mannich bases.

Despite the impressive progress achieved in the amine exchange reactions there is still room for improvement, especially towards developing a novel green procedure with the rapid development in the field of synthetic chemistry, the researchers have started to pay more attention to detrimental effect on non-green processes to the environment. Carrying out organic reactions in green solvents has become highly desirable due to detrimental effect of toxic solvents to the environment.

The use of Ionic liquids as a medium for organic reactions would greatly contribute to the development of environmentally friendly processes.



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## OPEN ACCESS INTERNATIONAL JOURNAL OF SCIENCE & ENGINEERING

### PHYSICO-CHEMICAL STUDY OF SEA WATER AT DHARAMTAR CREEK NEAR DOLVI VILLAGE OF RAIGAD DISTRICT (M.S.) INDIA

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**Abstract:** The study of physicochemical properties of sea water of Dharamtar Creek near Dolvi village in the Raigad district was undertaken and water samples were collected on Full moon (FM) and New Moon (NM) during the period of October 2017 to September 2018 from the sampling site. Few parameters like pH, Temperature, Dissolved oxygen and Salinity were recorded in the laboratory. It was observed from the study that the pH values were maximum in summer season and minimum values were obtained in the monsoon season. From the present study it is showed that temperature and rainfall have great influence on pH and salinity of sea water at the Creek site.

**Keywords:** *Physicochemical, Dharamtar Creek, Salinity, Rainfall*

#### INTRODUCTION

The study of physico-chemical properties of any aquatic ecosystem is necessary because the physicochemical parameters affect its biota to a great extent. Perceive of literature reveals that from the coast of India several workers have studied the hydrochemical aspects of the sea water. Narayanaswami and Vishwanath Sarma (1982), Eswari and Ramanibai (2004), Gopakumar and Jayaprakas(2004) and Ananthan et al.(2004) had studied the some parameters. But due to lack of literature giving detail information on hydrochemistry of sea water of Dharamtar Creek, the present study was undertaken. The latitude of Pen Taluka Dist-Raigad, Maharashtra, India is 18.7358°N, and longitude is 73.0947°E. For doing hydrological study, the physicochemical parameters of the sea water near Dharamtar Creek were measured fortnightly i.e. on every new moon and

full moon days of the months throughout the year.

#### II MATERIAL AND METHODS:

Regular sampling of the seawater was made from the Dharamtar Creek near Dolvi village on every new moon and full moon days of the months from October 2017 to September 2018. The physico-chemical parameters like pH, temperature, dissolved oxygen (DO) and salinity were recorded. The pH was recorded with the help of pocket pH meter at the time of sampling. The temperature of the sea water was recorded with the help of standard centigrade thermometer in degree Celsius. Separate samples were collected for dissolved oxygen in 250 ml DO bottles and oxygen was fixed by adding alkali iodide for further analysis. The samples were analyzed by Winkler's method with azide modification (Trivedy and Goel 1984.). The salinity was determined using method given by Parson et al (1984). The replicates of these determinations were used in final result.



## ASSESSMENT OF PHYSICOCHEMICAL PARAMETERS OF WELL WATER OF VILLAGES IN ROHA TAHSIL, DIST-RAIGAD (MAHARASHTRA)

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### Abstract

Assessment of physicochemical parameters of well water in the six villages of Roha Tahsil has been carried out during the year 2015-16 for instance water moving through underground rocks and soils may pick up natural contaminates, even with no human activity or pollution in the area. In addition to nature's influence, water is also polluted by human activities, such as open defecation, dumping garbage, poor agricultural practices, and chemical spills at industrial sites. The present study was undertaken for six villages of Roha taluka, viz. Khamb, Shiravali, Nadavali, Talavali, Chilhe and Devkhane where the well water is the second source of drinking water. The water analysis was performed for the selected parameters such as Temperature, pH, Total Dissolved Solids, Total Suspended Solids, Sulphates, Iron, COD, etc. It was concluded from the study that the well water can be used for the drinking purpose after a suitable treatment.

Keywords: Khamb, Shiravali, COD, pH, Sulphates, Iron physicochemical parameters.

### I. INTRODUCTION

Having safe drinking water and basic sanitation is a human need and right for every man, woman and child. People need clean water and sanitation to maintain their health and dignity. Having better water and sanitation is essential in breaking the cycle of poverty since it improves people's health, strength to work, and ability to go to school. Yet 884 million people around the world live without improved drinking water and 2.5 billion people still lack access to improved sanitation, including 1.2 billion who do not have a simple latrine at all (WHO / UNICEF, 2008). Many of these people are among those hardest to reach: families living in remote rural areas and urban slums, and families living in the poverty-disease trap, for whom improved sanitation and drinking water could offer a way out.

The World Health Organization (WHO) estimates that 88% of diarrheal disease is caused by unsafe water, inadequate sanitation and poor hygiene. As a result, more than 4,500 children die every day from diarrhea and other diseases. For every child that dies, countless others, including older children and adults, suffer from poor health and missed opportunities for work and education. To safeguard the long term sustainability of well water and ground water resources, the quality of water needs to be continuously monitored (NEERI 1981).

#### Study area:

Roha is a small city and taluka in the Raigad district of the Maharashtra state of India. It is located 120 km south-east of Mumbai. It is the starting point of Konkan railways and end point of central railways. Raigad is one of the industrially developed districts in the Maharashtra state. It lies at the bank of Arabian Sea. The geometrical position of it has latitude  $18.45^{\circ}$  and  $73.12^{\circ}$  longitude. Hilly area is one of the silent features of this area. The present investigation was carried out at the six selected villages in

STUDIES AND SYNTHESIS OF BIOLOGICAL ACTIVE MIXED LIGAND Zn (II) COMPLEXES

Chemistry

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ABSTRACT

Synthesis of mixed ligand Zn (II) complexes of the type [M (Q) (L)].2H2O have been carried out by using 8-hydroxyquinoline (HQ) as a primary ligand & N-and/or O-donar amino acids (HL) such as L-valine, L-asparagine, L-glutamine and L-methionine as a secondary ligands. The characterization of metal complexes has been carried out on the basis of elemental analysis, electrical conductance, room temperature, magnetic susceptibility measurements, spectral & thermal studies. The electrical conductance studies of the complexes in DMSO (dimethyl sulphoxide) in 10-3 M concentration indicate their non-electrolytic nature. Room temperature magnetic susceptibility measurements specify that Zn (II) complexes are diamagnetic in nature. Electronic absorption spectra of the complexes show intra-ligand, charge transfer & d-d transition respectively. The thermal analysis data of the complexes indicate the presence of co-ordinated water molecules. FTIR spectra shows bonding of metal ions through N- and O- donar atoms of ligands molecules. Tube dilution and Agar cup methods were implemented for study the antibacterial activity of the complexes against the pathogenic bacteria Staphylococcus aureus, Corynebacterium diphtheriae, Salmonella typhi and Escherichia coli. The results have been compared with those of tetracycline, which was screened simultaneously & indicated mild antibacterial activity of the complexes.

KEYWORDS

Mixed ligand zinc complexes, synthesis, characterization and biological studies.

1. INTRODUCTION

Comprehensive research have studied for characterization, antimicrobial & toxicological activity of mixed ligand complexes of transition metal (1-6). Mixed ligand complexes plays a vital role in biological process (7,8). It has been found that a majority of the metal complexes with 8-hydroxyquinoline process biological activity (9-11). Amino acids are well known for their tendency to form complexes with metals having biological significance & metabolic enzymatic activities (12). Mixed ligand complexes has also been reported to show Anti-tumour activities (13, 14). The antibacterial & Anti-fungal properties of a range of Zinc (II) complexes have been evaluated against several pathogenic bacteria & fungi (15-16).

Therefore, it was considered to study the complexation & to determine the biological activity Zinc complexes. The present paper reports synthesis, characterization & antibacterial studies of the mixed ligand Zn (II) complexes prepared with 8-hydroxyquinoline (HQ) as a primary ligand & amino acids (HL) such as L-valine, L-asparagine, L-glutamine, L-arginine and L-methionine as a secondary ligands. The metal complexes have been characterized on the basis of elemental analysis & various physico-chemical techniques such as molar conductance, magnetic susceptibility, electronic spectra, IR spectra & thermal studies.

2. EXPERIMENTAL

2.1 Materials

Analytical grade Zinc (II) chloride dehydrate was used as such without further purification L-valine, L-asparagine, L-glutamine, L-arginine and L-methionine & 8-hydroxyquinoline were obtained from S.D. Fine chemicals, Mumbai, India. Solvents like ethanol, dimethyl sulphoxied & laboratory grade chemicals, whenever used were distilled & purified according to standard procedures (17,19).

2.2 Preparation of Mixed Ligand Complexes

Mixed ligand zinc (II) complexes were synthesized from zinc (II) chloride dihydrate, 8-hydroxy-quinoline (HQ) as a primary ligand and different amino acids (HL) such as L-valine, L-asparagine, L-glutamine, L-arginine and L-methionine as secondary ligand.

An aqueous solution (10 cm³) of zinc (II) chloride dihydrate (136.29 mg, 1mmol) was mixed with ethanolic solution (10 cm³) of 8-hydroxyquinoline (145 mg, 1mmol). The mixture was stirred and kept in a boiling water bath for 10 minutes. To this hot solution, an aqueous solution (10 cm³) of amino acid (1 mmol) was added with constant stirring. The reaction mixture (1:1:1 molar proportion) was taken in

water bath and heated for about 10 minutes till the temperature reached to 50°C.

The pH of the mixture was raised by adding dilute ammonia solution in the reaction mixture and complex was obtained. Then the mixture was cooled and solid complex obtained was filtered, washed with water followed by ethanol. The complexes thus synthesized were dried under vacuum.

2.3 Instrumentation

The C, H, N & S elemental analysis of Zn (II) complexes were carried out on thermo Finnigan elemental Analyzer, Model No. FLASH EA 1112 Series at Department Of Chemistry, I.I.T., Mumbai. Metal content was estimated complexometrically by standard procedure (20,21).

The complexes were dissolve in DMSO (10⁻³M) to measure Molar Conductance values on an Equiptronics Auto Ranging Conductivity Meter Model No. EQ -667 with a dip type conductivity cell fitted with platinum electrodes (cell constant= 1.0 cm⁻¹).

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The electronic absorption spectra of all the complexes in DMSO solution (10⁻³M) in the ultraviolet & visible region were recorded on Shimadzu UV/VIS-160 spectrometer using quartz cell of 1cm optical path at GNIRD, Mumbai.

Infrared spectra of all the ligands & there metal complexes were recorded in KBr discs on a Perkin-Elmer FTIR spectrophotometer model 1600 in the region 4000-400 cm⁻¹ at Department of Chemistry, I.I.T., Mumbai. The pellets were prepared taking necessary precautions to avoid moisture. The instrument calibration with respect to wave number and percent transmission was confirmed by recording the spectrum of standard polystyrene film. From the spectra, the characteristic groups were assigned the respected frequencies (22)

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## RESEARCH ARTICLE

## Natural Bio-surfactant for Pseudomulticomponent Synthesis of 2-aryl-1-aryl Methyl-1H-benzimidazoles

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## ARTICLE HISTORY

Received: February 24, 2017  
Revised: May 27, 2017  
Accepted: June 23, 2017DOI:  
10.2174/1570178614666170710115331

**Abstract:** Green chemistry emphasizes the development of environmentally benign chemical processes and technologies. Pseudo-multicomponent synthesis of 2-aryl-1-arylmethyl-1H-benzimidazoles using o-phenylenediamine and aromatic aldehydes is carried out by Brønsted acid type bio-surfactant as a catalyst. The green features of this method include the use of biodegradable catalyst obtained from renewable resource *i.e.* *Citrus Limonium* extract as bio-surfactant type Brønsted acid, which provides a micellar media for effective cyclocondensation. The critical micellar concentration (cmc) of biosurfactant was determined by conductivity method and visualized by light microscopy measurement. Identity of all pure compounds was ascertained on the basis of FT-IR, <sup>1</sup>H NMR and <sup>13</sup>C NMR spectroscopic techniques.

**Keywords:** Bio-surfactant, Brønsted acid, *Citrus limonium*, benzimidazole.

## 1. INTRODUCTION

Heterocycles play important role for the design and discovery of new compounds of pharmaceutical applications [1]. Benzimidazoles are important structural motif exhibiting significant activity against several viruses such as HIV [2], herpes (HSV-1) [3], RNA [4]. Benzimidazoles act as DNA minor groove binding agents with antitumor activity [5], anticancer activity [6]. Their diverse applications comprise their role as potential angiotensin II inhibitors [7], 5-lipoxygenase inhibitors for use as novel anti-allergic agents [8], factor Xa (FXa) inhibitors [9], and ADP-ribose polymerase (PARP) inhibitors [10]. Some recently reported methods regarding benzimidazole synthesis are use of catalyst such as VO(acac)<sub>2</sub> [11], β-cyclodextrin (ZrO<sub>2</sub>-β-CD) [12], KOBut [13], Amberlite IR-120 [14], bnmim-HSO<sub>4</sub> [15], MoO<sub>3</sub>/CeO<sub>2</sub>-ZrO<sub>2</sub> [16], CAN [17], ([Hbim]BF<sub>4</sub>) [18], L-Proline [19], SnCl<sub>2</sub>·2H<sub>2</sub>O [20], Co-SBA~15 [21]. Although all these reactions can be efficient and selective but they often involve expensive reagents, drastic reaction conditions and tedious work up procedures. Therefore, it was thought that there is scope for improvement especially towards developing a green protocol for synthesis of benzimidazoles. Pseudomulticomponent reactions are multicomponent reactions in which at least one of the two reactants take part in two or more reaction steps. When two of the three or more

components are identical, the reaction is better designated as pseudo-MCRs. Even though incorporation of two identical components in the product of a pseudo-MCR exhibits severe limitation in terms of scope and functional flexibility, these transformations follow advantage of being very time-efficient, allowing for the rapid, sometimes spectacular, generation of molecular complexity. Particularly valuable are pseudo-MCRs involving successive but distinct and complementary reactivity's of the same component [22].

Biosurfactants being natural and promising surfactants because have certain advantages over chemical surfactants, such as their lower toxicity, their biodegradable nature, and their ecological acceptability. Some surfactants are biologically produced by yeasts or bacteria and are grouped as glycolipids, lipopeptides, fatty acids, polymeric and particulate compounds [23, 24]. One of the fundamental properties of surfactants is their self-association into organized molecular structure such as micelles, vesicles, microemulsions, bilayers, membranes and liquid crystals [25]. The simplest class of association colloids is the micelle. Micellisation characteristics of surfactant are determined by micellization parameters such as critical micellar concentration (CMC), aggregation number *etc.* Combined Brønsted acid surfactant catalysts have also been employed in several organic reactions [26]. Considering the significance of surfactants, in this communication, *Citrus limonium* extract (CLE) was chosen as catalytic media without using any external promoters, external acids, ligands, biphasic media and ionic liquids. The catalytic medium is sourced from the direct extraction of

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# Characterization of Tin Substituted Fe<sub>2</sub>TiO<sub>5</sub> Based Materials

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**Abstract** – In order to study the characterization of the tin substituted Fe<sub>2</sub>TiO<sub>5</sub> based materials the samples are prepared by standard ceramic technique. The single-phase formation of the pseudobrookite is confirmed by XRD technique.

*It is interesting to note that substitution of Ti<sup>4+</sup> by Sn<sup>4+</sup> is responsible to increase the unit cell volume and X-Ray or theoretical density. On the other hand, the use of anatase in the reaction causes the decrease in practical density and the increase in the porosity, Debye particle size and the inhomogeneity.*

**Key words:** Substitution, Pseudobrookite.

## 1. INTRODUCTION:

Iron titanate is a pseudobrookite which exhibits many interesting properties such as spin glass behaviour, thermal microcracking, high resistivity, etc. A cluster approach may be used for a description of spin glass behaviour of the pseudobrookites [1]. D. A. Kharmov, et.al [1] have studied the spin glass transition in the Fe<sub>2</sub>Ti<sub>1-x</sub>Sn<sub>x</sub>O<sub>5</sub> pseudobrookite and found that Sn<sup>4+</sup> ions appear to occupy only M1/4c octahedral sites and spin glass transition temperature T<sub>g</sub> depends on tin concentration monotonically. According to the XRD analysis and Sn-Mossbauer Spectral (MS) data the maximum solubility of Sn<sup>4+</sup> ions in the pseudobrookite structure at 1250°C is x = 0.22 [1], where the unit cell volume increases linearly with the increasing tin concentration.

The XRD analysis of the limit of solid solution Fe<sub>2</sub>Ti<sub>1-x</sub>Sn<sub>x</sub>O<sub>5</sub> (0 < x < 0.25) has been conducted by S. S. Meshalkin et al. [2] and has obtained x = 0.18 as the limit. A spin relaxation model has been used by G. M. Irwin et al. [3] However, the data of electrical transport and dielectric properties of the tin containing pseudobrookite is scarce [4].

SnO<sub>2</sub> (sintered ceramics and also compressed powder under very high pressure) exhibits an astonishingly high value of dielectric constant of the order of 10<sup>6</sup> [5] It is observed that small amount of SnO<sub>2</sub> doping enhances the rutilation of anatase and effectively prohibits the grain growth in these powders [6]. The incorporation of about 17% of Sn completely transforms anatase to the rutile form at a calcination temperature as low as 500°C [7]. The optical analysis shows that the band gap and Fermi level of the Ti<sub>1-x</sub>Sn<sub>x</sub>O<sub>2</sub> solid solutions increases

with increasing x and these solid solutions are expected to be of better photocatalytic properties [7]. However, the grain boundary barrier or energy barrier is ineffective. The solubility of Ti<sup>4+</sup> ions in SnO<sub>2</sub> is up to 25 mole %.

SnO<sub>2</sub> has been supported on TiO<sub>2</sub>, Al<sub>2</sub>O<sub>3</sub>, MgO and SiO<sub>2</sub> [8-9] and the resulting interactions between the components in the prepared samples and after reduction in flowing hydrogen by slowly raising the temperature from ambient to the reduction temperature are characterized by Mossbauer Spectral (MS) data. It is found that on titania a smaller Quadrupole Splitting (QS) is observed, which might be explained assuming that Sn<sup>4+</sup> is inside the structure of the titania. This is in agreement with the findings reported by Bartholomew and Boudart [10], who have reported that the Quadrupole Splitting (QS) for an atom in a crystal is lower than on the surface. The reduction of the species is easier if it is present on the surface than within the structure of support. The results obtained for tin on titania agree with this fact. Therefore, tin is present on the surface as well as within the structure of titania [9].

Ceramic bodies have been prepared from the ferric stannates and their dielectric properties have been measured [11]. They are found to be semiconductor. The substitution of Sn<sup>4+</sup> ion for the Ti<sup>4+</sup> ion may also be expected to improve the stability of titanate bodies with regard to changes in the state of oxidation during normal firing treatment, since SnO<sub>2</sub> is more stable in this respect than TiO<sub>2</sub> [12]. The study of Reitveld structure refinement of XRD of tin doped α-Fe<sub>2</sub>O<sub>3</sub> has been reported to contain tin in both interstitial and

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