3.3.3. Papers published in in national/ international conference proceedings per teacher during year (2021-2022)

INDEX

Sl. No.	Name of the teacher	Title of the paper	Name of the conference	National / International	Year of publication	ISBN/ISSN number	Page No.
1	Prof. Prerana Chaithra	Role of Artificial Intelligence in Robotics	Recent Trends in Computer Science and Information Technology (RTCSIT – 2022)	International	2022	2278-0181	4
2	Prof. Prerana Chaithra	Better Health Care with Artificial Intelligence	Recent Trends in Computer Science and Information Technology (RTCSIT – 2022)	International	2022	2278-0181	5
3	Dr. ANUSUYA A M, Dr. B S KRISHNA	Synthesis Characterization and Antimicrobial Studies on 5-(2-phenyl-2, dihydro-1H Benzimidazole-yl) Quinolin-8-ol and Transition Metal Complexes as a Biologically Active Pharmacophore.	International Conference on Global Convergence in Technology, Entrepreneurship, Computing and Value Engineering: Principles and Practices - 2022 (ICGCP-2022)	International	2022	ISBN: 979-88-35073-61-0	6
4	Dr. Roopa K P	Assay of Cephalosporins in bulk and Pharmaceutical Formulations	International Conference on Global Convergence in Technology, Entrepreneurship, Computing and Value Engineering: Principles and Practices - 2022 (ICGCP-2022)	International	2022	ISBN: 979-88-35073-61-0	7
5	Prof. Y H Krishne Gowda	Analysis of the Physico-Chemical parameters in the Groundwater of Hutridurga Hobli Kunigal Taluk, Karnataka, India.	International Conference on Global Convergence in Technology, Entrepreneurship, Computing and Value Engineering: Principles and Practices - 2022 (ICGCP-2022)	International	2022	ISBN: 979-88-35073-61-0	8
6	Prof. Pallavi G A, Prof. C H Bhavya	Experimental investigation on properties of self-compacting and self-curing concrete using light weight aggregate, M-Sand and Fly Ash as a mineral Admixture	International Conference on Global Convergence in Technology, Entrepreneurship, Computing and Value Engineering: Principles and Practices - 2022 (ICGCP-2022)	International	2022	ISBN: 979-88-35073-61-0	9
7	Dr. Praveen Kumar K V	Survey: Yield Prediction using Machine Learning: Special Emphasis on Coconut Yield Prediction	International Conference on Global Convergence in Technology, Entrepreneurship, Computing and Value Engineering: Principles and Practices - 2022 (ICGCP-2022)	International	2022	ISBN: 979-88-35073-61-0	10

Sl. No.	Name of the teacher	Title of the paper	Name of the conference	National / International	Year of publication	ISBN/ISSN number	Page No.
8	Prof. Prakash Jadhav, Prof. Sudha M S, Prof. Veena N	Multi-Scale Wavelets for Quality Video Frames	International Conference on Global Convergence in Technology, Entrepreneurship, Computing and Value Engineering: Principles and Practices - 2022 (ICGCP-2022)	International	2022	ISBN: 979-88-35073-61-0	11
9	Dr. A M Nagaraja, Prof. Girish J R, Prof. Suma V Chetty, Prof. Shilpa V	Design and Analysis of Multiple-input OTA circuit for VLSI implementation of neural networks	International Conference on Global Convergence in Technology, Entrepreneurship, Computing and Value Engineering: Principles and Practices - 2022 (ICGCP-2022)	International	2022	ISBN: 979-88-35073-61-0	12
10	Prof. Suma V Shetty, Prof. Shilpa V, Prof. Girish J R	Redundant Binary Signed Digit Frame Work for ALU Implementation	International Conference on Global Convergence in Technology, Entrepreneurship, Computing and Value Engineering: Principles and Practices - 2022 (ICGCP-2022)	International	2022	ISBN: 979-88-35073-61-0	13
11	Prof. Gayathri R	A review on QoS in Wireless Sensor Networks	International Conference on Global Convergence in Technology, Entrepreneurship, Computing and Value Engineering: Principles and Practices - 2022 (ICGCP-2022)	International	2022	ISBN: 979-88-35073-61-0	14
12	Prof. Shwetha B S, Prof. Santhosh H C, Prof. Parshwanath P	Big Data and Artificial Intelligence in Agriculture	International Conference on Global Convergence in Technology, Entrepreneurship, Computing and Value Engineering: Principles and Practices - 2022 (ICGCP-2022)	International	2022	ISBN: 979-88-35073-61-0	15
13	Prof. Bhavya N P, Prof. Nandini B J, Prof. Parshwanath P	COVID-19 Pandemic and Digitla Revolution in Improving the quality of Teaching and Learning	International Conference on Global Convergence in Technology, Entrepreneurship, Computing and Value Engineering: Principles and Practices - 2022 (ICGCP-2022)	International	2022	ISBN: 979-88-35073-61-0	16
14	Prof. Ram Kumar M, Prof. A M Mahesha, Prof. Mahesh S, Prof. Mohan A E	Study on Mechanical Characteristics of GF65/PA6 Composite Laminate	International Conference on Global Convergence in Technology, Entrepreneurship, Computing and Value Engineering: Principles and Practices - 2022 (ICGCP-2022)	International	2022	ISBN: 979-88-35073-61-0	17
15	Dr. Basavaraj Ganiger	Studies on Thermal Barrier Coating Influence on C I Engine Performance Fuelled with Biodiesel	International Conference on Global Convergence in Technology, Entrepreneurship, Computing and Value Engineering: Principles and Practices - 2022 (ICGCP-2022)	International	2022	ISBN: 979-88-35073-61-0	18

Sl. No.	Name of the teacher	Title of the paper	Name of the conference	National / International	Year of publication	ISBN/ISSN number	Page No.
16	Dr. Jagaadeesha Gowda G V, Prof. C Devaraja	Structural, Physical and Optical properties of Alkali Lead Boro Tellurite Glasses: Role of Eu3+ Ions On	International Conference on Global Convergence in Technology, Entrepreneurship, Computing and Value Engineering: Principles and Practices - 2022 (ICGCP-2022)	International	2022	ISBN: 979-88-35073-61-0	19
17	Dr. G V Jagadeesha Gowda, Prof. C Devaraja	Structural, studies of Cobalt and Tin Embedded Calcium Nano-Ferrites: Effect of SiO2	International Conference on Global Convergence in Technology, Entrepreneurship, Computing and Value Engineering: Principles and Practices - 2022 (ICGCP-2022)	International	2022	ISBN: 979-88-35073-61-0	20
18	Dr. Jagaadeesha Gowda G V	Mössbauer spectroscopy Study of LuFeO3	International Conference on Global Convergence in Technology, Entrepreneurship, Computing and Value Engineering: Principles and Practices - 2022 (ICGCP-2022)	International	2022	ISBN: 979-88-35073-61-0	21
19	Dr. Jagaadeesha Gowda G V	Humidity sensing behavior of rare earth doped Cobalt chromate for sensor applications	International Conference on Global Convergence in Technology, Entrepreneurship, Computing and Value Engineering: Principles and Practices - 2022 (ICGCP-2022)	International	2022	ISBN: 979-88-35073-61-0	22
20	Prof. Shashikala B S	Ultrasonication Assisted Synthesis of Dy3+ Activated CaAl2O4 nanophosphor: Photoluminescent and Photometric Prompted WLED's and Latent Fingerprints Development Applications	International Conference on Global Convergence in Technology, Entrepreneurship, Computing and Value Engineering: Principles and Practices - 2022 (ICGCP-2022)	International	2022	ISBN: 979-88-35073-61-0	23
21	Prof. Gnanendra D S	Spectroscopic studies of Eu3+ doped B2O3–PbO–Ag2O Glasses	International Conference on Global Convergence in Technology, Entrepreneurship, Computing and Value Engineering: Principles and Practices - 2022 (ICGCP-2022)	International	2022	ISBN: 979-88-35073-61-0	24

Role of Artificial Intelligence in Robotics

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Abstract:- **Artificial intelligence (AI) is a broad spectrum section of computer science which is related with structuring of smart machines or so called robots. These machines are skillful and can perform activities that require human brilliance. Science, Engineering and Technology combine together to form robotics which in turn produces robots that can substitute or replicate human actions. These tasks can vary from machines that are used to help in daily households to machines used in defence. There is this regularity and dependence that certain sectors especially manufacturing sector rely on imported products for reduced operation costs with the aid of AI assisted Robots technology. However in the larger perspective of maintaining competitiveness across the world in the modern era economy in the near future, magnifying domestic superiority is a bigger test that is very crucial as progressing along with the expansion of the global market with the assistance of robotization.**

Keywords: Artificial Intelligence, Application, Robotics, Exploration, Technology

I. INTRODUCTION

Artificial Intelligence and Robotics have a common origin and a very long synergic history. We can observe that the upsurge of both Artificial Intelligence and Robotics took place in the same period [1] and during the early stages there was no clear differentiation between them. This is because of the label of "intelligent machines" generally lead to robotics and Robots [2].

Robots require AI Technology to work according to commands from the user or the administrator or to the situation in the neighborhood. In accordance to the Moore's Law the processing capability of computers is progressing exponentially. There are certain challenges right now that need to be addressed: Currently we are able to come up with one solution to one query or requirement based on the preloaded information that's available in the backhand, whereas it's still challenging to give a feedback which is natural developed on the analysis of the circumstances of the instruction given or by understating what someone really means, responding to untold circumstances is one other challenge that needs to dealt with as the machine translation is still in the developmental stage[3].

It is very essential to study the modularization of AI and software in terms of developing resources and also improving it and concentration of research. These threats need expansion and synthesis of AI which is driven by the data and AI represents brilliance," R n D" of machines which work like brain. Sensing and recognizing technology to import information [4], [5]. As the prices of semiconductor has decreased making it easier for its usage in terms of the standard as well as quantity.AI can be used in various fields as shown in figure 1.

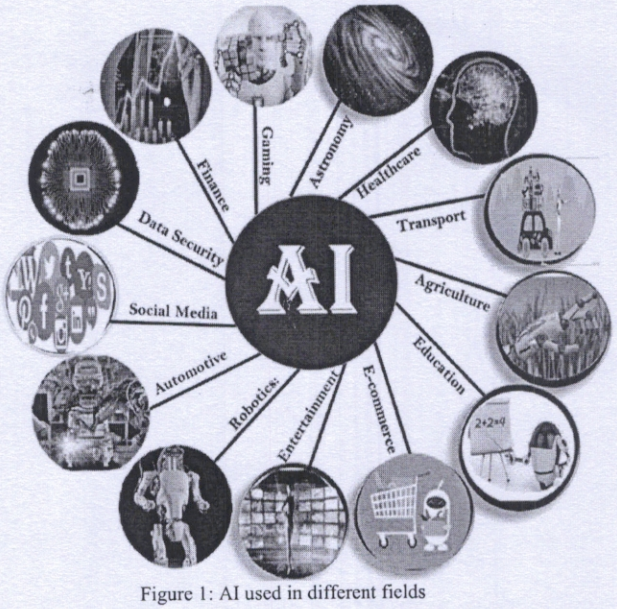

Figure 1: AI used in different fields

II. BACKGROUND STUDY (LITERATURE)

We can see many different applications in different industries like manufacturing, agriculture, entertainment, etc .As there are few jobs which require boring tedious work these works usually require precision and accuracy. In such scenarios, robots or AI powered machines are more convenient to be used than human labor. There are a few tasks which can be dangerous for the life of a human. Robots are better suited here as well as this prevents loss of human life due to these superiority factors we can see that robots are now used almost in every industry. Here let us look at a few top applications of robots in different industries now.

1. Safety

How important is human life and how tedious can it be to keep guarding a place for countless hours in order to overcome this robots are now being suggested as security guards as they can safeguard humans, wealth in banks , and their life wouldn't be in danger unlike humans [5]. Currently, different companies are working on having security robots along with human consultants. These robots can be helpful in avoiding and facing different crime activities, currently the trials are being done . We may get to see robots as security guard in the near future

Better Health Care with Artificial Intelligence

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Abstract:- In recent years artificial intelligence has contributed the most even towards the medical healthcare. AI application not just masters the healthcare but also manages the medical productions, facilities of health, medical colleges and so on which are using it. Artificial intelligence assists the radiology, dermatology, cardiology, echocardiography, MRI scanning, neurology, CT scanning, screening retinal care etc. AI gives accessibilities which are convenient for doctor as well as patients. It produces interpretation for medical society to do analysis. Artificial intelligence aid for screening, monitoring, bring forth medical and clinical studies about the suffering person.

Keywords: Artificial Intelligence, application, MRI scan, Health Care, Clinical Studies

I. INTRODUCTION

AI is upgrading version in the world of computer engineering whereby it describes that a machine can do tasks easily but compulsorily need the aid of human brains and mediations[1]. Altogether the machine deliberates by itself for the execution of a piece of work. AI helps a machine to perform any tangled or straight forward task with high productivity and at high rate, superior to humans. Today majority of the scholars feel that AI could be the succeeding digital metamorphosis worldwide [2].

By taking the assistance of AI in this continuous development of medical technology and diagnostics it can be very straightforward and economical. Most of the first-time technicians use artificial intelligence to diagnose the disease even before it becomes dangerous so that it can be easily treated early[3]. Many firms work to diagnose deadly diseases like cancer early by AI-ML techniques. In order to enhance the suffering person's health state, quickly the health centre evolves treatment options for the patient to speed up the patient's recovery, but in some cases these clinical measures do not go according to plan in such cases the practical wisdom can be very helpful.

At this point AI becomes the best program to be developed with the help of machine learning. Management tasks will also be simplified with practical wisdom. All payments will be handled with ease[5]. The patient's mental health and physical condition can be easily improved with the help of artificial intelligence. The fact that a specific medicine is specified for the suffering person to help him tackle the health issues can be achieved in a simplified manner with the assistance of AI-ML.

II. BACKGROUND STUDY (LITERATURE)

AI mainly deals with the making of programs and intelligent machines that work much faster than humans. It is a program made to run and understand the behavior and intelligence of humans. AI is software that runs without human interruption as the program that is developed on AI is made in retrospect of not having any disturbances[6]. It also called as machine intelligence.AI requires human intelligence.

AI is the process of making machines intelligent and intelligence is the quality that enables a process to function properly which is compatible with the environment. Artificial Intelligence is the study of important ideas and information that make humans intelligent. AI is the ability of a computer that is able to perform a high level problem that is generally not solvable by us humans.

This field was discovered on the idea that someday machines would be able to think up their own solution to the problems, along with consciousness, the functions that make us human. Artificial Intelligence is not just a turning point in the field of research but also in the current evolving industry and work as we know it today. AI has all the possibilities to make our daily life preferably much easier in terms of effort that we put into doing a particular task.

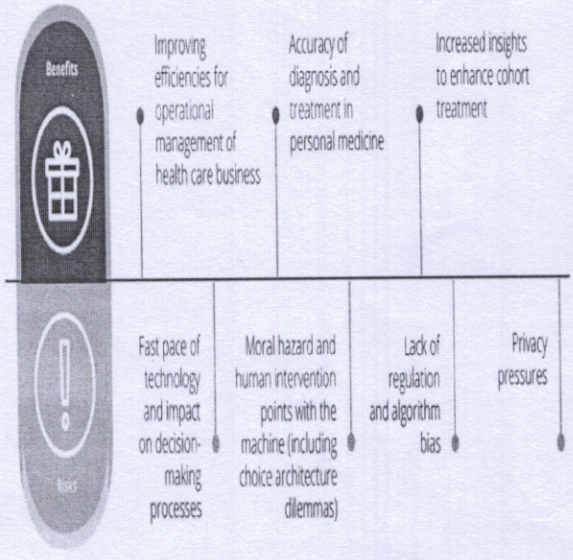

Figure 1: Pros and Cons of AI

Synthesis Characterization and Antimicrobial Studies on 5-(2-phenyl-2, 3-dihydro-1H- benzimidazole-yl) quinolin-8-ol and Transition Metal Complexes as a Biologically Active Pharmacophore.

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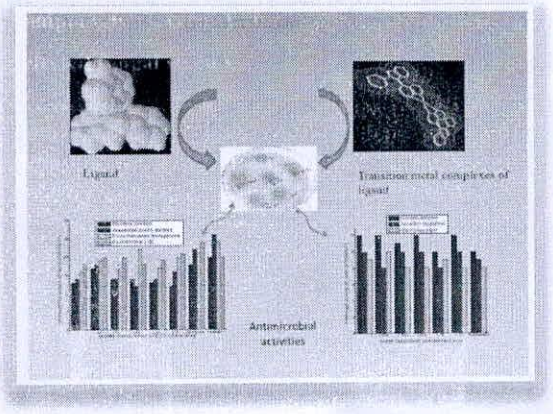
Abstract:

5-(2-phenyl-2,3dihydro-1H-benzimidazol-yl) quinoline-8-ol ligand and transition metals Copper, cobalt, nickel, zinc and manganese complexes prepared by condensation method. The synthesized ligand and its complexes characterized by various physicochemical and spectral characterization methods like IR, NMR, MASS, Uv-Visible and elemental analysis. The biological activity of the ligand and complexes screened for the antibacterial and antifungal studies for the selected bacterial and fungal strains by using cup plate disc diffusion method, inhibition zone of the tested compounds measured and tabulated the values, the synthesized compounds screened for antifungal activity of selected fungal strains..

Keywords: ***Chelating agent, alkylation, pharmacophore, antimicrobial, cup plate disc diffusion method, benzimidazole, gram positive bacteria, gram negative bacteria, fungal species.***



I.INTRODUCTION

The foremost prominence of the researcher is to explore on biologically active and clinically significant moieties in the budding field of research, benzimidazole and it derivatives are the pleasing group of pharmacophore to meet the target of various microbial diseases due to their structural diversity(Salahuddin et al., 2017; Trotsko et al., 2020).anatomically benzimidazole is a fused structure of Benzene and imidazole containing chemically two different nitrogen reveals diverse action and biological activity helps to characterize such compounds in the study of microbial activity(Gürsoy et al., 2020). 8-hydroxyquinoline is the another part of reactant in the synthesis of ligand which is a versatile structural molecule acts as a good chelating agent complexes with biologically significant transition metal complexes plays an important role in the study of microbial activity and being used in various industrial, pharmaceutical, agricultural, metallurgical and biological applications(Martins et al., 2004). The coupling of benzene and 1,2-phenylenediammine is the key reaction step involved in getting the benzimidazole (Bildstein et al., 1999),the cyclisation and bond formation favored under acidic condition maintained in the synthetic procedure, the purity and the product formation confirmed by thin layer

II. MATERIALS AND METHODS:

All the chemicals and reagents used were analytical grade procured from commercial suppliers and used without purification, IR spectra were recorded on FT-IR spectrometer KBr disc, UV-Visible spectra recorded by using UV-Visible double beam spectrometer software 6.89.9, 1H NMR were recorded in bruker (600MHz) by using DMSOd6 as a solvent, Mass spectra were recorded using maldi mass spectrometer IISER pune, melting points were determined by open capillary method, elemental analysis by using CHN analyzer & metal analyzed by standard laboratory method.

III. Experimental procedure:

Synthesis of ligand 5-(2- phenyl-2, 3-dihydro-1H-benzimidazol-yl) quinoline-8-ol:

Equimolar ratio of 0.02mole of 1,2-phenylene diamine and 0.02 mole benzene are allowed to mix continuously at room temperature for one hour and neutralized with 5M HCl and this reacting mixture treated with 0.02mole of 8-hydroxyquinoline in presence of catalytical amount of ammonium chloride and kept at room temperature nearly for

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Assay of cephalosporins in bulk and pharmaceutical formulations

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Abstract: A simple, accurate and sensitive spectrophotometric method is developed for the analysis of cephalosporins (ceftriaxone, cefotaxime , ceftazidime and cefepime) in bulk and pharmaceutical formulations. The method is based on the diazotization of cephalosporins in acidic medium and followed by coupling with 3-amino phenol to give orange red colored diazotized product at λ_{max} of 500nm.The optimum reaction conditions and other analytical parameters are evaluated. A study of the effect of commonly associated excipients does not interfere with the determinations. Statistical analysis of results indicates that the method is precise and accurate.

Keywords: ***Cephalosporins, Diazotization, 3-amino phenol, Diazocoupling reaction, spectrophotometry.***

INTRODUCTION

Cephalosporins are a class of β-lactum antibiotics discovered in 1950's and are produced by various species of the mold cephalosporium and from semi-synthetic processes. Cephalosporins are the broad spectrum of antibiotics is mainly used to control gram positive and gram negative bacterial infections. They are generally used in the treatment of upper respiratory and urinary tract infections. Cephalosporins are the second most important β-lactum after penicillin for treating infectious diseases. They are generally useful for the rare patient who is sensitive to penicillin although sensitivity to Cephalosporins is also sometimes found. Cephalosporins are derivatives of 7-aminocephalosporanic acid (7-ACA) , which composed of a β-lactum ring fused with dihydrothiazone ring , but differ in the nature of substituent at the 3- and/or 7-positions of cephem ring. Cephalosporins are traditionally divided into first, second, third & fourth agents based roughly on the time of their discovery and their antibacterial properties.

Several methods have been reported for the analysis of the cephalosporins. The methods include spectrophotometer [1, 2, 3, 6], Spectrofluorimetric [4. 5], Indirect polarographic [7], Atomic absorption and spectrophotometric [8], Colorimetric [9, 10], Voltametry and spectrophotometry [11, 12], Flow injection analysis [13, 14], kinetic spectrophotometric [15], Capillary electrophoresis [16], High performance liquid chromatography and mass spectrometry [17], and UV – Visible spectro photometric methods [18-20]. While each of these reported methods have advantages, majority of them are extensively time consuming, tedious and utilizes reagents which are expensive. Spectrophotometric methods are the most convenient techniques because of their inherent simplicity, high sensitivity, low cost and wide applicability in QC laboratories.

The aim of the present work is to develop simple and accurate method for the determination of cephalosporins in pharmaceutical formulations. The proposed method stands atop over the reported method with respect to simplicity, cost effectiveness and the method neither requires extraction nor prior separation of the drug.

MATERIALS & METHODS

Apparatus

A BL 198 Bio spectrophotometer (UV-VISIBLE) with 1.0cm matched quartz cells was used for electronic spectral measurements.

Reagents

Cephalosporins were received from pharmaceutical company. Cephalosporins (gift sample from strides Arco lab, Bangalore), Amino phenol (sigma, USA), Sodium nitrite (BDH), Hydrochloric acid (AR), Sulphamic acid (AR) were used for the experiment. All other chemicals and solvents used were of analytical reagent grade. Deionised water was used to prepare all solutions and in all experiments.

Standard solutions

3-amino phenol (0.3% AP): prepared by dissolving 0.3g of AP in water and diluting to 100mL with water.

Sodium nitrite (0.1%): prepared by dissolving 0.1g of sodium nitrite in 100mL distilled water.

Sulphamic acid (2%): freshly prepared by dissolving 2g of Sulphamic acid in 100mL distilled water. Aqueous solution of hydrochloric acid (1M) was used.

Standard procedure

Ceftriaxone (CEFT), Cefotaxime (CEFX), Cefepime (CEPM) and Ceftazidme (CEZD)

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Analysis of the Physico-Chemical parameters in the Groundwater of Hutridurga Hobli Kunigal Taluk, Karnataka, India

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Abstract: Thirty two groundwater samples of Hutridurga Hobli Kunigal Taluk, Tumkur District were analysed for the Physicochemical properties like pH, TDS, EC, Alkalinity, Total Hardness, Ca++, Mg++,$Cl^-Na^+K^+$following the standard guidelines of APHA (1998).

Key Words: Taluk, Hobli, Alkalinity, APHA, groundwater.

Introduction:

Water forms an important natural resource without which life becomes unmanageable.The entanglement between life and water is such that the first life forms were originated in water is the early seas and oceans formed in the beginning. Over 70% of the earth's surface is filled with water (1). Majority of the water is locked in the seas and oceans which are unfit for potability. Only About 1% of it is available as fresh water wherein majority of it is stored as groundwater in the Aquifers. Potable water is a vital element for good health and the socio-economic development of humans (2). Water chemistry is a function of the number of features namely the nature of recharge, hydrologic gradient and residence time in the aquifer (3). Groundwater refers to all the water occupying the voids, pores and fissures within the geological formations. The composition of groundwater obtained at different locations will have different chemical composition due to the possibility of extraction from different aquifers. Groundwater is a precious fresh-water resource, and its reservoir of the world is estimated to be approximately 5×10^{24} L (4). It is extracted through hand-dug wells, hand pumps operated shallow-wells and submersible pump, operated deep well or boreholes (5). Water contamination is a situation wherein unwanted substance which are detrimental to human health are present in water in considerable amounts. The cause for water contamination may be either Geogenic or anthropogenic or even both. The domestic, industrial, municipal and agricultural utility of groundwater is a function of it physical, chemical and bacterial characteristics (6) (7). The quality of water is superior to its available

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Experimental Investigation on Properties of Self Compacting and Self-Curing Concrete Using Light Weight Aggregate, M-Sand and Fly Ash as a Mineral Admixture

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Abstract - Self-compacting concrete (SCC) is considered as a concrete which can be placed and compacted under its self-weight with little or no vibration effort and which is at the same time cohesive enough to be handled without segregation or bleeding of fresh concrete. This study presents an experimental investigation on Self-Compacting and Self-Curing Concrete (SCCM) with fine aggregate replacement of a M-Sand (0, 10, 20, 30, 40%) with 10% and 15% LWA constant and addition of mineral admixture Fly Ash. Mix proportions of SCCM for M40 grade concrete were arrived. For each concrete mix nine 150×150×150 mm cubes, 150×300 mm cylinders were cast and left for Self-Curing for 7, 28 and 56 days and results are compared with Self-Compacting Concrete (SCC). The Slump Flow, J-Ring, U Box, L-Box and V- Funnel test is carried out on the fresh properties of SCCM and in harden concrete Compressive Strength, Split Tensile Strength were determined. The flow properties on SCC with cement, Fly Ash as additional for cementitious material and various proportions of M-Sand has been performed and found that the values of Slump flow, V-Funnel, U-Box, L-Box and J-Ring were within the limits prescribed by EFNARC. From overall study, it was concluded that SCC with Quarry Dust found satisfactory.

Keywords - Self Compacting Concrete (SCC), Fly Ash, Light Weight Aggregates and M-Sand.

I. INTRODUCTION

The self-compacting concrete (SCC) is the newest innovating category of high-performance concrete, characterized by its ability to spread and self-consolidation in the formwork exhibiting any significant separation of constituents. Elimination of vibration for compacting concrete during placing with the use of SCC leads to substantial advantages related to better homogeneity, enhancement of working-environment and improvement in the productivity by increasing the speed of construction. One of the disadvantages of SCC concrete is its cost, associated with the use of high volume of Portland cement and use of chemical admixtures. One alternative to reduce the cost of SCC is the use of mineral admixtures such as fly ash, which is finely, divided material added to concrete during mixture procedure. When this mineral admixture replaces a part of the Portland cement, the cost of SCC will be reduced especially if the mineral admixture is waste or industrial by-product. Moreover, the use of mineral admixture in the production of self-compacting concrete not only provides economic benefits but also reduces heat of hydration. SCC is not a new material, but rather new and improved way of executing the concreting operation. SCC, similar to CVC (conventional vibrated concrete), has a wide variety of properties to achieve specific targets. A wide number of definitions can be found in the literature, but all of them describe SCC in the common way: SCC is a concrete that is able to flow under its own weight and completely fill the formwork and encapsulate the reinforcement, while maintaining homogeneity and can consolidate without the need for vibration compaction. The use of SCC offers benefits in the key areas such as construction process, concrete quality, energy conservation, health and safety. There are many advantages of using SCC especially when the material cost is minimized. These include:

1. Reducing the construction time and labour cost.
2. Eliminating the need for vibration.
3. Reducing the noise pollution
4. Improving the filling capacity of highly congested structural members.
5. Facilitating construability and ensuring good structural members.

SCC consists of the same components as conventionally vibrated concrete, which are cement, aggregates and water, with the addition of chemical and mineral admixtures in different proportions.

II. OBJECTIVES OF STUDY

1. To study the fresh properties for all mix proportions such as:

Slump Flow

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SURVEY : YIELD PREDICTION USING MACHINE LEARNING : Special Emphasis on Coconut Yield Prediction.

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ABSTRACT :

Coconut is a major plantation crop of coastal India. Accurate prediction of its yield is helpful for the farmers, industries and policymakers. Weather has profound impact on coconut fruit setting, and therefore, it greatly affects the yield.. But the farmers usually plan the cultivation process based on their experiences. But due to the lack of precise knowledge about cultivation, they may end up cultivating undesirable crops which will not give them an expected production rate. So there is an invention of new technologies like ML, IOT, AR but it's not getting used properly in the agricultural field. So our paper proposes a research work helps to predict crop yield from past data. This can be done by applying a machine learning algorithm on that data.

Machine learning is an important decision support tool for crop yield prediction, Several machine learning algorithms have been applied to support crop yield prediction research. We investigated these selected studies carefully, analyzed the methods and features used, According to our analysis, the most used features are temperature, rainfall, soil type, and etc .

Keywords: ***Agriculture production, Machine learning Prediction, Supervised learning, Unsupervised learning.***

1. INTRODUCTION

Coconut is a major plantation crop of coastal India. Accurate prediction of its yield is helpful for the farmers, industries and policymakers. Weather has profound impact on coconut fruit setting, and therefore, it greatly affects the yield. According to recent survey, around 1.82 million farmers dwell in Karnataka. It has been also found that suicide rates of farmers is also increasing from last few years. Therefore, to help the farmers take decisions that can make their farming more efficient and profitable. So in this we are proposing a system that will estimate crop production before harvesting depending on certain parameters. If they are having an idea about the amount of production they can expect, they can contact to their crop production contractor in advance of harvesting, often assuring a more competitive price. And moreover there is no such application exists as of now. Our paper proposes a system to predict crop yield from previous data using the concept of machine learning.

However, due to numerous complex factors, the prediction of crop yield is challenging. Basically, the crop yield is dependent on numerous factors, including landscapes, soil quality, pest infestations, genotype, quality

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Multi-Scale Wavelets for Quality Video Frames

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***Abstract*—** Immersive Multimedia or Virtual Reality as it is sometimes known, is the realization of real-world environment in terms of video, audio and ambience like smell, airflow, background noise and various ingredients that make up the real world. Virtual Reality remains in research and experimental stages. The objective of this research is to explore and innovate the esoteric aspects of the Virtual Reality like stereo vision incorporating depth of scene, rendering of video on a spherical surface, implementing depth-based audio rendering, applying self-modifying wavelets to compress the audio and video payload beyond levels achieved hitherto so that maximum reduction in size of transmitted payload will be achieved. Considering the finer aspects of Virtual Reality, we propose to implement like stereo rendering of video and multi-channel rendering of audio with associated back-channel activities, the bandwidth requirements increase considerably. Against this backdrop, it becomes necessary to achieve more compression to achieve the real-time rendering of multimedia contents effortlessly.

***Keywords*—** Discrete Cosine Transform (DCT), Quantization, Artificial Neural Networks, Root Mean Square Error (RMS), Peak Signal to Noise Ratio (PSNR),

I. INTRODUCTION

Audio has attained unimaginable clarity by splitting the spectrum into various frequency bands appropriate for rendering on several speakers or acoustic waveguides. The combination and synchronization of audio and video with better clarity has transformed the rendition matched in quality by 3D cinema. Multicasting of several channels over a single station, program menu options, parental control of channels and various online activities like gaming, business transactions etc. through back-channel activities have made multimedia systems truly entertaining and educative. But then, there are several aspects of virtual reality that are missing from practical implementations even today names of the authors, should be checked before the paper is sent to the Volume Editors.

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II. LITERATURE SURVEY

The existing implementations of Compressor and Decompressor follow the ISO Standard 13818. The standards evolved from MPEG - 1, MPEG - 2, MPEG - 4, MPEG – 7, and MPEG - 21. There are implementations of CODEC based on H.264 Standard, which uses Wavelets instead of DCT. MPEG2 implements the CODEC based on DCT. The shortcomings of existing CODECs are not adaptive to the patterns of the pixel residents in the video frames. MPEG2 uses a flat and uniform quantization while other implementation uses Vector Quantization techniques. It is important to observe that Vector Quantization, while being marginally superior in terms of compression ratio, has substantial computing overheads which counterbalance the gain resulting from better compression ratio for a given visual quality metric. There is a authentic need for better mechanisms of compression which will seek to achieve (1) decoding of pictures faster at the receiver end (2) compression ratio is better and (3) frames are constructed in better quality factor in terms of Peak Signal to Noise Ratio and Mean Square Error

III. IMMERSIVE VIRTUAL REALITY

Immersive Virtual reality it defines about 'virtual' and 'reality'. The meaning of 'virtual' is near and meaning of 'reality' is as human beings what we feel or experience. Therefore, the 'virtual reality' term means 'near-reality'. This is the classical definition of virtual reality. To make Virtual Reality nearer to reality, the video or images could be immersed in a 3D world with stereo/ 3D vision. Natural scenes are not flat but embedded in a 3D spherical world. Rendering these on a 2D flat screen removes the effect of depth of scene. Then again, the human visual system is stereo in nature. The scene is captured by both the left and right human eye giving a true sense of depth of objects within. Audio rendering has so far reached the level of DOLBY 5.1 with the use of 6 different bands. Although DOLBY 5.1 is considered the most sophisticated media of audio rendering, there is still a lot left in its implementation. DOLBY standard does not generate high frequency sounds around

Design And Analysis Of *Multiple -Input OTA Circuit* For VLSI Implementation Of Neural Networks

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Abstract — **An Operational Transconductance Amplifier (OTA) is suitable for the VLSI implementations of artificial neural networks. This paper is mainly concentrating on design of MIOTA circuit modeling for one neuron. Keeping this as a main aspect, Opamp specifications are taken into account, i.e., Gain, phase margin, slew rate, power dissipation and others. This work presents a design and implementation of MIOTA circuit. It generates an output voltage which is sigmoidal like function of the linear sum of a number of weighted inputs. Weight of each input controlled by the bias voltage. Simulation process is carried out by using an EDA tool cadence virtuoso with 90nm technology.**

Keywords— opamp,Cadence,90nm technology, gain

I. INTRODUCTION

The Operational transconductance amplifier (OTA) is still a fundamental building block in modern microelectronics. In order to achieve high performance , OTAs with high DC gain, GBW and large output swing is required. The challenge faced in CMOS technology is mainly about scaling these devices to decrease their size and power consumption. However increase in the gain improves the performance and keeps up the stability of device.

Recently there has been an increase in interest in artificial neural networks for use in artificial intelligence applications. This will especially useful in the pattern recognition or optimization with many simultaneous constraints.

Work in this area is still developing still unknown about how biological networks work. In order to simplify the analyses , most work uses the simplest possible model of a neuron. The output function is mostly a nonlinear monotonic increasing function ,typically a sigmoid.

Working models of artificial neural networks have been demonstrated through , so far, they have been limited in the size. These circuits are much faster than software simulations running on conventional computers.

The circuit presented in the following paragraphs may be useful for the VLSI implementations of neural networks.it generates an output voltage which is sigmodial like function of the linear sum of a number of weighted input voltages. the weight of the each input which is controlled by the bias voltage which can be varied dynamically. The inputs have a wide linear range and the number of inputs for each circuit can be large.

II . BASIC CIRCUIT DIAGRAM AND ITS SPECIFICATIONS.

Fig. 1 shows the basic building block which represents one weighted input to the neuron. It sinks an output current, I, which is a linear function of the input voltage vgs1 and has transconductance which is controlled by the bias voltage vb.

(The transconductance is defined as *dI/dV,* and is the gain of the module.) When the outputs of a number of these blocks are connected to a common node, the currents sum according to Kirchoff's current law and an op amp can then be used to convert the current to an output voltage which is the weighted sum of the input voltages.

The following paragraphs develop this in more detail.

In Fig. 1, when MOSFET Al is biased in its active region, vgs1— vt1 > vds1, the current can be written as

$$I = \beta[(vgs-vt1)- vds1/2]vds1 \quad \text{---------- (1)}$$

where *beta - (y C„)W/L* is determined by the fabrication process and the size of the transistor. Vt1 is the threshold voltage of M1. When W2 /L 2 >> W1 /L 1 and M2 is biased in its saturation region. (Vgs2-VT2< Vds2) , then Vds1= Vb-VT2.

If vb is a constant voltage, and it is assumed that VT= VT1=VT2 then I can be written

$$I = \beta(V_b - V_T)\left[V_i - \text{Vb/2+VT/2 }\right] \text{----------(2)}$$

Or

$$I = G\,(Vi- Voffset) \text{ ----------(3)}$$

when M1 biased in its active (ohmic) region, *I* is a linear function of the input voltage vi= vgs1 and has a transconductance, *G* controlled by the bias voltage Vb.

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Redundant Binary Signed Digit Frame Work for ALU Implementation

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Abstract— A redundant binary representation is a numeral system that uses more bits than needed to represent a single binary digit because of which most numbers have several representations. The unique feature of redundant binary signed digit number system allows addition without using typical carry. The paper proposed the design of an Arithmetic Logic Unit based on redundant binary signed digit number system. One digit redundant binary signed digit ALU is designed by VHDL and its FPGA implementation using synthesis process. Finally, it is compared with other ALU architectures such as conventional binary, carry look ahead adder. The frame work is designed using VHDL and its RTL view is generated by its FPGA implementation in Xilinx ISE environment.

Keywords- ALU, RBSD, FPGA, RTL, Xilinx, VHDL

I. INTRODUCTION

Today's world requires faster processor for the computation purposes to meet the application demand of the digital systems. Speed of these processors is usually limited by the latency of arithmetic units like adders and multipliers. With the constant growth of computer applications in every field of engineering such as signal processing, communications and neural networks, fast arithmetic logic units (ALU) are increasingly required. The ALU of any processor perform many functions such as Addition, Subtraction, Multiplication, Division and Logical Comparison etc. The arithmetic operations like addition is performed using conventional binary number system produces longer chain of carry. This increases the complexity of the circuit and also reduces the operating speed. ALU designed using such arithmetic operating circuits generating long carry chain will have low operating speed.

ALU can be designed using different adders like ripple carry or carry look ahead adder. ALU designed using ripple carry adder the delay will be more since the carry getting propagated from LSB to MSB. So speed will be reduced. Compared to ripple carry adders Carry look ahead adders are faster, but in case of Carry look ahead adders the complexity of the circuit increases as the number of bits increases. Because of these drawbacks non-conventional number systems cherishing in designing ALU in recent years because of their attractive property of carry free addition. Processors designed using ALU with carry free adders will have high operating speed. Redundant binary number system in one of the nonconventional system which provides carry free addition. For making the processing faster a carry free addition technique is adopted by using Redundant Binary Number System [1][2][6]. Redundant The property of carry propagation chain elimination tends to make the processing faster.

In this paper, the RBSD based arithmetic and logical unit is designed using VHDL and its RTL view is generated by its FPGA implementation. The FPGA Implementation is done in Xilinx ISE environment. The simulation is done in Model Sim environment.

II. CARRY FREE ADDITION USING REDUNDANT BINARY SIGNED DIGIT

The redundant binary representation (RBR) is a non conventional number system that uses more bits than needed to represent a single binary digit. Each number will have more than one representation in case of Redundant Binary Representation. RBR is a place-value notation system. In RBR system digit set will have more digits than the radix and digits are pairs of bits, that is, for every place RBR uses a pair of bits. Conventional binary number systems, including two's complement, which use single bit for each digit.

The value represented by an RBR digit can be found using a translation table as shown in Table 1. This table indicates the mathematical value of each possible pair of bits. As in conventional binary representation, the integer value of a given representation is a weighted sum of the values of the digits. The weight starts at 1 for the rightmost position and goes up by a factor of 2 for each next position. Usually, RBR allows negative values. There is no single sign bit that tells if a RBR represented number is positive or negative. Most integers have several possible representations in an RBR. An integer value can be converted back from RBR using the following formula, where 'n' is the number of digit and d_k is the interpreted value of the k^{th} digit, where 'k' starts at 0 at the right most position [5]:

$$\sum_{k=0}^{n-1} d_k 2^k$$

□

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A Review on QoS in Wireless Sensor Networks

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Abstract- Wireless Sensor Networks (WSN) is a prominent area of new interests and research. Advances in technology and availability of tiny, inexpensive sensors pave the way for intelligent life. WSN has applications in military, healthcare domains. Also, there are numerous operations where accurate and timely delivery of the sensed information is necessary. So, reliable and timely delivery of sensed information is the primary requirement of WSN. Quality of Service (QoS) provision usually consumes energy but energy is a scarce resource in WSN; so QoS based routing algorithms should be energy efficient. Due to distributed nature, dynamic topology and resources constraints of tiny sensing nodes in wireless sensor networks (WSNs), the quality of service (QoS) support is a challenging issue. However, satisfying the stringent QoS requirements is an open problem. In this paper, we focus on the QoS satisfaction in WSNs, basics of QoS support in WSNs, and more importantly challenge, requirements of QoS at each layer. The paper is concluded with open research issues.

Keywords- WSNs, QoS

I. INTRODUCTION

The WSNs are defined to be wireless networks composed of a very large number of interconnected nodes which can sense a variety of data, communicate with each other and have computation capabilities. The sensors are usually deployed into the scattered area, known as sensor field. These sensors gather data from an environment and forward it to the Base Station (BS) through multi-hops. The BS, also known as the sink, usually communicates with the users through a satelliteor an internet connection [1].

Due to diverse and a wide range of applications Wireless Sensor Networks (WSNs) have gained considerable attention in recent years. Advances in miniaturization technologies, especially in Micro-Electro-Mechanical Systems (MEMS), have made it possible to develop Multi-functional Tiny Smart Sensors (MTSE). The MTSE now utilize WSNs and are envisioned to completely replace their conventional networks with WSNs. This will enable WSNs to become an integral part of human lives.

The WSNs based on their applications can be divided into two main categories i.e. tracking and monitoring [2], [3]. Monitoring application includes inside and outside environmental monitoring such as industrial unit and development monitoring, seismic and structural monitoring, physical condition monitoring and control monitoring. Tracking applications include vehicles, humans, animals and trackingobjects.

They can also be deployed for a collection of various types of data mentioned above in almost every kind of physical environments such as plain, underground and undersea sensing fields. In every situation, a sensor network gets constrained differently depending on an environment.

However, WSNs are still facing many challenges such as limited power, bandwidth, mobility and no central controller. The performance of any network including WSNs can be gauged, predicted and improved once the parameters characterizing the network are determined accurately. These parameters of a network include availability, bandwidth, latency, and error rate. Methods and techniques used to determine the parameters are known as Quality of Service (QoS).

At the present stage, WSNs need more attention in QoS provisioning making it a hot issue in current research.

However, incorporating QoS is not an easy task usually dueto a large number of nodes involved in the network. Some of the important aspects like energy protection, protocol designing, and architecture in WSNs are explored in details but still QoS support issues need more attention.

In figure, a simple model shows that more users can always be included in the networks given that users are satisfied with the services of the network. Hence, the basic objective of the networks is how to utilize the network resources that provide QoS to users.

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BIG DATA AND ARTIFICIAL INTELLIGENCE IN AGRICULTURE

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Abstract *- Agriculture plays breath taking role during pandemic situations, what human community is facing and experiencing in 2020. Crop yielding depends on several parameters which is nothing but data. When the data is more or big, it helps in analysis and decision making process. In this case farmers take decisions based on various data available to them. To make farmers life easy, data analytics plays a vital role and big data technology is the key technology to be used. Along with this, Artificial intelligence can be used to analyse various parameters helping farmers in completing the process of cultivation with good and accurate results.*

In this work, we study on various approaches of implementing big data and Artificial technology to address problems faced by farmers and find out solutions by defining problems which can be implemented practically. We also try to find out the challenges, tools to face challenges and solutions for these challenges.

Key words:

Big data, ArtificialIntelligence(AI), Agriculture, crop development

I. INTRODUCTION

Approximately 26.5% of the world's population work in agriculture.

The agricultural industry is looking at different solutions to meet these challenges, one of which is data analytics. Big Data analytics is seen as the fourth technological revolution in agriculture and it is hoped that it will provide a solution to our growing food demands

Big Data today dominates many fields, but scientists at the science congress think agriculture will also soon be driven by data analytics and artificial intelligence (AI).

Agricultural Big Data analytics is the analysis of large datasets from a wide range of re-sources, often using artificial intelligence (AI) techniques . "With advancement of satellite and drone technology, agriculture is entering the domain of big data," said Partha P. Banerjee, Asia Pipeline Lead, Bayer Crop Science Ltd., delivering a plenary lecture at ISC 2020 on Tuesday. Incidentally, the State government has already begun experimenting with drone technology for farm data collection and crop pattern analysis.

"From mobile phones to satellites, we are producing data on the farms everyday. If tillers are fit with sensors, we can analyse the soil nutrient conditions of every inch of the farm and its applications are immense. Drone technology and data analytics are already being used to recommend advanced water irrigation strategies and diagnose disease on the farm in real time. This will help farmers understand which part of the farm needs more water or where the disease is spreading from, so that it can be tackled," he said.

Yield of a crop is a function of seed and plant genetics, environment and climate, and farm practices. To each of these, we have data layers, for instance, soil health, temperature, humidity, and rainfall for climate input. We have identified 40 key decisions a farmer makes from sowing to harvest. Data analytics can help farmers make informed decisions based on three larger parameters the yield is a function of," he said. "We are still in the prescriptive analytics stage and science will move towards predictive analytics,".

II. Role of data analysis in agriculture

Application of science and new technologies is currently lacking within this space. Many companies and start-ups are looking to fill this information gap. If Big Data has made serious advancement in fields like information technology, healthcare, education and even sports, there is an obvious need for it in the agricultural industry too.
While the vast majority of farmers and ranchers did great work for maintaining and increasing soil health using conservation practices alone, measurement tools will be instrumental in ensuring a sustainable farming future.
To maintain yields and meet the food demands of a growing population while also protecting natural resources required, making additional changes and data tools can help determine what these changes should be.
The end result of gathering data is to analyse it and come up with actionable solutions with better results. For example, a satellite image of a plot of land has several layers of data embedded into a single spectrum giving us a tonne of information to analyse. The geospatial approach and satellite monitoring of farms have led to major advancement in how farmers and companies make their decisions.

COVID-19 PANDEMIC AND DIGITAL REVOLUTION IN IMPROVING THE QUALITY OF TEACHING AND LEARNING

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Abstract *- The World Health Organization has declared Covid-19 as a pandemic that has posed a contemporary threat to humanity. This pandemic has successfully forced global shutdown of several activities, including educational activities, and this has resulted in tremendous crisis-response migration of universities with online learning serving as the educational platform. The crisis-response migration methods of universities, faculty and students, challenges and opportunities were discussed and it is evident that online learning is different from emergency remote teaching, online learning will be more sustainable while instructional activities will become more hybrid provided the challenges experienced during this pandemic are well explored and transformed to opportunities. The outbreak of COVID-19 has reminded us that the complexity of education needs responsive practices to facilitate effective teaching and learning across all levels of schooling globally. All over the world, the normative ways of teaching and learning evolved drastically in the first quarter of the 2020 academic year when teachers and students found online offerings to be the dominant option available as a sequel to the pandemic conditions. We argue that teaching the topic on an online platform constrain student teachers' procedural thinking, conceptual development, and demonstration of their thought processes during mathematics learning and assessment.*

I. INTRODUCTION

The outbreak of the novel coronavirus disease (COVID-19) began in the Wuhan region of China in December 2019. By February 2020, cases of COVID-19 had been detected on every continent. Governments are advising citizens to be prepared for an outbreak in their community. Today, we are globally experiencing closures in schools and universities, postponements or even cancellations of conferences and other organized events, and social distancing. In addition, we have also seen the promotion of flexible ways of studying and working to hinder the rapid spread of the virus. The respiratory failure and unwavering deaths caused by COVID-19 continue to cause sparked anxiety worldwide. In South Africa, the Minister of Health Dr. Zweli Mkhize reported the first case of the pandemic on 5 March 2020, when a male citizen in KwaZulu-Natal tested positive upon his return from Italy. It was in this context that the government configured strategies to fight against the virus on March 2020. As cases continued to be reported daily, the South African Government imposed a hard lockdown on the population on March 23 for 21 days effective on March 26 2020. The officially confirmed cases had increased to 554 with zero deaths nationally. The lockdown continued to be extended and adjusted based on recommendations made by South Africa's Ministerial Advisory Committee on COVID-19, with the primary aim being to flatten the curve by reducing daily reported cases and ensuring speedy recovery on infected people. In view of this, universities, colleges, clubs and religious houses, and economic activities involving face-to-face interactions to name but a few were restricted. Accordingly, given the mandate to save the academic year, representatives of both public and private higher educational institutions resorted to putting alternative strategies in place for students and lecturers to continue with their lessons when physical attendance is not feasible.

One of the strategies was a transition from physical attendance of classes to online education, to ensure the limited level of contact with and amongst students while attempting to promote students' learning continuation and growth. It appears that nowadays, we are entering into the new phase of the evolution in academia and higher education that is going to create the 4th generation of universities which can be named "online and digital universities" (Figure 1). Much of that is because of the COVID-19 pandemic that launched a digital revolution in academia and higher education.

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Study on Mechanical Characteristics of GF65/PA6 Composite Laminate

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Abstract *– In this paper, the mechanical properties of the composite material i.e Glass fiber 65 reinforced in Polyamide (Nylon6) composite material is determined using micromechanical analysis techniques like like rule of mixtures, semi-empirical model, and finite element analysis and validated with the experimental results. From the evaluation and study of PA6 GF65 composite, it can be noticed that the results obtained through experimental results are in excellent agreement with finite element and numerical results. So it can be concluded that finite element method can be used as one of the methods to determine the composite properties. The advantage of finite element method over experimental method is that the specimen model may not be prepared and broken. Hence the cost of manufacturing a specimen can be reduced*

Keywords – Glass fiber Composite, Polyamide Composite, Nylon6, Laminate analysis

I.INTRODUCTION TO MICROMECHANICS

Study of mechanical behaviour of a composite material in terms of its constituent materials is termed as micromechanics. In this approach we find the average properties of composite ply from the individual properties of the constituents. Note that the average properties are derived by considering the ply to be homogeneous. At this level, one can optimize for the stiffness and strength requirements of a lamina.

Given the (linear and/or nonlinear) material properties of the constituents, one important goal of micromechanics of materials consists of predicting the response of the heterogeneous material on the basis of the geometries and properties of the individual phases, a task known as homogenization. The benefit of homogenization is that the behaviour of a heterogeneous material can be determined without resorting to testing it. Such tests may be expensive and involve a large number of permutations Furthermore continuum micromechanics can predict the full multi-axial properties and responses of inhomogeneous materials, which are often anisotropic. Such properties are often difficult to measure experimentally, but knowing what they are, is a requirement, e.g. for structural analysis involving composites. To rely on micromechanics, the particular micromechanics theory must be validated through comparison to experimental data.

The second main task of micromechanics of materials is localization, which aims at evaluating the local (stress and strain) fields in the phases for given macroscopic load states, phase properties, and phase geometries. Such knowledge is especially important in understanding and describing material damage and failure.

Most methods in micromechanics of materials are based on continuum mechanics rather than on atomistic approaches such as molecular dynamics. In addition to the mechanical responses of inhomogeneous materials, their thermal conduction behaviour and related problems can be studied with analytical and numerical continuum methods. All these approaches may be subsumed under the name of "continuum micromechanics".

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STUDIES ON THERMAL BARRIER COATING INFLUENCE ON C I ENGINE PERFORMANCE FUELLED WITH BIODIESEL

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Abstract— The combustion chamber surfaces (piston crown face, cylinder head & valves) were coated with ceramic material. Ceramic layers of ZrO_2-Y_2O_3 were coated by using plasma spray method onto the base of NiCrAlY bond coat to thicknesses of 0.28mm & 0.07mm respectively. The engine was tested at different load conditions like 20%, 40%, 60% and 80% of rated load without coating. The engine with coated piston crown, cylinder head and valves was tested at the same conditions as of standard (without coating) engine. The results showed a reduction in brake specific fuel consumption and an increase in brake thermal efficiency.

Keywords: ZrO2-Y2O3, plasma spray, piston crown, specific fuel consumption and brake thermal efficiency.

1. INTRODUCTION

Thermal barrier coatings (TBCs) because of their ability to provide thermal insulation have generally been accepted to improve brake thermal efficiency for diesel engines. So reduction of heat transfer from the combustion chamber reduces the energy loss to the coolant during the power stroke of the cycle thus increases the operating temperatures to improve efficiency [1]. The thermal efficiency of most commercially available diesel engines ranges from 38% to 42%. Therefore 58% to 62% of the energy content of the fuel is lost in the form of waste heat. Approximately 30% is retained in the exhaust gas and the remainder is removed by cooling water/air. In order to save energy, it is an advantage to protect the hot parts by thermal insulating layer [1 & 2].

One of the development trends for heat engines is improvement of their thermal efficiency. In case of internal combustion engines, one of the ways to achieve improved thermal efficiency is by engine adiabatization. One of the possible methods to adiabatize an engine is to cover the surface of the combustion chamber with a Thermal Barrier Coating (TBC) of low thermal conductivity. The thermal insulation thus obtained is supposed to lead to an improvement in the engine's heat efficiency and a reduction in consumption according to the second law of thermodynamics. Higher temperatures in the combustion chamber can have a positive effect in diesel engines, due to the reduction in delay and hardness of engine operation [3, 4 & 5]. A two layer TBC system consists of a ZrO_2-Y_2O_3 ceramic top coating and an oxidation resistant metallic bond coat of NiCrAlY to thicknesses of 0.28mm and 0.07mm respectively. These thermal barrier coating systems are applied to the metal substrate by plasma spray technique [1, 5, 7, 8 &10]. Experiments were conducted with single cylinder, directly injected, diesel/biodiesel fuelled C I engine with and without thermal barrier coating at different loads ranging from 20%, 40%, 60% and 80% of rated load [6 &9]. The main objectives of present investigation is to evaluate the effect of thermal barrier coating on engine performance parameters like brake specific fuel consumption (BSFC) and Brake thermal efficiency (BTE) and

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Structural, Physical and Optical Properties of Alkali Lead Boro Tellurite Glasses: Role of Eu^{3+} Ions on

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Abstract

In this work, the consequences of doping europium ions in to alkali lead boro-tellurite glasses on physical, structural and optical properties are explored. By conventional melt quenching method the new set of glass were prepared. Structural properties were studied by XRD and Raman spectrometer. Variations in density were estimated by Archimedes principal and other physical properties such as molar volume, oxygen packing density, interionic distance, field strength, were estimated by applying suitable formulae. To analyse the optical properties of all prepared glass samples the absorption spectra were taken in UV-visible region in the wave length region 200-1100 nm. Optical properties like optical energy band gap and Urbach energy were determined by means of Davis-Mott method. By using estimated refractive index values, the corresponding molar refraction, molar polarizability, dielectric constant, reflection loss and metallization criterion of all prepared glass samples were measured by applying appropriate formulae.

1 Introduction

In recent research, the preparation and studies on structural, optical and physical properties of metal oxide glasses doped with rare earth ions have attracted attention of researchers due to their huge applications in the fields such as optical amplifiers, optical fibers, optical materials, waveguide lasers, sensors, displays, and optical data storage devices[1][2][3][4]. Tellurium dioxide is a better conditional glass former and tellurium based borate glasses have unique properties such as , low phonon energy and relatively high thermal stability, ease of production and high chemical durability, high thermal and chemical stability, reasonably low phonon energies, and excellent nonlinear-optical properties [5]–[8]. These remarkable features made tellurite glasses as potential materials for developing of photonic devices [9]. Over the decades researchers were using B_2O_3 due its excellent glass forming ability and remarkable structural variations when it is inserted in to alkali and alkaline earth cations and optical properties[10]–[14]. Lead oxide (PbO), if it is added to boro-tellurite network improves ability of glass forming property and decreases the crystallization rates [7], [15], [16]. Among the few lanthanide oxides, europium oxide is popularized as a explorer of the optical behaviour of the boro-tellurite glasses due to a very good fact that Eu^{3+} ions contains narrow band emission(4f6), high lifetime of optically active state and almost monochromatic nature [17]–[19]. Though some works have been done already, but not many details reported about effect of Eu^{3+} and PbO on optical and structural and physical properties of boro tellurite glasses[15], [17], [20].

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Structural studies of Cobalt and Tin Embedded Calcium Nano-Ferrites: Effect of SiO_2

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Abstract: **By using the sol-gel microwave auto combustion technology, a set of cobalt and tin substituted calcium nano-ferrite samples of chemical composition Ca(Co-Sn)Fe2-xO3+SiO2x (x = wt percent) have been created with varied SiO2 ratios. An X-ray diffractometer confirms the structural representation of prepared samples (XRD). XRD tests validated the samples' Z-type tetragonal crystal structure and crystal planes. Scanning Electron Microscope was used to examine the morphological features of ready samples (SEM). The existence of nano ferrites with a particle size of 33 to 74 nm is indicated by the SEM examination. The EDS tests confirm that there are no impurity elements present. The fundamental composition of materials was identified by "Energy Dispersive X-Ray analysis technique (EDS). The average particle size in powder samples was found in the range of 41 -57 nm.**

Keywords: Calcium nano-ferrite; Aloe Vera; Agglomeration; Z-type tetragonal crystal.

1. INTRODUCTION

The new ferrites are ferromagnetic materials made up of massive iron oxides as well as additional oxides such as barium, cadmium, strontium, nickel, manganese, zinc, cobalt, lithium, tin, and calcium [1-8]. Because of their distinctive magnetic, electrical, mechanical, and optical properties, ferrites with the chemical formula MFe2O4 (where M is a divalent metal ion) showed promise in technological applications [1,4]. As a result, ferrites have been identified for a variety of applications such as magnetic recording medium, MRI augmentation, catalysis, magnetic fluids in the storage or retrieval of data sensors, and pigment [1,2,7,8]. The structure of spinal-type ferrites consists of a densely packed oxygen array with 32 oxygen ions forming a single cell. For the production of ferrite nanoparticles, a variety of processes are available, including hydrothermal [9], chemical co-precipitation[10], combustion[11], sol-gel [12,13], traditional ceramic process[14-18], and RF-sputtering [9,10,18]. Among all acknowledged technologies, simple and cost-effective approaches for preparing nano-ferrites with the lowest cost for use, nontoxic and ecologically friendly precursors are extremely relevant. The sol-gel microwave auto combustion method was employed to manufacture calcium nano-ferrites in the current study. The use of diverse plant extracts for the manufacture of nanoparticles with particle sizes ranging from 5 to 50 nm has been documented in recent research [19,20].

Aloe Vera is one of the boons to researchers because i) It contains 99.5% of water in its leaves and the rest is solid content, ii) The solid material of Aloe Vera possesses over 75 diverse ingredients, namely salicylic acid, sugars, minerals, enzymes, sterols, vitamins, amino acids, saponins, etc., iii) It is a natural plant and easily available in India and many other countries, iv) Aloe Vera gel is mainly used in cosmetics products such as sun lotions, lip balm, face creams, healing ointments, hydrating elements in liquids. v) Further, it is also used in pharmacology for anti-inflammatory, and burn treatment[21]. Aloe Vera is a good reducing agent and it can reduce the particle size to nanometers [22,23]. The effect of various diamagnetic-paramagnetic cations on the nanostructure and magnetic properties of M-type hexaferrite has been reported to be important for use in technical applications [24-31]. It is stated by Preksha N, et al [32] that, the $Sr_3Co_{2-x}Ga_xFe_{24}O_{41}$ hexaferrite materials can be used for microwave absorbers applications. The replacement of Nd^{3+} ions in nickel ferrites can improve the magnetic parameters [33,34]. E. Ahilandeshwari et al showed that the nano ferrite materials with the chemical formula $BaNd_xFe_{2-x}O_4$ are potential candidates for the reduction of EMI with the least reflection loss over a broad frequency range [8]. It is stated that [35-37], the simultaneous inclusion of SiO_2 and CaO is well-matched to stimulate the densification of hard ferrite magnets without letting in large amounts of grain growth.

The present investigations are mainly focused on synthesis, structural, morphological, and elemental analysis of calcium nano ferrites, doped with cobalt and tin. The result of SiO_2 on crystalline size, structural, microstructure, and elemental analysis of calcium nano ferrites was analyzed with XRD, SEM, and EDS.

2. EXPERIMENTAL METHOD

Calcium ferrites doped with cobalt and tin ions having chemical composition $\mathbf{SiO_{2x}Ca(Co\text{-}Sn)Fe_{2-x}O_3}$ have been synthesized by sol-gel microwave auto combustion method. The ferrite samples were prepared by taking analytical reagent grade (AR) chemicals such as calcium nitrate $Ca(No_3)_24H_2O$, cobalt nitrate $Co(No)_3$, tin oxide (SnO_2), ferric nitrate $Fe(No_3)_29H_2O$ having 99% purity procured by Sigma Aldrich as starting materials. Here $Co(No)_3$ and SnO_2 were taken as substituting material, urea (NH_2-Co-NH_2), and Aloe Vera plant extract were used as fuel with suitable ratios. Further, the sol-gel combustion is one of the best approaches for the synthesis of nano-materials due to the following factors, i) it gives ultrafine powder nanoparticles, ii) better particle size distribution, iii) high probability of forming a single structure, and iv) excellent chemical homogeneity. The calcium nano ferrites were prepared by microwave-induced sol-gel combustion method [29,35]. Here, instead of a conventional furnace, the microwave oven was used for combustion, because it gives uniform heating during the sample combustion process.

For preparation, the quantified amount of metal nitrates was dissolved into distilled water and heated at a temperature of 353.15 K for 3 hours by taking urea as fuel, which gives the necessary energy to start an exothermic

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Mossbauer spectroscopy Study of $LuFeO_3$

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Abstract — In the present work we investigate the electronic structural microstructure and spectroscopic characteristics of $LuFeO_3$. Sample is prepared by the solution combustion method. X-ray diffraction patterns of $LuFeO_3$ nanoparticles confirms the *orthorhombic* structure crystallite size were found in nano range X-ray photoelectron spectra were excited with a monochromatized AlK _-line radiation. Absolute resolved energy interval was 0.6 eV, which was determined with the $Ag3d_{5/2}$ line. The diameter of the X-ray spot on a sample was 500 mkm; it was small enough to study the samples obtained Mossbauer spectra of $LuFeO_3$ were collected in the temperature range of 13K – 700K. At 700K the spectra of both samples are paramagnetic doublets with similar parameters. At the lowest temperature (14K) the spectra of both samples are magnetically split sextets. The isomer shift values of the sextets and doublets are typical for Fe^{3+} ions in oxygen octahedron. .Morphology study and elemental analysis results reveals that the particle morphology and size is highly dependent on the reaction temperature, synthesis method and fuel. Further the active vibrational bands in these spectra correlate to the functional groups found in the examined system.

Keywords— XPS, Powdered XRD, FTIR, SEM, Mössbauer spectroscopy, $LuFeO_3$

1.INTRODUCTION

The most stable orthorhombic structure -$LuFeO_3$ andthe metastable hexagonal structure- $LuFeO_3$ are bothfound in Lu-ferrite [1, 2]. Because of its meta-stability, experimental studies of bulk hexagonal structure- $LuFeO_3$ multiferroicity are difficult and consequently uncommon [3–5]. Further because of hexagonalstructure-$LuFeO_3$ has a greater unit cell capacity than O- $LuFeO_3$. Although hexagonal structure- $LuFeO_3$ films may be stabilized on various substrates, strain effects, interface/surface effects, and widely presentflaws in films can all have a significant impact on their inherent physical characteristics [6]. As a result, it's critical to conduct experiments with high-quality bulk samples. However, unlike $RMnO_3$, where the hexagonal phase takes precedence over the orthorhombic when R^{3+} is low, the orthorhombic phase in $RFeO_3$ is always stable since Lu^{3+} is alreadythe smallest rare earth ion. Scandium (Sc)-substitutedLuFeO$_3$ has recently been found to have a stable hexagonal structure [6]. Three intriguingquestions have arisen as a result of this research. First, why does the addition of Sc maintain the hexagonal structure, despite the fact that neither$ScFeO_3$ nor $LuFeO_3$ prefers the P63cm hexagonal form? Second, how such a swap affects or does not influence certain physical features, particularly multiferroicity. Third, does the replacement result in a high-temperature magnetic transition? There was no magnetic measurement above ambient temperature in Ref., although a mild ferromagnetic order was identified below TR 162 K. Further, P. V. Coutinho etal. [7] reported structural, vibrational, and magnetic properties of the orthoferrites $LaFeO_3$ and $YFeO_3$: A comparative study. He concentrated specifically distortions induced in the bulk material due to the exchange between elements with different atomic radii in the individual A sites of perovskite. He got single phase with orthorhombic-distorted structure belonging to the space group Pnma.

But we need to understand $RFeO_3$ structure in proper manner. C Sai Vandana et al. [8] reported cobalt-substituted $GdFeO_3$ orthoferrites. These sample orthoferrites disclosed the orthorhombic *Pbnm* structure. It is thus a perfect time to take a step backand recap what we already know about the structure of $RFeO_3$. The main motivation of the work is how functional materials work in order to design the next generation of materials in their domains. We chose LuFeO3 and Lu(YFe)O_3 to study the electronic structural and spectroscopic properties using X-ray photoelectron spectroscopy and Mossbauer spectra to accomplish this.

In this work in order to understand the electronic structure of $LuFeO_3$and Yttrium-doped $LuFeO_3$ samples were examining through X-ray photoelectron spectroscopy and Mossbauer Spectra.

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Humidity sensing behavior of rare earth doped Cobalt chromate for sensor applications

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Abstract:

In the present work role of Cerium (Ce^{3+}) on the structural, microstructural, Fourier infrared spectroscopic, electrical and humidity sensing behaviour $CoCr_{2-x}Ce_xO_4$ (CoCrCe) under frequency & humidity conditions are reported. The CoCrCe samples were prepared by solution combustion method. All the samples were sintered for 3 hours for 600°C to get a pure crystalline nature without impurity phase. X-ray diffraction confirms the formation of cubic spinel structures with typical crystallite sizes less than 16 nm. When Ce^{3+} ions are replaced by Cr^{3+} ions, compressive lattice strain is produced, hence we found lowering the lattice parameter. Further samples were analysed by using FTIR technique to know the information about octahedral and tetrahedral stretching band and it is confirming the ferrite structure without impurity. Microstructural studies of the samples were studied by using Scanning Electron microscopy. All the samples were confirmed samples are highly porous in nature. High porosity will help to humidity sensing behaviour. Elemental analysis was done using Energy dissipative spectra and it confirms all the elements is present in the samples. Humidity improves the conduction mechanism in ferrite pellets. With increasing relative humidity, resistivity drops considerably. Further we investigated the relevant conductivity of the samples, the reaction time of the capacitive sensor, and the humidity influence on the relative permittivity characteristics at a constant frequency range of f = 1 kHz. Among all the Ce concentration Ce^{3+} 2 mole % possess superior humidity sensing properties. Our findings indicate that $CoCr_{1.98}Ce_{0.02}O_4$ could be exploited as an active material in humidity sensor applications.

Key words: Chromate, solution combustion method; humidity; permittivity; electrical conductivity.

1. Introduction:

Spinel ferrites are the most studied ceramic materials in recent years due to their unusual mix of structural, magnetic, and dielectric properties [1-5]. These features encourage the use of ferrites in a variety of sectors such as high-frequency applications, electronic devices, and biological devices as catalysts, inductors, sensors, transformer cores, choke coils, filters, drug delivery and nonreciprocal devices, and so on[5-10]. Because of rising environmental concerns, sensors are receiving a lot of attention these days [10-15]. Precise humidity monitoring is critical in domains such as agriculture, manufacturing industries, food storage applications, and indoor and outdoor air quality. In enterprises, optimal humidity levels are critical for enhancing production efficiency [16- 19]. Reduced SARS-CoV-2 transmission is associated with increasing relative humidity, the first pandemic of the twenty-first century [20–23]. Plant growth is negatively impacted by unbalanced humidity levels [24–26]. A excellent humidity sensor has various properties, including high sensitivity, chemical and thermal stability, reversibility, and a quick response time. Because of their porous structure, wide surface-to-volume ratio, humidity variable resistivity, low cost, ease of synthesis, and

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Ultrasonication Assisted Synthesis of Dy^{3+} Activated $CaAl_2O_4$ nanophosphor: Photoluminescent and Photometric Properties Prompted WLED's and Latent Fingerprints Development Applications

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Abstract: Systematic study of lanthanide based calcium aluminate nanophosphor was considered to be eventual building blocks for multifunctional applications. In this work, Dy^{3+} activated $CaAl_2O_4$ (1-11 mol %) nanophosphor was explored via sonication method using fresh lemon juice as a bio surfactant. The cause of sonication time, pH value, sonication power and temperature on the framework of the prepared nanophosphor were studied and discussed. The powdered x-ray diffraction results of prepared nanophosphor consist of monoclinic phase. The morphological and elemental analysis was studied through SEM and EDAX. The PL emission spectra of $CaAl_2O_4:Dy^{3+}$(1-11mol %) nanophosphor show intensive and sharp peaks centered at ~ 483, 574 and 636 nm, mature to $^4F_{9/2}\rightarrow{}^6H_{15/2}$, $^4F_{9/2}\rightarrow{}^6H_{13/2}$ and $^4F_{9/2}\rightarrow{}^6H_{11/2}$ transitions of Dy^{3+} ions, respectively. The dipole-dipole interaction between the activator ions leads to concentration quenching transpire at 9 mol %. The optimized sample was utilized for visualization and revelation of authenticated ridge details present in latent fingerprints (LFPs). The CIE and CCT results affirm the present NPs intensify white light emission eminently useful for the fabrication of white light emitting diodes.

Keywords: Sonochemical route; Photoluminescence; forensic; WLED

INTRODUCTION

Fingerprints (FPs) are commonly employed in advanced forensic investigations since they provide unique evidence on people. The ridge and furrow characteristics of FPs provide proof on the donors because they are precise and unmistakable for each individual [1-2]. Identification of fingerprints helps investigators to track a criminal's record and the FPs detectable in crime scene investigation was latent and therefore the visualization has created new possibility in various fields, like medical diagnostics, forensic investigation etc [3-4].Till date, many chemical, physical, and biological methods are rapidly emerged for visualization of latent fingerprints (LFPs). However, most of these conventional methods consist of drawbacks such as low sensitivity, selectivity, background hindrance as well as high toxicity [5-6]. Among these, the powder dusting method has been most widely utilized approach in crime investigation due to its convenience and broad applicability [7]. Regular and metallic powders are the two types of fingerprint powders available. However, the presence of resinous polymers (starch, rosin, silica gel, etc.) in normal powders, as well as hazardous components such as lead, gold, and silver in metallic powders, made identifying the latent fingerprint of surface contamination problematic [8]. On the other hand, luminescent nanomaterials give high sensitivity, low background hindrance, spatial resolution and hence provide noticeable applications in forensic science. LFPs universal recognition is mostly based on the level II structures (such as ridge termination, bifurcation, and crossover). Sometimes, the collected LFPs may be incomplete, and even don't have enough characteristics features. Therefore, more characteristics excluding level II of fingerprints are required for better recognition. In addition to level II details, the level III characteristics (sweat pore) on fingertips are also permanent, indisputable and unique to visualize the fingerprint more effectively [9]. Various fluorescent materials have been used in the past to visualize LFPs, followed by a powder dusting method capable of revealing clear friction ridge features such as level I to III primarily with UV stimulation [10]. To avoid the damaging effects of UV radiation, $CaAl_2O_4:Dy^{3+}$ NPs were utilized as a fluorescent marker for the imaging of level I to level III ridge patterns under normal light.

Nowadays, the advancement of luminous resources is gaining ubiquity in nanotechnology owing to their numerous applications in a variety of fields, such as plasma displays, field emission displays, latent finger prints (LFP), opto-electronic devices, cathode ray tubes, solid state lasers,

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Spectroscopic studies of Eu^{3+} doped B_2O_3–PbO–Ag_2O Glasses

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***Abstract*— Europium (Eu^{3+}) doped lead borate glasses have been successfully prepared by the conventional melt quenching method. Their structural studies and luminescence properties were carried out using transmittance, excitation, and emission spectra. The investigation of FTIR spectra shows the presence of boron atoms in both BO_3 and BO_4 units in the glass network. Also found that the presence of new structural groups such as Boroxyl rings, pyro, and Dipent-Borate. Photoluminescence (PL) spectroscopy was used to examine down-conversion (DC) emission under 394nm excitation exhibits five emission bands centered at 577nm, 590nm, 612nm, 650nm, and 697nm corresponding to $^5D_0$-$^7F_0$, $^5D_0$-$^7F_1$, $^5D_0$-$^7F_2$, $^5D_0$-$^7F_3$ and $^5D_0$-$^7F_4$ transitions of Eu^{3+} ions, respectively and also recorded emission spectra at 306nm and 296nm, both the excitations exhibit two emission bands centered at 590nm and 612nm corresponding to $^5D_0$-$^7F_1$ and $^5D_0$-$^7F_2$ transitions of Eu^{3+} ions.**

Keywords*— Silver Lead borate; FTIR; Photoluminescence.

I. Introduction

Rare-earth doped glasses are superior materials for solid-state laser, optical amplifiers, display, and photo-electronic devices [1]–[3]. Among the other rare-earth (RE) ions, trivalent europium is due to the narrow emission band, producing almost monochromatic light and a long radiative lifetime [4]. This kind of glass is widely used as efficient red phosphors in mainly designing mercury-fluorescent lamps and plasma displays. Silver-containing glasses have been technologically interesting materials for solid-state batteries and electrochemical devices due to their valuable optical properties and high ionic conductivity value [5], [6]. Lead borate glasses are of research interest due to their structural peculiarities. The addition of PbO into the borate network brings modification of boroxol rings and formation of complex groups with one or two 4 coordinated boron atoms [7]. Lead borate glasses have several applications, including radiation shields and optical and thermal properties [8].

In the present work, we report the structural studies and luminescence properties of europium doped lead borate glasses through Fourier Transformer Infrared (FTIR) spectroscopy and Photoluminescence (PL).

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II. Experimental

The raw materials of reagent grade chemicals H_3BO_3, PbO, Ag_2O, and Eu_2O_3 were used to synthesize the samples by the conventional melt quenching method. The glass with the composition of $70B_2O_3$–29PbO–29PbO–(1-x)Ag_2O–xEu_2O_3 (x = 0.5 mol%) was taken in a porcelain crucible and placed in a furnace set temperature at 1100°C for 2 hrs and stirring several times to ensure complete melting and homogeneity for the prepared glass. The homogeneous molten liquid was cast into a brass mold and quickly pressed with another mold. The prepared sample was immediately transferred to another muffle furnace set at 150°C for 1hr to remove thermal stress and strain. The prepared sample was cut into appropriate dimensions for the required measurement.

The FTIR spectra of powdered glass were recorded at room temperature by Nicolet spectrometer with a resolution of 0.2 cm^{-1} in the frequency range 400 – 4000 cm^{-1} using the standard KBr pellet method. The excitation and fluorescence spectra were recorded using F-2700 FL Spectrophotometer with a xenon flash lamp as the source.

III. Result and Disscussion

A. FTIR studies

The FTIR spectra of the glass system as depicted in figure 1, and their assignments of the bands are presented in table 1. The broad composite band extending from 3200–3600 cm^{-1} is attributed to the hydroxyl (OH) or water group [9]. The broad water bands have divided into:

- Peak 2700–3000 cm^{-1} — originating from hydrogen bonding;
- Peak 3200–3500 cm^{-1} — originating from molecular water; and
- Peak 3600–3750 cm^{-1} — originating from OH-groups.

In figure 1, it can be seen that robust broadband appeared at 1292 cm^{-1} is attributed to B–O asymmetric stretching of trigonal BO_3 unit, and the shoulder at 1234 cm^{-1} may rise from B–O stretching vibrations of $(BO^3)^{3-}$ units in metaborates, pyroborates and orthoborates [10]. Similarly, the band at 1004 cm^{-1} is due to the vibration of some boron atoms attached to

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