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Receptor based virtual screening of potential novel inhibitors of tigar [TP53 (tumour protein 53)-induced glycolysis and apoptosis regulator

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Abstract

TP53 (tumor protein 53)-induced glycolysis and apoptosis regulator (TIGAR) belongs to the phosphatases family of proteins that modulates the level of reactive oxygen species in tumor cells. This protein plays a vital role as a negative regulator of glycolysis, thus lowering ROS levels in the cells, which helps the cancerous cells to resist programmed cell death. Besides, TIGAR also mediates the DNA damage repair in cancer cells by increasing tumor cell survival. In the current study, we have screened natural products that compete with the substrate to bind to the active site of TIGAR. Extra precision and MMGBSA scoring function were used to screen the lead molecules. Five compounds were considered as lead molecules with 2-(2-(3,4-dihydroxy phenyl)-3,5-dihydroxy-8-(4-hydroxyphenyl)-4-oxo-4H-furo[2,3-h]chromen-9-yl) acetic acid(DDFA) as a top lead with a docking score of −9.428, and −53.16 MMGBSA, bind to the positively charged amino acids present in the active site. Further, the molecular dynamics simulation studies indicated the structural stability attained by TIGAR protein upon the binding of DDFA, suggesting it to be a potent inhibitor of TIGAR, and could be employed as an anticancer drug during combinational therapy.

Introduction

Cancer development is suppressed by the tumor suppressor gene p53 by induction of genome stability, apoptosis, and cell cycle arrest. Stress-activated p53 regulates cell survival and death by controlling reactive oxygen (ROS) species levels [1].ROS level and antioxidant activity of p53 play a significant role in tumor development and DNA damage. The response to ROS by P53 induced proteins depends on the type of ROS generated in the tissue. The level of ROS contributes to the induction of apoptosis. Recent studies proved that p53 family proteins are involved in lowering the level of ROS in the cells. The p53induced proteins like sestrins [2] and Aldehyde Dehydrogenase 4 (ALDH4) [3] reduce the level of hydrogen peroxide and ROS, respectively, in cancer cells. Also, p53 induces target genes such as sestrins, ALDH4, phosphoglyceratemutase [4], and TP53 (tumor protein 53)-induced glycolysis and apoptosis regulator (TIGAR) in response to ROS stress. Recent studies reported TIGAR regulates the ROS level and protects the tumor cells from apoptosis. TIGAR protein is well-known for its ability to switch the glycolysis pathway into the pentose phosphate pathway to promote antioxidant protection of cancer cells [5].

In hypoxic conditions, TIGAR translocates into the inner membrane of mitochondria. Wherein it interacts with membrane-bound hexokinase 2(HK2) and increases its activity (Fig. 1). HK2 helps in the maintenance of the membrane potential of mitochondria by increasing the level of ADP. This event in mitochondria reduces the ROS and prevents the assembling of Bax at voltage-dependent anionic channels. Consequently, the release of cytochrome *C* into the cytoplasm, caspase cascade, and apoptosis is prevented.

Studies on TIGAR have demonstrated that it is a prospective drug target in many cancers. Recent studies by Chu et al. [6] ascertained that TIGAR plays a vital role in esophageal squamous cell carcinoma (ESCC) progression and chemoresistance. Overexpression of TIGAR was correlated with the growth of Hodgkin Lymphoma, Ovarian Epithelial Tumor, Neuroblastoma, Non-Seminomatous Germ Cell Tumor, Seminoma, Kidney Cancer, and breast carcinoma [2], [3], [7], [8]. TIGAR is a potent target for breast and gastric cancers [9]. Inhibition of TIGAR also helps in the radiosensitization of glioblastoma cells [10], [11]. Hence inhibiting TIGAR will help combat the cancer chemoresistance.

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An evaluation of noble nanocomposites based on zinc oxide: synthesis, characterization, environmental, optical and biomedical applications

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Metal oxide nanocomposites have concerned an obvious agreement of consideration because of their enormous applications in numerous domains like photocatalyst, catalysis, biological and sensors. The conservational purification technology is getting advanced by the development of heterostructured semiconductor photocatalysts. In this paper, we documented a comparative analysis of synthesis process (Solution-based methods, High temperature-based methods and Electrical methods) and characterisation techniques such as Transmission electron microscopy, X-ray diffraction, Fourier-transform infrared spectroscopy and Scanning electron microscopy on various noble Nanocomposites (NCs) of metal (M) - zinc oxide (ZnO/ZO). This review inclines over multiple stat-of-the-art applications like photocatalytic, catalyst, sensor and biological activities. It could be concluded from this study that, the catalytic activity of noble M-ZO nanostructures depends not only on the noble metal species, but on the catalytic material architecture as well. The future research and development challenges together with future prospects are critically presented.

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Keywords: M-ZnO, NCs, Synthesis, Characterisation, Photocatalysis, Catalyst, Sensor, Biological activity, Thermal, Electrical, Antimicrobial, Mechanical and optical properties

1. Introduction

Recently, nanocomposites (NCs) of metal-oxide is one of the evolving research domain owing to its smaller size, unique structure, photocatalytic, thermal, electrical, antimicrobial, mechanical and optical properties [1],[2]. NCs of metal-oxide are mostly formed by the mixture of two or more metal oxides with specific concentrations [3]. NCs of metal oxide finds applicable in numerous applications like sensors, photocatalytic activity, catalytic activity, antimicrobial activity, Deoxy ribonucleic acid (DNA) binding property, anticancer activity, magnetic property,

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Research article

In silico evaluation of naturally isolated triterpene glycosides (TG) from *Gymnema sylvestre* towards diabetic treatment

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ABSTRACT

Diabetes is a metabolic disorder which is characterised by high levels of blood glucose. Most of the oral drugs available today for the treatment of diabetes are associated with various side-effects. Herbal medicines are considered relatively safer alternatives and *Gymnema sylvestre* (GS) is one such known traditional medicinal plant widely used for the treatment of diabetes. In our previous work, we isolated active triterpene glycosides (TG) from *Gymnema sylvestre* (GS) and screened for yeast α-glucosidase inhibitory activity *in vitro*. The present study aims to use *in silico* techniques to understand and predict the inhibitory role of the isolated triterpene glycosides (TG); Gymnemic acid I, IV, VII and gymnemagenin against disaccharidase enzymes. enzyme kinetic analysis using Lineweaver-Burk plot indicated that TG competitively inhibited yeast α-glucosidase at IC_{50} concentration with K_i 0.0028 μM. TG also exhibited significant inhibitory activity against mammalian sucrase and maltase respectively, compared to control.

Practical applications: The molecular docking simulation reveals that TG is capable of docking well with crystallographic structures of the selected enzyme targets. Inhibition of α-glucosidases could delay the absorption of glucose in the blood during post-meal digestion. Thus the current study highlights the dietary intervention of TG towards the selected enzyme targets, thus making TG a potential nutraceutical candidate towards management of blood glucose.

1. Introduction

Diabetes mellitus is characterized by an abnormal increase in plasma glucose, known as hyperglycemia, caused either by a deficiency in insulin secretion (Type1 diabetes mellitus or T1DM), resistance to insulin secretion (Type 2 diabetes mellitus or T2DM) or both (Willson et al., 2000; Shearer and Billin, 2007; Feldman et al., 2008). It has been estimated worldwide that 347 million people have diabetes with a prevalence of 8.3% (Woerle et al., 2004). Hyperglycemia and oscillating blood glucose concentrations attribute directly to the development of cardiovascular disease (Ceriello et al., 2008; Kato et al., 2008). Management of postprandial hyperglycemia is considered as a first therapeutic strategy for T2DM treatment. This can be accomplished by delaying the release of glucose through the inhibition of carbohydrate hydrolysing enzyme α-glucosidase (EC 3.2.1.20) in the digestive tract (Lee et al., 2012). Inhibiting this class of enzyme retards gastrointestinal absorption of dietary carbohydrates by restricting the breakdown of linear or branched oligosaccharide units like α-limit dextrins, maltose and maltotriose to produce glucose thereby preventing glucose absorption into blood stream (Lee et al., 2012). Commercially, α-glucosidase inhibitors are extensively used as monotherapy and in combination with other antidiabetic agents to reduce postprandial increase in blood glucose level (Fujisawa et al., 2005). But most of these are known to have certain adverse effects such as liver and gastrointestinal toxicity (Williams and Pickup, 1991; Rao et al., 1997). Thus, there is an increased demand for natural products with antidiabetic activity with no side effects. Indian traditional systems of medicine have a plethora of promising plants for treatment of diabetes, of which *Gymnema sylvestre (GS)* is most well established and extensively used (Shanmugasundaram et al., 1983). Several compounds have been isolated over the years from *GS* such as gymnemic acids, gymnemasaponins, gymnemasides, gymnemasins, deacylgymnemicacid, gymnemagenin, gymnestrogenin b and gymnemanol (Sahu et al., 1996; Saneja

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Evaluation of antimycobacterial, antioxidant, and anticancer activities of CuO nanoparticles through cobalt doping

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Abstract

Here, we report the synthesis of cobalt-doped copper oxide nanoparticles (CuO–NPs) via combustion strategy with lime juice as a reductant at relatively low temperature of 600 °C and at shorter duration of 3 h. Powder X-ray diffraction (XRD) results revealed that, every compound was in monoclinic structure with space group C_{12}/C_1 (No. 15) and average particle size were found to be 18–21 nm. These NPs were used to evaluate the antimycobacterial activity against "*Mycobacterium tuberculosis H37Rv ATCC*

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in vitro DNA Binding, Anticancer and Molecular Docking Studies of New Sydnone Compounds

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Sydnones have been a novel class of mesoionic compound due to versatility of their applications in various fields. Sydnone derivative have seen as an interesting structure grouped in the heterocyclic community, which is having regions of both positive and negative charges linked with a poly-heteroatomic system. This structural characteristic allows them to cross biological membranes and interact with biomolecules. Four sydnones namely 3-(4-decyloxybiphenyl-4′-yl) sydnone (MC-176), 3-(4-octyloxy-2,3-difluorobiphenyl-4′-yl) sydnone (MC-192), 3-(4-biphenyl-4′-yl) sydnone (MC-450) and 3-(4-butylbiphenyl-4′-yl) sydnone (MC-456) were evaluated for biophysical interactions between DNA and sydnones and antiproliferative activity. The UV-visible spectroscopic study indicates interaction between sydnone and dsDNA with a slight red and hypochromic shift in absorption spectra, which shows the intercalation mode of binding. The binding constant of DNA-Sydnone complexes were in the range from 1.4×10^4 M^{-1} to 7.1×10^4 M^{-1} for different sydnone compounds (MC-176, MC-192, MC-450, MC-456). FTIR spectra indicated that sydnone interaction with DNA occurs through base pairs and the phosphate backbone of the DNA. The cytotoxic and apoptotic effects of a sydnone derivatives on human cervical cancer (HeLa) and breast tumor (BT) 474 cancer cell lines were determined. The compounds possess antiproliferative activity in a concentration-dependent mode. The changes of morphological characteristic of cancer cells were determined by fluorescent staining techniques indicate the apoptotic cell death. The molecular docking studies of sydnone compounds with caspase 3 and EGF-TK showed better interactions (according to docking score) along with commercially available breast cancer drug molecule anastrozole. The docking score of sydnone molecules (MC-456, MC-450, MC-192 and MC-176) with EGF-TK enzyme were -6.44, -6.42, -5.46 and -4.53, respectively. The binding energy of anastrozole with EGF-TK was -6.41. As well Caspase 3 inhibition with sydnone compounds MC-456, MC-450, MC-192 and MC-176 were -6.09, -6.48, -5 and -3.49, respectively. The binding energy of anastrozole with caspase 3 was -6.24. All sydnone compounds were studied for ADME toxicity studies along with Lipinski rule of five to assess their drug likeness properties by *in silico* approach. MC-450 found to have good ADMET (absorption, distribution, metabolism, excretion and toxicology) properties among all the sydnone compounds. Thus, the present work indicates that these sydnone compounds would be a well prospective in developing anticancer medicines.

Keywords: Sydnone, Liquid crystal, Apoptosis, Cell lines, Molecular docking.

INTRODUCTION

Cancer is the one of most eminent diseases in the world causes death around 9.6 million death cases reports were reported in 2018. According to WHO reports occurring and death cases of cancer showing around 70% in middle and low-income countries [1]. Cervical cancer and breast cancer are common among most of the cancers seen in women throughout the globe [2]. Chemotherapeutic drugs are essential to fight against cancer, which has helped the humans to lead quality life. Over the ancient and earlier days, the health issues are under risk because of generally used chemotherapeutic drugs to treat cancer has been less effective due to increase in drug resistant and also many of them have adverse reactions [3]. It is crucial to explore new molecules to treat the cancer and other diseases. Recently many scientists have showed a path in drug discovery by the biological properties of liquid crystal pharmaceutical (LCP). The LCP molecule Tolectin was identified as effective against

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A NEW APPROACH OF STEEL MANUFACTURING FLASH BAINITE TECHNIQUE: REVIEW

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Abstract : Treating heat with steel t yields the Strongest, Most Ductile, Lean alloyed, Readily Weldable, Least Cost and Maximum Strength Metal known to man.

It can be used in concrete as it is low cost and stronger than the conventional steel. Steel building components can be manufactured to rely on much higher tensile strength. Significantly lighter roof trusses could be constructed from Flash Bainite members with greater tensile strengths. Tensioning components such as wire and re-bar may positively impact the bridge and highway building industries. The Combination of high strength and increased quality of steel allows engineers to design vehicles made from parts that are lighter yet stronger than the existing parts making the vehicle more efficient.

It employs rapid thermal cycling to strengthen steel sheets and tubing into AHSS (Advanced High Strength Steel). This process is environment friendly and consumes less than half Kilowatt of energy per Kilogram of steel processed. Flash Bainite is still a new field for study. More information and principles regarding this topic is still needed to be developed. This review paper has been set up to serve those purposes and fulfill the missing information for any furtherstudy.

The aim of this paper is to give a review about the various properties and uses of Flash Bainite for the improvement of the strength of the structures based on various studies done abroad. The paper also gives a review about the process involved, their production and advantages over conventional steel used regularly without awareness.

***IndexTerms* – Tensioning, flash bainite, thermal recycling.**

I. INTRODUCTION

Steel is the leading construction material for sustainability. When a steel-framed building is demolished, its components can be reused or returned to the steelmaking process to create brand new components. Various types of steels have been developed throughout these years to serve the requirements of industries. Different combinations of compositions and processing of this steel yield different characteristics of steels for various uses. Some of them is utilized for mechanical purposes, Civil purposes and some of them have been developed to serve other applications.

In 2010, ARDEC was contacted about Flash Bainite (FB). They produced a steel microstructure of high strength and good elongation and toughness. The process was demonstrated on plain carbon and lean alloyed steels and has been performed on a variety of different forms including sheet, plate, and tubing (round and rectangular).

Flash bainite is the latest method of microstructure development by the method of heat treatment process called “Flash Processing”. Using this process high performance steel is obtained by treating it for only a short period of time. It is a mixed microstructure of bainite and martensite.

The microstructure of bainite and martensite With Flash Processing, the microstructure developed is claimed to be a mixture of about 20 percent of bainite and 80 percent of martensite. The resulting steel undergoing Flash Process is called “Flash Bainite”.the process is still new and more details need to be discovered. This is why this research has been set up: to study details of flash process and the flash-processed steels. The study aims to develop understanding of the flash process and the characteristics of steels after undergoing the process.

To meet the properties requirements, compositions and processing of the steels plays an important role. So, in order to achieve the desired mechanical properties, the suitable heat treatment process has to be considered and designed.

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INVESTIGATION OF IRON ORE TAILINGS IN PRODUCTION OF MASONRY BLOCKS

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ABSTRACT : THIS PAPER AIMS TO DEAL WITH UTILIZATION OFWASTE IRON TAILINGS IN BUILDING BLOCKS. THE EXPLOITATION OF MINERAL RESOURCES SUCH AS IRON ORE WOULD PROMOTE THE DEVELOPMENT OF ECONOMY AND SOCIETY, BUT IT GENERATES MASSIVE OVERBURDEN IN THE FORM OF IRON ORE TAILINGS, THAT MAY POLLUTE THE ENVIRONMENT. THEREFORE, COMPREHENSIVE UTILIZATION OF WASTE IRON TAILINGS IS IMPORTANT IN SAVING RESOURCES, IMPROVING SURROUNDINGS AND FOR SUSTAINABLE DEVELOPMENT. MASONRY UNITS MADE OF IRON ORE TAILINGS ARE WIDELY ACCEPTED AS ENERGY EFFICIENT ALTERNATIVES TO BURNT CLAY BRICKS. IN THIS STUDY, ATTEMPTS WERE MADE TO INVESTIGATE THE SUITABILITY AND RELIABILITY OF IRON ORE TAILINGS IN MANUFACTURE OF BUILDING BLOCKS.

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IndexTerms – Iron tailings, compressive strength, Quarry Dust, Alternative Material**.**

I. INTRODUCTION

Masonry is widely used to construct both small andlarge structures because of its structural versatility and attractive appearance. Masonry is of considerable volume in most of the structures and masonry units are consumed in bulk quantities. Compressive strength of masonry greatly depends on strength of the masonry units. In order to cater to the different needs of construction, various masonry units have been developed and used.

Masonry is the building of structures from individualunits laid in and bound together by mortar; the term masonry can also refer to the units themselves. The common materials of masonry construction are brick, stone, marble, granite, limestone, concrete block. Masonry is generally a highly durable form of construction. However, the materials used, the quality of the mortar and workmanship, and the pattern in which the units are assembled can significantly affect the durability of the overall masonry construction.

India has large reserves of metal bearing ore and it occupies sixth position in the world with regard to iron ore reserves. Further, India is one of the important iron ore producers and exporter in the world. However, the rapid growth in production, especially from large surface mines, have already caused ecological imbalance in their respective regions and emerge as the source of main environmental hazards. The waste/tailings that are ultra-fines or slimes, having diameter less than 150μm, are not useful and hence are discarded. In India approximately 1500 to 2000 million tons of such mined ore is lost as tailings. The safe disposal or utilization of such vast mineral wealth in the formultra-fines or slimes has remained a major unsolved and challenging task for the Indian iron ore industry.This work has been done to exploit the waste of industry mainly iron ore tailing and been used in concrete for their improvement in strength.

II. LITERATURE REVIEW

Need for Alternative Building Materials:

By using the Alternative materials instead ofconventional materials, we would not only be preserving the natural precious resources, but also solving the problems of disposal of waste generated from various industries, which has become a national problem. Since the need for alternative building materials is growing at an alarming rate, in order to meet the demand for new buildings, new ways and techniques must be evolved.

Manufacturing of building materials like brick, cement, steel, aggregates etc. which are consumed inbulk quantities, puts great pressure on natural resources and are highly energy demanding.

Therefore, the use of alternative materials for construction should be encouraged.

* High amount of decreasing building materials suchas sand, aggregate, top soil for brick, timber.

* Consumption of large amount of energy in building materials.Utilization of waste or recycled materials for environmental or health issues. The materials are Iron ore tailings, fly ash, agriculture waste, quarry dust, debris etc.

* High cost of building materials and greater the distance of transportation.

* Environmental friendly and cost effective construction purpose.

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Design of Roof top Rainwater Harvesting in Suggata Village – Bangalore North

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Abstract: Water is the most important resource on the earth, it requires for various activities in our day-to- day life At the rate in which India's populace is expanding. India will without a doubt supplant China from its main position of most thickly populated nation of the world. This will prompt high rate of utilization of most significant characteristic asset "Water" bringing about expansion of weights on the allowed freshwater assets and supply of it is decreasing at a rapidly safe on this planet. Keeping in mind the end goal to ration and take care of our day-to-day demand of water prerequisite, we have to think for elective savvy and moderately simpler mechanical strategies of conserving water. The technical aspect of this study is rainwater harvesting collected from rooftop which is considered to be catchment for Suggatta village. The study starts by collecting some important researches on rainwater harvesting and studied them. After proper field planning work conducted to Suggata for proper visualize the situation of village and to measure the dimension of roof catchment area. Then other required data are collected i.e. hydrological, rainfall and meteorological data. The collected water from different types of roofs is tested for physical, chemical as well as biological aspects. The volume of water will calculate for determining to provide combined water tank for the people of Suggata village. Water harvesting potential for the village will calculate, and on the basis of tank capacity with suitable design will be considered. The key factor of this study is the filter unit which will be design efficient and economical and feasible to implement in the village or anywhere.

Keywords: Rooftop harvesting, filter design, groundwater recharge.

I. INTRODUCTION

1.1 Present water scenario in Suggatta village

At present people in Suggatta village depends their water requirements through local water supply tankers to the tune of 50% involving huge expenditure and the remaining 50% is met through the ground water abstraction structures located in the village. This is due to not taking sustainable measures for recharge to groundwater in the village. Suggatta with an area of 50 acres is a perfect location to implement the rain water harvesting and artificial recharge to ground water through different conservation structures over a period of time.

Spare Water and Save Nation from Water Crisis and Saving Rainwater Saves Money", helps the Environment. The more water is utilized, the less the need to utilize chlorinated or other treated faucet water. The more we utilize water, the less that will go into storm sewers where it is blended with oil and other harmful buildups from boulevards, parking areas. With rooftop harvesting, most any surface — tiles, metal sheets, plastics, but not grass used will intercept the flow of rainwater. To provide a household with high-quality drinking water and year-round supply for gardens, livestock, and irrigation, etc. rainwater harvesting is a need of the hour.

Rooftop harvesting collecting/water reaping is the strategy through which rain water is caught from the roof top catchments and water is put away in tanks, wells and stores. Collected rain water can be put away in sub-surface ground water repository by receiving manufactured energize strategies to meet the family unit needs through capacity in tanks. Groundwater asset gets normally revived through permeation. Be that as it may, due to in separate improvement and fast urbanization, uncovered surface for soil has been decreased definitely with

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EXTERIOR INSULATION AND FINISHING SYSTEMS

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*Abstract:*Differential temperature in the cement structure causes cracks, spalling and eventually allows chlorides, sulphates & other ions to penetrate through the porous spaces causing the structural problems. These detrimental factors are limited if the cement has the ability to repel water. Here water repellency is achieved through internal &external surface application of water proofing compounds. Existing durable materials such as metals and ceramics are generally hydrophilic & require polymeric modifiers to render them hydrophobic properties. Plaster drain provides a cavity drainage system, suitable for remedial works, and is used to provide a key for plaster and render finishes. Water is an essential ingredient in cement structures, but uncontrolled excessive moisture can create whole host damage. The purpose of this research is to give an idea about insulation of building with the finishing systems like plastering and painting. Using good quality of materials and sustainable materials increases the durability of the structural component. It also gives knowledge about R value of individual component used, how to create a crack free finishing systems with eco-friendly materials.

IndexTerms **- EIFS, Insulation, R-value, Moisture, sustainability, durable structures.**

I. INTRODUCTION

Exterior Insulation and Finishing System's (EIFS) are a type of building material that is used as the exterior facing of a building's exterior wall. EIFS is composed of a number of layers. EIFS is a type of wall surfacing system and needs to be thought of as such a system.

EIFS is unique in that it is the only wall material that provides insulation, a finished exterior surface & weather proofing, in a single seamless product. This "single product does it all" attributes accounts for its popularity; EIFS is a good value.

EIFS looks like stucco (Portland Cement Plaster), Stucco is a "natural" product, composed of sand, Portland cement & other materials. EIFS is a synthetic product, unlike Stucco, EIFS can be made in large areas without any joints and also with a wide variety of shapes, colors and textures. EIFS is also called as synthetic stucco.

Here in this research incorporation of EIFS is directly done in the exterior finishing systems i.e. plastering by selecting few components of EIFS. So EXTERIOR INSULATION in FINISHING SYSTEM is a way of providing thermal insulation for the building. This system even concentrates on providing protection for building against moisture and also aims at crack proof finishing using sustainable green materials.

The expression deep energy retrofit lacks precision but broadly suggests a program of existing building improvement that has as one its goals a dramatic improvement in the level of energy efficiency while providing a healthier living environment and improving durability and safety. Adding insulation to exterior walls is often a key piece of a deep energy retrofit. However, this measure is often cost prohibitive and there are formidable challenges to altering the thermal envelope of existing, older structures.

II. OBJECTIVES

To provide the finishing system for external walls of the building with: -

1. Crack free surface:

Water plays a vital in the construction field. The surface exposed to external atmosphere is subjected to various kinds of attacks. Making the external surface to resist various sorts of attacks increases the durability of the structure. If the surface is crack free and having uniform temperature throughout makes the structure durable and sustainable.

2. Resistance to moisture attack:

Majority of the buildings in olden days was wood framed buildings, these buildings were facing water infiltration problems which leads to structural dampness and strength reduction in buildings. By incorporating EIFS system which includes drainage path to let water drain out behind the cladding system.

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Groundwater Pollution Due to Agricultural Activity in Hosakote Taluk, Bangalore Rural District, Karnataka, India: A Case Study

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Abstract

The present study highlights the impact of increased agricultural activity on groundwater in Hosakote taluk, Bangalore Rural district, Karnataka, India. The study area lies between the Lat. 12^o 50' and 13^o 25' and Long. 77^o 35' to 78^o 00' with an aerial extent of 548 square kilometers The results are based on the chemical analysis of groundwater samples. The Bangalore metropolis being close to the study area, it depends on the life support on the suburbs. As a result, farmers of the study area have shifted from the traditional agricultural practices to cash crops such as fruits, vegetable and floriculture, which is more lucrative. This has paved way for over-exploitation of groundwater without proper management. The indiscriminate use of chemical fertilizers, insecticides and pesticides for increased production has resulted in pollution of groundwater. The chemical constituents such as Na, K, Cl, SO_4 and NO_3 show the increase anomaly in the study area. These anomalies can be related to the excess use of fertilizers and pesticides in the agricultural practices, which has deteriorated the groundwater quality. The deterioration of the water quality if more localized in nature and can be overcome by judicious usage of chemical fertilizers and pesticides.

*Keywords:*Groundwater, Pollution, Agrochemical, Landuse, Hosakote

1. Introduction

The increased agricultural activities have polluted groundwater to an extent which needs attention before it attains a point of non-return. The present day increase in agricultural activity to meet the food grains target of growing population has adversely affected the quality of water as well as land. The economic interest in agriculture has pushed the ecological importance of agricultural activity to the background. Due to urbanization about 12-12.5 million hectares of fertile land is lost each year around the globe resulting in more stress on available land for usage causing over-exploitation and degradation due to various agricultural activities. Thus, agrochemicals input has become a source of pollution to the groundwater. The usage of fertilizers and pesticides in agricultural practices by developed countries is far more than developing countries like India, but due to non-judicious usage it has become a primary source of contamination of groundwater in developing countries. The usage of fertilizers and pesticides is more in case of horticulture than agriculture in contaminating the groundwater. The close proximity of the study area to Bangalore metropolis has given thrust in developmental activity in Hosakote taluk both on industrial and agricultural fronts. The metropolis depends for life support particularly for fresh fruits, vegetable, flowers etc, on its suburbs. As a consequence, this the farmers in the study area have shifted from traditional crops to more lucrative cash crops to meet the city demands. Thus, resulting in over-exploitation of groundwater, with indiscriminate usage offertilizers and pesticides causing pollution.

2. Location

Hoskote taluk is in Bangalore rural area and forms the eastern part of the district. It falls in the Survey of India (SOI) toposheet Nos. 57 G/12, 57 G/16, 57 H/9 and 57 H/13 and lies between 12^o51' to 13°15' N.Latitude and 77° 41' to 77° 58' E Longitude, covering an area of 602 sq.km (Fig.1). Physiographically, the area is characterized by undulating terrain. The highest elevation is found near Nandagudi hill, which rises 940m above the

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STUDY AND ANALYSIS OF CHIKKABANAVARA LAKE, BANGALORE URBAN DISTRICT, KARNTAKA, INDIA

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Abstract: Chikkabanavara lake is a naturally formed lake which is located at a distance of 1.5 km north of Chikkabanavara Railway Station along Bangalore – Tumkur railway line, situated between Chikkabanavara and Kereguddadahalli village, It lies between Lat. 13^0 08'N and longitude of 77^0 50'E. The lake is accessible by Hesaraghatta Road from 8th mile (T. Dasarahalli) junction on the Bangalore -Tumkur highway (NH4). The total extent of the lake is 105 acres and 15 guntas (according to Bangalore Development Authority (BDA) records. This lake is situated outside BBMP area coming under the custody of BDA North Division. The Chikkabanavara lake gets water from rain fall having catchment in nearby chimney hills due to the topography of land the natural in flow runoff water reaches the lake from all the sides of lake. In the present study water chemistry of the lake water and encroachment of lake has been discussed.

IndexTerms - Water quality, Urbanization, Water pollution, Chikkabanavara lake

I. INTRODUCTION

Chikkabanavara lake is a naturally formed sub watershed which was having an area of 170 acres of watershed (which is now reduced to 105 acres and 15 guntas), Several city folks who had their farms in Chikkabanavara village therefore still remember that this lake used to be just around 700 metres from the railway line. The encroachment over the lake can be gauged from the fact that it has been pushed almost1.5km away from the railway line. In past years the lake water was used for irrigation, agricultural, fishing purposes by the surrounding villages. The lake water was even used drinking and cooking by people nearby in the past decades. The water was used to washing clothes by the Dobhi (dry cleaners) from surrounding locality in western part of lake nearby waste weir nearly 10 years before. Few decades ago, the road which was connecting the Chikkabanavara village and Abbigere village via Dasappanapalya village is now completely submerged by lake and became un existed for nearly two decades from now. It is learnt that the reasons for the un-existence of road is mainly because of the increase in the volume of water in lake, encroachment of the lake, and lack of planning for up-gradation of bunds and waste weir of the lake. In 2013, the huge number aquatic life (fishes) was killed due the increase in the pollution of water, which was also reported in the Paravani, The Hindu, Deccan Herald newspapers. Influent on the eastern part of the lake started producing lather/foam due the entry of the sewage. The aerial view and encroachments in the study area is shown in the Figures 1,2 and 3.

II OBJECTIVES OF THE STUDY

The main objective of the present study is to evaluate the water quality parameters of Chikkabanavara lake and to find the extent of encroachment of lake has happened due urbanization. This lake is one of the main lakes constructed by the founder of Bangalore. Since the Bangalore city is far from perennial rivers of the State, several lakes have been constructed to meet the demand of water for domestic usage and irrigation. The water samples from the lake have been collected from different locations of the lake for chemical analysis. The chemical analysis data has been presented here. The main reason for different chemical anomalies is due the entry of municipal waste water and improper disposal of solid waste especially during the festival times.

III METHODOLOGY

Field study has been carried to check present condition of the lake. During the filed study it is observed that lot of encroachment has occurred and lake bed area has been damaged due to urbanization. It is also noticed that demolished waste of the buildings has also been dumped at some places in the lake bed area.

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GROUNDWATER CONTAMINATION DUE AGRICULTURAL PRACTICES IN MANDYA TALUK, KARNATAKA, INDIA

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Abstract : The present study highlights the impact of agricultural practices on groundwater quality. The study area lies between Long. $76^0\,40'$ to $77^0\,00'$ and lat. $12^0\,25'$ to $12^0\,45'$ with an aerial extent of 720 km^2. The area falls in Kaveri River basin and its tributaries. The interpretations are based on 28 water sample from both dug wells and bore wells. The area under study has an annual rainfall of 700 mm, but vigorous agricultural activities are mainly due to network of canals in the entire taluk connected to the major reservoirs. Hence the water availability is assured throughout the year for agricultural practices paving way for more drylands being brought under irrigation. Thus, the farmers started cultivating cash crops, sugarcane, groundnut, paddy etc. resulting in indiscriminate usage of bio-manure, chemical fertilizers and pesticides for higher crop yield. This has caused deterioration of groundwater quality, resulting in the anomalies for the constituents like Na, K, Cl, and SO^4. These anomalies can be related to the excess usage of fertilizers, rather than lithology and soils of the taluk. To overcome this problem of groundwater quality further, the farmers must be educated about the judicious usage of input products such as fertilizers and pesticides.

***IndexTerms* – Groundwater, Contamination, Anomaly, Fertilizer, Mandya**

I. INTRODUCTION

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The green revolution in India is both boon and bane for the population and environment. The reason is that population grew by staggering number, hence the need for more food grains and other essentials are increased. This resulted in achieving green revolution to meet the basic minimum requirement and this has paved way for various agricultural projects. As a result, many governments aided projects and schemes came into being and the target was well achieved. But repercussions of these schemes were not considered, because the aim was to achieve more production/hectare. The farmers were encouragedto go in for application of more of chemical fertilizers and pesticides (Alymoreand Kookana1993). without thinking their impact on the groundwater quality. The consumption of fertilizers per hectare, earlier to green revolution was an average of 50kg/hectare, but of late it is about 100kg/hectare and also an average pesticide used is 1kg/hectare. Hence the indiscriminate use of chemical fertilizer is seen and that too not in optimal quantity at an appropriate time.

The input which is not completely utilized percolated into the ground by water action and other agricultural activities thus, contaminating the groundwater in the study area. This paper highlights the impact of agricultural activities on groundwater quality in Mandya taluk, Karnataka, India, which is considered to be one of the bowls of paddy and sugarcane production in the State. The study area is cri-crossed by a network of canals of major irrigation projects thus, water is available in plenty throughout the year for growing various types of crops. The average rainfall is 700mm per year with an average 40 rainy days. The maximum temperature is 35^0 C and minimum is 21^0 C.

Location:

The study area lies between Long. $76^0\,40'$ to $77^0\,00'$ and lat. $12^0\,25'$ to $12^0\,45'$ with an aerial extent of 720 km^2. The area falls in Kaveri River basin and its tributaries. (Fig.1)The State highway linking Mysore and Bangalore passes through the study area and Mandya is 95kms from Bangalore

Influence of Manufactured Sand on Mechanical Properties of Self Compacting Concrete

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Abstract - This experimental work aims to investigate the effect of manufactured sand on mechanical behavior of self-compacting concrete. In the present study, natural river sand has been replaced by manufactured sand for fine aggregates, in the percentages of 0, 25, 50, 75, and 100. A total of 54 cubical specimen measuring 0.15 x 0.15 x 0.15 meters, 45 cylindrical specimen measuring 0.15 x 0.15 x 0.3 meters and 20 prism specimen measuring 0.5 x 0.1 x 0.1 meters were cast respectively to study the compressive, tensile and flexural strength of the self – compacting concrete after a curing period of 7, 14 and 28 days. It was observed that the addition of manufactured sand enhanced the mechanical properties of self-compacting concrete.

Index Terms – Self-compacting concrete, Self-consolidating concrete, Artificial sand, Manufactured Sand, M-sand.

I. INTRODUCTION

Self-compacting also known as self-consolidating concrete, is a concept that was proposed by Prof. Okamura at Ouchi University – Japan, in 1986. During that time skilled labor was in a limited supply, and this caused major setbacks in the construction industry. Self-compacting concrete was designed to flow under its own weight, thus eliminating the need for external compaction using vibrators, especially in structures where heavy reinforcements were provided to handle the loads coming on them. Heavy structures require provision of heavy reinforcement and concrete with medium to high strength. The self-compacting concrete met these requirements at the time when the construction industry was suffering with shortage in skilled labor.

The construction industry is continuously facing challenges of depleting resources and increasing carbon emissions. Sustainable development and use of alternative building materials to replace the conventional materials used in concrete, is the need of the hour, to meet these challenges. Manufactured-sand, is one such material, which has been allowed as a replacement to natural river sand by Bureau of Indian Standards (IS 383:1970), to be utilized in concrete as fine aggregates. Manufactured-sand is much more angular and has cubical shaped particles when compared to that in the natural river sand. Angular shape of these fine aggregate particles, leads to improved strength, when used in concrete, due to better internal interlocking of particles.

Fig. 1 Manufactured Sand

II. RESEARCH OBJECTIVES

The main object of this experimental process is to study the rheological and mechanical behavior of self – compacting concrete using manufactured-sand.

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STUDY ON THE WATER CHEMISTRY OF CHIKKABANAVARA LAKE, BANGALORE URBAN DISTRICT, KARNATAKA, INDIA

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Abstract: Chikkabanavara lake is a naturally formed lake which is located at a distance of 1.5 km north of Chikkabanavara Railway Station along Bangalore – Tumkur railway line, situated between Chikkabanavara and Kereguddadahalli village, It lies between Lat. 13^0 08'N and longitude of 77^0 50'E. The lake is accessible by Hesaraghatta Road from 8th mile (T. Dasarahalli) junction on the Bangalore –Tumkur National Hhighway (NH4). The total extent of the lake is 105 acres and 15 guntas (according to Bangalore Development Authority (BDA) records. This lake is situated outside BBMP area coming under the custody of BDA North Division. The Chikkabanavara lake gets water from rain fall having catchment in nearby chimney hills due to the topography of land the natural in flow runoff water reaches the lake from all the sides of lake. Due urbanisation in recent years the lake is not able to get the rainwater as most of the natural drains were disturbed, instead the lake is collecting municipal and industrial waste water. In the present study chemical parameters of the lake water has been done and to compare the results one bore well water near to the lake and municipal water one samples were analysed for comparision.

I INTRODUCTION

Chikkabanavara lake is one of the naturally formed sub watershed of Arkavathi river basin was having an area of 170 acres of watershed (which is now reduced to 105 acres and 15 guntas The encroachment over the lake can be gauged from the fact that it has been pushed almost1.5km away from the railway line. In past years the lake water was used for irrigation, agricultural, fishing purposes by the surrounding villages. The lake water was even used drinking and cooking by people nearby in the past decades. The water was used to washing clothes by the Dobhi (dry cleaners) from surrounding locality in western part of lake nearby waste weir nearly 10 years before. Few decades ago, the road which was connecting the Chikkabanavara village and Abbigere village via Dasappanapalya village is now completely submerged by lake and became un existed for nearly two decades from now. It is learnt that the reasons for the un-existence of road is mainly because of the increase in the volume of water in lake, encroachment of the lake, and lack of planning for up-gradation of bunds and waste weir of the lake. In 2013, the huge number aquatic life (fishes) was killed due the increase in the pollution of water, which was also reported in the Prajavani, The Hindu, Deccan Herald newspapers. Influent on the eastern part of the lake started producing lather/foam due the entry of the sewage. The aerial view and encroachments in the study area is shown in the Figures 1 and 2. In the present study five lake water samples and one sample from municipal water supply and one from bore well near the to the lake have been collected for chemical analysis for various water chemistry parameters. The parameters analysed are Na, Ca, Mg, Mn, S, Boron, Carbonates, Bicarbonates and metallic elements like iron, copper and zinc as the lake very close to the some metal fabricating industries. The analysed parameters are shown in Table 1. The results of the water chemistry parameters are discussed in details to find the reason for their higher concentration.

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Design, Modelling, and Simulation analysis of a Single Axis MEMS-based Capacitive Accelerometer

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Abstract *- This paper presents the design, simulation, and analytical modeling of the single proposed axis MEMS-based capacitive accelerometer. Analytical modeling has been done for frequency and displacement sensitivity. The performance of the accelerometer was tested for both static and dynamic conditions, and the corresponding static capacitance value was calculated and was found to be C0=0.730455pF, a response time of 95.17µs, and settling time of 7.261ms and the displacement sensitivity* S_d*= 3.5362*$*10^{-8}$ *m/g. It was observed that the sensitivity of the accelerometer depends on its design parameters like beam length, overlap area of comb, sensing mass, and the number of interdigital fingers. A novel capacitive accelerometer has been designed for an operating frequency of 2.1kHz*
The accelerometer was designed using COMSOL Multiphysics and analyzed using the MATLAB simulator tool. The single proposed axis MEMS-based capacitive accelerometer is suitable for automobile applications such as airbag deployment and navigation.

Keywords *- single axis, Comb drive MEMS accelerometer.*

I. INTRODUCTION

The accelerometer is an electromechanical device that is used for physical measurements like acceleration, force, the vibration of a moving solid. Micro machined accelerometers are one of the important classes of MEMS devices. There is a wide scope of utilization that requires acceleration measurement such as automotive industry, biomedical applications, oil and gas exploration, vibration analysis, navigation system, robotics, mobile, and computer accessories.
Most accelerometers are based on the principle of mechanical vibration. The fundamental structure of the MEMS accelerometer contains the seismic mass supported by beams. The mass is frequently appended to a dashpot that gives the essential damping impacts [1,2]. The spring and the dashpot are in turn connected to the frame, as shown in figure 1. An accelerometer that is kept at rest will measure acceleration due to gravity of g ≈ 9.81 m/s^{2,} and in contrast, accelerometers that are in a free-fall state will measure as zero [3].
Accelerometers are classified based on their principle of operation. They are piezoelectric, piezoresistive, capacitive, heat transfer, optical, hall effect, thermal, interferometric, etc. [4], but commercially, piezoelectric, piezoresistive, capacitive were widely used.
Piezoelectric: utilizes piezo ceramics like lead zirconate titanate, and they have a very high-frequency range, large measuring range up to 6000g, self-powered device [5].
Piezoresistive: employ beam-like structure whose resistance varies with acceleration. They are cheap due to their simple construction design, low hysteresis, simple readout circuits and have the ability to operate at higher temperatures [6].
Capacitive: the capacitive-based MEMS accelerometers measure capacitance change between a fixed and movable electrode isolated by a littlegap[7].
Although commercially different accelerometers are available, the main aim for selecting capacitive based MEMS accelerometers are their high Sensitivity and linearity, good repeatability, low noise performance, flexible structure to design, uses low power to operate, and high durability
This paper presents a novel single folded beam-type capacitive MEMS Accelerometer. A literature survey is done and is presented in section II. Principle of operation and the design of the proposed accelerometer is discussed in section III and IV respectively. Mathematical modeling of the proposed accelerometer is presented in section VI and followed by the simulation results. An open-loop model of the proposed accelerometer and the results are discussed in consecutive sections.

II. LITERATURE REVIEW

Lots of work has been done in the field of MEMS comb-type accelerometers, and numbers of publications are available. Many authors have proposed their ideas on design, working, mathematical analysis of MEMS accelerometer and still working on improving the performance of the same.

ELECTROMAGNETIC RAIL-GUN USING HIGH VOLTAGES AND PULSE POWER SUPPLY

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ABSTRACT

This paper mainly deals with the construction of an electromagnetic rail-gun working under high voltages and pulsed power supply. This paper emphasizes mainly on proving the working principle of Rail-gun, its design specifications, overall energy performance, energy losses, efficiency etc. This paper also provides an insight regarding the reasons for the energy losses in the system. A high voltage supply is supplied to two parallel rails and a sliding projectile is placed between them. Due to suitable energy conversion i.e. energy used in discharging the capacitor bank being converted to kinetic energy to slide the projectile which is a pulse power application.

Keywords: capacitor bank, efficiency, high voltages, homopolar - motor, Lorentz force, pulse-power

1. INTRODUCTION

A rail-gun is an electrically powered electromagnetic projectile launcher based on similar principles to the homopolar motor. A rail gun comprises a pair of parallel conducting rails, along which a sliding armature is accelerated by the electromagnetic effects of a current that flows down one rail, into the armature and then back along the other rail. The armature may be an integral part of the projectile, but it may also be configured to accelerate a separate, electrically isolated or non-conducting projectile. Solid, metallic sliding conductors are often the preferred form of rail-gun armature but "plasma" or "hybrid" armatures can also be used. In its simplest (and most commonly used) form, the rail-gun differs from a traditional homo-polar motor in that no use is made of additional field coils (or permanent magnets). This configuration is thus a self-excited linear homo-polar motor formed by a single loop of current.

A relatively common variant of this configuration is the **augmented rail-gun** in which the driving current is channeled through additional pairs of parallel conductors, arranged to increase ("augment") the magnetic field experienced by the moving armature. In electric motor terminology, augmented rail-guns are usually **series-wound** configurations.

A railgun requires a pulsed, direct current power supply. For potential military applications, rail-guns are usually of interest because they can achieve much greater muzzle velocities than guns powered by conventional chemical propellants. Increased muzzle velocities can convey the benefits of increased firing ranges while, in terms of target effects, increased terminal velocities can allow the use of kinetic energy rounds as replacements for explosive shells.

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Study of Wear Characteristics of Ultra High Molecular Weight Polyethylene Nano Composite reinforced with Nano Al_2O_3

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ABSTRACT

An attempt has been made in the present work to study the wear characteristics along with the effect of parameters on the wear behaviour of UHMWPE nano composite reinforced with nano Al2O3. Also optimization of parameters and the wear values with respect to the parameters is attempted using Response Surface methodology through MINITAB software. Three levels of three different parameters are considered for the study wherein the design of experiments is done using Taguchi technique. Most importantly the effect of different reinforcement percentage of Al2O3 is discussed so as to know the behaviour of composite under dry wear conditions and the corresponding influence of the presence of reinforcement in terms of quantity. The results shows that the addition of nano alumina with increased percentages imparts superior wear properties into the composite which can also be seen through the surface profile. The statistical analysis also shows the importance and effects of parameters on the wear rate during the experimentation

Keywords: UHMWPE, Al2O3, Response surface methodology, Taguchi, MINITAB, Design of Experiments.

1.0 Introduction

UHMWPE were seen to be developed in the early 1950s has now gained much popularity due to their superior bio-compatible property [1-4], self-lubrication, chemically stable [6], and high wear and impact resistance property, which leads of path in biomedical as well as various engineering applications.During the absence of wet lubrication mating parts which are metallic in nature requires some kind of coating to resist wear and friction up to a greater extent and this is done by the researchers by using UHMWPE due to their terrific Tribological characteristics leading to reduced friction and high wear resistance. Researchers adopted a technique wherein nano and hybrid composites were synthesized using UHMWPE with reinforcements in the form of nano fillers like carbon nano tubes [7, 8], graphene [9], nano clay [10] and nano clay/CNT [11].Reinforcing UHMWPE with different wt. % of nano clay and conducting Tribological tests upon them showed that the failure of 1.5% reinforcement did not happen until 100000 cycles with a normal load of 9N with a linear speed of 0.1m/s, but at a load of 15N it failed instantly [10]. To overcome this again UHMWPE with 1.5 wt% nano clay and 1.5wt% CNT were combined to form hybrid composite and observed that the load bearing capacity is increased above 15N [11].Reinforcements are used along with the polymer to produce polyethylene which find their applications in many orthopaedic parts like knee joints and bone joints which leads to the synthesis of ultra-high molecular weight materials which can be used as bio-materials in practice. The first application of UHMWPE was in the joint replacement which has now found a vast variety of applications through different combination or composition with different materials leading to mechanical properties which are improved and superior.One of the application of UHMWPE is in the replacement of a component serving load bearing function in joint and joint surface implants, in particular the acetabular cups in the hip prosthesis [12]. Polyethylene and polypropylene when compared to UHMWPE has high wear rate and friction co efficient leading to lesser bio-compatibility and hence the UHMWPE finds its application due to reduced wear rate and co efficient of friction. Although UHMWPE has got good Tribological properties, its application is restricted to load bearing components and cannot be used in any other non-load bearing components or as a direct replacement for bones due to their low strength compared to other polymers. Even from the past decade the UHMWPE is used in place of fibre sutures. When the family of materials is considered alumina is one such material which finds wide usage [13]. High purity Al2O3 has got superior properties in terms of bio compatibility, wear resistance and corrosion resistance properties and hence can also be used as replacements. Its cyto compatibility is not damaged due to its bio-inert nature. It has got a wide range of properties including high modulus of elasticity, and compressive strength towards higher side. Due to these properties when added with UHMWPE, the mechanical as well as the Tribological properties are enhanced and the material altogether behaves bio-compatible. With the discovery of its benefits different manufacturers combined UHMWPE with Al2O3 to

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Enhancement in Energy Conserving and Securing the Data in Wireless Sensor Networks: A Comprehensive Review

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Abstract

Wireless sensor networks (WSN) are a technology that has been demanding, emerging and popular in recent decades. Since WSN has many areas of application, it also presented the researchers with several challenges. Even though there are many energy conservation techniques available, energy conservation in the WSNs has become a very big task for designers. Security has also become a huge concern because of the inclusion of the wireless channel in the WSN. The biggest task in recent trends is to secure the data, maintaining confidentiality without hampering coverage. Therefore, a mechanism is needed to overcome all these problems in order to improve the network lifetime with energy conservation, data security, reliability, and improvement of the network lifetime. With enhancement of energy efficiency, data protection, t, and without hindering the coverage, network life time will be increased. This paper discusses the different approaches used for the above problems and also offers a brief overview of some of the protocols used to achieve protection and conservation of energy. The other researchers will further use these results to make the WSN more safe and increase energy efficiency by selecting the best mechanism.

Key words- Energy conservation. Security, challenge.

I. INTRODUCTION

The Wireless Sensor Network (WSN) is a cluster of spatially distributed and dedicated sensors designed to track physical or environmental conditions such as temperature, pressure, etc. and to systematize the data collected to a main location through the network. One of the primary objectives of wireless sensor networks is to gather knowledge from the real environment. Combined with computing power and wireless connectivity, sensing technology makes it lucrative to be used in abundance in the future[1]. The wireless sensor network (often referred to as the wireless actuator network)[2] consists of sensor nodes that range in size from shoebox size to grain dust size. WSN is independent of infrastructure, where it can be built virtually to work without the need for wired connection in any harsh environment. Military applications such as battlefield surveillance have driven the development of WSN, and today such networks are used in many industrial and consumer applications [2]. WSN is used in many indoor and outdoor applications [3]. It is very important to provide security during the transmission of data on the network [4]. In WSN, security is considered to be the most difficult task because it is very difficult to keep track of the sensor nodes or network all the time. But it needs to be secured to the maximum extent to prevent the data from being attacked by an intruder.

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Evaluation of Antimicrobial, Antioxidant, and Cytotoxicity Activities of CuO Nanopellets Synthesized by Surfactant-Free Hydrothermal Method

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Abstract

Copper oxide nanopellets (CONPs) were produced by hydrothermal strategy. The particles were characterized by distinctive techniques. The synthesized particles were found to have pellet morphology with nonuniform thickness and varying sizes extending between 200 and 550 nm. Studies revealed their microbial nature against both Gram-positive and Gram-negative microscopic organisms, specifically *Staphylococcus aureus*, *Bacillus subtilis*, *Pseudomonas fluorescens*, and *Escherichia coli* and a plant parasitic pathogen *Fusarium oxysporum*. Studies demonstrated the antioxidant ability of CONPs at higher concentrations. In this paper, cytotoxicity was measured by blood hemolysis. Anticancer activity of CONPs tested against PC-3, HCT116, A549 and MDA-MB-231 cell lines after 24 hours exhibited IC_{50} values of 72.27, 144.2, 173.9, and 13.07 µg/mL, respectively. Although these phenomena have been determined in other reports, this report is indeed of significance for CONPs within the particle length of 200–550 nm.

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Effect of vitamin-C on structural, thermal, and optical properties of lithium sulfate monohydrate crystal

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ABSTRACT

A single crystal of vitamin-C-doped lithium sulfate (VCLSM) was grown at room temperature from aqueous solution by slow evaporation method. The as-grown crystals were found to be transparent and yellow in color. Powder X-ray diffractogram of the pure and doped crystals was recorded and various planes were identified for their corresponding reflections. The X-ray diffraction (XRD) analysis validated the crystalline nature of the samples. Single crystal X-ray diffraction study revealed the structure of the crystals and also revealed their monoclinic crystal system with space group $P2_1$. The vibrational modes of different functional groups present in the compound were analyzed using Fourier transform infrared (FTIR) spectral analysis. Thermal characteristics study of the crystal was carried out by thermogravimetric analysis (TGA) and differential thermal analysis (DTA) techniques, which clearly showed that the materials have high thermal stability even after doping. Optical transmittance spectrum using UV–Vis–NIR spectrometer showed that the grown crystal is highly transparent in the whole visible and Infrared (IR) region. Second-harmonic generation (SHG) property was confirmed for both pure and doped crystals by Kurtz's powder test using Nd:YAG Laser.

1 Introduction

Recent research works on crystal growth paid more attention towards the growth of sulfate crystals because of their ferroelectric, piezoelectric, and pyroelectric behaviors [1]. These materials also find applications in the fabrication of nonlinear optical (NLO) devices. For usage in different applications, the materials should have nonlinear frequency conversion, fast optical response time, wide phase matching angle, high laser damage threshold, and high mechanical strength [2].

Lithium sulfate monohydrate crystal crystallizes in monoclinic crystal structure. It was proved to be a

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Feature extraction and genre-classification using customized kernel for Music information retrieval

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AbstractMusic feature extraction and genres form a natural way to consolidate audio and they share related rhythm and texture. We will be building a customizedfeature extraction genre classification model using customized kernel in support vector machine that will use features representing timbre, rhythmic and pitch analysis of the audio. We train various classifiers like k-Nearest neighbor, Support vector machine, Logistic Regression, Neural Network on the GTZAN dataset provided by MARYSAS. We are able to get good accuracy using Customized kernel and ensemble voting classifier and support vector machine on both 10-genre and 4-genre classification.
Keywords: Genreclassification, Support vector machine, feature extraction GTZAN dataset.

1. Introduction

With the advent of digital music, it has become very important to group music files for various tasks like search-retrieval and recommender systems. Manual annotation of such a huge dataset is an impossible task, and hence" Automatic Music Genre Classification" has been a widely studied research topic in the field of Multimedia Information Retrieval (MIR).Automated Music Genre Classification has been studied by numerous researchers and still remains a challenging topic in Music Information Retrieval (MIR) community due to the fuzzy nature of features and the ambiguity associated with human perception of genres. Ground breaking work in this field was performed by Tzanetakis, etc. al in [1], by using acoustic features through audio analysis done on a dataset consisting of 1000 audio files. This dataset, now provided by MARSYAS, has been widely used in approaching this problem. This work has also proposed various content-based features which we are using in our approach as well.

Materials and Methods

1. Dataset: The 1000 songs are considered for feature extraction, exploring and exploiting the different methods of audio data. The labeled data in the range of [-1,1] and sampling frequency average is considered as 4.2Hz.the work carried out with the dataset of GTZAN from MARSYAS audio data is distributed into several genres like hip hop, classical, pop, metal, rock, reggae, blues, disco, jazz and country. File length is 30seconds and 22050 Hz and it is 16-bit sample and used 67% for training and 33% for testing.

2. Music data processing for machine Learning: (i) Time domain features, (ii) Frequency domain features, (iii) Time-Frequency domain features. In Time domain features analog signals are edited and manipulated by computers. Analog digital conversion process sample and quantize the analog songs to get digital signals, once the digitized process is done next step is to do with framing and bundle together with a bunch of samples, for example frame1: sample1=128 frames are overlapped, and it is perceivable audio chunk 1 sample = 44.1khz = 0.0227ms, human can receive sound with 1 sample <10ms, duration of frame(df) = 1/sampling rate * total number of samples in frame. Sample rate is nothing but duration of single sample. 1/44100*512 = 11.6ms.

   Next step is to compute features then to aggregate using mean, median, Gaussian mixture model were we get feature value/vector/matrix and these are the snapshots for the complete duration of audio signals and pipeline include Figure 1.

Finger Vein Authentication using Deep Learning

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Abstract **- The main aim of the project is to use finger vein for authentication. Finger vein recognition technology is one of the new biometric technologies, which has been gaining a significant amount of attention. It uses the vein pattern underneath the skin for authentication. This technique captures the finger vein pattern by shining an infrared light on the fingers. If the finger vein matches with the person's vein pattern which is stored in the database a success message is displayed. If it does not match a buzzer sound will be played.**

I.INTRODUCTION

Finger vein is the vascular pattern underneath our skin which is unique to a person. Finger vein authentication system helps us to uniquely identify a person by using their finger vein pattern. Some current identity verification systems such as password, smart cards, etc carry the risk of theft, forgery and unauthorized use. This has lead to a lot of financial loss. Finger vein authentication has been lately gaining a lot of attention due to its many advantages. Some advantages of using finger vein for authentication are-It has a high accuracy of identifying a person. It cannot be easily forged, unlike the fingerprint and iris of a person, as it is present under the skin. The fingerprint of a person changes as he ages i., it starts to wear off and a person's iris pattern can also change if he/she gets some surgery done. This is not the case with the finger vein patter which remains exactly the same throughout a person's life. The finger vein is obtained by using a near-infrared reader.

II. LITERATURE SURVEY

In paper [1] a method is proposed which extracts the vertical cross-sectional profiles to determine the approx. positions of the vein regions in a given finger-vein image. The proposed method correctly detects the positions of the vein regions of the finger by checking the depth of the vein profile using various depth thresholds. Based on the detected positions, the proposed method measures the quality of the finger-vein. Image using the number of detected vein points (NDVP) relative to the depth thresholds, which allows one's variations in the vein density to be considered for quality assessments. In this study, the vein points are all the image pixel points on the detected vein lines. Finally, this proposed method assesses the quality of input finger-vein images and images of inferior quality are not used for recognition, thereby enhancing the accuracy of finger-vein recognition. Capturing a clear vein pattern in the finger-vein image is very important in finger-vein recognition.

In paper[2], they have presented a finger-vein based biometric security system that can be used for security based electronic devices. The method can extract the finger-vein feature for recognition from the NIR images. This method uses single sample and is convenient to the application. This work can be extended with increasing the database for further verification

In paper [3] they have discussed recent approaches to solving the problem of varying finger lengths and proposed using a set of images of same size interval in a selected sub-block approach. For each image sub-block, wavelet moment was performed and PCA features extracted. LDA transform is performed, and the two features were combined for recognition. For Finger Vein Recognition 53 matching and identification, we proposed a method of fuzzy matching scores. Experimental results show that wavelet moment PCA fusion method achieved good recognition performance; error rate FAR was 0.7%, rejection rate FRR of 1.05%.

In paper [4] they propose precise extraction of finger vein pattern is a elementary step in developing finger vein based biometric authentication systems. Finger veins have textured patterns, and the directional map of a finger vein image represents an intrinsic nature of the image. The finger vein pattern extraction method

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Flat and Nested Named Entity Recognition: A Review

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Abstract. The developments in Information Technology have significantly improved our lives. Information is at our fingertips; we can reach a wider audience and explore new things with ease. With all these made possible, there comes an issue that needs to be addressed: Information Overload. There is an extensive amount of information out there that has caused the extraction of relevant information arduous. Here is where the role of Named Entity Recognition (NER) comes into play. Identifying proper nouns from text and labeling them with their semantic type that belongs to a predefined list of classes is called NER. Moreover, NER is the initial step for various other applications in Natural Language Processing (NLP). With the continual endeavors in this promising research area breaking new grounds, we discuss some notable works in this field. Further, we present a comprehensive study on nested NER. This study shall help the readers with a quick rundown of some of the major works proposed for flat and nested NER.

Key words: Named Entity Recognition, Nested named entities, Information Extraction, Natural Language Processing, Internet of Things.

1. Introduction

Named entity recognition (NER) is a crucial task of natural language processing (NLP). NER is the course of extracting information from known semi-structured or unstructured data by identifying and tagging (categorizing) the named entities like Organization (ORG), Location (LOC), Person (PER), Timex (TIME and DATE), Monetary, Percent and Miscellaneous (MISC). In other words, it is the process where it captures sentences or paragraphs as input to the algorithm and discovers the named entities that are present in the given text and classifies them. Consider the example: From 1987-1989, Mr. Khan studied at the GITAM University located in Bangalore. In the above example, NER algorithm classifies Mr. Khan as person, GITAM University as organization and Bangalore as location. Named entities are of the two forms: flat named entities and nested named entities. Nested entities will be discussed in detail later on.

NER is one of the ongoing research area for the past 2-3 decades. There is an exponential advancement in detecting named entities but still there are huge disputes in deciding named entities because of deviation in spelling and usage of foreign words. Other challenges in NER include the usage of NEs that are too long or too short(abbreviations) especially in biomedical domain[15] and lack of available resources in specific domains and languages. Moreover, the presence of homonyms and heteronyms in some languages makes it difficult to tag these expressions due to the fact that the sense in which these expressions are used depends on the context. Consider the word ‘minute’. When it is used in the sentence, ‘It took her 50 minutes to reach the Airport.’, the entity ‘50 minutes’ is tagged with the label TIMEX. Whereas in the sentence, ‘This tea contains minute quantities of cardamom in it.’, ‘minute’ being an adjective here is a non-entity tagged with the label OTHER.

Suppose you have an e-book of a novel and would like to know the names of the characters in the novel before reading it, or the historical time period the novel is set in or the places that the plot revolves around. NER is apt for such tasks. NER has a vast range of applications in the real world. For example, NER can be used to find the names of persons, places and organizations in a particular news article or blog, to find the most related research or review paper from a particular journal, to find solutions for customer complaints and appreciably more.

Evaluation metrics are used to evaluate the excellence of any statistical machine learning model and is done by using precision, recall and F1-score.

Influence of Manufactured Sand on Mechanical Properties of Self Compacting Concrete

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Abstract - This experimental work aims to investigate the effect of manufactured sand on mechanical behavior of self-compacting concrete. In the present study, natural river sand has been replaced by manufactured sand for fine aggregates, in the percentages of 0, 25, 50, 75, and 100. A total of 54 cubical specimen measuring 0.15 x 0.15 x 0.15 meters, 45 cylindrical specimen measuring 0.15 x 0.15 x 0.3 meters and 20 prism specimen measuring 0.5 x 0.1 x 0.1 meters were cast respectively to study the compressive, tensile and flexural strength of the self – compacting concrete after a curing period of 7, 14 and 28 days. It was observed that the addition of manufactured sand enhanced the mechanical properties of self-compacting concrete.

Index Terms – Self-compacting concrete, Self-consolidating concrete, Artificial sand, Manufactured Sand, M-sand.

I. INTRODUCTION

Self-compacting also known as self-consolidating concrete, is a concept that was proposed by Prof. Okamura at Ouchi University – Japan, in 1986. During that time skilled labor was in a limited supply, and this caused major setbacks in the construction industry. Self-compacting concrete was designed to flow under its own weight, thus eliminating the need for external compaction using vibrators, especially in structures where heavy reinforcements were provided to handle the loads coming on them. Heavy structures require provision of heavy reinforcement and concrete with medium to high strength. The self-compacting concrete met these requirements at the time when the construction industry was suffering with shortage in skilled labor.

The construction industry is continuously facing challenges of depleting resources and increasing carbon emissions. Sustainable development and use of alternative building materials to replace the conventional materials used in concrete, is the need of the hour, to meet these challenges. Manufactured-sand, is one such material, which has been allowed as a replacement to natural river sand by Bureau of Indian Standards (IS 383:1970), to be utilized in concrete as fine aggregates. Manufactured-sand is much more angular and has cubical shaped particles when compared to that in the natural river sand. Angular shape of these fine aggregate particles, leads to improved strength, when used in concrete, due to better internal interlocking of particles.

Fig. 1 Manufactured Sand

II. RESEARCH OBJECTIVES

The main object of this experimental process is to study the rheological and mechanical behavior of self – compacting concrete using manufactured-sand.

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Influence of process parameters on tensile strength and hardness of AW2024/B_4C composite using Taguchi's technique

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Abstract

The need for engineering materials in the aerospace industry is increasing day by day. AW2024 alloy with boron carbide particulates will suit specific applications like aircraft structure, window panel, seats, aircraft fittings, and wheels. Hence in this research paper, AW2024 alloy was selected as the matrix and boron carbide particulates as reinforcement. Boron carbide particles with three different mesh sizes have been chosen and varied in wt% into the AW2024 matrix routed through stir casting process. Taguchi's Technique was used to evaluateoptimization, S/N ratio, influence of process parameters, and regression equation to validate the experimental values. It was noticed that tensile strength and hardness were found to be improved with an increase in wt% of boron carbide particulates in the AW2024 alloy. SEM images show that boron carbide particles are uniformly distributed in the AW2024 alloy and dimple structures were formed at the tensile fracture surface.

Introduction

Metal Matrix Composites (MMCs) originate their outstanding mechanical properties from the combination of a hard reinforcement and a ductile matrix material such as magnesium or aluminum [1]. Aluminum alloys are used due to their low density, high strength, machinability, durability. Further, these materials are cost-effective too [3]. Low density material can be used for transportation, aerospace application. The rare combination of properties cannot be achieved by conventional materials. A composite material is distinct as a physical material formed artificially by adding two or more materials having dissimilar features [4]. Aluminum alloys are robust by adding other elements, attains a slightly different effect than that of original aluminum. For aluminum, copper is added which increases the strength and hardness of aluminum which makes it heat treatable [5]. Composite is a combination of the best features of each of the constituent materials [6]. The presence of dendritic erections during the solidification, with related to micro segregations, is of great notice. Since these solidification structures are commonly found in several production materials and also, greatly impact mechanical behavior [7]. Heat treatment is generally carried out to obtain an optimum combination of strength and ductility in Al–Cu alloys. Steps involved are solution treatment, quenching and artificial aging [8].

Composite material [13] generally exhibit the optimal qualities of their elements and frequently some attractive qualities which is one of the key features [9]. The Aluminium matrix's existence in lighter can be reinforced by reinforcing less thick hard ceramic elements such as Al_2O_3, SiC, B_4C, TiB, etc, which express in the improvement of properties [12]. Boron carbide is a vigorous material having outstanding chemical and thermal stability, low density, and high hardness. It is used for engineering bulletproof vests, armor tanks, etc. Henceforth, boron carbide reinforced with aluminum metal matrix composite [10], [11], [17] has attained more attraction with less cost stir casting technique [14]. It was reported that the tensile strength and hardness of Al matrix composites enhanced with the percentage of boron carbide particles through the cooling rate in LM 13 alloy [15]. Stated that, Particles of B_4C improves the mechanical properties of Al-matrix. The maximum improvements in the tensile properties were recorded for the specimen with 4wt% of boron carbide [18] so as the yield stress, tensile strength, and the modulus of elasticity were increased by 11%, 51%, and 51% correspondingly [16]. Numerous Specialized applications in automotive industries and aerospace can be achieved through metal matrix composites [21] which are due to their good fatigue strength, high strength to weight ratio

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Design Of a Prototype Wireless Power Transmission System for A 50W Load

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Abstract: The proposed paper discusses on the possibilities of transmitting power wirelessly over certain small distances for a load of 50W (maximum 75W). The system consists of mainly five blocks namely: AC-DC rectifier, DC-AC high frequency inverter, resonating circuits, DC-AC high frequency rectifier and a closed loop buck converter. This particular system is designed to operate in the radio frequency bandwidth of 25kHz to 150kHz. The system is designed keeping in mind applications such as very low power electric cycle and laptop chargers. This concept can be extended for mid-range WPT systems mainly wireless EV charging by changing few devices.

Index Terms **- WPT, PTC, DC-AC High Frequency Inverter, Buck Converter, Wireless EV Charging.**

I. INTRODUCTION

The technology for wireless power transmission or wireless power transfer (WPT) is in the forefront of electronic development. The main function of wireless power transfer is to allow electrical devices to be continuously charged and overcome with the constraint of a power cord. In day-to-day life many applications are witnessed which are powered using tangled wires. The concept of wireless power transmission has been there since 1886. Hertz performed experiment with pulsed wireless energy transfer, he produced an apparatus that produced and detected microwaves in UHF (ultra-high frequency) region. Tesla also performed experiment in the field of wireless energy transfer in 1899.

WPT system is a very necessary field of research as this technology can be extended to many devices in day-to-day life to make life comfortable. To understand in a better way let us consider two coils namely transmitting coil Tx and receiving coil Rx which send and receive power on the principle of mutual inductance. As stated by Faraday when current passes through a conductor magnetic field is created which surrounds the conductor. Similarly, the varying current during the transmission time produces time varying magnetic field. When this magnetic field cuts another conductor, an EMF is induced into the conductor. This phenomenon is known as Faraday's Law of Electromagnetic Induction.

In a wireless power transmission system, a transmitter device driven by electric power from a power source generates a time varying EM (electromagnetic field) which transmits power across space to a receiver device which in turn converts the electrical energy into desired form. Wireless power transmission mainly falls into two categories namely near field and far field. This paper focuses on near field or non-radioactive power transfer technique using inductive coupling between coils of wire at a frequency of 130kHz

II. LITERATURE SURVEY

2.0 EXISTING SYSTEM

The existing WPT systems are used to charge mobile phones whose voltage rating is very small and total power output is also, less. The extension of WPT for mid and high range power is still under research. This manuscript will help and explain in designing a WPT system for a load of 25V, 50W (Maximum 75W).

2.1 PROPOSED SYSTEM

This paper is an attempt to design a WPT system which is powered using 230V, 50Hz single phase AC. This system can be used to power a maximum load of 50W keeping the frequency fixed at 130kHz (which can be varied from 25kHz to 150kHz).

This system comprises mainly of five blocks as seen in Fig 1.0. The first block is the rectifier block which converts the input single phase AC voltage to DC. The second block is a high frequency inverter which converts our DC to high frequency stepped AC, which is significant to achieve wireless transmission. The third block comprises of resonating circuits and their corresponding transmission and receiving coils. The fourth block is a high frequency rectifier circuit which converts high frequency AC to DC. The last block is the closed loop buck converter which converts DC voltage to lower value of DC voltage.

Abstract

A thiourea-doped lithium sulfate single crystal was grown by the solution growth slow evaporation technique. The unit cell parameters of the grown crystal determined by X-ray diffraction (XRD) studies indicated that the crystal belongs to a monoclinic crystal system with noncentrosymmetric space group P2. Ultraviolet–visible spectral study signified that the crystal possesses an energy gap of 4.54 eV with 68% transparency in the visible region. The grown crystals were irradiated by Co-60 gamma radiation with different doses of 10 kGy, 30 kGy, and 50 kGy and the effects on powder XRD, dielectric properties, mechanical hardness, linear transmittance, and second harmonic generation (SHG) of the crystal were studied. It is observed that the crystallite size, energy gap, and transparency decreased, whereas the dielectric constant, AC conductivity, microhardness, and SHG efficiency increased with an increase in radiation dose.

Graphical Abstract

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DIAMETERS (*BIMBAS*) OF THE SUN, MOON AND EARTH'S SHADOW-CONE IN INDIAN ASTRONOMICAL TEXTS, WITH SPECIAL REFERENCE TO THE *MAKARANDASĀRIṆĪ* AND THE *GAṆAKĀNANDA*

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Abstract: The diameters of the Sun, Moon and Earth's shadow-cone are important in the computation of lunar and solar eclipses. This paper discusses the procedures for computing the diameters of the Sun, Moon and Earth's shadow-cone according to the *Makarandasāriṇī* and the *Gaṇakānanda* texts. The results are compared with those of the basic *siddhādntic* text, *the Sūryasiddhānta*, and with the popular astronomical handbook, the *Grahalāghava* of Gaṇeśa Daivajña (CE 1520). A number of illustrative examples are provided, along with possible explanations.

Keywords: angular diameters, *bimbas, nakṣatrabhoga*, *Grahalāghava*, *Makarandasāriṇī*, *Gaṇakānanda*, *Sūryasiddhānta*, *Makaranda*

1 INTRODUCTION

In astronomy, the sizes of objects in the sky are often given in terms of their angular diameters as seen from the Earth. The angular diameter of an object is the angle the object subtends at the observer as seen from the Earth. These angular diameters play a very important role in the computation of lunar and solar eclipses, conjunctions, occultations and transits.

In Indian classical astronomical texts, the procedures for calculating angular diameters *(bimbas)* are given in different forms in different texts. The majority of the *Siddhāntic* texts give angular diameters in terms of the true daily motions of the Sun and Moon. Some other texts, including astronomical tables like the *Makarandasāriṇī*, determine angular diameters as a function of the duration of the running lunar mansion (*nakṣatrabhoga*), or the anomalies of the Sun and Moon from their respective apogees.

By sustained observations over many centuries Indian astronomers realized that the angle subtended by a heavenly body at the viewer (i.e. the angular diameter) depended on the distance of the body from the viewer, while in turn the angular velocity of the body was also related to its distance. The Siddhāntic astronomers made out, though as a first approximation, that the angular diameter of a body was proportional to its true daily motion in longitude as observed from the Earth. However, for makers and users of almanacs (*pañcāṅga*) the readily available parameters were

(i) the true daily motion in longitude;
(ii) the duration of the lunar mansion (*nakṣatrabhoga* or *nakṣatramāna*);
(iii) anomalies of the Sun and the Moon from their respective apogees (*mandocca*); and
(iv) the duration of the Sun's stay in different zodiacal signs (*rāśi*) i.e. of (sidereal) solar months.

These diameters are expressed in different units in different texts, and the notations and units used in this paper are listed and explained below, in Section 1.1. The famous classical *Siddhāntic* text, the *Sūryasiddhānta,*

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An AI solution for Soil Fertility and Crop Friendliness Detection and Monitoring

Varshitha D N, Savita Choudhary

Abstract: ***Agriculture is the main occupation of India and more than 50% of people are dependent on agriculture. Research on agriculture will strengthen the economic growth of the country. Technologies play a vital role to bolster the agriculture. Since soil is the main fount of agriculture , there is a need for significant approach to help the farmer to test and monitor the soil and its properties ,which will boost the fertility of the soil thereby intensifying the crop growth, also if crop recommendations are imparted to farmers in a proper way, crop yield can be enhanced to meet the growing demand for the food. Proper awareness on soil will benefit the farmers to grow the right and healthy crop. To overcome the disadvantages of traditional soil testing practices we are proposing an approach which has Deep learning, an artificial intelligence(AI) technique and IOT features . This helps in getting fast and accurate result. Soil fertility can be calculated by parameters like pH level, temperature, Moisture content of the soil,temperature, humidity and NPK(nitrogen, phosphorus, and potassium) ,organic matter, carbon level. Weather and Climatic conditions along with the soil parameters will help to evaluate the soil fertility. The lacking nutrients in the soil and needed nutrients/fertilizers to boost the soil fertility can be suggested to the farmers and also the crops which can be suitably grown from the given soil sample and nutrients required for all the recommended crops to enhance the yield can be suggested to the farmers.***

Keywords: ***Artificial Intelligence, Deep learning, Crop recommendation , NPK, Soil fertility .***

I. INTRODUCTION

A.Basic Notion

Agriculture is the biggest economy sector of our India and contributes more to the socio-economic development of India. For more than 50% of Indian population, agriculture is the source to fulfill the livelihood. Farmers strive very hard right from the time they sow to the time they reap. The traditional methods of agriculture need to have modern touch to increase the productivity as to meet the growing population and market. The innovations using technologies are reaching the farmers to serve them in monitoring the crop growth , increase their yield & productivity, hence precision agriculture is the trending field to work for the researchers in India. There are several researches going on across the globe to promote precision agriculture and dwindle the burden of farmers.

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The emerging technologies like IOT, robotics ,Sensor networks, cloud networks , machine learning and many more things are stepping into farmer's life and trying to ease his work. Soil plays a vital role for agriculture, important nutrients in the soil will result in the crop growth. If nutrients are more in soil, more fertile will be the land to grow healthy crops hence more yield will be produced. Soil properties like NPK(nitrogen, Potassium, Phosphorous), pH, moisture, temperature , organic matter, carbon content, humidity along with seasons/weather or climatic conditions and type of soil are important to be considered for plant growth. Maintaining and monitoring soil fertility and its nutrients becomes the prioritized task of agriculture. There needs a lot of researches to enhance the soil fertility and crop prediction practices in Agrarian country like India. The application that has to be developed for soil testing need to be robust, cost friendly and user friendly to reach the farmers. The growing environmental changes have to be taken care to make the application more successful, since there are many ideas proposed the practical implementation is the question of concern . Cost for deployment is also an issue for unsuccessful implementation. There are various research works happening to come up with the solutions for managing soil and to increase its fertility , some are proposed ideas and rest are prototype systems which need to be implemented in future after successful result showcase. Robotic seed sowing and harvesting is already implemented in few countries. Pest control system using artificial intelligence is getting implemented in few places. The work which we have proposed here, is to help the farmers to test the soil sample and let them know what is lacking in it by analyzing soil fertility and what has to be added to increase soil fertility , also this work aims to recommend the crops which can be suitably grown from given soil sample. This is going to help our Indian farmers to understand about the soil in an easier and better way and take further steps to grow crops in an efficient way. This will surely reduce the defective crops and promote healthy crops. There are soil sensors which are available in market which senses the soil and sensed data is given to the system for analysis, Features like PH, Nitrogen, Potassium, Phosphorous, moisture content and humidity are used to find the fertility of soil. Using Deep learning ,a technique of artificial intelligence , the system will be trained in such a way that the soil fertility and its crop friendliness is detected .IOT features along with AI technique will increase the soil testing and monitoring efficiency.

B. Artificial Intelligence in IT for soil testing

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Deep convolutional neural network for chronic kidney disease prediction using ultrasound imaging

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Abstract

Objectives

Chronic kidney disease (CKD) is a common disease and it is related to a higher risk of cardiovascular disease and end-stage renal disease that can be prevented by the earlier recognition and diagnosis of individuals at risk. Even though risk factors for CKD have been recognized, the effectiveness of CKD risk classification via prediction models remains uncertain. This paper intends to introduce a new predictive model for CKD using US image.

Methods

The proposed model includes three main phases "(1) preprocessing, (2) feature extraction, (3) and classification." In the first phase, the input image is subjected to preprocessing, which deploys image inpainting and median filtering processes. After preprocessing, feature extraction takes place under four cases; (a) texture analysis to detect the characteristics of texture, (b) proposed high-level feature enabled local binary pattern (LBP) extraction, (c) area based feature extraction, and (d) mean intensity based feature extraction. These extracted features are then subjected for classification, where "optimized deep convolutional neural

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Artificial intelligence enabled plant emotion xpresser in the development hydroponics system

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Abstract

In this paper the development of scalable Hydroponics monitoring systems is presented. Hydroponics, a system of growing crops without soil, has been successfully used to grow crops on a commercial scale. Hydroponics has the potential to fill the gap of low agricultural production in India due to its high efficiency while serving as an environmentally friendly alternative to soil culture. This method of farming has benefitted from new technologies like IoT and machine learning that make it possible to integrate intelligent agents in the management of hydroponic systems as well as collecting live data. These technologies allow for increased automation and refined control of hydroponic systems. In this paper the development and execution of a hydroponic structure equipped with intelligent agents for internet enabled monitoring, data collection and storage.

Problem Formulation

Nowadays, as the population is growing widely it becomes difficult for the cultivation of plants in the land. There are different types of soil present on the earth, it is not possible to cultivate all types of plants everywhere. Due to scarcity of water, it becomes difficult for the farmers to cultivate the plant in the soil. In conventional methods, farmers need to monitor the plants frequently for the good yield. The effects of global warming, and the plants are affected with UV rays. For this reason, it is more difficult to plant in an uncontrolled environment. To overcome all the above problems, we implement the cultivation of plants in water without soil.

Introduction

The feeding source in today's world is agriculture and land mass. The Indian economy is exceedingly reliant on agricultural yield. As there is increased food demand, labor cost, unstable weather conditions and less area of agricultural land, there is an essential need towards enclosed farming such as Hydroponics and Aeroponics [1]. Hence it is vital to use advanced techniques to increase the productivity of the agricultural products and thereby increasing income of farmers.

Hydroponics technique utilizes no soil for the plant growth, instead the plants are used to grown in nutrient based solvents, so that chemicals in soil won't affect the plant growth, also in hydroponics system the plant grows in a faster rate than in soil based cultivation [3]. The existing techniques of hydroponic system include NFT (Nutrient Film Technique), DFT (Deep Flow Technique), and DRT (Dynamic Root Floating) [4].

- **Nutrient Film Technique (NFT):** In this technique a channel is take first which are basically a watertight gully, in which a very shallow water is re-circulated past the bare roots. The water contains all the required nutrients which are important for the plant growth. This technique saves a lot of water due to the process of recirculation and in this technique any leafy greens can be grown, this is due to their short root system as compared to the vegetables plants, the amount of produce can be increased by just stacking the channels one above the another, which gives a large produce in a smaller area.

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Research Article

Chatbots: Cross-Domain Engineering Applications

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Abstract

This paper overviews the cross-domain engineering applications of Chatbots. Chatbots are powerful software built using artificial intelligence and machine learning algorithms that respond to user input data and have impacted a wide range of working fields, including healthcare, journalism, and finance. In Journalism, chatbots mean the rise of interactive news communication, spreading awareness more effectively among the younger generation. In the Healthcare systems, chatbots prove to be extensively useful in emergencies where identifying symptoms for individual patients can be difficult, but having stored a vast amount of personalized data, chatbots can predict quite accurately what problem the patient might be facing – including chronic illnesses. In Finance, chatbots are used to customize responses to each user based on factors like age which vary their intention of using their account to secure financial stability. Further research on chatbots will thus prove to enhance their efficiency in several fields like these where they have immense potential**.**

Keywords- Healthcare, Finance, Journalism, Growth, Restrictions.

I. INTRODUCTION

The Chatbot is a word contracted using two words Chat and Bot, where the word bot is derived from robot. Chatbots are intelligent software that reacts to the input data or the information [1-5]. In recent years chats bots are built above the most powerful algorithms of artificial intelligence and machine learning, showcasing the impressive User interfaces (UI) with a natural humanistic response. However, with the advanced development of natural language processing (NLP), chatbots are also integrated with voice-to-voice responsive technology [6-7]. There are many applications of chatbots in the field of manufacturing industry, marketing, medical and education, etc. For many years, businesses have benefited from the use of social,

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