



Lokmanya Tilak Jankalyan Shikshan Sanstha's
PRIYADARSHINI BHAGWATI COLLEGE OF ENGINEERING
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This is certified that Number of research papers published per teacher in the Journals notified on UGC care list during the last five years.

Year	2022	2021	2020	2019	2018
Number of Research papers	18	9	12	11	2
Total					52

Certified Document from page No. 01 to 22

Principal



3.3.1 Number of research papers published per teacher in the Journals notified on UGC care list during the last five years.

For Year 2022				
Sr. No	Title of paper	Name of the author/s	Name of journal	Is it listed in UGC Care list
1	Natural Extracts Mediated Biosynthesis of Zinc Nanoparticles and their pharmacotherapeutic and Scientific Application Perspectives	A G.M. Haldar	Jordan Journal of Physics	Scopus Index
2	Utilization of Mother Nature's Gift for the Nanobiofabrication of Copper Nanomaterials for Multifarious Applications	A.G.M. Haldar	Jordan Journal of Physics	Scopus Index
3	Half a Decade Progress of Biomass-assisted Development of Zirconium Nanomaterials: Anti-microbial Potentials	A. G.M. Haldar	Jordan Journal of Physics	Scopus Index
4	A Compact Circular Polarized MIMO Fabric	Ms. T. U. Pathan	Advanced Electromagnetics Journal [Web Of Science, Esci, Scopus (Elsevier)]	Scopus Index
5	Effect of Pozzolan Material on Drying Shrinkage Characteristics of Blended Cementitious Mortar	Nitesh Thikare, Ranjit Patil	IOP Conference Series: Earth and Environmental Science	Scopus Index
6	Tainted Wastewater Remediation through Inverted Multimedia Biofilter	Ranjit N. Patil	IOP Conference Series: Earth and Environmental Science	Scopus Index
7	Effect of using plastic granules on the characteristics of concrete	Tejas Patil, Dr. M.P. Verma, Dr Sanjeev Kumar Verma	International Journal of Mechanical Engineering	Scopus Index
8	Comparative study of preparation and characterization of activated carbon obtained	Archana R. Chaudhari	Materials Today: Proceedings	SCI



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	from sugarcane bagasse and rice husk by using H ₃ PO ₄ and ZnCl ₂			
9	Synthesis of Pure Phase SmFeO ₃ orthoferrites via self propagation on Solgel Combustion	Ms. U. V. Gaikwad	Ferroelectrics	Taylor & Francis (SCI)
10	First observation of Luminescence in Synthetic boralsilite	Dr. S. G. Revankar	Optik	Elsevier(Scopus)
11	Luminescent Material Based on Aluminates: A review	Dr. S. G. Revankar	Physica Status Solidi(a)	Scopus Index
12	Broadening the excitation Spectrum of BaMgAl ₁₀ O ₁₇ :Cr ³⁺ using Eu ²⁺ as a Codopant	Dr. S. G. Revankar	Journal of Luminescence	Elsevier(Scopus)
13	Study of Luminescence of Gd ³⁺ in some aluminoborates and energy transfer from Gd ³⁺ to Ln ³⁺	Dr. S. G. Revankar	Optik	Elsevier (Scopus Index)
14	Gamma Degraded oligomeric nanochitosan for adsorptive removal of Cd (II)	Dr. S. Revatkar (Korde)	Bioresource Technology Reports	Scopus Index
15	Fitness Center: An Automated System for Gym Notification with Client Attendance and Guidance System	Rashmi Dadge	Asian Journal of Organic & Medicinal Chemistry	UGC Care
16	Hybrid Swarm Optimization of Device-To-Device Resource and Power Allocation Using Multi-Objective Particle Swarm Optimization	Ms. S.S. Dhanvijay	Journal of Northeastern University	Scopus Index
17	Design & Fabrication of Stair Lift Chair	Prof. S. M. Pimpalgaonkar	Journal of Engineering Science	UGC Care
18	Study of synthesis and characterization of raw bagasse, its char and activated carbon prepared using chemical additive	Dr. (Mrs.) Archana R. Chaudhari	Water Science & Technology	Scopus Index

Principal

Natural Extracts-mediated Biosynthesis of Zinc Oxide Nanoparticles and Their Multiple Pharmacotherapeutic Perspectives

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Abstract: Eco-friendly green syntheses of nanoparticles (NPs) have involved the natural biomass contents since over a decade. The NPs of zinc oxide (ZnO) have important applications in diagnostics, detection of biomolecules, opto-electronic devices, microelectronics like electromagnetic coupled sensor laser devices, neutralization of environmental hazard pollutants as well as pharmaceutical components from water. ZnO-NPs play a pivotal role in drug delivery, exhibiting biomedical activities, such as anti-pathogenics, diagnosis of various diseases, anti-oxidants etc. The interest in synthesizing ZnO-NPs via the biological method (plant extracts) has increased considerably in the last few decades. The development of this new approach and the significant interest in it are mainly related to the absence of toxic chemicals or high-energy applied methods to the biological synthesis which develop more environmentally friendly and cost-effective methods. This review article focuses on recent (January 2020 to May 2020) plant-mediated green synthetic methods which are highlighted comprehensively in this review article.

Keywords: Zinc, Nanoparticles, Natural, Synthesis, Plant, Extract.

Introduction

Nanotechnology has been a subject of great research and enthusiasm for researchers in recent years [1]. Nanomaterials having nanoscale dimensions possess unique properties as compared to their micro-molecules. The most current approach focuses on more cost-effective techniques for creating and manipulating materials at the nanometer scale [2]. The research on nanomaterials is one of the most demanding and greatly growing areas in the branch of science and engineering. Nanoparticles (NPs) of different noble metals have been

already in practice for therapeutic purposes since centuries ago. These NPs proved to be very valuable for pharmaceutical, biomedical and tissue engineering [3].

Synthesis of NPs is conducted by biological or green technology and physical and chemical methods. The two end processes of developing NPs have been accompanied by costly and environmentally hazardous effects. In chemical synthesis, toxic and hazardous chemicals are involved in NP synthesis, which causes various ecological risks and serious diseases.

Utilization of Mother Nature's Gift for the Biofabrication of Copper/ Copper Oxide Nanoparticles for Therapeutic Applications

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Abstract: This review enumerates the green *cum* biosynthesis of copper/copper oxide nanoparticles (Cu/CuO NPs) using plant and biogenic extracts. Moreover, it explores the biogenic synthesis of Cu/CuO NPs using different methods and elaborates on biological and eco-friendly modes of synthesis using different plant species. The survey revealed that biological methods involve the use of plant extracts, bacteria, protozoa and fungi. However, plant mediated nanomaterials synthesis is the best technique. Some of the microscopic characterization techniques, like XRD, SEM, TEM, FTIR, XPS, BET and UV-Vis, have been discussed to explore the size, shape, structure, composition and porosity of Cu NPs. The current review highlights the phytosynthesis, characterization and therapeutic applications of Cu/CuO NPs. The therapeutic applications of Cu/CuO NPs, like antimicrobial, anti-parasitic and anticancer activities against a variety of gram-negative and positive bacteria, fungi and human cancer cells, respectively, have been discussed.

Keywords: Biosynthesis, Phytosynthesis, Cu/CuO NPs, Microscopic techniques; Therapeutic applications.

Introduction

Research all over the world on green nanotechnology enhanced the scientific revolution of the twenty-first century. Metal nanoparticles have varieties of applications, like catalytic, energy storage, environmental remediation, biological, and so forth [1]. There are various chemical and synthetic routes that have been employed to synthesize nanoparticles due to their various applications in scientific, technological, pharmacological and biomedical sectors [2]. One of the interesting and human beneficial biogenic synthesized metallic nanoparticles is copper nanoparticles (Cu NPs).

In the synthesis of Cu NPs, low-cost chemicals and plant extracts as precursors are used, several of which have advanced chemical and physical properties [3]. Cu NPs are among the most useful elements in medical sciences that can be used in numerous therapeutic effects, such as anti-inflammatory, anticancer, analgesic and antimicrobial effects [6]. Cu NPs have greater applications in heat transfer systems, such as sensors as well as catalysts [7]. Nanotechnology has greater applications in research area. In the past, chemical methods of the synthesis of Cu NPs were used which are known to be expensive

Half a Decade Progress of Biomass-assisted Development of Zirconium Nanomaterials: Anti-microbial Potentials

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Abstract: Nanotechnology has revolutionized all fields across the globe and opened up several frontiers in nanobiotechnology, nanopharmacotherapeutics, material and applied sciences, biomedical sciences, drug delivery, tumor therapy imaging, biosensing, electronics, bactericidal activity, catalysis, optics and photoelectrochemistry. Nature has provided abundant biological resources to synthesize NPs eco-friendly. Over the past few years, purified extracts of bacteria, fungi, algae, seaweeds and viruses have received adequate attention for the development of energy-efficient, non-toxic, economic nanoparticles (NPs). The present review article exclusively focuses on the last 5 years (January 2016 to December 2020) progress in the area of green synthesis of zirconium nanomaterials (zirconium NPs (Zr-NPs), zirconium dioxide (ZrO₂) and zirconium/metal nanocomposites, Cu/ZrO₂) by utilization of plant extracts, fungal extracts and seaweed extracts. The probable mechanism(s) of the formation of NPs by reduction with bioreductants is (are) also described briefly.

Keywords: Zirconium, Nanoparticles, Plant, Fungi, Seaweed, Anti-microbial potentials.

Introduction

Nanotechnology has revolutionized all fields across the globe and opened up several frontiers in nanobiotechnology, nanopharmacotherapeutics, material and applied sciences, biomedical sciences, drug delivery, tumor therapy imaging, biosensing, electronics, bactericidal activity, catalysis, optics and photoelectrochemistry [1-2].

Diversity of chemical and physical processes has been reported for the synthesis of metallic nanoparticles (NPs) [3]. However, several

methods subsisted, but many problems are associated with these processes, like utilizing toxic solvents, expensive production of harmful by-products, ...etc [4]. Chemicals, like hydrogen peroxide, hydrazine hydrate, polyvinylpyrrolidone, sodium borohydride, ethylene glycol and dimethylformamide, are generally used for the production of NPs, but they get absorbed on the surface of NPs formed, thereby producing toxicity [5]. Thus, there is a need to explore eco-friendly synthetic protocols for the synthesis of nanomaterials [6-15].

A Compact Circular Polarized MIMO Fabric Antenna with AMC Backing for WBAN Applications

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ABSTRACT A compact circular polarized (CP) multiple-input multiple-output (MIMO) fabric antenna with improved isolation at 2.4 GHz for wireless body area network (WBAN) applications is presented. A metamaterial (MTM)-inspired radiating element has been used for the miniaturization of the presented fabric antenna. The proposed antenna has very compact size of $58 \times 23 \times 1.6 \text{ mm}^3$. The circular polarization is achieved by trimming the two diagonal corners of the radiating elements. A defected ground structure (DGS) consists of two U-slots which is placed under each radiator to increase the bandwidth of the presented antenna. The isolation characteristics (S_{21}) between the two antenna elements is increased by 20 dB by cutting a slit in a ground plane. The proposed CP-MIMO antenna incorporates an artificial magnetic conductor (AMC) layer to limit backward radiation towards the human body and hence enhances the gain. The proposed MIMO antenna has been designed on a denim substrate with permittivity $\epsilon_r = 1.6$ and thickness of 1.6 mm. The proposed antenna offers bandwidth of 160 MHz (2.38-2.54 GHz). The peak gain of antenna without AMC is 2.5 dBi and with AMC is 4.5 dBi. To validate the simulated results, a prototype for the proposed antenna has been fabricated and experimentally characterized. Due to its small size, low specific absorption rate (SAR), ease of integration and robustness, this antenna is a good option for wireless body area network (WBAN) applications.

INDEX TERMS Artificial Magnetic Conductor, Defected ground structure, MIMO Antenna, Isolation, Wearable antenna

I. INTRODUCTION

Continuous development in wireless electronic technology has enabled the integration of technology in cloth to enhance the capability. Such wearable textile antenna that can integrate into a communicating garment offer many potential applications, including military, telemedicine, GPS sensing for personal safety, wireless information relay, sports and tracking applications [1]. Circularly polarized (CP) antennas are attractive candidates for wearable applications due to their orientation flexibility, better mobility and multipath interference suppression capability. Multiple-input-multiple-output (MIMO) technology is also gaining popularity for improving link capacity, particularly in complex multipath environments. A multi-element antenna with circular polarization (CP) is a good choice for encountering multipath fading and establishing reliable channels [2,3]. However, the backward radiation resulting from wearable antennas has been a design challenge. Recently, several techniques for implementing the electromagnetic band gap (EBG) structures or artificial magnetic conductor (AMC) planes have been proposed to

enhance the performance of wearable antennas. The AMC plane is used to eliminate the detuning effects, to increase the antenna gain and, meanwhile, reduce the back-lobe radiation as reported in [4,5,6,7]. Wearable textile antennas with different AMC backing structures have been reported in [4,5,6,7]. However, these antennas are electrically large and radiation inefficient. The performance of wearable antenna in close vicinity to human body has been reported in [8].

It is important to mention that, the performance of wearable antenna is disrupted and drastically impair the resilience and reliability of wireless communication links due to multipath fading effects when it is smoothly stretched over the non-flat human body reported in [9,10]. Hence, MIMO antennas are widely suggested for improving communication performance. Many MIMO antennas for wearable applications have been reported in [10,11,12,13,14]. However, in previous demonstrations, the impact of antenna bending on its radiation characteristics has not been evaluated. More importantly, the backward radiation which is crucial to the operation of wearable antennas, has been largely overlooked. The textile MIMO antenna with high isolation using stub techniques have been reported

Effect of Pozzolanic Material on Drying Shrinkage Characteristics of Blended Cementitious Mortar

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Abstract: To maintain sustainability, the production of Portland cement is a major contribution to greenhouse gas emissions. Various methodologies are used for the purpose of reduction of Portland cement consumption in mortar are desirable to minimize the greenhouse gases. Based on past studies, the authors have studied fly ash behavior with the cement and its effect on mortar and concrete i.e. usage of fly ash (FA) contents in mortar as one of the sources of cement replacement, which makes mortar less permeable due to its fineness and pozzolanic response. This paper briefly discusses the cement replacement with a different fineness of FA from various hoppers at different percentages and does experimental examinations related to the compressive strength (CS) and drying shrinkage (DS) mortar. The FA was used for the research work from the Khaperkheda power plant, Nagpur. FA is used as a replacement with cement in a 12.5 % proportion up to 37.5% with a mix proportion for the mortar is 1:3. Casting of mortar for compressive strength and drying shrinkage is done as per the Indian Standard (IS) code. The result elucidated that, up to optimum level, the CS of mortar was increased and further observed increase in FA content decreased the CS. For drying shrinkage, the value of shrinkage is found lesser than the controlled cement mortar due to its fineness.

Keywords: Fly Ash, Mortar, Compressive Strength (CS), Drying Shrinkage (DS)

1. Introduction

The industrial waste, fly ash is obtained from thermal power plants which have pozzolanic characteristics after burning of pulverized coal. At present, India produces around 120 Million tons of ash per year. Due to the rapid increase in industrialization and population more consumption of power is required for the country. In India around, 80 percent of electricity (power) generation depends on thermal power plants. The source of generation of power in plants is due to the burning of pulverized coal, which generates 35 % of ash. As the requirement for power increases, day-by-day also increases ash production. The utilization of ash is major factor in India, about 70 percent of ash is used in cement industries [1]

The utilization of fly ash in recent times is more important and is used in mortar, concrete, landfilling, etc. Fly ash has become a popular element in the production of high-strength mortar. The cementitious supplementary material FA has already been implemented in accordance with IS 4031-1988. Fly ash has some amount of cementitious characteristics like cement hence it is used as an SCM in concrete or mortar [2]. Due to loss of moisture, shrinkage will occur at every cementitious product. As the multidimensional contraction of the mortar due to loss of moisture, the DS is evaluated on the largest side of the body. The



Tainted Wastewater Remediation through Inverted Multimedia Biofilter

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Abstract. The growth of industry leads to the contamination of surface as well as groundwater. Improper industrial wastewater disposal causes a serious problem of metal accumulation in the soil and freshwater. To tackle this issue there is a need of recycling and reuse wastewater using low-cost sustainable treatment. The main objective of this research is to check the feasibility of multimedia vermifilter for the efficiency removal of physicochemical parameter and fluoride metal ions of fluoride-tented used water (wastewater). For the treatment, we used fluoride contaminated used water (wastewater) from the fluoride contaminated site. In this study multimedia vermifilter integrated with moringa seed extract, activated charcoal powder, and earthworm *Eisenia fetida* were used as bio-media to treat contaminated used wastewater. In this experimental analysis, we checked the removal efficiency on different HLR in m³/day/m². The result showed that percentage removal efficiency for BOD, COD, TDS and Fluoride using inverted multimedia filter was observed for the optimized hydraulic loading rate at 0.933m³/day/m² was found to be BOD (81.64%), COD (51.47%), TDS (82.17%), Fluoride (35.81%) respectively. The earthworm, moringa seed extract, and activated charcoal play a vital role in the removal of Bioconversion of organic matter. Furthermore Treated effluent waste-water is then used for gardening and irrigation purposes.

Keyword: Fluoride, Moringa olifera, Flyash, Charcoal, Esina Fetida

1. Introduction

The ecological system is affected due to insufficient management of waste handling. Wastewater production and processing it's a big problem in developing countries.[1] in preventing the health issue and To protect from hazards effect of waste on society the treatment of wastewater is important[2].The rise in activities of various industrial and urban sector, agricultural, metal exploration, power sector lead to the generation heavy metal in the air, soil surface, surface water, and underground water bodies which will lead to the detrimental effect on the environment.



Effect of using plastic granules on the characteristics of concrete

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Abstract: Reusing of plastic is significant in the present condition. Consolidating the waste plastics in concrete by changing over them into aggregates is one of the potential ways for consuming them. In the current work usage of waste Low Density Polyethylene granules as partial substitution of coarse aggregate and its mechanical way of behaving is examined. Present work focuses on utilization of reused plastic and glass powder with concrete terms a fractional substitution of fine aggregate and Concrete. The waste plastic of LDPE is collected and blended in with OPC in different percentage (0%, 20%, 30%, 40%) as partial substitution of coarse aggregates. Blends were created by replacing concrete by glass powder in various extents, for example, 5%, 10% and 15% for every variety of plastic granules. The adaptability, compressive force and tensile test with splits were determined for prepared concrete mixes.

Keywords: concrete; aggregates; plastic; characteristics; strength

1. Introduction

There are great characteristics of waste material accessible like fly ash, silica fume, substantial waste, marble waste, modern waste, farming waste, red soils and so on. Utilization of a large number of this waste has become normal in creating different items like fly ash concrete, jute fiber and so on. One of such waste material is plastic delivered in enormous amount all through the world as plastic convey packs, poly-ethane bag, plastic jugs, plastic piece and so on. Removal of plastic waste in climate is viewed as a major issue because of its exceptionally low biodegradability and presence in enormous amounts. To investigate reasonable substitution, for substantial constituent, an exploratory program was attempted to supplant coarse aggregate with plastic. This exploration work subsequently manages concentrating on the presentation of cement by supplanting normal aggregate with plastic granules. Kind of aggregates influences the essential attributes of cement (Muhit et al. 2013). The significant goal of this research is to conduct a survey of various concrete cement characteristics created by utilizing plastic granules and glass powder as a concrete fractional substitution coarse aggregate, and Concrete with as far as rut worth and burden bearing limits. Taking over for concrete using glass powder lessens cement's compressive strength (Bajad et al., 2012).

2. Literature Audit

Coarse aggregate is a central piece of concrete as it takes a raised level of cement. A few scientists' chips away at the mechanical properties of cement produced using contemporary shape aggregates. Joined impact flaky, and stretched aggregates based on strength and usefulness of cement has occurred communicated by Ponnada (2014). M 25 concrete is used for various proportions of loads of stretched in comparison to flaky aggregate and precise to add up to aggregate had been capable for various qualities of arranged concrete.

Muhit et al. in (2013) decide the properties of cement because of various sorts of aggregates alone. To watch the impact of coarse aggregates strongly kept different factors like w/c steady for every classification and of aggregates. Various shapes and projected aggregates have been joined and used to get ready various gatherings of cement with variable water-concrete. Aftereffects of research center assessment have been introduced by Jakarsi (2013) and assessed the impacts of flaky dimensioned aggregates on qualities of cement. Three types of flaky aggregates were proportioned in the blend and had been considered in this exploration. Singh and Biswas (2013) saw that flaky aggregates have higher relative region which brings about higher prerequisite of bitumen in blend. Flaky aggregates likewise break when rolling and lessen the power of the asphalt layer. During the real execution of work, the evaluating and size of the aggregates change from the planned one in the gig blend strategy.

Naidu and Adishesu (2013) encountered that strength usefulness of hot blends exceptionally depend over actual properties of aggregate. Thick bituminous macadam blends had been examined with disparate extents of various states of aggregates studies. Meaning of the state of aggregate has been seen by Rya et al. (2013). In particular, the state has been made up of aggregate particles connected with a few properties, for example, dependability, rut or shear stream, obstruction against shear, ductile and other behaviors. In recent years, Advanced Picture methods have been directed to observe the molecule shape attributes of aggregate. Patil and Sangle (2013) concentrated on the utilize of discarded glass powders as an alternative to the substantial part For analyzing strength results replacement for concrete by use of glass powder concrete is subbed in various proportions. For concentrating on the impact of glass powder size the powder is conveyed in to two classifications.

Khatib et al. (2012) examined the viability of blend as in glass powdered concrete as an insufficient substitute of concrete. Examinations directed are ultrasonic heartbeat speed, pressure and retention test.

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journal homepage: www.elsevier.com/locate/matpr

Comparative study of preparation and characterization of activated carbon obtained from sugarcane bagasse and rice husk by using H_3PO_4 and $ZnCl_2$

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This research aim to prepare activated carbons from agricultural bio-waste materials by using chemical additives. In this study, activated carbons were synthesized by chemical activation of sugarcane bagasse and rice husk by using H_3PO_4 and $ZnCl_2$. The sugarcane bagasse and rice husk was impregnated with ratio (raw precursor: activating agent) 1:1, 1:2 and 1:3. Activation was carried out at 600, 700, 800 and 900 °C in muffle furnace. Effect of different impregnation ratio, activation temperature and yield was studied and compared. As iodine number determination is the quick and easy indication of the internal surface area of activated carbon, hence, all the synthesized activated carbons were tested for iodine number and compared. The iodine number of the carbon made from sugarcane bagasse by using zinc chloride was 1140.69 mg/g for 1:2 ratio at 900 °C and with phosphoric acid iodine number found was 987.31 mg/g for 1:1 ratio at 900 °C. The carbon prepared from rice husk gives lesser iodine values and surface area as compared to sugarcane bagasse. The highest surface area of sugarcane bagasse made activated carbon impregnated with $ZnCl_2$ found to be 1386.58 m²/g with pore volume of 0.9947. The optimum ratio was 1:2 with activation temperature of 900 °C. The rice husk gave maximum surface area 749.51 m²/g with $ZnCl_2$. It has been observed from the results that, carbons prepared with zinc chloride gives maximum surface area than phosphoric acid. The characterization study, FTIR, SEM, BET, XRD and TGA-DTA of selected carbons were carried out and presented in the paper.

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1. Introduction

The richness and accessibility of agricultural byproducts make them worthy sources of low-cost raw materials for natural bio-adsorbents. Converting biomass into activated carbon requires considerable carbon content. Sugarcane bagasse contains 24.7% of carbon with chemical composition of hemicellulose 25%, cellulose 50% and lignin 25% [1,2]. High cellulose content imparts micro-porous structure of activated carbon [3,4]. Hence, sugarcane bagasse can be utilized for making activated carbon. Rice husk activation produces an extremely porous carbon with very high surface area [5]. The preparation of activated carbon from agricultural waste materials capturing interest in research field

that can convert the waste materials into value added product with wide range of environmental applications [6].

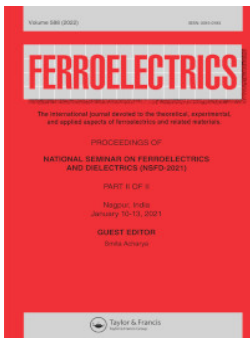
Water pollution is a common problem nowadays. Water pollution is caused by natural activities as well as anthropogenic activities like, domestic sewage discharge, effluent discharge from industries and surface run off from agricultural fields. This will leads to release of heavy metals in water resources [7]. Heavy metals like Arsenic, lead, mercury, cadmium and chromium are imparting severe health effects. Long term arsenic exposure will cause “arsenicosis” related with skin problem like pigmentation and keratosis [8]. Lead toxicity may damage central nervous system [9]. Long term exposure of mercury tremble of the hands, remembrance loss, nervousness, and sleeplessness [10,11]. Deposition of cadmium in bones and lungs causes due to its long-term exposure. Cadmium inhalation can results in irritation of lungs and respiration problem [12]. Cadmium causes “Itai-itai” disease

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Synthesis of pure phase SmFeO_3 orthoferrites via self-propagating sol-gel combustion synthesis and study of Ce doping effect on their ferroelectric properties

Uma V. Gaikwad, Smita A. Acharya, Shraddha Shirbhate & Chitra Khade

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Synthesis of pure phase SmFeO_3 orthoferrites via self-propagating sol-gel combustion synthesis and study of Ce doping effect on their ferroelectric properties

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ABSTRACT

SmFeO_3 (SFO) is a highly challenging rare earth orthoferrites system for future modern spintronics applications and data storage devices due to its outstanding dielectric and ferroelectric properties, among other RFeO_3 members. In the present attempt, Ce doped SFO system with compositions $\text{Sm}_{1-x}\text{Ce}_x\text{FeO}_3$ (where $x = 0.02$ to 1) is explored to reveal its structural and ferroelectrics behavior in view to check its suitability for data storage applications. The systems were synthesized by a sol-gel method based on glycine gel reaction. The structural features of the as-synthesized samples are fitted by Rietveld refinement of x-ray diffraction patterns, which confirms an orthorhombic phase with Pbnm space group. Temperature driven ferroelectric properties of $\text{Sm}_{1-x}\text{Ce}_x\text{FeO}_3$ (where $x = 0.02$ to 1) were studied. Ce doped SmFeO_3 indicates a reduction in losses and leakage current by Ce doping, suggesting that it is a promising material to explore as room temperature multiferroics.

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Introduction

Perovskite rare earth orthoferrites (RFeO_3 : where $R = \text{lanthanide}$) are gaining attention due to their anomalous structural features, magnetic and ferroelectric anisotropy [1–4]. The RFeO_3 compounds have an orthorhombic distorted perovskite structure with the space group Pnma . For the temperature varying from 620 to 750 K, the Fe^{3+} magnetic moments in RFeO_3 undergo a magnetic phase transition from the paramagnetic state into the canted antiferromagnetic state [5]. At a lower temperature, a spin reorientation (SR) transition occurs on the Fe^{3+} sites due to the anisotropy introduced by the rare-earth cations on the R sites. For most rare-earth ions, the R^{3+} spins also order at an even lower temperature. R-site and Fe-site doping effects are found dominantly to modulate their magnetic and dielectrics behavior.

Samarium orthoferrite (SmFeO_3 , or SFO) is a member of the RFeO_3 family. SFO has an orthorhombic structure ($\text{Pnma}/\text{D}16$ 2h space group) and is composed of four distorted perovskite unit cells. Structural studies using x-ray diffraction (XRD) in SFO have revealed a weak distortion of FeO_6 octahedra, leading to a buckling angle (Fe-O-Fe) of 147° in SFO [6]. SFO has been found to exhibit improper ferroelectricity with a substantial degree of polarization [7, 8]. The origin of ferroelectricity is attributed to



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First observation of luminescence in synthetic boralsilite

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ABSTRACT

Boralsilite is well known to mineralogists. Its nominal formula is $\text{Al}_{16}\text{B}_6\text{Si}_2\text{O}_{37}$. Though it is known now for nearly 25 years no luminescence studies have been carried out. We attempted synthesis of this mineral by combustion method and introduced lanthanide activator Europium and Cerium during the synthesis. Characteristic emissions of Ce^{3+} , Eu^{3+} and Eu^{2+} is reported. Maximum PL intensity was obtained for the activator concentration of 1 mol%.

1. Introduction

Dietzel and Scholze [1] explored the phase diagram $\text{B}_2\text{O}_3\text{-Al}_2\text{O}_3\text{-SiO}_2$. Using data on optical properties and the variation of unit cell size along c-axis vis-a-vis B_2O_3 content, they deduced formation of solid-solutions. The series involved 3:2 mullite ($\text{Al}_{4.5}\text{Si}_{1.5}\text{O}_{9.75}$) and $\text{Al}_{18}\text{B}_4\text{O}_{33}$ in which Si was partially replaced by B. Subsequently, phase diagram of $\text{Al}_2\text{O}_3\text{-B}_2\text{O}_3\text{-SiO}_2$ system has been discussed on several occasions and revised with discovery of new phases. Cempírek et al. [2] mentioned phases like $\text{Al}_8\text{B}_2\text{Si}_2\text{O}_{19}$ and “boron-mullite” which was first synthesized by Werding and Schreyer [3] (and named so by Grew et al.) [4], $\text{Al}_{16.8}\text{B}_{3.6}\text{Si}_{3.7}\text{O}_{38}$, $\text{Al}_{4.5}\text{B}_{0.6}\text{O}_{9.4}\text{Si}_{0.9}$ other boron-mullites [5], Vranaitite, $\text{Al}_{16}\text{B}_4\text{Si}_4\text{O}_{38}$, dumortierite $\text{Al}_7\text{BSi}_3\text{O}_{18}$ [6], Boralsilite $\text{Al}_{16}\text{B}_6\text{Si}_2\text{O}_{37}$. Besides this boromullite $\text{Al}_9\text{BSi}_2\text{O}_{19}$ is also known [7]. An unknown columnar mineral from the Almgjotheii pegmatite was noticed by Huijsmans et al. [8] in 1982. They attempted a proper analysis of the same. This can be said to the beginning of Boralsilite discovery. Grew et al. formally gave it a status of new mineral [9]. The name is derived from the constituents. “The new mineral and the name have been approved by the Commission on New Minerals and Mineral Names of the IMA. Its structure is closely related to that of sillimanite and thus to a large group of aluminosilicates and boroaluminosilicates which includes sillimanite, andalusite, mullite, werdingite, grandidierite, and synthetic aluminum borate ($\text{Al}_{18}\text{B}_4\text{O}_{33}$). Boralsilite is a relatively widespread, albeit minor, constituent of pegmatites belonging to two generations in the Larsemann Hills, one associated with the D2-D3 deformation and the second with D4 (deformation scheme of Carson et al.)” [10]. Crystal structure of Boralsilite was described by Peacor et al. [11].

Despite wealth of information on these minerals, and their synthetic counterparts there are no luminescence studies reported for the related materials. This is rather surprising in view of the fact that both borates [12,13] and silicates [14] are known to be efficient luminescent materials. We have thus undertaken investigations on luminescence in these compounds.

In the past, most of the synthetic compositions were prepared under high pressure. Luhr et al. prepared and analysed some phases at ambient pressure. Considering that aluminoborates could be successfully synthesized by combustion synthesis [15], we attempted the preparation of Boralsilite by the same technique.

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Luminescent Materials Based on Aluminates: A Review

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An aluminate is a compound containing an oxyanion of aluminum. Many aluminates are found in nature. A large number of phosphors that are used in various applications, such as scintillation detectors, optical thermometry, long-lasting phosphorescence, solid-state lighting, solid-state lasers, upconversion, bioimaging, and plasma display panels, are based on aluminate formulae. This review focuses on the synthesis and characteristics of such phosphors. The conventional as well as novel methods of synthesizing these phosphors are reviewed. The emphasis on commercially important aluminate phosphors is discussed.

1. Introduction

Luminescent phosphors are important materials that find applications in many diverse fields. The phosphors have been discovered using various types of hosts such as vanadates, phosphates,^[1] aluminosilicates^[2,3] zirconia,^[4] zirconates,^[5–8] zinc oxide,^[9] tungstate, etc. Apart from these, many aluminate compounds are important hosts. For example, several lamp phosphors are based on aluminate compositions. A good account of the history of fluorescent lamps and lamp phosphors may be found in a book by Amick.^[10] Various landmarks in this history have been briefly discussed by Pappalardo.^[11] Aluminate phosphors have also assumed an important role in modern solid-state lighting. With the advent of GaN, high-power blue light-emitting diodes (LEDs) were fabricated, this has opened up a new era of LED applications. The first high-brightness blue LED was demonstrated by Shuji Nakamura of Nichia Corporation in 1994 and was based on InGaN.^[12] Its development was built on critical developments in GaN nucleation on sapphire substrates and the demonstration of p-type doping of GaN, developed by Isamu Akasaki and H. Amano in

Nagoya.^[13] In 1995, Alberto Barbieri^[14] at the Cardiff University Laboratory (GB) investigated the efficiency and reliability of high-brightness LEDs and demonstrated a transparent contact LED using indium tin oxide (ITO) on (AlGaInP/GaAs). Group-III nitrides composed of GaN and its alloys with InN and AlN have revolutionized the solid-state lighting market due to their ability to emit a wide range of wavelengths in the visible spectrum. GaN-based high-efficiency light-emitting diodes (LEDs) have increasingly become a viable light source for illumination applications, such

as automotive headlights, interior/exterior lighting, and full-color displays. For realizing full color, blue LEDs need to be coated with suitable phosphors, and most of these are related to aluminates.

In chemistry, an aluminate is a compound containing an oxyanion of aluminum, such as sodium aluminate. In the nomenclature of inorganic chemicals, the suffix aluminate indicates an anion with aluminum at a central position surrounded by varying number of oxygen. There are various oxyanions of aluminum such as AlO_2^- , AlO_4^{5-} , AlO_6^{9-} , $\text{Al}_6\text{O}_{18}^{18-}$, $\text{Al}_2\text{O}_7^{8-}$, etc.

Many aluminates are found in nature. The elemental abundance of aluminum in the Earth's crust is 8.23×10^{-2} kg kg⁻¹ mass fraction. During the formation of the crust, Al^{3+} is depleted from the mantle to a minimum. During the initial stages of the formation of igneous rocks, Al^{3+} gets included. It is commonly concentrated in residual soils and sediments. It is enriched in ferromanganese nodules found in deep-sea water. There are 3187 minerals spread over 57 species with Al and O. 97.82% of Al minerals are with O, which is 27.71% of all minerals. Some important aluminate minerals are listed in **Table 1**.

2. Aluminate Classification

Aluminates have been classified in several ways. The often cited classification makes use of the ratio of metal to aluminum, that is Ortho-aluminate $\text{MeO}:\text{Al}_2\text{O}_3 = 1:1 = \text{MeAl}_2\text{O}_4$ [e.g., SrAl_2O_4 , YAlO_3 etc.]

Di-aluminate $\text{MeO}:2\text{Al}_2\text{O}_3 = 1:2 = \text{MeAl}_4\text{O}_7$ [e.g., SrAl_4O_7 , CaAl_4O_7 etc.]

Hexa-aluminate $\text{MeO}:6\text{Al}_2\text{O}_3 = 1:6 = \text{MeAl}_{12}\text{O}_{19}$ [e.g. $\text{CaAl}_{12}\text{O}_{19}$, $\text{SrAl}_{12}\text{O}_{19}$ etc.]

A more distinguishing classification is based on the structure. There are five important structure types in aluminates. The most celebrated garnet structure is YAG ($\text{Y}_3\text{Al}_5\text{O}_{12}$, yttrium aluminum garnet). Most orthoaluminates have perovskite structure, for example, YAlO_3 (YAP) or stuffed tridymite, hexagonal-like SrAl_2O_4 , hexa-aluminates with magnetoplumbite ($\text{PbFe}_{12}\text{O}_{19}$)

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Broadening the excitation spectrum of BaMgAl₁₀O₁₇:Cr³⁺ using Eu²⁺ as a codopant

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ABSTRACT

BAM:Eu is a very well known, commercial phosphor that is used for tricolor fluorescent lamps and plasma display panels. In recent years, Cr³⁺ doped BAM had been suggested as a phosphor for LED lamps for plant growth. However, excitation spectrum of Cr³⁺ is narrow. To overcome this problem, we have attempted codoping by Eu²⁺. Eu²⁺ → Cr³⁺ energy transfer was observed in BaMgAl₁₀O₁₇:Eu²⁺,Cr³⁺ phosphor. The energy transfer was established by photoluminescence emission, excitation and lifetime measurements. Efficiency of the energy transfer is 40.2%. By virtue of this energy transfer, the excitation spectrum corresponding to Cr³⁺ emission covers a broad spectral region 340–430 nm. These phosphors were prepared by facile combustion synthesis which is a fast method. It is suggested that this phosphor will be useful for preparing LED lamps based on near ultraviolet, violet and blue chips.

1. Introduction

Luminescent materials receive attention of the scientists due to the variety of applications [1–3]. About a half century back, Verstegen and Steven explored various aluminates derived from beta alumina [4] and studied luminescence of Eu²⁺ activators. Later, Verstegen [5] prepared Ba_{0.86}Eu_{0.14}Mg₂Al₁₆O₂₇ phosphors with an emission peaking at 450 nm and found it suitable as a blue component of tricolor fluorescent lamp. Later, it was found that the correct formula was not BaMg₂Al₁₆O₂₇ but BaMgAl₁₀O₁₇ [6]. Since then, BaMgAl₁₀O₁₇ is abbreviated as BAM. Use of BAM:Eu for lamps and related applications have been reviewed extensively, long back [7].

Work on BAM received impetus due to application in tri-colour fluorescent lighting, and rather surprisingly, even after nearly 50 years, the interest and investigations on BAM related phosphors are continuing [8–10]. Apart from Eu²⁺ [11,12], luminescence of several other activators like lanthanides Sm²⁺ [13], Gd³⁺ [14], Ce³⁺, Tb³⁺ [15], and 3 d transition metal ions like Cr³⁺ [16,17], Mn²⁺ [18–20], Mn⁴⁺ [21] has also been investigated. Er³⁺ and Nd³⁺ have also been used as dopants, or rather co-dopants in BAM:Eu. However, characteristic

emission was not studied, instead the focus was on enhancement of Eu²⁺ emission intensity [22], especially for vacuum ultraviolet (VUV) excitation [23]. BAM has been exploited as a host for studying energy transfers between various sensitizer-activator pairs. Among these, Eu²⁺-Mn²⁺ pair had been studied very extensively [24–27]. It enables green emission of Mn²⁺; emission of Eu²⁺ being blue. Other notable pair exhibiting energy transfer is Eu²⁺-Yb³⁺ which yields near infrared (NIR) emission with nUV excitation that can be useful for modification of the solar spectrum for enhancing performance of c-Si solar cell [28]. Apart from sensitizer-activator pairs, an interesting energy transfer is from host itself. BAM has absorption in VUV region. Energy transfer from the host enables VUV excited luminescence of Eu²⁺ [29]. This makes BAM:Eu²⁺ phosphor suitable for applications like plasma display panel (PDP) [30,31], scintillator [32] and Mercury free fluorescent lamps [33]. VUV excitation required for this application could be enhanced by various codopants such as Mg²⁺ at Al³⁺ site [34].

BAM based phosphors have been used not only for fluorescent lighting and PDP, but variety of other applications have been envisaged. BAM:Eu²⁺ is a phosphor for thermography: remote temperature measurement [35]. Lifzig et al. [36] suggested Gas-phase thermometry using

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Study of luminescence of Gd^{3+} in some aluminoborates and energy transfer from Gd^{3+} to Ln^{3+} ($Ln = Eu, Tb$ or Dy)

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$Gd^{3+} \rightarrow Ln^{3+}$ energy transfer

ABSTRACT

Series of $YAl_3(BO_3)_4:Gd^{3+}$ and lanthanide doped $GdAl_3(BO_3)_4$ phosphors were synthesized using solid state method. By virtue of large distance between lanthanide ions, very moderate concentration quenching was observed. Efficient sensitization of Eu^{3+} , Tb^{3+} and Dy^{3+} luminescence by Gd^{3+} is reported for $GdAl_3(BO_3)_4$. The efficiencies of energy transfer have been estimated using lifetime measurements.

1. Introduction

“During the course of investigation of a variety of molten solvents suitable for crystal growth, a new series of rare earth compounds of the general formula $RX_3(BO_3)_4$, where R is yttrium or a rare earth and X is aluminum or chromium”, have been prepared by Ballman [1,2]. Knox [3] “found these compounds to belong to space group R32 and to be isostructural with huntite”. Mills published XRD data for the entire series of lanthanide huntites, as well as Yttrium compound [4]. Optical and dielectric properties of these compounds make them attractive for further studies. Among these, the $RE_xY_{1-x}Al_3(BO_3)_4$ borates offer good hosts for luminescence studies because of very low-concentration quenching. In context of solid state lasing applications, low-concentration quenching enables more intense luminescence and lower lasing thresholds. The low-concentration quenching is a consequence of relatively large separation ($\sim 6 \text{ \AA}$) between sites occupied by Y/lanthanide ions. Blasse et. al. studied fundamental luminescence properties of stoichiometric Eu [5] and Tb [6] compounds. $YAl_3[BO_3]_4$ is isostructural with $NdAl_3[BO_3]_4$ or huntite [7], $CaMg_3(CO_3)_4$, and belongs to “the symmetry group R32. The rhombohedral unit cell has the parameters $a = 9.288$, $c = 7.226 \text{ \AA}$, $Z = 3$ [8]. The coordination polyhedra of Y^{3+} , Al^{3+} , and B^{3+} are respectively trigonal prisms, octahedra, and triangles, formed by oxygen ions; the Al octahedra form spirals along the [001] axis, joined to isolated B triangles and Y prisms”. The compound $NdAl_3[BO_3]_4$ was rediscovered and the crystal structure was described by Hong and Dwight [9]. From luminescence measurements, it was predicted to be a good laser material.

The high-temperature forms of these borates have “the centrosymmetric monoclinic space groups: $C2/c$, $a = 7.262 \text{ \AA}$, $b = 9.365 \text{ \AA}$, $c = 11.138 \text{ \AA}$, $\beta = 103.41^\circ$, $Z = 4$ (high $YAl_3[BO_3]_4$) [10]; and $C2$, $a = 7.227 \text{ \AA}$, $b = 9.315 \text{ \AA}$, $c = 16.184 \text{ \AA}$, $\beta = 90.57^\circ$, $Z = 6$ (high $GdAl_3[BO_3]_4$) [11]. The phase transition temperature ranges for $YAl_3[BO_3]_4$ and $GdAl_3[BO_3]_4$ are 880–900 C and 1040–1050 C, respectively” [12].

Due to incongruent melting behavior of $YAl_3[BO_3]_4$ (1280 C) [13], the conventional crystals growth from melt is not possible, and

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Gamma degraded oligomeric nanochitosan for adsorptive removal of Cd(II)

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ABSTRACT

This study is the first ever report of application of gamma degraded nanochitosan biopolymer for the adsorptive removal of Cd(II) from aqueous systems. The viscosity studies revealed that the average molecular weight goes on decreasing with increase in gamma irradiation dose. The degraded products were subjected to characterization and were used for adsorption of Cd(II) in aqueous medium showing optimum adsorption capacity of 47.6 mg g⁻¹ at 10 kGy dose in nice accordance with Freundlich model of isotherm and followed pseudo-second order rate expression. The crystallite size of chitosan was found to reduce from 39.15 nm to 7.012 nm with 10 kGy dose.

1. Introduction

Waste water contaminated with heavy metal ions as pollutants need to be treated before their disposal into larger bodies. Various researchers have reported different techniques for the removal of metal toxicants (Bhavani et al., 2016). The use of adsorbents, especially the biopolymers, have attracted various workers in last decade due to their nature sources, abundance in existence and biocompatibility. Chitosan has shown great sorption capacity for numerous toxic metal cations due to presence of hydroxyl and amino groups (da Silva Alves et al., 2021). In general, native chitosan has very high molecular weight and hence a very high viscosity, low solubility in aqueous media limits its use in numerous applications. Oligomeric chitosan has low molecular weight and has shown to have better interaction with metal ions as compared to high molecular weight chitosan (Younis et al., 2019). The decrease in molecular weight can be brought about by various chemical and physical processes. An excellent tool among them is non-chemical gamma irradiation technique. Recently, we have shown application of gamma irradiation on adsorption enhancement of chitosan composite for defluoridation of water (Tandekar et al., 2020).

This paper reports degradation of chitosan through irradiation using ⁶⁰Co gamma source. Chain breakage led to formation of oligo-nanochitosan will increase with irradiation dosage (Mahmud et al., 2014). Also, the study measured the effect of gamma irradiation on molecular weight drop of chitosan biopolymer and examine the effect of high energy gamma treatment on its adsorption efficiency, Cd(II) was

selected as representative pollutant.

2. Materials and methods

All the chemicals and reagents were of Analytical grade. Solid chitosan with DDA 95% was procured from Meck chemicals, Ahmadabad, India while other chemicals were procured from SRL chemicals, India. Gamma irradiation of chitosan was carried out using Gamma Irradiation Chamber GC-1200 (Model: BRIT, India) at an activity of 9.5 kGy h⁻¹.

For functional group analysis, FT-IR spectra were recorded using Bruker Alpha spectrometer working in the range of 500–4000 cm⁻¹, averaging 23 scans, with ZnSe ATR crystal. SEM and EDX analysis simultaneously using TESCAN VEGA 3 SBH and (EDX) Diffractometer model Oxford INCA Energy 250 EDS. The XRD pattern was recorded using Rigaku Miniflex 300 and XPERT-PRO X-ray diffractometer using Cu K α radiation in the range of 1^o to 100^o. Thermal studies were carried out using DTG-60 (Shimadzu) thermogravimetric analyser working in nitrogen atmosphere at a flow rate of 100 mL min⁻¹ in a temperature range of ambient to 800 °C.

Batch adsorption studies were performed by taking required concentration of cadmium solution (25–500 mg L⁻¹) with variable pH (2.0 to 7.0). It was equilibrated with different dosages of adsorbent (50 to 500 mg) irradiated with different gamma doses (5 to 100 kGy) for different time (10 to 120 min). The solution was filtered and the concentration of Cd(II) was determined using differential pulse polarographic technique. The amount of Cd(II) adsorbed (mg g⁻¹) on the

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Fitness Center: An Automated System for Gym Notification with Client Attendance and Guidance System

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ABSTRACT

Many gym owners have paper receipts for the fees. It is very difficult for both the members and the trainer to keep all the paper receipts safe. Also it is difficult to manage all the client at a time and mark their attendance and provide exercises and diet plans. Some of the issues that arise when using an online application are: There are many people who are not able to use it due to various reasons. So, we are making an Android app which will help them. This project will allow the gym owner to manage all the receipts and also notify the users about their fees, mark their attendance by own, provide them proper diet plans as per the BMI and body type. Also this application will help them by providing exercise guidance clips. Gyms and workout studios often only focus on getting people to purchase year-long memberships. The holistic approach to the customer's well-being, be it physical exercise or mental state and motivation – is missing from most of the gyms.

Keywords: fitness centers, customer service, customer engagements

I. INTRODUCTION

There are plenty of fitness apps out there with strong focus on providing performance feedback, dietary suggestions or workout plans. Fitness apps can be helpful for individuals who don't mind the extra engagement with the app itself. Unfortunately, not many have the headspace to stay engaged with apps and consistently put in personal fitness information, diets or design workout plans. Analytics can help optimize personal performance but some users feel daunted by checking on analytics too often. Daily fluctuations in body weight and not improving performance of previous weeks can have a negative effect on the motivation.

More so we face a personalization issue with almost every fitness application. Dietary computations and performance indicators can be overstated or understated for users. The rising awareness around the importance of fitness is clearly not converting into an increased number of people joining your gym or fitness studio. Because usually after joining the gym, people often struggle to continue with their workout regime. Apart from lack of motivation, there is also, evidently, a clear lack of engagement between your workout center and the people you wish to convert into customers.

Creating a personalized experience which goals, educates them and motivates them is the need of the hour. And talking about a cost-effective solution for personalization, what's better than a gym chatbot! A chatbot in the fitness sector can help your customers stay loyal to their workout plan and in turn, to your brand.

A gym chatbot interacts with your users using a chat interface and solves their FAQs about your business and the services that you provide. Chatbots are integrated with websites or messaging apps to help businesses automate their regular tasks. These days, it is common to encounter a chatbot while booking flights, ordering food, approaching a company's customer support.

LITERATURE REVIEW

Physical fitness is not just one of the most becoming popular, with many fitness studios and gyms opting for them not only to enhance important keys to a healthy body, it is the foundation of dynamic and creative work "(Jahn F Kenedy). The first human anatomy keeps them at night free to move and our body needs movement. Sports talk has always been used for survival purposes, such as hunting, breeding, and providing shelter. As civilization began in sports of the body than modern humans (Cooper, 2013)

As time went on and physical activity Even in the industrial sector, after the first steam engine was developed and as traditional methods were already established with the people growing their own food, the average person still burns more calories than today. The era of technology has begun, exercise has declined for the average person but as more spectators have said there has been an increase in recreational Sports. Sports has reached a new level of participation.

Exercise had become a real option for all classes and levels of slow exercise began to rise again by the end of the 20th century. During this time, many people had the option of becoming an athlete. This began with the package agreement, having a personal trainer, eating a healthy diet and creating a socially acceptable health image.

HYBRID SWARM OPTIMIZATION OF DEVICE-TO-DEVICE RESOURCE AND POWER ALLOCATION USING MULTI-OBJECTIVE PARTICLE SWARM OPTIMIZATION

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Abstract

The rapid growth of users in cellular networks influences resource allocation and degrades the efficiency of cellular communication. Device-to-device communication is an emerging communication model for wireless communication without interfering with the resources of cellular networks, which provide direct communication to secondary users. Device-to-device communication explores the potential of the cellular network for emerging communication systems such as the Internet of Things and edge computing. In device-to-device communication, the major bottleneck problem is the management of resources and interference. The management of resources in device-to-device communication applied various optimization algorithms. Recently, several authors proposed swarm intelligence optimization of resources in communication systems. This paper proposes a novel resource optimization method based on particle swarm optimization. The proposed algorithm applies the multi-objective constraints function for the selection of resources in communication mode. The proposed MOPSO algorithm simulates and tests standard parameters in MATLAB environments. The performance of the proposed algorithm compares with existing resource allocation and optimization algorithms such as the genetic algorithm, ant colony optimization, and particle swarm optimization. The analysis of the results suggests that the proposed algorithm is better than existing algorithms for optimization.

Keywords: - Wireless communication, D2D, Resource allocation, Optimization, Swarm intelligence

Introduction

The increasing rate of wireless network traffic increases network overhead and decreases the efficiency and resource capacity of cellular networks. The emerging technology of communication systems offers high-speed data and reliable communication. the high-speed data and reliability of communication achieved by device-to-device communication [1-5]. Device-to-device communication allows for direct communication without interfering with cellular network base stations. through the D2D network effectively frequently involves solving difficult radio resource management (RRM) issues, including choosing between shared and dedicated modes, managing interference to and from CUEs (cellular user equipment), allocating channels, and managing power, to name a few. Traditional algorithms for the

DESIGN AND FABRICATION OF STAIR LIFT CHAIR

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Abstract This topic deals with the fabrication and analysis of a stair case lift, which can be used as Material Handling System. A stair case lift is a mechanical device for lifting people and wheelchairs up and down on the stairs, who may find difficulty in doing so themselves. For sufficiently wide stairs, a rail is mounted on the treads of the stairs. A chair or lifting platform is attached to the rail. A person on the chair or platform is lifted as the chair or platform moves along the rail, old age and goods are to be carried across the staircase. Stair case lift is a type of lift that can be mounted on the stair case without altering civil structure. This lift runs on electric power and consists of a motor, reduction gear box, rope drive, two rails a sliding chair. In this system we use DC motor for changing the polarity of the power supply which will make the motor run in reverse direction connected with the earlier, while the later will form the entire assembly run in downward direction, with the help of Toggle switches and push buttons. Advantages over the conventional hydraulic lift are no civil structure and alteration is required, low cost, less bulkiness, less power, less maintenance requires. Easy design, easy installations. Can be of industrial use too. Moreover, considering some drawbacks due to weight carrying capacity completely depend upon the capacity of motor. There is lot of scope for further modification in the project as using monorail instead of two. Use of belt drive or chain drive instead of rope drive. Incorporation and automation/ timer unit which will ease the use of device. Rack and carrier arrangement for using the device for curved stair case. Use of work & roller reduction gear assembly

Keywords: STAIR LIFT; CAD,CAM

I. INTRODUCTION

There are many old and physically disabled people in the world and it is difficult for them to climb stairs as compared to normal people. So to help them and to help the people who cannot afford a lift as their houses are small, the project is made. The most concern of this project is to fabricate a mechanism which will lift them up and put them down whenever they want and at a very low budget. A stair with an escalator is a mechanical device for lifting people up & down. A rail is mounted on the stairs on which a platform is attached. The platform is lifted by a simple mechanism of rope & pulley by which it is lifted. A person gets on the platform, is lifted when he/she switches on the plug, the motor starts, after that the shaft of the motor is connected to a gearbox (speed reducer) by the Oldham's coupling. The outlet shaft of the gearbox is connected to another Oldham's coupling which

transmits the power to the spindle to wind or unwind the rope.

Winding the rope will lift the platform up & unwinding will make the platform go down.

Hydraulic lifts use the principles of hydraulics (in the sense of hydraulic power) to pressurize an above-ground or in-ground piston to raise and lower the car. Roped hydraulics use a combination of both ropes and hydraulic power to raise and lower cars. Recent innovations include permanent magnet motors, machine room-less rail-mounted gearless machines, and microprocessor controls. The technology used in new installations depends on a variety of factors. Hydraulic lifts are cheaper, but installing cylinders greater than a certain length becomes impractical for very high lift hoist ways. For buildings of much over seven storeys, traction lifts must be employed instead. Hydraulic lifts are usually slower than traction lifts. Lifts are a candidate for mass customization. There are economies to be made from mass production of the components, but each building comes with its own requirements like different number of floors, dimensions of the well and usage patterns.

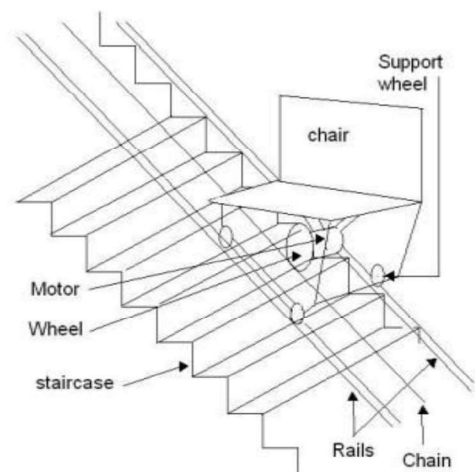





Fig. 1 Stair Case Lift

Study of synthesis and characterization of raw bagasse, its char and activated carbon prepared using chemical additive

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ABSTRACT

This paper reports the use of naturally available raw material as sugarcane bagasse (SB) to prepare cost-effective activated carbon. Activated carbon preparation from SB by using $ZnCl_2$ was carried out by chemical activation method. The raw bagasse, its char and activated carbon were characterized on the basis of iodine number, carbon, hydrogen, nitrogen analysis, Fourier-transform infrared spectroscopy (FTIR), scanning electron microscopy (SEM), thermogravimetric analysis (TGA) and Brunauer–Emmett–Teller (BET) surface area to check their effectiveness. During activated carbon synthesis, the impregnation ratio of SB and $ZnCl_2$ was maintained at 1:1–1:3 and activation temperature was in the range of 600–900 °C for 1 h. From the characterization study, the highest iodine adsorption of activated carbon was found to be 1140.69 mg/g with a 1:2 ratio at 900 °C whereas char gives an iodine number of 529.63 mg/g at the same temperature. The BET surface area of raw bagasse, its char and activated carbon (SB- Zn_2 -900) obtained was 4.30, 514.27 and 1386.58 m²/g, respectively, which shows charification and chemical activation improves surface area. The optimum ratio of impregnation and activation temperature was found to be 1:2 at 900 °C. In this work, activated carbon was successfully prepared and obtained product has better characteristics than previously reported studies.

Key words: activating agent, activation, agricultural waste, char, impregnation

HIGHLIGHTS

- Utilization of agricultural waste material for production of value-added material such as activated carbon.
- Minimizes the burden of solid waste management.
- Prepared activated carbon can be utilized for pollutant removal.
- Minimizes water pollution by adsorption.
- Can replace expensive commercial activated carbon.

1. INTRODUCTION

The role of the agricultural sector in human and economic development cannot be overemphasized. The impact of agricultural solid waste on human and animal well-being as well as on the environment is substantial, which is mainly due to ignorance during managing agricultural solid waste. A lot of lignocellulosic biomass is created every year causing environmental issues and hence, one can convert agro-waste into net worth products. This step can promote the utilization of sustainable raw materials in a proper way (Hon & Siraishi 2000; Obi *et al.* 2016).

Due to an incessant demand for commercial activated carbon (AC) for industrial applications, the market cost of commercial activated carbon reached \$1,100–1,500/tons. Hence, the preparation of activated carbon from cheap and easily available raw materials can make it cost-effective (Hock & Zaini 2018). One such agricultural waste is sugarcane bagasse (SB) which is used to synthesize biomass waste-based activated carbon in this study.