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Structural, optical, and electrical evolution of sol–gel-immersion grown nickel oxide nanosheet array films on aluminium doping

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Abstract
We developed aluminium (Al)-doped nickel oxide (NiO) nanosheet arrays film on the indium-doped tin oxide (ITO) substrate via sol–gel immersion method using nickel nitrate hexahydrate and aluminium nitrate nonahydrate as precursor and dopant materials, respectively. The Al-doping concentrations were varied from 0 to 2 at.%. Uniform Al-doped NiO nanosheet array films were observed on the substrate; the denser and smaller size of the NiO nanosheets were obtained at higher Al-doping concentrations. The growth mechanism was proposed. The crystallinity of Al-doped NiO nanosheet deteriorated at higher doping concentration. Meanwhile, the crystallite size, lattice parameter, and interplanar spacing were reduced with the doping quantity. The compressive strain, tensile stress, dislocation density, and band gap of the Al-doped NiO upsurged at higher doping concentration. The current–voltage measurement results revealed that the resistivity increased after the doping process up to 2 at.%. The Raman spectra showed that the doped samples exhibit blue-shift and decreased intensity of the Raman peaks.

1 Introduction

Nanostructured oxides such as zinc oxide (ZnO), titanium dioxide (TiO_2), niobium pentaoxide (Nb_2O_5) and nickel oxide (NiO) have been utilized in the several technical areas including solar cells, sensors, batteries, photocatalyst, and smart coatings [1–6]. These materials possess tremendous characteristics although in the pristine condition, and their characteristics could be further fine-tuned and enhanced based on different applications. Among these nanostructured metal oxides, NiO as a transition metal oxide provides huge potential for various applications including supercapacitor, sensors, and photocatalyst [7–9]. In addition, NiO has several potential applications particularly for packaging materials, batteries, wide-electromagnetic absorbers, and wastewater catalysts when composited with polymers and other metal oxides [10–14]. NiO belongs to p-type semiconductor category, which has wide band gap of 3.6 to 4.0 eV. NiO also has prominent electrical and electronic properties and outstanding chemical stability. However, as a p-type material, NiO properties and their characteristic tunings are still at the early stage to be understood as compared to the n-type materials, particularly for applications in electronic devices. Therefore, more systematic studies are required to produce NiO nanostructured with desired properties and perhaps these NiO nanostructures with enhanced performance could become alternative materials to n-type semiconductors for various applications in the near future.

To improve NiO characteristics, there are several effective approaches have been reported by other researchers to suit different applications. For example, NiO nanostructures have been constructed in numerous complex shapes

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Structural modification of ZnO nanorod array through Fe-doping: Ramification on UV and humidity sensing properties

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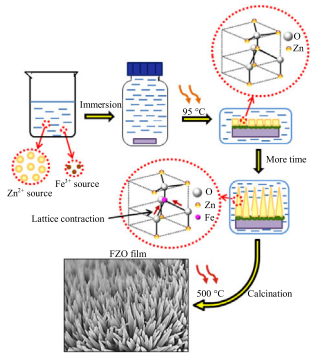
GRAPHICAL ABSTRACT



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ABSTRACT

Iron (Fe)-doped zinc oxide (ZnO) nanotip arrays (FZO) were prepared using low temperature sol–gel immersion method. The X-ray diffraction analysis reveals that the crystallite size reduces from 30.7 to 28.3 nm after doped with Fe. Besides, it is perceived that the lattice strain metamorphoses from tensile to compressive strain after doping with value of -0.23%. Field emission scanning electron microscopy images show that the Fe doping induced a significant modification to the ZnO structure; transforming the structure from rod-like to tip-like structure. The current–voltage measurement results indicate that the FZO film has good electrical properties with resistance value of 12.34 MΩ. The FZO is also capable of performing well as UV and humidity sensors. This study points out that FZO films are suitable for multifunctional uses particularly for UV and humidity sensing.

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1. Introduction

In the new global economy, zinc oxide (ZnO) has become a central issue for the development of facile, low cost, and outstanding quality of semiconducting devices [1]. Extensive research have shown that the ZnO materials are applicable for wide range of applications including sensors, solar cells, light emitting diodes,

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RESEARCH ARTICLE

Novel D SRR-based dual band antenna for WiMAX/C applications

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Abstract

A novel miniaturized D shape split ring resonator (SRR) antenna is proposed for dual band (3.6 GHz and 4.7 GHz) applications. This proposed antenna structure has dimensions of 18 × 20 × 0.8 mm^3 which is built on FR4 dielectric constant (ε_r=4.4). This antenna consists of top and bottom side dual SRR creating dual band resonant frequency which is excited from microstrip line as monopole and slotted partial ground plane for better impedance matching. The microstrip line (monopole) is creating a resonance frequency at 4.7 GHz and the SRR is responsible for creating resonance frequency at the frequency of 3.6 GHz. The parametric study of microstrip line and the position of SRR has been analyzed. The D shape SRR in the monopole is generating another resonating frequency at 3.6 GHz. The metamaterial property of proposed D shape SRR is also verified to validate the resonance frequency. The antenna radiation measurement is carried out in Antenna Research Centre (ARC) FKE, Universiti Teknologi MARA, Malaysia. Both simulated and measured results agreed well. Measured gain achieved with this dual band antenna is around 2-3 dB.

KEYWORDS

D SRR, dual band, microstrip line, miniaturization, monopole

1 | INTRODUCTION

The wireless and mobile devices support multiple radio frequency bands, for that a single antenna has to operate dual or multi band frequencies to reduce its cost and size. The main consideration of any antenna design is that it should occupy less space and the number of components is also to be reduced which may lead to unwanted coupling and other disturbances. For that reason if an antenna is working in dual band then it reduces the usage of separate antenna for the other frequencies. To achieve dual band, different types of antenna designs have been proposed.[1–10] Due to low cost, light weight, and ease of integration, microstrip patch antennas are preferred in many microwave applications. However, there is demand on the reduction of antenna size in particular applications such as some military and commercial wireless communication systems where the system size and profile are a constraint. Over the past few years, significant amount of work has been done to reduce the size of the patch antennas. One of the traditional methods is to use materials with high permittivity which yields a size reduction up to 30%-50%. However, high permittivity substrates lead to high cost and suffer from surface waves which degrade the radiation characteristics of the antenna by increasing significant amount of side lobes. To suppress the surface waves, a number of techniques are proposed. In Ref. 1, the dual band is designed and analyzed in a rectangular printed monopole antenna which used slits and truncated technique; Meander T shape slot antenna, inverted U shape. In Ref. 2, array of square CSRR is etched from ground plane in a conventional patch antenna. Inverted F-micro strip antenna is a kind of dual band which is operated at 2.4 GHz and 5 GHz embedded in L shape slots. In Refs. 3,4, the antenna is designed for about 2.4 GHz-5.2 GHz central frequency which is done by using inverted L shape modified in normal patch antenna. In Ref. 7, the antenna utilizes an H-shape defected ground structure; in Ref. 8, feeding two different length resonant paths with a 50 Ω microstrip line. In Ref. 6,5, the antenna is optimized for dual band by using metamaterial structures such as, circular, hexagonal CSRR, and SRR which exhibits negative permittivity and permeability.

In this work, a D shape SRR based microstrip line monopole antenna is proposed for WiMax (3.45 GHz-3.7 GHz) and C band (4.86 GHz-4.63 GHz) applications.

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Direct and seedless growth of Nickel Oxide nanosheet architectures on ITO using a novel solution immersion method

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Highlights

- Direct growth of NiO nanosheets arrays on ITO glass using solution immersion method.
- The NiO nanosheet arrays film have good structural and optical properties.
- The grown NiO nanosheet arrays show promising results for liquid ethanol sensing.

Abstract

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Low-temperature-dependent growth of titanium dioxide nanorod arrays in an improved aqueous chemical growth method for photoelectrochemical ultraviolet sensing

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Abstract
The growth of titanium dioxide nanorod arrays (TNAs) in aqueous solutions containing titanium butoxide and hydrochloric acid can be controlled by regulating the temperature from 115 to 150 °C as an adjustable physical parameter. The transparent colloidal solution of titanates is clouded on the basic growth of TNAs when heated at a certain temperature using an improved aqueous chemical growth method in a clamped Schott bottle. The structural, optical and electrical properties of grown TNAs films were thoroughly investigated and discussed. The distinct and high-intensity peaks observed in the X-ray diffraction pattern and Raman spectra of the grown TNAs show the rutile phase with high crystal quality. The crystallite size, diameter size, and thickness of TNAs decrease with decreasing growth temperature. The prepared TNAs were used to detect 365 nm ultraviolet (UV) photon energy (750 μW/cm^2) in a photoelectrochemical cell structure with a maximum photocurrent of 26.31 μA and minimum photocurrent of 3.48 μA recorded for TNAs grown at 150 °C and 115 °C, respectively. The size, structural properties, charge transfer resistance, and electron lifetime play a key role in determining the UV sensing characteristics of the TNAs. Results show that TNAs are very promising in fabricating a UV sensor with a high response at 0 V bias even at a low growth temperature of 115 °C.

1 Introduction

Titanium dioxide (TiO_2) is an expedient semiconducting material for extensive applications due to the ease with which it can be utilized to form nanostructures as well as its outstanding electrical properties, such as a wide band-gap and large excitation binding energy [1–3]. The TiO_2 nanostructure possesses a high surface-to-volume ratio to form active sites for inducing the sensing mechanism. The ratio also inflicts nanoconfinement effects on the liquid molecules, which may uphold or overturn the surface reactions [4, 5]. In recent years, the aspect of nanoconfinement on photoelectrochemical cell (PEC) reactions in nanorod structures have been studied in terms of photocurrent transportation and electrolyte molecules [6–11]. A previous study has also suggested that the characteristics of nanoconfined electrolyte molecules diverge significantly than in their bulk counterpart as a result of interfacial reactions at the surface of TiO_2 nanorod structure [12–16]. Although the nanoporous structure offers a high surface-to-volume ratio, the transportation mechanism of charge carriers is not in favour due to the formation of multiple paths and electron traps between

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REVIEW

Flexible, biodegradable and recyclable solar cells: a review

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Abstract
Solar energy is conceivably the largest source of renewable energy at our disposal, but vital advances are expected to make solar cells economically viable. Biodegradable and flexible solar cells are currently under extensive investigation for environmentally-friendly electronic applications. Biomaterials based solar cell is emerging due to their sustainable, scalable, abundant, renewable, and environmentally-friendly energy production. This review highlights recent research progress in the emerging group of biomaterials and their integration for flexible solar cell devices. The more emphasis is given to the absolute recyclable solar cell technology, processing conditions and optimized processing conditions to produce a high amount of energy. This review briefly describes the recent progress in these classes of material, covering substrates and semiconductors. A prominent demand still exists for a next-generation of flexible, biodegradable and biocompatible solar cell substrate for ultimate energy generation application.

1 Introduction

The sustainability of life on earth owes its existence to the radiant energy received from the sun. The radiant (solar) energy acts as an energy supplier in almost all natural processes in addition to earth's surface temperature determination. The strong motivation behind the use of solar energy pertains to pollution reduction caused due to energy generation utilizing degradable fuels. The solar energy has the potential of being prevalent biodegradable energy source viable for use [1]. The main requirement, however, tends towards the technological advances pertaining to cost reduction, eco-friendly nature and flexibility. As it is known that radiant energy from the sun forms cleanest energy source which can be converted into another desired form of energy. One such widely known conversion of solar energy is into the electrical energy by means of solar cells. The utilization of light energy from sun offers one of the encouraging options to deal with today's energy issues. The solar cells operate on the principle of direct conversion of radiant energy from the sun into electrical energy by incorporating electronic properties of some semiconductors [2]. Solar cells are based on the photovoltaic effect reported by Edmond Becquerel 1839 while observing light dependent voltage between electrodes submerged in an electrolyte [3]. The advances in the development of solar cells began in the 18th century and continue to date. There have been various phases of developments regarding solar cells beginning from observation of photovoltaic effect, development of materials exhibiting photovoltaic effect, the discovery of photoelectric effect, development of solar energy conversion apparatus followed by implementation of such units at large scale.

The photovoltaic based conversion of solar energy can be attained by various materials exhibiting different efficiencies. However, so far no single material or material combination concerned with photovoltaic conversion stands in competition with large-scale energy generation amassed by

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Material Properties

Electromagnetic interference shielding properties of polyvinylchloride (PVC), barium titanate ($BaTiO_3$) and nickel oxide (NiO) based nanocomposites

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ABSTRACT

Polyvinylchloride/barium titanate/nickel oxide (PVC/$BaTiO_3$/NiO) nanocomposite films were prepared by solvent casting method and their electromagnetic interference (EMI) shielding effectiveness (SE) was investigated with respect to variable nanofiller loadings. The X-ray diffraction (XRD), Fourier transform infrared spectroscopy (FTIR) and scanning electron microscopy (SEM) studies were carried out to ascertain surface morphology, functional groups and dispersion state of the nanofillers in the nanocomposites. The interfacial interaction between PVC, $BaTiO_3$ and NiO at different nanofiller loadings was evident from FTIR analysis while SEM micrographs show uniform dispersion of nanofillers in the polymer matrix. The EMI SE of PVC/$BaTiO_3$/NiO nanocomposites in the frequency range 12 GHz–18 GHz (Ku-band) were investigated using vector network analyzer. The EMI SE studies revealed the impact of nanofiller addition on the conductivity and the EMI SE of the nanocomposites yielding maximum EMI SE of −18.7 dB.

1. Introduction

The conductive polymer based composites are considered as the key materials for applications in various fields including energy storage, optoelectronic devices, antistatic packing, plastic welding and electromagnetic shielding [1–3]. These applications are as a consequence of their low cost, elasticity, insubstantial weight, corrosion resistance along with ease of large-scale production [4]. Due to diversity in the field of electronics especially related to telecommunication and high-speed communication systems, the requirement of higher frequency for operation and bandwidth in these devices raises anxiety regarding descent in the radio wave region called as electromagnetic interference (EMI) [5]. This descent produces consequences on the working of electronic devices like operational malfunction owing to interaction with undesired electromagnetic waves and information leakage in wireless telecommunications [6]. To avoid such incidents and to retain electromagnetic compatibility of the electronic device, the EMI shielding materials are obligatory.

The EMI shielding materials possess the ability to sustain the ideal working conditions for electronic devices [7]. The EMI shielding materials work as safeguard materials against unwanted radiations, thereby reflecting or absorbing the electromagnetic radiations [8]. The metals or metallic based composites due to their better electrical conductivity are mainly used for EMI shielding purpose. However, the metal and metallic composites experience limitations due to their chemical resistance, radiation leakage, oxidation, corrosion and processing difficulty [9]. The limitation in chemical resistance can be negotiated by using polymers which have better chemical resistance than metals [10]. While the other limiting factors can be interceded by incorporation of nanofillers [11]. Contrary to that, the addition of another compound besides polymer and nanofiller causes no effects on the basic properties of polymer including chemical resistance and strength [12]. The conductive polymer-nanofiller based nanocomposites provide cheap, lightweight, corrosion resistant, high electrically conductive and mechanically strong materials which are ideal for EMI shielding applications [13].

Polymer nanocomposites based materials comprising of polymers and nanofiller possess the ability to significantly reduce the radiation leakage [14]. The polymer matrix apart from being chemically sound suffers from poor mechanical strength. Therefore the addition of nanofillers or other conductive materials with the polymer enhances the mechanical strength as well as the EMI shielding properties of the

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RESEARCH ARTICLE

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Subcellular compartmentalization of glutathione peroxidase 1 allelic isoforms differentially impact parameters of energy metabolism

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Abstract

Specific genetic variations in the gene for the selenium-containing antioxidant protein glutathione peroxidase 1 (GPX1) are associated with the risk of a variety of common diseases, including cancer, diabetes, and cardiovascular disorders. Two common variations have been focused upon, one resulting in leucine or proline at codon 198 and another resulting in 5, 6, or 7 alanine repeats were previously shown to affect the distribution of GPX1 between the cytoplasm and mitochondria. Human MCF7 cells engineered to exclusively express GPX1 with five alanine repeats at amino terminus and proline at codon 198 (A5P) and seven alanine repeats at amino terminus and leucine at codon 198 (A7L), as well as derivatives targeted to the mitochondria by the addition of a mitochondrial localization sequence (mA5P and mA7L) were used to assess the consequences of the expression of these proteins on the cellular redox state and bioenergetics. Ectopic expression of A5P and A7L reduced the levels of reactive oxygen species, and the mitochondrially targeted derivatives exhibited better activity in these assays. Bioenergetics and mitochondrial integrity were assessed by measuring mitochondrial membrane potential, oxygen consumption, adenosine triphosphate (ATP) levels, and the levels of lactate dehydrogenase. The results of these assays indicated distinctively, and sometimes opposing, patterns with regard to differences between the consequences of the expression of A5P, A7L, mA5P, and mA7L. These data provide new information on the consequences of differences in the primary structure and cellular location of GPX1 proteins and contribute to the understanding of how these effects might contribute to human disease.

KEYWORDS

glutathione peroxidase (GPX), gene polymorphisms, mitochondria, oxidative stress, respiration

1 | INTRODUCTION

Glutathione peroxidases (GPXs) are antioxidant enzymes that detoxify hydrogen peroxide (H_2O_2) or lipid hydroperoxides using reducing equivalents obtained from glutathione.[1] One member of this family is GPX1, a selenocysteine-containing enzyme expressed in most tissues and cell types, being present in both the cytoplasm and mitochondria.[2] Lower levels of GPX1 have generally been associated with increased cancer risk although this association is not absolute [reviewed in reference[1]]. We have previously reported on a positive correlation

Md Aashique and Soumen Bera contributed equally to this study.

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Biotic and abiotic substrates for enhancing Acinetobacter baumannii biofilm formation: New approach using extracellular matrix and slanted coverslip technique.

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Abstract

Acinetobacter baumannii has been well recognized as a problematic human pathogen and several reports has shown the incidence of multidrug and pandrug-resistant A. baumannii strains in infirmary infections. A. baumannii grows only on an air-liquid interface and does not form a contiguous biofilm. Extracellular matrices (ECM) and slanted glass coverslips are (SGC) used as biofilm substrates and biofilms have been investigated by SEM, confocal and crystal violet staining. ECM has shown enhanced biofilm formation under dynamic conditions rather than static conditions. SGC biofilm yield assay has shown higher levels of continuous layers and packed thicker biofilm formation with glass coverslip inserts, up to 1.7 to 3 times higher biofilm formation, than when compared with no glass coverslip inserts. A media immersed ECM study revealed that biofilm grown on extracellular matrixes formed thread-like pili structures, and that these structures had contact with the ECM and also showed excellent cell-to-cell interaction. In summary, A. baumannii showed higher biofilm formation capacities with ECM, while the prominent results were directly related with the biofilm formation capacity of A. baumannii. For the initial step of biofilm formation, adherence is an important factor and, consequently, strains with a comparatively high capability to adhere to extracellular matrices and slanted glass coverslips provide a new method of enhanced biofilm growth for in vitro assays. ECM can be used as a substrate for immersed biofilm formation studies and the SGC method for air-liquid interface exposed biofilm formation studies, and these substrates can provide better biofilm growth and easy handling for in vitro adherence and biofilm assays.

KEYWORDS: Acinetobacter baumannii; biofilm growth; biofilm substrates; extracellular matrix

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Effect of water depth on a novel absorber plate of pyramid solar still coated with TiO_2 nano black paint

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Abstract

In this study, the absorber plate of a new pyramidal basin type solar still is coated with TiO_2 nanoparticles doped in black paint on the basin to analyze the performance under the various depth of water. Water depth is varied from 1 cm till 3.5 cm on a basin area of 0.25 m^2 which is almost equal to the area of the glass cover. Instead of using other sensible storing materials inside the basin which probably increase the weight, a novel solar still with the absorber plate coated with TiO_2 nanoparticle mixed with black paint to improve the performance. Experimental results revealed that the use of TiO_2 nanoparticle in black paint improved the water temperature by 1.5 °C than that of absorber without nanoparticle. Similarly, the yield improved during the sunshine hours rather than the off shine hours. With increased depth of water in the basin, the water temperature is minimum which simultaneously resulted in the lower yield on absorber without coating whereas the yield from the still improved by 12% at maximum water depth using coated absorber plate. The accumulated yield from the solar still absorber plate with and without coating was found to be 6.6 and 6.2 kg/m^2 respectively at 1 cm water depth. TiO_2 nano black paint coated pyramid solar still improves the distilled yield by 6.1% as compared to the conventional basin type pyramid solar still. Similarly, the values of instantaneous efficiency based on operational and climatic parameters using linear and non-linear were

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An investigation of chemical composition and antimicrobial activity of essential oils extracted from *Aeollanthus and Plectranthus* species

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ABSTRACT

Essential oils from plants represent a rich source of new antimicrobials that are able to overcome the microbial virulence. The present study was designed to determine the chemical compositions and assess antimicrobial potentials of essential oils derived from *Aeollanthus cucullathus* (Ryding), *Aeollanthus heliotropioides* (Oliv.) and *Plectranthus glandulosus* (Hook. F.) against *Candida* species biofilm formation. Essential oils were extracted using hydrodistillation followed by the chemical composition determination using gas chromatography coupled with mass spectrometry (GC-MS). The minimum inhibitory concentration (MIC) was determined using a microdilution method. Then, the antibiofilm assay was performed in two stages; germ tubes and mature biofilm formation by a micro biofilm inhibition assay. Extraction yields were 0.0001%; 0.07% and 0.04%, respectively for *Aeollanthhus cucullathus* (ACap), *Aeollanthus heliotropioides* (AHap) and *Plectranthus glandulosus* (PGl) essential oils (EOs). The chemical analysis revealed the presence of naphthalene, 1,2,3,4,4a,5,6,8a-octahydro-4a,8-dimethyl-2-(1-methylet henyl)-, [2R-(2.alpha.,4a.alpha.,8 a.beta.)]- (6.71%), caryophyllene oxide (5.12%), 2-Isopropyl-5-methyl-9-methylenebicyclo[4.4.0]dec-1-ene (4.95%) in ACap EOs; linalool (25.67%), farnesene (13.20%), caryophyllene (6.02%) in AHap EOs and germacrene D (9.90%), (E)-3-hexenyl butyrate (9.30%), L-fenchone (8.75%) in PGl EOs. MIC values ranged from 0.31 mg/mL to 5 mg/mL respectively for AHap and PGl EOs. The inhibition of pseudo-hyphae formation revealed an activity up to 0.03 mg/mL for AHap EO on *C. albicans*. All the EOs inhibited the mature biofilm formation at subinhibitory concentrations. This study highlighted the possible uses of *A. heliotropioides, A. cucculathus* and *P. glandulosus* for therapeutic agent's development.

1. Introduction

The impact of fungal infections is increasing with the number of immunocompromised people, especially those living with HIV (Binder and Lass-Flörl, 2011; Ortega et al., 2011; Vandeputte et al., 2012). The rate of HIV/AIDS infected people is higher in Sub-Saharan Africa than the other world regions, which makes such population more vulnerable to opportunistic candidiasis (Unaids and Who, 2009). *Candida albicans* (*C. albicans*) induces more than 60% of infections, which leads to 40% of death despite the use of conventional drugs (Mensa et

Abbreviations: ACap, Aeollanthhus cucullathus, AHap, Aeollanthus heliotropioides, PGl, Plectranthus glandulosus, EOs, Essential oils, MIC, Minimum Inhibitory Concentration

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RESEARCH ARTICLE

Fungal-mediated synthesis of pharmaceutically active silver nanoparticles and anticancer property against A549 cells through apoptosis

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Abstract

Generally, fungi have the ability to secrete large amounts of secondary metabolites which have the ability to reduce metal ions to metallic nanoparticles. In this report, silver nanoparticles (AgNPs) were synthesized by using an endophytic fungus isolated from the medicinal plant, *Catharanthus roseus* (Linn.). The endophytic fungus was identified as *Botryosphaeria rhodina* based on the ITS sequencing. The synthesized AgNPs were characterized by adopting various high-throughput techniques, scanning electron microscopy (SEM) equipped with energy dispersive X-ray analysis (EDAX), high-resolution transmission electron microscopy (HR-TEM) and UV–Visible spectrophotometer. In vitro anticancer efficacy of AgNPs was tested on A-549 cells. The synthesized AgNPs were effective in scavenging free radicals and induced hallmarks of apoptosis including nuclear and DNA fragmentation in lung (A549) cancer cell lines under in vitro conditions. The results suggested that the natural biomolecules in the endophytic fungi incorporated into the nanoparticles could be responsible for the synergetic cytotoxic activity against cancer cells. The AgNPs were found to have cytotoxicity IC_{50} of 40 μg/mL against A549 cells. To the best our knowledge, this is the first report demonstrating that AgNPs from *Botryosphaeria rhodina* could be able to induce apoptosis in various types of cancer cells as a novel strategy for cancer treatment.

Keywords *Botryosphaeria rhodina* · Silver nanoparticles (AgNPs) · FTIR · SEM · TEM · Antioxidant activity · Anticancer activity

Introduction

Nanotechnology has been fast flourishing in the field of medicine for the past two decades (Barar 2015). Nanotechnology also plays an important role in biohydrogen production (Pugazhendhi et al. 2019). Silver has been increasingly used in the medicinal field, ranging from topical applications to surgical incisions (Jain et al. 2006; Zhihong et al. 2010). It has been found to have strong antimicrobial and bactericidal properties, where they bind to the membrane and interact with certain proteins. Silver nanoparticles (AgNPs) can be obtained through physical, chemical and biological methods (Ge et al. 2014). Green synthesis is found to produce nanoparticles that are relatively more stable, because it only uses natural phytochemicals and biological sources such as proteins, bacteria, algae, fungi and plants, for the synthesis (MubarakAli et al. 2011a, b ,c; 2012; Gopinath et al. 2012a, b). Plant extracts act as both reducing and capping agents, which enable the size-controlled synthesis of nanoparticles (MubarakAli et al. 2011a, b ,c). It was found that physical and chemical methods of synthesis have limitations such as the temperature, pH, less productivity, use of toxic chemicals and requires too much energy. These limitations provoked the biomedical researchers to find an alternative cheap, eco-friendly and high-yield

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Synthesis of Biocompatible Cellulose-Coated Nanoceria with pH-Dependent Antioxidant Property

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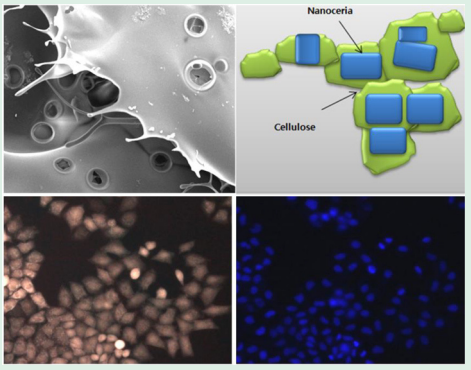
Supporting Information

ABSTRACT: Recent developments in nanomedicine have validated nanoceria as an antioxidant of therapeutic potential. However, its clinical application is far too limited in view of its poor stability *in vivo* and the use of hazardous solvents during its synthesis. There is a pertinent need for development of improved strategies for nanoceria to work better, especially by complexation with a matrix to improve upon its antioxidant property without toxicity. In the present study, cellulose has been used as a matrix of nanobiocomposite in which nanoceria are embedded, adopting solution plasma process (SPP). This resulted in cellulose-nanoceria(C/nanoceria) biocomposite by plasma reactions for 15 min using cellulose powder and $Ce(NO_3)_2$. Three-dimensional scaffold of the C/nanoceria biocomposite was prepared by lyophilization. The biocomposite was characterized adopting UV−vis spectroscopy, FTIR, FESEM equipped with EDS, and HRTEM analysis. The cubical nanoceria, in the size range 3.2−32 nm, were successfully internalized in the cellulose nanomatrix without agglomeration and exhibited excellent antioxidant property in pH-dependent manner. The nanobiocomposite is not cytotoxic to HeLa cell at a concentration as high as >1 mg.mL^{-1} as revealed in the cytotoxicity assay. Thus, we describe for the first time synthesis of C/nanoceria, in a manner that is green and sustainable, which has potential in external clinical applications as an effective antioxidative green material for scavenging reactive oxygen species.



KEYWORDS: *solution plasma process, cellulose, nanoceria, nanobiocomposite, antioxidant property*

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1. INTRODUCTION

Advanced nanoengineering techniques that enable synthesis of nanomaterials and their utilization for human welfare are subjects of great interest. In recent times, nanomedicine is becoming a crucial area of biomedical research, particularly as a tool for preventing neuro-degenerative diseases.[1,2] In this context, cerium (Ce) has attracted attention in view of its interchangeable electronic structure. The energy at the inner 4f level of CeO_2 is the same as that in the outer electrons. Further, little energy is required to change the electronic level. It has been reported that insertion of O_2 brings about reduction in the size and increase in surface area, that renders the particle a highly effective antioxidant.[3,4] The unique chemical and physical characteristics make nanoceria useful in industrial applications such as optics,[5] catalysis,[6] sensors,[7] sunscreens, and coatings.[8] Among several properties, nanoceria are an outstanding biomaterial that combats oxidative stress (OS) in the cell. The reactive oxygen species generated in excess of what could be dealt with by the scavengers of ROS trigger the OS.[9] Prolonged oxidative stress leads to cellular damage and eventually neurodegenerative diseases.

Nanoceria is an alternative free radical scavenger in view of its size tunability, biocompatibility, and membrane permeability.[10,11] Especially, nanoceria with Ce^{3+} and Ce^{4+} take to catalase-mimetic and superoxide dismutase activities in the cell.[10−12] Currently, the biomedical applications of nanoceria

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Biosynthesis and characterization of copper oxide nanoparticles from indigenous fungi and its effect of photothermolysis on human lung carcinoma

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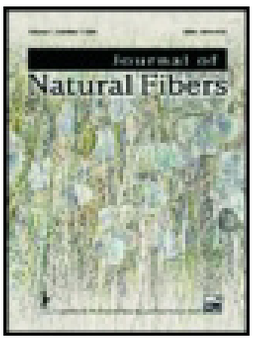
Highlights

- CuO NPs were synthesized from aqueous extracts of *Trichoderma* sp.
- High through-put techniques were adopted for characterization of CuO NPs.
- The synthesized CuO NPs found to have photothermolysis of A549 cancer cells.

Abstract

In this report, copper oxide nanoparticles (TA-CuO NPs) were synthesized using cell-free extract of *Trichoderma asperellum* and assessed their photothermal induced anticancerous activity. The fungal mediated TA-CuO NPs was



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The Hybrid Effect of Jute/Kenaf/E-Glass Woven Fabric Epoxy Composites for Medium Load Applications: Impact, Inter-Laminar Strength, and Failure Surface Characterization

M. R. Sanjay, G. R. Arpitha, P. Senthamaraikannan, M. Kathiresan, M. A. Saibalaji & B. Yogesha

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Review

Synthesis, optimization and applications of ZnO/polymer nanocomposites

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ARTICLE INFO

Keywords:
ZnO/polymer composites
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ABSTRACT

Polymer composites have established an excellent position among the technologically essential materials because of their wide range of applications. An enormous research interest has been devoted to zinc oxide (ZnO) based polymer nanocomposites, due to their exceptional electrical, optical, thermal, mechanical, catalytic, and biomedical properties. This article provides a review of various polymer composites consisting of ZnO nanoparticles (NPs) as reinforcements, exhibiting excellent properties for applications such as the dielectric, sensing, piezoelectric, electromagnetic shielding, thermal conductivity and energy storage. The preparation methods of such composites including solution blending, in situ polymerization, and melt intercalation are also explained. The current challenges and potential applications of these composites are provided in order to guide future progress on the development of more promising materials. Finally, a detailed summary of the current trends in the field is presented to progressively show the future prospects for the development of ZnO containing polymer nanocomposite materials.

1. Introduction

In recent years, the interest in the study of polymer composite system has been continuously growing due to their various potential applications in sensors [1–4], dielectrics [5–11], biomedical field [12], food packaging [13], bioplastics [14], and coatings [15,16]. The researchers suggested that the addition of inorganic nanofillers into polymers results in improved polymer properties that greatly differ from the properties of conventional polymers [17–23]. It has been revealed that the NPs significantly influence the properties of base polymers when they are introduced into it to generate, a nanocomposite [24–29]. Polymer nanocomposite is defined as a multicomponent system containing minor constituents (fillers) of < ~100 nm size in at least one dimension [30–32]. Nanofillers act as smart dopants to polymers due to their large surface area resulting from the very high aspect ratio. Moreover, they exhibit fascinating improvements in properties accompanied by quantum confinement effects, making their reinforcement with diverse polymers, a subject of current attention [33,34]. Moreover, hybrid nanocomposites containing different nanomaterial dopants as inorganic-organic components within the polymer are also reported [27]. Some of the most important inorganic metal oxide nanofillers reported in the literature are TiO_2, Al_2O_3, SiO_2, AlN, BN, ZnO etc. [35–38], among which the ZnO is the subject of the present survey.

ZnO can be synthesized in different nanostructural forms such as nanorods, nanowires, NPs, and tetrapods. ZnO is a multifunctional n-type (II-V) semiconductor with a wide band gap (3.4 eV), large exciton binding energy (60 meV), effective ultraviolet absorbance and good

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Dielectric properties of polyvinyl alcohol (PVA) nanocomposites filled with green synthesized zinc sulphide (ZnS) nanoparticles

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Abstract
In this study, zinc sulphide nanoparticles (ZnS NPs) have been synthesized by green synthesis approach. These ZnS NPs were used as nanofiller to fabricate polyvinyl alcohol (PVA) based nanocomposite films via solution casting method. The PVA/ZnS nanocomposite films have been characterized by X-ray diffraction, Fourier transform infrared spectroscopy, field emission scanning electron microscopy, atomic force microscopy and thermogravimetric analysis. The results from these characterization techniques evidenced the improvement in structural, morphological and thermal properties of PVA/ZnS nanocomposite films and also confirmed the incorporation of ZnS NPs in the PVA matrix. In addition to that, the dielectric properties of the PVA/ZnS nanocomposite films were investigated for different frequencies (50 Hz–1 MHz) and temperatures (40–140 °C) using an impedance analyzer. The values of dielectric constant and dielectric loss of PVA/ZnS nanocomposite films were observed to be 328.93 (50 Hz, 140 °C) and 6.02 (50 Hz, 140 °C) with 3 wt% ZnS NPs content. This enhancement in dielectric properties demonstrated the good interaction between ZnS NPs and PVA matrix. The aforementioned results evidenced that the ZnS NPs were homogeneously distributed within the PVA matrix.

1 Introduction

Generally, the properties of the polymers are modified by adding nanofillers into the polymer matrix [1–6]. The properties of polymer nanocomposites (PNCs) depend mostly on the particle size, shape, concentration and the method in which the nanofillers are dispersed [7–9]. Further, much attention has been given to the PNCs due to their unique properties which are able to be attained by means of these materials. Polymers can be selected as excellent host materials for the nanoparticles (NPs), which show the outstanding properties [10]. Due to high surface to- volume ratio, the NPs impressively enhance the properties of PNCs as compared with that of pure polymers [11–13]. Among various synthetic polymers, polyvinyl alcohol (PVA) has been extensively used as a host polymer for different kinds of nanofillers [10] to fabricate PNCs due to its easy processability, biocompatibility, excellent film forming character, hydrophilicity, good chemical resistance, low cost, excellent solubility in water, non-toxicity, biodegradability, transmittance, noncorrosive nature and availability with diverse molecular weights [14–16]. PVA possesses excellent charge storing capacity, good thermal, chemical, and mechanical stability, better environmental stability and high dielectric strength. PVA has been used widely in various applications such as artificial biomedical devices, electronic devices, drug delivery systems, membrane applications, electrochromic devices, paper coating, packaging and textile applications [17–20]. Furthermore, PVA has a carbon backbone consisting of hydroxyl groups that can be a source for hydrogen bonding interaction between the nanofiller facilitating the formation of PVA based nanocomposites. Due to these

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RESEARCH ARTICLE

WILEY INTERNATIONAL JOURNAL OF ENERGY RESEARCH

Experimental investigation on the effect of MgO and TiO_2 nanoparticles in stepped solar still

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Summary

This work aims at augmenting the amount of potable water using MgO and TiO_2 in stepped solar still. Experiments were carried out for the climatic conditions of Chennai, India, with two different concentrations of nanofluids inside a stepped basin under three different cases. Results show that there is an improvement in yield of fresh water from stepped solar still by 33.18% and 41.05% using 0.1% and 0.2% volume concentration of TiO_2 nanofluid, respectively, whereas the freshwater yield from stepped still with MgO nanofluids improved by 51.7% and 61.89%. Furthermore, the economic analysis revealed that the cost of potable water from the modified solar still reduced from 0.029 to 0.016 $/kg. Similarly, the useful annual energy, yearly cost per kilogram, and annual cost per kilowatt hour are significantly profitable with the use of MgO nanofluid in the stepped basin and found as 512.46 kWh, 0.025 $/kg, and 0.026 $/kWh, respectively. It is also found that the cost of potable water from the modified still significantly increases as the amount of fresh water produced is decreased with increased fabrication cost of the solar still.

KEYWORDS

augmentation, concentration, economic analysis, nanoparticles, stepped solar still

Nomenclature: CRF, capital recovery factor; FC, first cost (cost on first/principle investment); $h_{c,\ w-g}$, convective heat transfer coefficient (CHTC) between water and the inner cover surface; $h_{e,\ w-g}$, evaporative heat transfer coefficient (EHTC) between water and an inner cover surface; n, a life of solar still (year); P_{gi}, partial pressure inner glass cover (°C)P_w, partial pressure of water (°C); r, rate of interest (%); T_{gi}, temperature of inner glass cover (°C); T_w, temperature of water (°C)

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ACCEPTED MANUSCRIPT

Fuel Waste to Fluorescent Carbon Dots and Its Multifarious Applications

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Graphical Abstract

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Solution plasma process: An option to degrade bisphenol A in liquid-phase to non-toxic products

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ABSTRACT

Bisphenol A (BPA) is a potential endocrine disruptor. It causes hormonal imbalances and also affects aquatic organisms when discharged in untreated form into the ecosystems. Many attempts have been made to degrade BPA in the liquid phase using chemical and or biological methods, which often require multiple steps and are not effective to any great extent. In this study, solution plasma process (SPP) was adopted for the degradation of BPA in liquid phase. BPA at a constant concentration (100 mg·mL^{-1}) was degraded using SPP at various of discharge times (0–45 min) and various pH (3–6). Physical conditions for SPP were voltage at 800 V, frequency 35 kHz with bandwidth of 2 μS and unipolar and bipolar power supplies were used. The degraded BPA was extracted and investigated for the degradation adopting Gas chromatography-Mass Spectroscopy (GC–MS). During SPP, intermediates were formed at 15 min of treatment, and degradation was achieved to a maximum of 86% at 18 min. The GC–MS results revealed that dimethyl ester (91%), hydroxyl bicyclooctenone (56%), imidazole (23%), pyridine (10%) and benzene (9%) fragments were formed abundantly due to plasma treatment. Plasma-treated BPA was not toxic to aquatic fern, *Lemna minor* as revealed in relative growth rate (RGR_{area}) analysis. SPP causes release of free radicals, which are actively involved in BPA degradation without any additive chemicals. The approach in this study could be projected as an effective SPP-based clean-technology for degradation of toxicants in the aquatic ecosystems and also for effective wastewater treatment.

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1. Introduction

In recent years, due to the unlimited usage of plastic at all levels, including in food packaging are expelled to the environment. It causes serious health issues including, detrimental effects to aquatic forms. Very importantly, effect of chemicals such as bisphenol A (BPA) used for the plastic industry leads hormonal dysfunction and eventually causes infertility in male world-wide. Chemically, BPA is an organic compound with two phenol groups linked by attaching two methyl (—CH_3) groups. BPA is the principal component in the production of epoxy polymers and polycarbonate in the plastic industry, and food packaging materials [1]. Invariably, BPA is released into the aquatic environment during the process of manufacturing plastics. BPA detected in the blood plasma stored in polycarbonate tubes, and the aquatic environment [2]. The wastewater that contains BPA could be a source of contamination of the aquatic eco-systems [3,4]. BPA has been identified as an endocrine disruptor in the view of its estrogenic and genotoxic activities when present in the range 0.1–10 to humans and 0.04–0.4 μM to the aquatic organisms [5,6]. These compounds are difficult to degrade or remove by existing biotechnological procedures, which were once believed to be efficient, eco-friendly and cost effective to remedy the wastewater containing organic contaminants [7].

BPA contamination and methods to efficiently eliminate BPA from the environment are global issues. A number of wastewater treatment methodologies based on chemical, physical and biological process are available. However, fewer studies such as ozonation [8]; electrochemical [9]; photo-catalysis [1], sono-chemical [10]; fenton and sono-fenton [11] fenton-coupled nanofiltration [3], and non-thermal plasma [12] have been described for the degradation of BPA effectively but not completely and rapidly.

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Unveiling the potentials of biocompatible silver nanoparticles on human lung carcinoma A549 cells and *Helicobacter pylori*

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Silver nanoparticles (AgNPs) are gaining importance in health and environment. This study synthesized AgNPs using the bark extract of a plant, *Toxicodendron vernicifluum* (Tv) as confirmed by a absorption peak at 420 nm corresponding to the Plasmon resonance of AgNPs. The AgNPs were spherical, oval-shaped with size range of 2–40 nm as evident by field emission transmission electron microscopy (FE-TEM) and particle size analysis (PSA). The particles formed were crystalline by the presence of (111), (220) and (200) planes, as revealed by X ray diffraction (XRD) and energy dispersive spectroscopy (EDS). The presence of amine, amide, phenolic, and alcoholic aromatics derived from Tv extract was found to be capping and or reducing agents as evident by Fourier-transform infrared spectroscopy (FTIR) spectra. The Tv-AgNPs were observed to be biocompatible to chick embryonic and NIH3T3 cells at various concentrations. Interestingly, Tv-AgNPs at the concentration of 320 µg. mL^{-1} induced 82.5% of cell death in human lung cancer, A549 cells and further 95% of cell death with annexin V FITC/PI based apoptosis. The Tv-AgNPs selectively targeted and damaged the cancer cells through ROS generation. The Tv-AgNPs displayed minimal inhibitory concentration (MIC) of 8.12 µg.mL^{-1} and 18.14 µg.mL^{-1} against STEC and *H. pylori* respectively. This multi-potent property of Tv-AgNPs was due to shape and size specific property that facilitated easy penetration into the bacterial and cancer cells for targeted therapy.

Phytochemicals-medicated synthesis of metal nanoparticles has received due attention because of their bioactivities such as antibiotic, cytotoxic, drug cargo and photocatalytic potentials[1,2]. Among the metallic nanomaterials, silver nanoparticles (AgNPs) are of significance for their antibacterial effect on human pathogens[3–5], wound healing[6], antioxidant[7], anticancer activities, and dental applications as acrylic resins, composite resins and adhesives, endodontics, periodontal materials, porcelain restoration, titanium implants, and orthodontics[8]. The surgical sutures, when coated with AgNPs are shown to prevent the post wound healing infections[9]. The potent antimicrobial properties of AgNPs has increased the demand in medical applications. AgNPs-based medical products are also available in market such as contraceptive devices, bone prostheses, biomedical devices, wound dressing, and surgical instruments[10–13].

The multi-drug resistant pathogens are causing the life-threatening human diseases. In this regard, the Gram-negative *Helicobacter pylori* colonizes the gastric epithelium, and it causes several illnesses and chronic diseases in human[14]. This pathogen is known to produce urease enzyme, which converts the urea to ammonia and bicarbonate resulting in neutralization of acidic pH in stomach to create appropriate pH (4.5–7.0) for pathogenic colonization[15]. The eradication of *H. pylori* can prevent various gastrointestinal diseases including peptic ulcer, gastritis, mucosa-associated lymphoid lymphoma, and adenocarcinoma[16]. Recent advancement in the nanotechnology has developed several drug delivery systems to target *H. pylori*[17–21]. For the instance, the amoxillin loaded

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An effect of big data technology with ant colony optimization based routing in vehicular ad hoc networks: Towards smart cities

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ABSTRACT

Rapid growth in urban population creates various kinds of issues like long hours traffic-jams, pollution which makes the city life insecure and non-liveable. The concept of a smart city is introduced to improve the quality of city life. Smart cities are being developed to satisfy the need for the safety of its users' and secure journeys over in the urban scenario by proposing the smart mobility concept. At the same time, Vehicular adhoc network (VANET) comes under the type of mobile adhoc network (MANET), wherever the vehicles are treated as nodes in a network. The application of Big Data technologies to VANET gains useful insight from the massive quantity of operational data to enhance traffic management process like planning, engineering as well as operation. During the real-time processes, the VANET generates large data, and the VANET characteristics are mapped to Big Data attributes. Moreover, ant colony optimization (ACO) algorithm is employed for routing in vehicular networks over Hadoop Map Reduce standalone distributed framework and over multi-node cluster with 2, 3, 4 and 5 nodes. The simulation outcomes ensure that the processing time of the algorithm is significant decreases with a rise in the node count of the Hadoop framework.

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1. Introduction

A smart city is a development vision to combine information communication with an Internet of things (IoT) to handle a city's assets in a secure manner (Harteinstein and Labertaux, 2010). Presently, in smart cities, people look ahead for more than just vehicle quality and reliability. The next future for automotive revolution is expected by equipping automobiles with wireless communication capabilities. In the smart city environment, road safety had become a significant challenge for the government as well as the automobile industry in the last two decades. The recent growth in wireless technologies has attracted industries, academicians and professional to concentrate their work on enhancing road safety. In the past few years, the rise of wireless technologies enabled the researchers to design communication systems where vehicles contribute in the communication networks. Vehicular Ad hoc Network (VANET) comes under the subgroup of conventional Mobile Ad hoc Network (MANET). In VANET, the vehicles are treated as mobile nodes, which are integrated to "on-board" devices, traversing on constrained routes (i.e., roads as well as lanes), in addition to communication with every other node for information exchange through Vehicle-to-Vehicle (V2V) communication protocols, among vehicles and preset road-side units (RSU), against Vehicle-to-Infrastructure (V2I) communication (Harteinstein and Labertaux, 2010). An architecture of VANET in a smart city is shown in Fig. 1. In the coming generation, networked vehicles demonstrate the upcoming integration of computers,

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Enhanced Quality Factor of Polyvinyl formal (PVF) Based Nanocomposites Filled with Zinc Oxide and Carbon Black Nanoparticles for Wireless Sensing Applications

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Abstract

The present article deals with the preparation of polyvinyl formal based nanocomposites filled with zinc oxide (ZnO) and carbon black nanoparticles using colloidal blending technique. To explore the electrical and structural properties, PVF/ZnO/CBNP nanocomposite films were characterized using Fourier transform infrared (FTIR) spectroscopy, X- Ray diffraction (XRD) and Scanning electron microscopy (SEM). The surface morphology of these nanocomposite films was evaluated using polarized optical microscopy (POM). The structural change in PVF nanocomposite was achieved by incorporating ZnO and CBNP, by homogeneous distribution in polymer nanocomposite. The electrical properties such as impedance and quality factor (Q – factor) of PVF/ZnO/CBNP composite films were elucidated using impedance analyzer in the wide range of frequency from 50 Hz – 20 MHz and temperature in the range 50°C – 150°C. Quality factor was measured as a function of temperature (50 – 150°C) and wide range of frequency from 50 Hz - 20 MHz. The PVF/ZnO/CBNP nanocomposite exhibits high Q-factor (439) for neat PVF films. The incorporation of ZnO at 10% decreases Q-factor to 36.1. Incorporation of CBNP at 5% and ZnO at 5% further reduces the Q-factor to 13.7. With further increase in CBNP content, the Q – factor was found to decrease7.38. Impedance values of PVA/ZnO/CBNP nanocomposites varied at different filler loading in PVF at 3% of CBNP (3.54 X $10^7\Omega$) to 10% of CB (1.48 X $10^7\Omega$). Increase in the CBNP wt% in PVF shows enhanced conductivity. Thus, based on the above results the PVF/ZnO/CBNP nanocomposites can be used for high – k capacitor applications and also for wireless sensing applications.

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Pyrene-based prospective biomaterial: *In vitro* bioimaging, protein binding studies and detection of bilirubin and Fe^{3+}

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ABSTRACT

Herein, we have meticulously derived the nanosized fluorescent aggregates from pyrene Schiff base (PS) in DMSO:water (10:90) ratio. The aggregation property of PS molecule was characterized by SEM and TEM measurements, revealed the aggregated particles are in spherical shape with ~3 nm in size. Moreover, aggregates exhibit a high fluorescence quantum yield (48%) which was effectively used for the *in vitro* bioimaging of two different cancer cells such as A549 and MCF-7 cells in which it exhibiting excellent biocompatibility. Further, it was estimated the capability of twofold acridine orange/ethidium bromide (AO/EB) staining to identify the apoptotic associated changes in cancer cells. Additionally, the aggregates were successfully demonstrated as a luminescent probe for the perceptive biomolecule detection of bilirubin. On the other hand, the PS molecule was successfully utilized for protein binding and metal ion sensing studies. The interaction of bovine serum albumin (BSA) with PS molecule in DMSO was using fluorescence spectroscopic method and nature of interaction was also confirmed through molecular docking analysis. The PS molecule also acts as an excellent sensor for biologically important Fe^{3+} ion with detection limit of 336 nM. Overall, PS molecule can be a prospective material in biological field both in solution as well as aggregated forms.

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1. Introduction

Mutual attraction among the particles *via* Vander Waals force or chemical bonding results the aggregates [1]. Compared to the monomeric species, aggregates are exhibiting contrast optical properties especially in solution state [2–4]. Fluorescent aggregates are current trend in research owing to their broad sort of appliances in biological field like staining, bioimaging and detection *etc.* [5]. In the past, it was considered that aggregation caused quenching (ACQ) or concentration quenching which is the reduction in emission behavior of a fluorophore molecule in aggregated state under high concentration [6]. This ACQ effect was explored as a hurdle for the utilization of a fluorescent molecule for imaging and tracking applications [7]. Since the mentioned ACQ effect is restricts the lable-to-analyte ratio, people were used the fluorescent molecules in a very dilute conditions and fluorescence turn-off mode were practiced in order to overcome the ACQ effect [6].

At the same time, it is well known that fluorescent analysis is one of the most potential tool for biosensing and optical imaging, which allow the direct revelation of biological analytes in the molecular level [8]. The sensing and visualization of a bio probe is resolute by the clarity and contrast of the fluorophore used prior and after it's binding with the analyte [8]. Aggregation-induced emission (AIE) is a recently explored new photophysical observable fact which describes the non-fluorescent nature of a fluorophore in solution status, in contrast highly emissive in the aggregated or in solid condition [9]. AIE based fluorescent bio probes with diverse structural and surface functionalities give us an idea about innovative features more than the other reported probes such as inorganic chalcogenide based fluorescent quantum dots [10] and organic small molecule dyes [11] in view of larger molar absorptive nature, high emissivity, outstanding biocompatibility, refusal of random blinking, and enough resistance towards photo bleaching, *etc.* [12]. The reports revealed that the AIE active fluorescent probes were active in several important fields like, organic light-emitting diode for display and lightning [13], chemosensors for poisonous ions and molecules [14], explosive detection [15], bioprobes for macro and small bimolecular tracing [16] and contrast reagents for *in vitro* and *in vivo* imaging [17], *etc.*

For instance, the cross-linked AIE dye supported polymeric nanomaterials were used for cytotoxic studies, biocompatible evaluation and bioimaging [18]. Further, tetraphenyl ethene-triphenyl

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Material Properties

Electromagnetic interference shielding properties of polyvinylchloride (PVC), barium titanate ($BaTiO_3$) and nickel oxide (NiO) based nanocomposites

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ABSTRACT

Polyvinylchloride/barium titanate/nickel oxide (PVC/$BaTiO_3$/NiO) nanocomposite films were prepared by solvent casting method and their electromagnetic interference (EMI) shielding effectiveness (SE) was investigated with respect to variable nanofiller loadings. The X-ray diffraction (XRD), Fourier transform infrared spectroscopy (FTIR) and scanning electron microscopy (SEM) studies were carried out to ascertain surface morphology, functional groups and dispersion state of the nanofillers in the nanocomposites. The interfacial interaction between PVC, $BaTiO_3$ and NiO at different nanofiller loadings was evident from FTIR analysis while SEM micrographs show uniform dispersion of nanofillers in the polymer matrix. The EMI SE of PVC/$BaTiO_3$/NiO nanocomposites in the frequency range 12 GHz–18 GHz (Ku-band) were investigated using vector network analyzer. The EMI SE studies revealed the impact of nanofiller addition on the conductivity and the EMI SE of the nanocomposites yielding maximum EMI SE of −18.7 dB.

1. Introduction

The conductive polymer based composites are considered as the key materials for applications in various fields including energy storage, optoelectronic devices, antistatic packing, plastic welding and electromagnetic shielding [1–3]. These applications are as a consequence of their low cost, elasticity, insubstantial weight, corrosion resistance along with ease of large-scale production [4]. Due to diversity in the field of electronics especially related to telecommunication and high-speed communication systems, the requirement of higher frequency for operation and bandwidth in these devices raises anxiety regarding descent in the radio wave region called as electromagnetic interference (EMI) [5]. This descent produces consequences on the working of electronic devices like operational malfunction owing to interaction with undesired electromagnetic waves and information leakage in wireless telecommunications [6]. To avoid such incidents and to retain electromagnetic compatibility of the electronic device, the EMI shielding materials are obligatory.

The EMI shielding materials possess the ability to sustain the ideal working conditions for electronic devices [7]. The EMI shielding materials work as safeguard materials against unwanted radiations, thereby reflecting or absorbing the electromagnetic radiations [8]. The metals or metallic based composites due to their better electrical conductivity are mainly used for EMI shielding purpose. However, the metal and metallic composites experience limitations due to their chemical resistance, radiation leakage, oxidation, corrosion and processing difficulty [9]. The limitation in chemical resistance can be negotiated by using polymers which have better chemical resistance than metals [10]. While the other limiting factors can be interceded by incorporation of nanofillers [11]. Contrary to that, the addition of another compound besides polymer and nanofiller causes no effects on the basic properties of polymer including chemical resistance and strength [12]. The conductive polymer-nanofiller based nanocomposites provide cheap, lightweight, corrosion resistant, high electrically conductive and mechanically strong materials which are ideal for EMI shielding applications [13].

Polymer nanocomposites based materials comprising of polymers and nanofiller possess the ability to significantly reduce the radiation leakage [14]. The polymer matrix apart from being chemically sound suffers from poor mechanical strength. Therefore the addition of nanofillers or other conductive materials with the polymer enhances the mechanical strength as well as the EMI shielding properties of the

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Online clinical decision support system using optimal deep neural networks

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HIGHLIGHTS

- IoT with a cloud-based clinical decision support system is proposed for chronic kidney disease (CKD).
- Optimal Deep Neural Network (DNN) classifier for the prediction of CKD is proposed.
- Particle swarm optimization was used for the selection of the optimal feature subset.
- The proposed DNN classifier outperforms the compared methods for the diagnosis of CKD.

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ABSTRACT

The Internet of Health things (IoHT) has numerous applications in healthcare by integrating health monitoring things like sensors and medical devices for remotely observe patient's records to provide smarter and intelligent medicare services. To avail best healthcare services to the users using the e-health applications, in this paper, we propose an IoT with cloud based clinical decision support system for the prediction and observance of Chronic Kidney Disease (CKD) with its level of severity. The proposed framework collects the patient data using the IoT devices attached to the user which will be stored in the cloud along with the related medical records from the UCI repository. Furthermore, we employ a Deep Neural Network (DNN) classifier for the prediction of CKD and its level of severity. A Particle Swarm Optimization (PSO) based feature selection method is also used to improve the performance of DNN classifier. The proposed model is validated by employing the benchmark CKD dataset. Different classifiers are employed to compare the performance of the proposed model under several classification measures. The proposed DNN classifier alone predicts CKD with an accuracy of 98.25% and is further enhanced to 99.25 by PSO-FS method. At the same time, the improved classification performance is verified with higher values of 98.03 specificity, 99.25 accuracy, 99.39 F-score and 98.40 kappa value respectively.

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1. Introduction

Internet of Things (IoT) is a recent technology which aims to design and interlink the Internet-connected Things using computer networks. IoT defines that it is efficient to use more number of less powerful gadgets like wrist band, refrigerator, umbrella, etc. rather than the use of few powerful computing gadgets like computers, tablets and mobile phones [1,2]. Nowadays, some of the objects like room freshener, air conditioner are programmed by the micro controller to provide more sophistication in the day to day life activities. So, the interlinked gadgets or objects has the ability of powerful transmission and computation ahead of the requirements of less computation gadgets like low power electric lamp, umbrella and interlink buildings also by the use of computer networks. These interesting gadgets in IoT [3] have the scientific reasoning capability to perform the allocated task with no necessity of a name as well as humans. The term "Ubiquitous

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An investigation on the sterilization of berry fruit using ozone: An option to preservation and long-term storage

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ARTICLE INFO

Keywords:
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CFU

ABSTRACT

In the present study, the effect of ozone treatment on the bacteria affecting fruits was investigated. The process of application of ozone for treatment was termed as OTRE technique. Ozone is a trioxygen inorganic molecule having a pungent smell and formed from the atmospheric oxygen (O_2) by the action of electrical discharge. Ozone was generated adopting Ozonizer through corona discharge technology. The bacteria isolated from Kiwi fruits by microbiological technique were exposed to ozone in two approaches, firstly, the ozone discharged at various time from 10 to 60 min into the reactor vessel containing bacteria (1.5×10^8 CFU mL^{-1}). Secondly, use of OTRE in cycle basis, where the sample was treated 30 min and 5 min break and again repeated for 10 min, which continued to the discharge of 60 min. The absorbance of all these varied intervals showed decrease in absorbance, which implies that the number of colonies were decreasing as the OTRE continued. In addition, the growth of these colonies on the nutrient agar was also confirming that the OTRE is quite effective to prevent bacteria from kiwi viz., the bacterial count was decreased from 1.5×10^8 CFU mL^{-1} to 2.0×10^2 CFU mL^{-1} in 30 min and 1.5×10^8 CFU mL^{-1} to 1.2×10^2 CFU mL^{-1} in 60 min. Thusly, OTRE technique is a rapid, better solution to preserve fruits from disease causing bacteria and enhance fruits durability against spoilage during postharvest storage.

1. Introduction

Kiwi fruit is native to Asia and other few countries such as New Zealand and it is famous world-wide for its nutritional properties as it contains high levels of bioactive compounds such as flavonoids, vitamin C, vitamin E, minerals, carotenoids, antioxidants. Apart from the fact that kiwi fruit has a numerous health benefits but it is grown in very limited parts of the world like China, Italy and New Zealand and it takes 3–5 years for a kiwi plant to produce the fruit which makes it one of the expensive fruits all over the world. Internationally kiwifruit is the minor crop showing a mere representation of 0.2%–0.35% of total fresh fruit production. At the time harvesting fruits from the trees, they are flooded with the microorganisms. In kiwi these microorganisms are mostly bacteria where the milky exudates come from the infected part and these exudates are a good source of the inoculum. The bacterial canker caused by the *Pseudomonas syringae* was detected for the first time on the green fleshed kiwi fruit on Jeju island on 1988. After that the disease was found to be spread to other parts of the Korea producing kiwi (Koh et al., 2010).

The ozone is effective in both ways whether given in gaseous form directly or using ozone in the aqueous solution, it will reduce the microbial counts on fresh produces. The use of ozone as a disinfectant of vegetables and fruits was studies and shown its efficacy earlier (Horvitz, 2014). A number of factors that may affect the efficiency of ozone are microbial populations, time of exposure, ozone concentration, type of produce, relative humidity and the material in which the produce was packed (Glowacz et al., 2015).

It is a process or a treatment to destroy various microorganisms by the exposure of these microorganisms to ozone. Ozone is a trioxygen inorganic molecule having a chemical formula O_3. It is a pale blue gas with a pungent smell and it is an allotrope of oxygen much less stable than the diatomic allotrope oxygen. Ozone is formed from the

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ORIGINAL ARTICLE

Differential expression of Helios, Neuropilin-1 and FoxP3 in head and neck squamous cell carcinoma (HNSCC) patients

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Abstract
In recent years, studies have begun to explore the immune involvement in head and neck tumors. Advanced stage head and neck squamous cell carcinoma (HNSCC) has a poor prognosis with low survival rates with high level of immune infiltrates. Tregs (regulatory T cells) play a crucial role in constructing an immunosuppressive tumor microenvironment. In the present study, we highlighted specific Treg markers and its factors in HNSCC solid tumors and peripheral blood of cancer patients. By histopathology and immunofluorescence staining, we observed differential expression of CD4, CD25, Foxp3, Helios and Neuropilin-1. Further, we analyzed the expression of Foxp3, Helios, Neuropilin-1 and GARP by qPCR and flow cytometry in whole blood and found to be elevated in HNSCC patients in comparison with healthy donors. Additionally, IFN-γ, TGF-β, IL-6, IL-2, IL-10 and TNF-α expressions were also found to be relatively increased in the head and neck cancer patients when compared with healthy donors. Our findings emphasize that Tregs may be involved in promoting tumor progression. Helios and Neuropilin-1 could be potent markers in identifying subsets of Tregs. Association of soluble factors could sculpture the activity of Tregs. With further research, Treg markers and its associated soluble factors could be employed to block Tregs trafficking to the tumor, thus enlightening a potential strategy for targeting human cancers.

Keywords Squamous cell carcinoma · HNSCCs · Tregs · Foxp3 · CD4 · Soluble factors

Introduction

Head and neck squamous cell carcinomas (HNSCCs) resemble most squamous cell carcinomas and can be found in the larynx, pharynx, oral cavity and nasal cavity. Head and neck cancer (HNC) is a major public health problem affected by various factors such as demographical, environmental, behavioral, gender, age and geographical factors. (Kulkarni 2018; Poddar et al. 2018). When compared globally HNC constitutes more mortality in some developing counties. South central Asia has highest registered cases for lip and oral cavity cancers (Bray et al. 2018). HNC (both sexes) in India is found with more than 60% of patients with advanced disease compared to 40% in developed countries especially with people from lower and middle income groups (Francis 2018). HNSCCs have a poor prognosis with low survival rates for advanced stage tumors and negligible increases in survival rates over the past few decades (Torre et al. 2015). Other than cetuximab and nivolumab, no new targeted therapies or biomarkers have been approved for HNSCC (Jie et al. 2015; Ward-Hartstonge and Kemp 2017). This complex disease may be effectively targeted by immunotherapy once better understanding of the disease microenvironment is obtained (Melero et al. 2018). Understanding host cell signaling and identifying immune infiltrates can reveal novel approaches for cancer therapeutics (Li and Rudensky 2016). Further examination of the role of the immune system in the tumor microenvironment may lead to the identification of novel targets for the immunosuppression of tumor growth (Mohamed Adil et al. 2014; Whiteside

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An investigation of antibiofilm and cytotoxic property of MgO nanoparticles

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ABSTRACT

MgO nanoparticles (MgONPs) have been widely used as antibacterial agents with the advantages of them being nontoxic and their unique biological properties. In this study, we synthesized MgONPs by co-precipitation method and characterized them by XRD, SEM and EDS analysis. The antibiofilm activity of MgONPs as observed quantitatively by crystal violet assay and their action on biofilm architecture were assessed in both Gram-positive and Gram negative uropathogenic bacteria. In addition, the cytotoxic effect of synthesized MgONPs was evaluated against human breast cancer, MCF-7 cells. The morphological changes of apoptosis were observed by Acridine Orange/Ethidium Bromide (AO/EB) staining using a fluorescent microscope. MgONPs inhibited more than 50% of the biofilms in most of the tested uropathogenic bacteria; notably 80% inhibition in the case of *K. pneumoniae*. MgONPs successfully inhibited the viability of MCF-7 cells at a concentration of 50 $\mu g.mL^{-1}$. Given their antibiofilm properties; MgONPs could be used as a potential nanomaterial for *in vivo* applications such as coating for a medical implant.

1. Introduction

Nanotechnology is an area of emerging interest in the field of science and technology due to its wide variety of applications in the field of biomedicine, optics, and electronics; especially for purpose of developing new nanoscale materials (Albrecht et al., 2006). Various physical, chemical, biological, and hybrid methods are currently being employed for nanoparticle synthesis (MubarakAli et al., 2015a,b). Nanoparticles can be made by using various biological substrates such as bacteria, algae, diatom, actinomycetes, plants, and biomolecules (Priyadarshini et al., 2013; MubarakAli et al., 2011a, 2011b; MubarakAli et al., 2011a,b,c, 2013a,b).

Urolithiasis (kidney stone disease) is one of the most common urological diseases with high prevalence globally (Manzoor et al., 2017 and 2018a). Urinary tract infections (UTIs) and urolithiasis are inevitably linked and studies suggested that patients with kidney stone are more likely to have UTIs than the normal population (Barr-Beare et al., 2015). Bacterial biofilms play an important role in urolithiasis and many bacteria causing UTIs are associated with biofilm formation (Shabeena et al., 2018, Manzoor et al., 2018b, 2018c, 2018d). The biofilms are multi-cellular, surface-attached microbial communities with particular physiologic and architecture characteristics, which can sometimes confer resistance to different classes of antibiotics (Vahedi et al., 2017). This biofilm formation is an important virulence factor for a wide range of microbes that cause chronic infections, and are responsible for 75% of human microbial infections (Koo et al., 2017). Most of the Gram positive and Gram negative bacteria have the ability to form biofilms and main ones include *Escherichia coli, Klebsiella pneumoniae, Enterococcus faecalis, Staphylococcus aureus, Streptococcus viridans, Proteus mirabilis* and *Pseudomonas aeruginosa* (Donlan, 2001; MubarakAli et al., 2015).

The control of the bacterial biofilm formation is of importance for public health and economy, especially in the case nosocomial infections which leads to various life-threatening diseases (Naiyf, and Jamal, 2017). Several synthesized nanoparticles have shown their effectiveness for treating infectious microbes, including antibiotic-resistant

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nanomaterials

MDPI

Article

Biocompatibility and Bioimaging Potential of Fruit-Based Carbon Dots

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Abstract: Photo-luminescent carbon dots (CD) have become promising nanomaterials and their synthesis from natural products has attracted attention by the possibility of making the most of affordable, sustainable and, readily-available carbon sources. Here, we report on the synthesis, characterization and bioimaging potential of CDs produced from diverse extensively produced fruits: kiwi, avocado and pear. The in vitro cytotoxicity and anticancer potential of those CDs were assessed by comparing human epithelial cells from normal adult kidney and colorectal adenocarcinoma cells. In vivo toxicity was evaluated using zebrafish embryos given their peculiar embryogenesis, with transparent embryos developing ex-utero, allowing a real-time analysis. In vitro and in vivo experiments revealed that the synthesized CD presented toxicity only at concentrations of $\geq$1.5 mg mL^{-1}. Kiwi CD exhibited the highest toxicity to both cells lines and zebrafish embryos, presenting lower LD_{50} values. Interestingly, despite inducing lower cytotoxicity in normal cells than the other CDs, black pepper CDs resulted in higher toxicity in vivo. The bio-distribution of CD in zebrafish embryos upon uptake was investigated using fluorescence microscopy. We observed a higher accumulation of CD in the eye and yolk sac, avocado CD being the ones more retained, indicating their potential usefulness in bio-imaging applications. This study shows the action of fruit-based CDs from kiwi, avocado and pear. However the compounds present in these fruit-based CDs and their mechanism of action as a bioimaging agent need to be further explored.

Keywords: carbon dots; bioimaging; zebrafish embryotoxicity; cytotoxicity; biocompatibility

1. Introduction

Semiconductor quantum dots (q-dots) hold much attention for their various potential applications in optical bioimaging and biomedical devices among others [1]. Because of their unique photoelectric proprieties, q-dots are generally considered as an alternative to conventional organic dyes [2]. However, the most traditional q-dots contain heavy metal elements, which raise significant concerns about the impact of using these nanomaterials in biological systems due to their potential human and environmental toxicity [3]. Carbon dots (CD) are a novel class of nanomaterials that have lately received a high degree of attention and investigation as they present the same major advantageous characteristics of semiconductor q-dots, such as high photostability and tunable emission [4]. However,

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Optimal users based secure data transmission on the internet of healthcare things (IoHT) with lightweight block ciphers

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Abstract
The ever-growing advancement in communication innovation of modern smart objects carries with it a new era of improvement for the Internet of Things (IoT) based networks. The health care system is the best approach to store the patient's health data online with high privacy. Ensuring the privacy and confidentiality of patient information in the cloud is of utmost importance; here, the enhanced security model of healthcare data gives rise to trust. For the secure communication, the healthcare data sensed by the IoT sensor network is encrypted by Lightweight SIMON block cipher. For improving the privacy of healthcare data among individuals, we implemented the share generation model. Then, share creation model, i.e., Chinese Remainder Theorem (CRT) is developed to generate the copy of every ciphertext based on the selected number of users and the data is shared among the optimal number of users. The selection of the users in IoHT is made by the metaheuristic algorithm called Hybrid Teaching and Learning Based Optimization (HTLBO). Then, we present healthcare service providers for giving the full scope of medical services to people enrolled in IoHT. The performance of Secure Data is approved through simulations in terms of energy cost, computation time, etc., of the proposed algorithms and the outcomes demonstrate that Secure Data can be efficient while applying for ensuring security chances in IoT-based healthcare systems.

Keywords Internet of things (IoT) · Multimedia · Security · Optimization · Sensor network · Share creation · Block ciphers

1 Introduction

The Internet of Things (IoT) is gathered of an extraordinary number of things (devices) that are linked through the Internet [28]. In everyday things, the framework can be equipped with

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SPECIAL ISSUE PAPER

Optimal feature level fusion based ANFIS classifier for brain MRI image classification

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Summary

The cases identified with Brain tumor have increased with respect to time owing to various reasons. One of the major challenging issues can be defined by incorporating image processing along with data mining models as classification approach. There are various procedures as of now exhibited for segmentation of brain tumor effectively. In any case, it is as yet unequivocal to distinguish the brain tumor from MR images. In this new tumor classifying, considering two significant models, such as Feature Selection (FS) and Machine Learning classification techniques, are extremely valuable for distinguishing and visualizing the tumor in the MRI brain images; it is classified using Adaptive Neuro-Fuzzy Interface System (ANFIS). For better classification of image, Optimal Feature Level Fusion (OFLF) is considered to fuse low and high-level feature of brain image; from this analysis, the images are classifying as Benign or Malignant. From this implementation of medical images, the experiment results are evaluating performance metrics are compared existing classifiers. From the proposed MRI image classification process the accuracy as 96.23%, sensitivity as 92.3%, and specificity as 94.52%, compared to existing classifier. It is in the working platform of MATLAB that this proposed methodology is implemented.

KEYWORDS

ANFIS, classifier, feature extraction, machine learning, magnetic resonance imaging, tumor

1 | INTRODUCTION

In brain tumor investigation, experts combine their medical learning as well as brain Magnetic Resonance Imaging (MRI) scans while getting the nature and feature of a brain tumor and to settle on a choice on treatment decisions.[1] Brain tumors can be cancerous (malignant) or non-cancerous (benign). Benign brain tumors are low quality non-cancerous brain tumors, which grow progressively and push aside conventional tissue, in any case, do not assault the enveloping average tissue.[2] A brain tumor is a development of abnormal cells in the tissues of the cerebrum. Brain tumors can be kind, with no growth cells, or threatening, with disease cells that develop rapidly. Some are essential cerebrum tumors, which begin in the mind.[3] Although MRI is to be proficient for providing data with respect to the location and size of tumors, it cannot order the tumor types, thus the utilization of intrusive strategies.[4] Henceforth, MRI is a more obliging image philosophy than X-ray Computed Tomography for inspecting delicate tissues and organs.[5]

A potential utilization of MRI in clinical practice is brain tissue classification or division for ordinary and over the top tissues.[4] The segment of the cells and their centers from the straggling leftovers of the image content is one of the crucial issues looked by most by far of the medical imagery analysis structures.[6] The normal brain cells are damaged by tumors with the help of generating tenderness; it exerts pressure on parts of brain and raising pressure inside the skull. The most essential preferred standpoint of MR imaging is that it is a non-obtrusive procedure. The utilization of PC innovation in medical choice help is presently far reaching and inescapable over an extensive variety of medical regions, eg, malignancy inquire about gastroenterology, heart ailments, and brain tumors.[7,8]

The tumor is visible with beta, x rays, or gamma rays. An assured task is implemented in the machine learning and pattern recognition field; researchers develop methods and computer programs. The manifestations of the brain tumor are most normal for both malignant and benign. The

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Nanostructured Graphene Oxide Dots: Synthesis, Characterization, Photoinduced Electron Transfer Studies, and Detection of Explosives/Biomolecules

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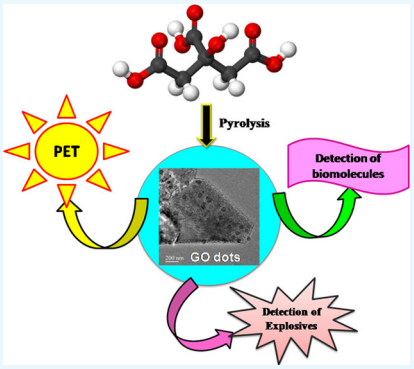
S *Supporting Information*

ABSTRACT: Herein, we report the preparation of graphene oxide dots (GO dots) by fine-tuning the carbonization degree of citric acid. The structure of GO dots was characterized by absorption spectroscopy, Fourier transform infrared spectroscopy, Raman spectroscopy, as well as high-resolution scanning electron microscopy and transmission electron microscopy analyses. The typical particle size of the GO dots was 42 nm. The fluorescent characteristics of the GO dots were analyzed by fluorescence spectroscopy. Once excited at 360 nm, the GO dots were fluorescent in the range of 450−550 nm, which was dependent on the excitation wavelength. Further, GO dots were effectively utilized for multifarious applications such as photoinduced electron transfer and detection of explosives and biomolecules. The emission property of GO dots was competently quenched by viologens, picric acid (PA), and bilirubin (BR). The mechanism of quenching by viologens and explosives/biomolecules was found to be due to photoinduced electron transfer and the internal filter effect, respectively. Intriguingly, the detection minimum of PA is in the nanomolar level. Toward commercialization, the economic test strips have also been introduced for the identification of PA. Furthermore, the GO dots have been applied as an efficient luminescent bioprobe for a selective and perceptive finding of BR.



INTRODUCTION

Starting from tooth paste to satellite and water purification to medicine, the use of nanomaterials has dramatically increased in recent years. Hence, it is necessary to have a basic knowledge of nanotechnology at all levels.[1] By a text book explanation, nanomaterials are in the size range of 1−100 nm at least in one dimension and small in size, which results in distinctive chemical and physical properties.[2] Recently, two emerging carbon-based nanomaterials,[3−6] such as graphene oxide (GO)[7] and graphene quantum dots (GQDs),[8] were introduced into the carbon-based nanomaterial family, which are fascinating to many researchers. GO is an atomically thin sheet of graphite covalently bonded with oxygen-containing functional groups, either on the basal plane or at the edges.[9] GQDs are a few graphene layers connected together in a quasispherical shape in the size of 1−10 nm,[10] which exhibit exclusive characteristics owing to their quantum confinement effects. It is previously reported that GQDs show an excellent fluorescent nature when compared to GO; however, later it was described that GQDs and GO have the similar luminescence properties,[8] which are highly utilized in several emerging fields, such as solar devices,[11] biocellular imaging,[12] and drug release.[13] GQDs and GO were generally prepared via both top-down (carving graphite crystallites via high-resolution electron beam lithography,[14] cutting of GO hydrothermally,[15,16] repeated oxidation,[17] electrochemical methods,[18] chemical oxidation treatment of carbon precursors,[19,20] and cage opening of the C_{60} on a ruthenium exterior[21]) and bottom-up methods. However, the former one has some limitations, such as special types of equipment being required, less product yield, complex synthetic conditions, and poor control of the size. At the same time, the bottom-up methods such as the hydrothermal method, direct pyrolysis, and so forth are simple and economic for the preparation of graphene-based nanomaterials from special organic precursors.[22] The bottom-up method has some specific benefits such as defined control over the morphology and the particle size allocation of the products derived.

In recent times, fluorescent carbon nanomaterials prepared from citric acid (CA) via the thermal pyrolysis route with a high fluorescence quantum yield were reported.[9,23] Behrmann and Hofmann used CA precursors with ammonia and

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SYSTEMS-LEVEL QUALITY IMPROVEMENT

Medical Image Security Using Dual Encryption with Oppositional Based Optimization Algorithm

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Abstract
Security is the most critical issue amid transmission of medical images because it contains sensitive information of patients. Medical image security is an essential method for secure the sensitive data when computerized images and their relevant patient data are transmitted across public networks. In this paper, the dual encryption procedure is utilized to encrypt the medical images. Initially Blowfish Encryption is considered and then signcryption algorithm is utilized to confirm the encryption model. After that, the Opposition based Flower Pollination (OFP) is utilized to upgrade the private and public keys. The performance of the proposed strategy is evaluated using performance measures such as Peak Signal to Noise Ratio (PSNR), entropy, Mean Square Error (MSE), and Correlation Coefficient (CC).

Keywords Medical image security · Blowfish encryption algorithm · Signcryption · PSNR and opposition based flower pollination optimization

Introduction

The need of quick and secure diagnosis is important in the medical world [1]. These days, the transmission of images is a day by [2] day routine and it is important to locate a productive method to transmit them over the network [3]. To confer the safe transmission of medical images, there exist some security necessities that should be met [4]. These necessities are privacy, authenticity, and trustworthiness [5]. Because of numerous problems with communication security [6], assurance of data has turned into a vital issue [7]. Particularly for the reason that advanced images contain a substantial measure of information [8], security for images is a noteworthy concern [9]. The necessities to satisfy the security needs of digital images have prompted the improvement of good encryption methods [10–12]. For capacity and transmission, encryption is an extremely effective device, yet once the sensitive data is decrypted, the data isn't secured any longer [13]. If the images are in the open (plain-content) frame, the real danger is the infringement of the entrance rights and of the daily logs by the interloper [14].

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Log D analysis using dynamic approach

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ABSTRACT

Log D the logarithm (log_{10}) of the distribution coefficient (D), is one of the important parameters used in Lipinski's rule to assess the druggability of a molecule in pharmaceutical formulations. The distribution of a molecule between a hydrophobic organic phase and an aqueous buffer phase is influenced by the *pH* of the buffer system. In this work, we used both the conventional algebraic method and the generalized 'dynamic' approach to model the distribution coefficient of amphoteric, diamino-monoprotic molecule and monoprotic acid in the presence of salt or co-solvent. We have shown the equivalence of these methods by analysing the recently reported experimental data of amphoteric molecules such as nalidixic acid, mebendazole, benazepril and telmisartan.

1. Introduction

Partition coefficient (P) is defined as the ratio of the concentration of a molecule, whether in ionized or unionized form, distributed between a hydrophobic phase and an aqueous phase [1–5]. Consider, a weak monoprotic acid, HA, which can exist in two forms such as, unionized (HA_a) and ionized (A_a^-) species in an aqueous buffer system. If such an aqueous buffer system is equilibrated with a hydrophobic solvent (e.g. octanol), the unionized species and the ionized species in the aqueous phase will get partitioned into the hydrophobic phase with the partition coefficient defined by, $P_{HA} = [HA_o]/[HA_a]$ and $P_{A^-} = [A_o^-]/[A_a^-]$, respectively. Since, it is less likely for a charged species like A^-, to get partitioned into an octanol phase, prior to partitioning it forms a neutral ion pair with prevalently available cation in the aqueous solution. The distribution coefficient (D), on the other-hand is dependent on the partition coefficient (P) and is defined as, $D = ([HA_o]+[A_o^-])/([HA_a]+[A_a^-])$, the ratio of the sum of the concentrations of both ionized and unionized species of a molecule, distributed between the hydrophobic organic phase and the aqueous buffer phase. Since the dissociation of a weak monoprotic acid is dependent on the *pH* of the aqueous buffer system, the distribution coefficient also becomes dependent on *pH*. In an experiment designed to assess the lipophilicity of a molecule, the distribution coefficient (D), is measured at different *pH* conditions and the resultant profile of D, is fitted to a model, to obtain partition coefficients (P), pK_a or pK_b of all the species present in the system [1–5].

The mathematical model to predict the *logD* profile of simple cases such as monoprotic, diprotic, mono-alkaline and amphoteric can be easily derived using algebraic approach [6]. On the other hand, while studying the effect of salt or co-solvent on the distribution of monoprotic acid, dynamic approach is preferred because of its generality and simplicity in deriving the models [3,5,7–9]. In this article, we explicitly, derive the algebraic and dynamic models for amphoteric, di-amino-monoprotic, and monoprotic in the presence of salt or co-solvent [7–9]. Further, the *logD* profiles of recently reported amphoteric molecules such as nalidixic acid, mebendazole, benazepril and telmisartan, were analysed to show the equivalence of dynamic approach and algebraic method [10].

2. Theory

A complex dynamic system can be modelled using several analogous kinetic mechanisms. If the experimental data points of the dynamic system is available prior to equilibrium, then the exact kinetic

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Isolation, structure elucidation and antibacterial activity of methyl-4,8-dimethylundecanate from the marine actinobacterium *Streptomyces albogriseolus* ECR64

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ABSTRACT

Around 120 actinobacterial colonies were isolated from various regions of marine East coast region of Tamil Nadu, India. Among them, 33 were morphologically distinct and they were preliminarily screened for their antibacterial activity against *Pseudomonas fluorescens, Vibrio cholerae*, *V. parahaemolyticus*, *V. alginolyticus*, and *Aeromonas hydrophila* by cross-streak plate technique. Among the isolated, the isolate ECR64 exhibited maximum zone of inhibition against fish pathogenic bacteria. The crude bioactive compounds were extracted from the isolate ECR64 using different organic solvents which exhibited maximum antibacterial activity. Separation and purification of the bioactive compounds were made by column chromatography which yielded 27 fractions and were re-chromatographed to obtain the active compound. Ultra violet (UV), Fourier transform infrared (FT-IR) and nuclear magnetic resonance (NMR) spectral studies were used to predict the structure of the active compound which was identified as *methyl-4,8-dimethylundecanate*. The potential isolate ECR64 was identified as *Streptomyces albogriseolus* by phylogenetic, phenotypic and genotypic (16S rRNA gene sequence) analyses. The identified compound *methyl-4,8-dimethylundecanate* can be used as potential and alternative drug in disease management of aquaculture.

1. Introduction

The natural drug development of microbial origin has slowed down considerably in recent years. In recent years, microbial resistance has been increasing against known drugs [1]. The discovery of new antimicrobial drugs is necessary to control the emergence of drug resistant pathogens [2,3] and to battle deadly diseases. Although considerable research is in advance in the field of biologically engineered and chemical synthesis of pharmaceutically active compounds, still nature stays as the best source for attractive new drugs [4–6]. Marine organisms are adapted to surviving and growing in the habitats with extreme physical and chemical conditions. Among the marine microorganisms, Actinobacteria have special importance in the production of novel biosynthetic capabilities. Recent studies have exposed that selected groups of marine actinobacteria are richest source and reservoir of novel natural products [7]. The diversity of marine actinobacteria entail that this resource will be of noticeable importance in the discovery of new drug. Majority of these marine actinobacteria have been isolated from coastal and their adjacent area soil and sediments. Since the members of the genus *Streptomyces* have confirmed to be a richest resource of new biologically active metabolites and varieties of valuable products of commercial importance [8], they are considered as most economic pharmaceutically valuable prokaryotes. Nearly 9500 antimicrobial drugs from actinobacteria have been reported up to 2008, 85% of them are from streptomycetes and remaining is derived from other rare actinobacteria [9]. Some of a single *Streptomyces* species produce different compounds [10].

Recently, fishery is rapidly growing sector worldwide as a source for the production of sea food [11] and it crack significant role in food shortage. However, the bacterial disease particularly *Vibrio* spp. and other associated infections has caused number of outbreak and is threat to public health in terms of quality and severe economic loss in

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Hydrothermal synthesis of $ZnWO_4$–MnO_2 nanopowder doped with carbon black nanoparticles for high-performance supercapacitor applications

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Abstract

A two-step hydrothermal method was employed to synthesize $ZnWO_4$–MnO_2 nanopowder with a high degree of crystallinity as revealed by X-ray diffraction studies. The synthesized nanopowder exhibits nanorod-type structure as revealed by high-resolution transmission microscopy with selected area electron diffraction pattern, confirming the crystalline behaviour. The electrochemical behaviour of the symmetrically fabricated electrodes using $ZnWO_4$–MnO_2 as active materials along with doped carbon black was investigated by means of cyclic voltammetry (CV), galvanostatic charge/discharge profiling and electrochemical impedance spectroscopy in the potential window of 0–1 V. The electrochemical analysis was carried out using 2 M KOH electrolyte. The fabricated electrodes showed better electrochemical behaviour with maximum specific capacitance of 714 F g^{-1} at a scan rate of 5 mV s^{-1} as demonstrated by CV curves. The capacitance obtained from CV measurements depicts dominant electrostatic double layer behaviour. The maximum specific capacitance of 690.6 F g^{-1} at a current density of 1 A g^{-1} was attained from charge/discharge profiling. In addition, the electrodes showed an energy density of 289.17 Wh kg^{-1} at a power density of

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INVESTIGATION OF MECHANICAL AND ELECTRICAL PROPERTIES OF KEVLAR/E-GLASS AND BASALT/E-GLASS REINFORCED HYBRID COMPOSITES

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ABSTRACT

Composite materials are preferred as an alternate for traditional metals due to its admirable properties like chemically inactive nature, high strength to weight ratio, ease of fabrication and capability of tailoring into the required shape. In order to apprehend the feasibility of Kevlar/E-glass and basalt/E-glass reinforced epoxy hybrid composites, this paper studies the low- velocity impact and flexural behavior and electrical conductivity of the composite laminates. Bend and impact test specimens were prepared as per ASTM 790 standard (80mm X 13mm X 3mm) and ASTM D256, ASTM D6110 standards respectively. The proportion of fiber and matrix material (75:25) is considered as an important factor for obtaining better flexural modulus. Izod and Charpy tests reveal that higher fiber volume fraction results in higher energy absorption. The hybrid composite combinations showed better electrical conductivity.

KEYWORDS: Impact Behavior, Flexural Behavior, Kevlar/E-Glass, Basalt/E-Glass, Hybrid Composite Laminates, Volume Fraction Hybridization & Electrical Conductivity

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Original Article

INTRODUCTION

Fiber reinforced polymer matrix composites are considered as the main alternate for the metallic materials due to its unique properties like cost economic nature, strength to weight ratio and lower density [1]. Carbon fiber plays a dominant role in the aerospace, automobile, marine, sports goods, and other industrial and construction applications over the past few decades due to its high fatigue resistance, chemical resistance, modulus and thermal insulation [2]. Even though carbon fiber has all superior properties over other traditional fibers its applications is limited in the industries due to its brittleness, high electrical conductivity, high cost and catastrophic failure over impact load [3]. Basalt, kevlar and glass fiber reinforced hybrid composites are purposefully used by the engineering industries to meet out the increasing demand of advanced materials.

There are the variety of materials and procedures available to produce tailor-made fiber reinforced composites but for developing composites for specific area or application the developer should familiar with materials and its properties over various circumstances [4]. The designer should conduct various experiments and

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COMPUTER AIDED MEDICAL DIAGNOSIS

Hybrid optimization with cryptography encryption for medical image security in Internet of Things

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Abstract
The development of the Internet of Things (IoT) is predicted to change the healthcare industry and might lead to the rise of the Internet of Medical Things. The IoT revolution is surpassing the present-day human services with promising mechanical, financial, and social prospects. This paper investigated the security of medical images in IoT by utilizing an innovative cryptographic model with optimization strategies. For the most part, the patient data are stored as a cloud server in the hospital due to which the security is vital. So another framework is required for the secure transmission and effective storage of medical images interleaved with patient information. For increasing the security level of encryption and decryption process, the optimal key will be chosen using hybrid swarm optimization, i.e., grasshopper optimization and particle swarm optimization in elliptic curve cryptography. In view of this method, the medical images are secured in IoT framework. From this execution, the results are compared and contrasted, whereas a diverse encryption algorithm with its optimization methods from the literature is identified with the most extreme peak signal-to-noise ratio values, i.e., 59.45 dB and structural similarity index as 1.

Keywords IoT · Medical images · Cloud · Encryption · Decryption · Optimization · PSO · Grasshopper optimization · ECC

1 Introduction

IoT makes incorporated communication circumstances of interconnected devices and stages by drawing in both practical and substantial worlds simultaneously [1]. In terms of IoT, a number of associated smart devices, sensors, and actuators work together to screen and deal with the physical condition and human frameworks [2]. IoT is likely predicted to accomplish novel and creative arrangements with negligible human involvement [3]. As the next era in information technology, IoT brings 'telemedicine,' an additional attempt, in which the sensors and systems [4, 5] are applied to customary medicinal devices which can appoint the knowledge to such devices and execute further communication and collaboration among patients to remote pros [6]. Further, the examination of IoT security and data integrity holds down to realistic importance in IoT advancement [7]. With best patient handling, gaining patient satisfaction and treatment at home rendered by the medicinal service suppliers is one more vital possible application in this area. In this way, different

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Green synthetic approach of silver nanoparticles from *Bauhinia tomentosa* Linn. leaves extract for potent photocatalytic and in vitro biological applications

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Abstract
Metal nanoparticles have numerous applications such as optics, biomedical sciences, drug delivery, catalysis and electronics. The present work deals with the green synthesis of silver nanoparticles (Ag NPs) using leaves extract of *Bauhinia tomentosa* Linn. and its photocatalytic and in vitro biological activities. The Ag NPs were synthesized via hydrothermal method by adding plant leaf extract. The synthesized Ag NPs were comprehensively characterized by XRD, FTIR, SEM, EDAX and HR-TEM. The green treated Ag NPs have spherical shape with uniform size of 8–25 nm. The optical energy gap of the Ag NPs was determined from the diffuse reflectance spectroscopy. Photocatalytic activity of green treated Ag NPs was studied using an organic dye Rose Bengal under solar irradiation and these nanoparticles showed efficacy in degrading the dye within a few hours of exposure. The detailed in vitro antibacterial and anticancer activities of the green treated Ag NPs were investigated. The Ag NPs was found to have effective antibacterial activity against *Escherichia coli* and *Staphylococcus aureus*. The MTT assay and the microscopic observations of cell morphology revealed, a potent anticancer effects of the synthesized nanoparticles on breast cancer cell line (MCF-7). According to the results, the present reported anisotropic silver nanoparticles with controlled shape and size were synthesized by a simple and efficient method and it has great potential for cost-effective environmental remediation and nanomedicine applications.

1 Introduction

In recent years, nanotechnology has gained major acclaim in different branches of science owing to its multifaceted, beneficial properties including electrical, optical, chemical properties and catalytic properties [1]. Amongst the wide range of available nanoparticles, metal nanoparticles with high specific surface area and a high fraction of surface atoms have been studied extensively because of their exceptional physicochemical characteristics with excellent catalytic activity, optical, electronic, magnetic and biological properties [2].

The properties and function of the nanoparticles are size and shape dependent. Consequently, for a better antibacterial and catalytic activity a specific control over the shape and size of the nanoparticles is prerequisite, which could be achieved by employing different synthesis methods, reducing agents and stabilizers [3, 4]. In current trend of research work, the researchers use plant materials due to their eco-friendly and cost effectiveness material for the synthesis of metal nanoparticles. Though, the synthesis of

V. Vasanthakumar and A. Priyadharsan have equally contributed to this work.

Electronic supplementary material The online version of this article (https://doi.org/10.1007/s10854-018-9246-2) contains supplementary material, which is available to authorized users.

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Process Biochemistry
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Unraveling rapid extraction of fucoxanthin from *Padina tetrastromatica*: Purification, characterization and biomedical application

Vasantharaja Raguraman [a], Stanley Abraham L. [a], MubarakAli D. [b, c], Narendrakumar G. [d], Thirugnanasambandam R. [a], Kirubagaran R. [e], Thajuddin N. [b]

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Highlights

- Ultrasound assisted extraction was adopted for the extraction of fucoxanthin.
- Parameters were optimized using RSM for rapid extraction and maximum yield.
- Extracted fucoxanthin showed pure as same as that of standard.
- Extracted fucoxanthin exhibited antioxidant and cytoprotective effects.

Abstract

Fucoxanthin, a group of carotenoids abundantly present in the marine macro algae which exhibits diverse health benefits. Extraction of such potential biomolecules involves multiple steps in conventional extraction (CE) and also

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Articles

The Hybrid Effect of Jute/Kenaf/E-Glass Woven Fabric Epoxy Composites for Medium Load Applications: Impact, Inter-Laminar Strength, and Failure Surface Characterization

M. R. Sanjay, G. R. Arpitha, P. Senthamaraikannan, M. Kathiresan, M. A. Saibalaji & B. Yogesha

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ABSTRACT

This research has been carried out to find better hybrid natural/glass fiber-reinforced composites for engineering applications. This research work studied the impact and inter-laminar strength of E-glass with jute/kenaf woven fabric epoxy composites with the aim of evaluating the hybridization effects on different laminate stacking

sequences made with jute, kenaf, and E-glass fabrics by the vacuum bagging method. All the laminates were prepared in 300 × 300 mm^2 with a total of five plies maintained

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Thymoquinone alleviates arsenic induced hippocampal toxicity and mitochondrial dysfunction by modulating mPTP in Wistar rats

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ARTICLE INFO

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ABSTRACT

Arsenic is a pervasive environmental pollutant that is found in ground waters globally and is related to numerous morbidities in the high-risk population areas in countries including Bangladesh, India, and the USA. Arsenic exposure has been ubiquitously reported for exacerbating free radical generation, mitochondrial dysfunction, and apoptosis by interfering with the mPTP functioning. Over the past decades, nutraceuticals with antioxidant properties have shown promising efficacy in arsenic poisoning. In the present study, we have examined, the protective efficacy of thymoquinone (TQ), an active component of seed oil of *Nigella sativa* with antioxidant and anti-inflammatory activity on arsenic–induced toxicity in hippocampi of Wistar rats. In our results, arsenic conditioning (10 mg/kg b.wt.; p.o.) for 8 days has caused a significant increase in intracellular ROS generation, mitochondrial dysfunction and apoptotic events. On the contrary pretreatment with TQ (2.5 and 5 mg/kg b.wt.; p.o.) inhibited arsenic–induced mitochondrial dysfunction such as lowering of mitochondrial membrane potential ($\Delta\psi m$). Our results indicated that the neuroprotective efficacy of TQ in arsenic–induced stress is mediated through or in part by inhibition of mPTP opening. Demonstration of neuroprotective action of TQ provides insight into the pathogenesis of arsenic-related neuropathological morbidities.

1. Introduction

Arsenic (As) is a highly prevalent environmental contaminant. The Agency for Toxic Substances and Disease repository (ATSDR) has prioritized arsenic as a substantial hazard to human health in comparison to other toxicants. With the World Health Organisation (WHO) permissible limit for drinking water standing at ten parts per billion, more than 100 million individuals get exposed to arsenic globally [1,2].

The environmental levels of arsenic, as well as its derivatives, keep on changing due to some dynamic natural and anthropogenic processes [3–5]. Reports since early 19th century have confirmed a relationship between arsenic exposure and morbidities [6]. Drinking water is the most common source of arsenic exposure [7]. The dietary intake of rice and its preparations is also a primary source of arsenic [8]. Numerous studies have reported that chronic exposures to low doses (< 100 ug/l) in drinking water causes increased skin, bladder, kidney, and lung cancer in humans [9,10].

Arsenic toxicity expedites generation of reactive oxygen species (ROS) [11–14]. Arsenic exposure mediated ROS generation causes oxidative stress and mitochondrial damage, which ultimately leads to apoptotic cell death [15–17]. In the brain, the energy requirement is high and mitochondrial dysfunction may pose a severe threat to neuronal survival that may lead to neurodegeneration [18]. Impaired mitochondrial functions are common manifestations of many neurodegenerative diseases [19,20]. Mitochondrial dysfunction contributes to enhanced intracellular reactive oxygen species (ROS) levels, which further elicit damage to the cells and mitochondria itself.

Chelation therapy using synthetic chelating agents like 2,3-dimercaprol, meso-2,3-dimercaptosuccinic acid and 2,3-di mercapto propane-1-sulfonate is the only available armor for arsenicosis [21–23]. However, related adverse side-effects such as chelation of essential metals and arsenic redistribution in tissues mostly limited their clinical use. Also, dietary antioxidants are known for a long time for their effectiveness against oxidative stress-related complications. The correlation between arsenic neurotoxicity and oxidative stress provides an indisputable platform for phytochemicals which may serve as a useful

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Research paper

Nanocarnation-like Nickel Oxide Thin Film: Structural and Optical Properties

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Abstract

Herein, the structural and optical properties of highly porous nanocarnation-like nickel oxide (NiO) thin film in possibility of sensing applications were reported. The highly porous nanocarnation-like NiO was grown on indium tin oxide (ITO) glass substrates by using sonicated sol-gel immersion process. The grown film was characterized in details to examine the structural and optical properties using field emission scanning electron microscopy (FESEM), X-ray diffraction (XRD), Raman spectroscopy, and ultraviolet–visible–near infrared (UV-vis-NIR) spectroscopy, respectively. The XRD pattern reveals that the grown nanocarnation-like NiO film has crystalline NiO with a cubic structure. The UV-vis-NIR spectrum demonstrates that the average transmittance value of the sample in the visible region is approximately 48 % transmission. The results showed that, in view of highly porous nanocarnation-like NiO structure exhibited a great influence on its possibility for sensing applications.

Keywords: *Nickel oxide (NiO); Thin Film; sol-gel; Structural Properties; Optical Properties*

1. Introduction

Some metal oxides with semiconductor properties of n-type or p-type such as ZnO, TiO_2, Fe_2O_3, WO_3, CuO and NiO has been discussed extensively to be utilized as outstanding electron mediator for sensing membranes [1]. From previous researches, metal oxides have attained excellent consideration because of its terrific surface properties like high surface area, large pore volume, pore diameter, well-ordered pore channels and capillaries [2]. For example, the porous structures of metal oxides can be seen their utilization in wide sensing applications [3] including for gas [1, 4-7] and humidity [8, 9]. In addition, metal oxides have other important advantages such as low cost preparation, easy integration in electronic circuit, and controllable preparation process.

Meanwhile, the reports on p-type metal oxides semiconductors are relatively rare. Among all the p-type metal oxides, nickel oxide (NiO) which has a wide band gap (3.6 - 4.0 eV) is most preferable for widely used in various sensing applications because of the excellent chemical stability and high optical transparency [3]. In addition, NiO nanomaterial possess magnificent electrical conductivity, distinctly electro-active nature, low synthesis cost and a high surface to volume ratio [1]. Meanwhile, the sensing properties based on p-type oxide semiconductor materials are relatively poor compare to the n-type oxide semiconductor materials if both materials share similar morphologies and size [10]. This is based on the equation of $S_p = (S_n)^{1/2}$, where S_P and S_N are the chemical or gas sensitivities of the p-type and n-type oxide semiconductors, respectively. This equation evidently reveals that the fabrication of p-type oxide semiconductor materials for high performance sensor applications remains a huge challenge. Therefore, the details study on fabrication processes and properties of nanostructured NiO provide interesting tasks toward improving the properties of p-type materials as a sensing membrane.

Although many techniques such as hydrothermal [1, 5, 6], chemical spray pyrolysis (CSP) and chemical bath deposition (CBD) [7], electrospinning [8, 9], and sol-gel [11] have been put widely into the synthesis of NiO nanostructures, it remains rare for researchers using a facile route of sonicated sol-gel immersion method. In addition to simple techniques, it is important because the design and preparation of nanostructured metal oxides with various morphologies can effectively improve the sensing properties due to their high surface area [12]. Accordingly, this NiO thin film was prepared on indium tin oxide (ITO) glass substrates in the present study for possibility in sensing applications.

2. Experimental Details

For this work, nanocarnation-like NiO thin film was successfully prepared on ITO glass substrates. The fabrication involved sonicated sol-gel immersion method using a precursor solution of nickel nitrate hexahydrate. Prior to the growth process, ITO glass was cleaned using solutions of ethanol, acetone, and de-ionized (DI) water in the ultrasonic bath (Hwasin Technology PowerSonic 405, 40k Hz) for 15 minutes each. Furthermore, the ITO glass is blown using nitrogen gas for drying. To grow nanocarnation-like NiO thin film, a solution consisting of 0.2M nickel (II) nitrate

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Synthesis, luminescent properties and energy transfer in Tb^{3+} and Eu^{3+} co-doped $Li_3Ba_2Gd_3(MoO_4)_8$ phosphors for W-LED's

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Abstract For the first time, single phase monoclinic $Li_3Ba_2Gd_3(MoO_4)_8$: 0.08 Tb^{3+},yEu^{3+} (0, 0.005, 0.02, 0.04, 0.06, 0.08 and 0.10 mol) nano phosphors were prepared by the simple mechanochemically assisted direct solid state reaction method at room temperature. Their crystal structures, luminescence properties, energy transfer mechanism and life time were studied in detail. At the excitation wavelength of 378 nm, the emission spectra of $Li_3Ba_2Gd_3(MoO_4)_8$: 0.08 Tb^{3+},yEu^{3+} (0, 0.005, 0.02, 0.04, 0.06, 0.08 and 0.10 mol) phosphors exhibit the characteristic emissions of Tb^{3+} and Eu^{3+} ions at around 545, 594 and 615 nm due to energy transfer from Tb^{3+} ions to Eu^{3+} ions. It is confirmed from the results that electric dipole–dipole interaction phenomena is the main cause for having energy transfer from Tb^{3+} to Eu^{3+} ions in $Li_3Ba_2Gd_3(MoO_4)_8$ host. The CIE coordinates of the prepared nano phosphors illustrate that by changing the ratio of Eu^{3+} ions the white light emission can be realized from $Li_3Ba_2Gd_3(MoO_4)_8$ phosphor and it coexist very close to an ideal white chromaticity coordinates (0.33, 0.33). All properties show that $Li_3Ba_2Gd_3(MoO_4)_8$: 0.08 Tb^{3+}, 0.005 Eu^{3+} nano phosphor is a promising material for single-phase phosphor based white light emitting diodes.

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1 Introduction

Nowadays, the phosphor based white light-emitting diodes (WLEDs) are well thought-out as next age bracket of solid state lighting owing to their environmental friendliness, stability, extensive lifetimes, consistency, and low power consumption [1–5]. In broad-spectrum, there are a range of methods to pile up the white LEDs. A usual way is to mix up a blue emitting LED in the midst of a yellow-emitting phosphor, as $Y_3Al_5O_{12}$: Ce^{3+} [6]. In view of the fact that, this route is about easy, the device has been used for commercial purpose applications. On the other hand, the white light produced by this route has feeble CRI due to the color deficiency occurs in the red and green region of the spectrum. On the road to get the better of its shortcomings, the arrangement of near-ultraviolet (n-UV) LEDs emitting at 370–410 nm with a red Y_2O_2S: Eu^{3+}, green ZnS: Cu^+, Al^{3+}, and blue ZnS: Ag^+ phosphor combination has been demonstrated [7]. This type of white LED can pay for first-rate color homogeny and a sky-scraping color-rendering index. However, for the present tri color commercially available phosphor mixtures, the well-built re-absorption and nonuniformity of luminescence problems stay alive, this outcome en route for the failure of luminescence efficiency, properties, and tricolor emitting points. In recent times, it is demonstrated that judge against among phosphor mixtures, a single-phased white light emitting phosphor with UV/NUV chips has more advantages and prevail over the

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Modulation of Sn concentration in ZnO nanorod array: intensification on the conductivity and humidity sensing properties

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Abstract
Tin (Sn)-doped zinc oxide (ZnO) nanorod arrays (TZO) were synthesized onto aluminum-doped ZnO-coated glass substrate via a facile sonicated sol–gel immersion method for humidity sensor applications. These nanorod arrays were grown at different Sn concentrations ranging from 0.6 to 3 at.%. X-ray diffraction patterns showed that the deposited TZO arrays exhibited a wurtzite structure. The stress/strain condition of the ZnO film metamorphosed from tensile strain/compressive stress to compressive strain/tensile stress when the Sn concentrations increased. Results indicated that 1 at.% Sn doping of TZO, which has the lowest tensile stress of 0.14 GPa, generated the highest conductivity of 1.31 S cm^{-1}. In addition, 1 at.% Sn doping of TZO possessed superior sensitivity to a humidity of 3.36. These results revealed that the optimum performance of a humidity-sensing device can be obtained mainly by controlling the amount of extrinsic element in a ZnO film.

1 Introduction

The influence of humidity level in the environment has been a major concern of moisture-sensitive fields, such as weather forecasting, chemical production area, agriculture, and inflammable gas inspection [1]. Recent studies on humidity sensors mostly focused on high sensitivity over a wide range of humidity levels, fast response time, good reproducibility, negligible temperature dependence, low cost, ease of fabrication, and long term stability [2–4]. Through intensive studies, metal oxides, such as titanium dioxide (TiO_2), tin oxide (SnO_2), zinc oxide (ZnO), and iron oxide (Fe_2O_3), were found to meet the criteria required to produce high-quality humidity sensors [5–8]. Among the metal oxides, ZnO has the highest potential in humidity sensor owing to its wide energy bandgap (~ 3.3 eV) of *n*-type semiconductor, non-toxicity, high chemical/physical stability, and unique electrical and optical properties [9–11]. ZnO is an important material in sensors, light emitting diode, and solar cells [12–14]. One-dimensional nanostructure films, such as nanorods, yield excellent performance because of its high surface-to-volume ratio, offering a direct pathway for charge transport along the axes of nanostructure arrays and significantly reducing the rate of electron–hole pair recombination [15–17]. Currently, ZnO nanorod arrays are synthesized through solution-based processes [12, 18–20], chemical vapor deposition (CVD) [21], sputtering [22], and metalorganic CVD [23]. The solution-based method is frequently preferred because of its simple preparation, low cost, and capability for high-quality ZnO nanorod array productions.

Nevertheless, high resistivity and low free carrier concentrations result in lagging changes in resistance values at high relative humidity (RH), thereby limiting the use

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Grammar Rule-Based Sentiment Categorization Model for Tamil Tweets

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Abstract The widespread of social media is growing every day where users are sharing their opinions, reviews, and comments on an item or product. The aim is to develop a model to mine user tweets collected from Twitter. In this paper, our contribution on user tweets to find the sentiments expressed by users about Tamil movies based on the grammar rule. Tamil movies domain is selected to confine our scope of the work. After preprocessing, N-gram approach is applied to classify tweets into different genres. This work intends to find the polarity of Tamil tweets in addition to genre classification. In this work, it is also shown how to collect user tweets which comes as data stream using modified N-gram approach to predict the sentiments of the users in the dataset. Results suggest that N-gram model not only remove the complexity of natural language process but also help to improve the decision-making process.

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A new route to synthesis of substituted pyrazoles through oxidative [3+2] cycloaddition of electron deficient alkenes and diazocarbonyl compounds

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ABSTRACT

A collection of 3,5-disubstituted pyrazoles are constructed by the oxidative [3+2] cycloaddition of electron deficient terminal olefins with α-diazoesters and amides in the presence of Oxone and cetyltrimethyl ammonium bromide. The highlights of this protocol are; (i) shorter reaction time (ii) moderate to excellent yield (iii) good regioselectivity.

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Pyrazole embedded molecules are ubiquitous in the literature displaying a vast repertoire of applications in biology and pharmaceutical science [1]. Some of the representative pyrazole containing drugs such as Celecoxib [2], Viagra [3], Rimonabant [4], and Zeleplon [5] are shown in Fig. 1. In addition they are also bestowed with versatile applications as precursors in *N*-heterocyclic carbenes [6] and ligands in coordination chemistry [7]. Hence it is imperative to develop novel and efficient methods to access the pyrazole moiety.

The conventional method adopted to access these molecules is Knorr pyrazole synthesis which involves the cyclocondensation of hydrazine with 1,3-dicarbonyls (Scheme 1, Eq. a) [8]. However, this method suffers the limitations such as poor regioselectivity and limited substrate scope. Alternatively, [3+2] cycloaddition of diazo compounds on alkynes [9] and allenes [10] were also used as a genuine avenue to access these molecules. However, the synthetic and economic viabilities of alkynes and allenes pose the need of alternative approaches. In response to this demand, olefins were employed in the place of alkynes and allenes as dipolarophiles in the [3+2] cycloaddition with diazo compounds.

In this case, two pronged diazo-olefin cycloaddition route was adopted. First approach is eliminative diazo-olefin cycloaddition (EDOC) where an olefin bearing a leaving group would undergo cycloaddition with the diazo compounds to furnish the pyrazoline and the concomitant elimination reaction would furnish the required pyrazole (Scheme 1, Eq. b). Second approach is oxidative diazo-olefin cycloaddition (ODOC) where an electron deficient olefin would be subjected to cycloaddition with the diazo compound and the resulting pyrazoline would be subsequently be oxidised into the required pyrazoles (Scheme 1, Eq. c). In the case of EDOC, olefins bearing various leaving groups such as azide [11], cyanide [12], sulphone [13] and nitro [14] have been successfully treated with diazo compounds to achieve the pyrazoles. Another intriguing part of EDOC called 'organo-click' reactions where enamines generated *in situ* from carbonyl compounds and secondary amines would be subjected to EDOC has also been reported [15]. Nevertheless, in the case of ODOC, only a very few reports are found in the literature. ODOC of Bestman-Ohira reagent with enones was demonstrated by Smietana and Namboothiri to construct the library of phosphonyl pyrazoles [16]. Subsequently, Wan *et al.* have reported Bu_4NI catalysed ODOC of electron deficient olefins with various α-diazocarbonyl compounds (Scheme 1, Eq. d) [17]. In continuation to our previous contributions in the synthesis of 1,2,3-triazoles *via* azide-olefin oxidative cycloaddition [18], we were prompted to extend the similar approach to ODOC to achieve an array of pyrazole analogues. In this paper we report, ODOC of

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SCIENTIFIC REPORTS

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A side-effect free method for identifying cancer drug targets

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Identifying effective drug targets, with little or no side effects, remains an ever challenging task. A potential pitfall of failing to uncover the correct drug targets, due to side effect of pleiotropic genes, might lead the potential drugs to be illicit and withdrawn. Simplifying disease complexity, for the investigation of the mechanistic aspects and identification of effective drug targets, have been done through several approaches of protein interactome analysis. Of these, centrality measures have always gained importance in identifying candidate drug targets. Here, we put forward an integrated method of analysing a complex network of cancer and depict the importance of k-core, functional connectivity and centrality (KFC) for identifying effective drug targets. Essentially, we have extracted the proteins involved in the pathways leading to cancer from the pathway databases which enlist real experimental datasets. The interactions between these proteins were mapped to build an interactome. Integrative analyses of the interactome enabled us to unearth plausible reasons for drugs being rendered withdrawn, thereby giving future scope to pharmaceutical industries to potentially avoid them (e.g. ESR1, HDAC2, F2, PLG, PPARA, RXRA, etc). Based upon our KFC criteria, we have shortlisted ten proteins (GRB2, FYN, PIK3R1, CBL, JAK2, LCK, LYN, SYK, JAK1 and SOCS3) as effective candidates for drug development.

Cancer, one of the world leaders in morbidity and mortality, reportedly causing 8.8 million of human global death in 2015 (http://www.who.int/mediacentre/factsheets/fs297/en/), needs much weighted attention. This highly complex phenomenon encompasses a multi-step process of the conversion of benign cells into malignant, with each step corresponding to the breakdown of the normal cellular control mechanism. Such effects on cell growth and differentiation are manifested through genetic abnormalities attributed to either heritability or extraneous agents like chemical carcinogens, radiations and infectious organisms (https://ntp.niehs.nih.gov/pubhealth/roc/listings/index.html). At the cellular level, a multitude of signal transduction pathways are evoked encompassing the involvements of the above[1]. This essentially incorporates numerous genes and proteins along with their involved interactions. Systems biological studies, including but not limited to network analyses, have been done to simplify the complexity posed by the huge volume of transcriptomic and genomic data related to cancer[2–6].

Identification of therapeutic drug targets has taken a new dimension with the advent of network analyses[7,8]. Till date, networks of interacting proteins in disease pathways have been conferred as interactomes and analysed for identifying candidate drug targets[7,9,10]. The analyses focussed on some selected centrality measures that reflect the importance of a particular protein connecting major hubs of interacting protein partners in the complex disease scenario. For instance, an interactome of cancer proteins with centrality measures has been reported where the proteins have stronger interactions than the non-cancer disease proteins and products of essential housekeeping genes[8,11–14]. However, despite such efficient measures, drugs designed for identified targets were reported to have serious side effects[15] to the extent of attaining the withdrawn status[16]. In fact, BC and DC of drug targets had been associated with toxicity[13,15,16]. Here, we present an integrated stepwise approach encompassing separate parametric measures of identifying potential cancer drug targets with a minimal risk of being declared as withdrawn at a later stage.

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SPECIAL ISSUE PAPER

Adaptive optimal multi key based encryption for digital image security

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Summary

The security of digital images is an essential and challenging task on shared communication Model. Generally, high secure working environment and data are also secured with an encryption and decryption method by using secret and public keys. In this paper, the innovative encryption technique for image security, ie, Multiple key-based Homomorphic Encryption (MHE) technique is proposed. For increasing the security level of encryption and decryption processes, the optimal key is selected using Adaptive Whale Optimization (AWO) algorithm. Fitness function was considered for optimization as PSNR of plain and cipher images. The original image was transformed into blocks and then rearranged utilizing encryption process, this work achieved maximum security, much better than other encryption techniques. From the outcomes, one can achieve incredible quality of the proposed model, the maximum PSNR, and the minimum MSE contrasted with other encryption schemes.

KEYWORDS

decryption, encryption, images, optimization, security, whale optimization (WO) and homomorphic

1 | INTRODUCTION

With regularly expanding media applications, security is becoming an essential issue in communication and capacity of images, whereas encryption is one of the approaches to guarantee the security.[1] A number of image data security arrangements were proposed as of late. Encryption is one of these essential common methods.[2] Encryption process changes plain-image data into number-image by including an algorithm so as to join the first image with at least one key.[3] Encryption is the way toward applying exceptional numerical algorithms and keys to change digital data[4] into cipher code before they are transmitted. In the decryption process, the scientific algorithms and keys are used to get back the first data from number code.[5] A large portion[6] of the common images and the estimations of the neighboring pixels are emphatically connected (ie, the estimation of any given pixel can be sensibly anticipated from the estimations of its neighbors[7]). Therefore, extraordinary security systems were utilized to provide the required assurance.[8]

The security of digital images has turned out to be increasingly essential because of the quick advancement of web in today's digital world. Among the available algorithms, chaos-based algorithm has proposed an effective approach to manage the obstinate issues[9] of quick and exceedingly secure image encryption.[10] Homomorphic cryptosystems are exceptional cryptosystems with a point of confinement to achieve advancement and increment process on mixed data decision to uncover any data with regards to intriguing data.[11] Homomorphic encryption appears to be a decent method to ensure protection in terms of outsourcing applications, particularly when taking care of the integer data type.[12] However, as the data type in distributed computing is different, the way to utilize homomorphic encryption in different kinds is yet a challenging issue.[13] For instance, due to the popularization of photography equipment, a lot of digital images are produced every day.[14] It has turned out to be a standout among the most popular types of individual data for clients.[15] This model is impractical since it requires non-colluding servers and thus provides only weak security guarantees.[16] In addition, it utilized distinctive preprocessing for each protected task.[17] With bootstrapping, many a times a larger part of computation time is consumed while assessing an unpredictable circuit and upgrading intermediate ciphertexts are bootstrapped, which largely affects

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COMMUNICATION

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An Efficient One-Pot Synthesis of 1,2,3-Triazole-Fused Chromenes/ Quinolines *via* Oxidative [3+2] Cycloaddition followed by Reductive Cyclization

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Supporting information for this article is available on the WWW under http://dx.doi.org/10.1002/adsc.201######.((Please delete if not appropriate))

Abstract. A convenient and efficient one-pot synthesis of 1,2,3-triazole-fused chromenes/ quinolines is developed. The methodology is based on oxidative azide-olefin [3+2] cycloaddition followed by intramolecular reductive cyclization. This methodology affords fast and simple access to 1,2,3-triazole-fused heterocycles in good to excellent yields without necessitating chromatographic purification.

Keywords: Fused 1,2,3-Triazoles; One-Pot Synthesis; Oxidative [3+2] Cycloaddition; Reductive Cyclization

Chromene and quinoline are two important structural scaffolds for pharmaceutical and biologically active natural products.[1-4] On the other hand, the 1,2,3-triazole moiety has its own importance in synthetic, medicinal and materials chemistry.[5-6] Especially, 1,2,3-triazole-fused heterocycles are found in a wide spectrum of bioactive molecules and pharmaceutical targets (Figure 1), such as benzodiazepine receptors, chemotherapeutic, GPR109A agonists and cardiovascular agents.[7-10] Hence, new strategies to synthesize this class of molecules are highly desirable. In this regard, different methods have been developed toward the synthesis of compounds containing fused triazoles.[11]

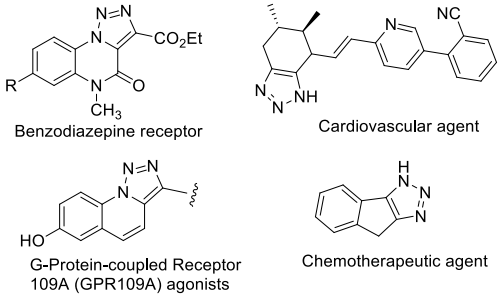
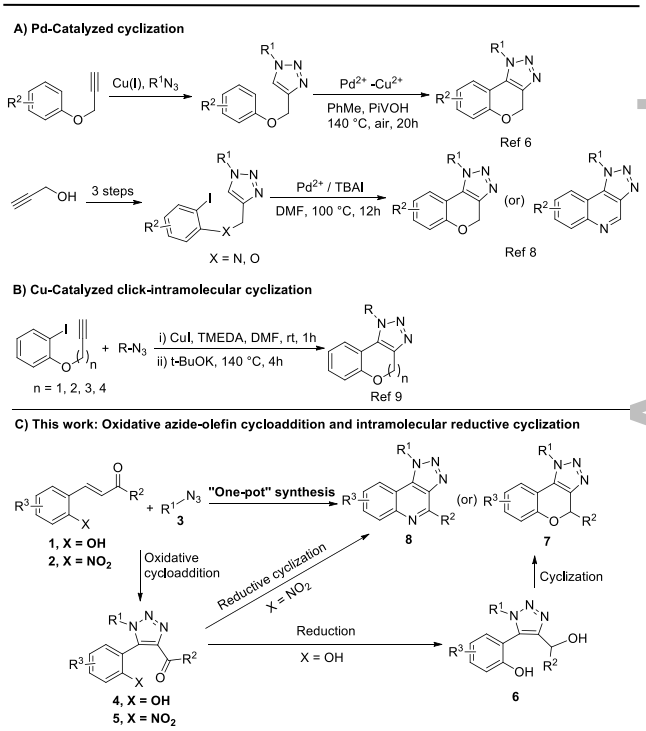


Figure 1. Pharmacologically active 1,2,3-triazole-fused heterocycles.

Literature reports infer that 1,2,3-triazole-fused heterocycles can be synthesized primarily by two strategic approaches. First strategy involves intermolecular regioselective 1,3-dipolar cycloaddition between azide and terminal alkyne followed by metal catalyzed arylation (coupling) of the resulting 1,2,3-triazole (Scheme 1, A). With this strategy Ackermann[12] synthesized 1,2,3-triazole-fused chromenes by a click reaction then followed by an intramolecular dehydrogenative arylation using a Pd^{2+}–Cu^{2+} catalytic system under air. More recently,



Scheme 1. Synthetic routes to access 1,2,3-triazole-fused heterocycles.

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Analysis on Improving the Response Time with PID-SARSA-RAL in ClowdFlows Mining Platform

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Abstract

This paper provides an improved parallel data processing in Big Data mining using ClowdFlows platform. The big data processing involves an improvement in Proportional Integral Derivative (PID) controller using Reinforcement Adaptive Learning (RAL). The Reinforcement Adaptive Learning involves the use of Actor-critic State–action–reward–state–action (SARSA) learning that suits well the stream mining module of ClowdFlows platform. The study concentrates on batch mode processing in Big Data mining model with the use of proposed PID-SARSA-RAL. The experimental evaluation with the conventional ClowdFlows platform proved the effectiveness of the proposed method over continuous parallel workflow execution.

Keywords: SARSA Active Learning, Big Data Mining, PID Controller, Reinforcement Learning

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1. Introduction

ClowdFlows is an open cloud platform that includes composition, execution and interactive sharing of data mining workflows. The ClowdFlows platform works under the principle of service based knowledge discovery in large databases with an interactive workflows. The ClowdFlows platform has a user programming interface, which provides access to 3rd party services. It also uses the workflow execution in the cloud environment over static data [1].

The ClowdFlows platform is improved to operate on real-time data. Here, the improvements are made to access different operating systems and can utilize the utmost resource of the server to reduce the computational complexity with increased data transfer rate [2]. ClowdFlows platform using batch mode processing to perform distributed computing with MapReduce framework [3].

The main problem associated with data mining in large database is the data scalability. Hence, active or semi-supervised learning approach is suitable for better data selection strategy [4] in big data mining systems. Similarly, the use of active learning in ClowdFlows platform increases the parallel processing of data selection. Kranjc et al. [5] used on-line dynamic adaptive analysis in ClowdFlows platform that reduces the computational efforts. The active learning is improved with Support Vector Machine on microblogging data streams [5].

The active learning approaches to improve the data selection in big data sets using ClowdFlows platform is currently less. Henceforth, the proposed method

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ACCEPTED MANUSCRIPT

Antimicrobial activity, Cytotoxicity and DNA binding studies of Carbon Dots

Mariadoss Asha Jhonsi[a]* Devanesan Arul Ananth[b], Gayathri Nambirajan[b], Thilagar Sivasudha[b], Rekha Yamini[c], Soumen Bera[c] and Arunkumar Kathiravan[d]

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E-mail address: asha@bsauniv.ac.in (Dr. M. Asha Jhonsi)

Abstract

In recent years, quantum dots (QDs) are one of the most promising nanomaterials in lifesciences community due to their unexploited potential in biomedical applications; particularly in bio-labeling and sensing. In the advanced nanomaterials, carbon dots (CDs) have shown promise in next generation bioimaging and drug delivery studies. Therefore the knowledge of the exact nature of interaction with biomolecules is of great interest to designing better biosensors. In this study, the interaction between CDs derived from tamarind and calf thymus DNA (ct-DNA) has been studied by vital spectroscopic techniques, which revealed that the CDs could interact with DNA via intercalation. The apparent association constant has been deduced from the absorption spectral changes of ct-DNA–CDs using the Benesi-Hildebrand equation. From the DNA induced emission quenching experiments the apparent DNA binding constant of the CDs (K_{app}) have also been evaluated. Furthermore, we have analyzed the antibacterial and antifungal activity of CDs using disc diffusion assay method which exhibited excellent antibacterial activity against *E. coli* and *C .albicans* with inhibition zone in the range of 7-12 mm. The biocompatible nature of CDs was confirmed by an *in vitro* cytotoxicity test on L6 normal rat myoblast cells by using MTT assay. The cell viability is not affected till the high dosage of CDs (200 µg/ml) for more than 48 h. As a consequence of the work, future development of CDs for microbial control and DNA sensing among the various biomolecules is possible in view of emerging biofields.

Key words: Antimicrobial, cytotoxicity, fluorescent carbon dots, DNA, TCSPC

Proof for Sl no 54

Purdue University, West Lafayette, Indiana, USA

Prof. Raji Sundararajan, Visiting Professor at School of Life Science, BSACIST

June, 10, 2017

Dr. Sahol Hamid Bin Abu,
Vice Chancellor,
B. S. Abdur Rahman Crescent University,
Vandalur, Chennai – 600 048

To

Prof. Raji Sundararajan,
Purdue university, 401 N. Grant St.
West Lafayette, Indiana, USA

Dear Dr. Sundararajan ,

It is my immense pleasure to invite you as an Adjunct Faculty /Visting Professor at the School of Life Sciences B. S. Abdur Rahman Crescent University, Vandalur, Chennai, India.

It is my fervent hope that your participation as visting professor will immensely benefit the faculty and students of our university both in teaching and research in Life Sciences.

The visting professor position is initially for a period of two years from the date of your acceptance and is extendable for a further period. The remuneration will be paid according to the university norms.

Please convey your acceptance of this invitation at your earliest convenience to the Dean, School of Life Sciences, B. S. Abdur Rahman Crescent University, Vandalur, Chennai,

I look forward to a mutually enriching and rewarding relationship.

Thanking You
With best wishes,

Yours Sincerely,

Dr. Sahol Hamid Bin Abu, Vice Chancellor,

Proof for Sl No 55

University of Nottinghamm, United Kingdom (UK)

Dr. Nagamani Bora, Visiting Professor at School of Life Science, BSACIST

June, 10, 2017

Dr. Sahol Hamid Bin Abu,
Vice Chancellor,
B. S. Abdur Rahman Crescent University,
Vandalur, Chennai – 600 048

To

Dr. Nagamani Bora,
School of Biosciences,
Sutton Bonington campus,
University of Nottingham,
LE125RD, UK.

Dear Dr. Bora ,

It is my immense pleasure to invite you as an Adjunct Faculty /Visting Professor at the School of Life Sciences B. S. Abdur Rahman Crescent University, Vandalur, Chennai, India.

It is my fervent hope that your participation as visting professor will immensely benefit the faculty and students of our university both in teaching and research in Life Sciences.

The visting professor position is initially for a period of two years from the date of your acceptance and is extendable for a further period. The remuneration will be paid according to the university norms.

Please convey your acceptance of this invitation at your earliest convenience to the Dean, School of Life Sciences, B. S. Abdur Rahman Crescent University, Vandalur, Chennai,

I look forward to a mutually enriching and rewarding relationship.

Thanking You
With best wishes,

,

Yours Sincerely,

Dr. Sahol Hamid Bin Abu, Vice Chancellor,

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Dielectric and electromagnetic interference shielding properties of germanium dioxide nanoparticle reinforced poly(vinyl chloride) and poly(methylmethacrylate) blend nanocomposites

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Abstract
Germanium dioxide (GeO_2) nanoparticles reinforced poly(vinyl chloride) (PVC) and poly(methyl methacrylate) (PMMA) blend nanocomposite films were prepared using solution casting technique. The PVC/PMMA/GeO_2 nanocomposite films were characterized by FTIR—Fourier transform infrared spectroscopy, XRD—X-ray diffraction and TGA—thermogravimetric analysis. The morphological and structural characteristics were examined using POM—polarized optical microscopy, SEM—scanning electron microscopy and AFM—atomic force microscopy. The dielectric properties and the electromagnetic interference (EMI) shielding effectiveness of these nanocomposite films were also studied. The EMI shielding properties were studied in the broadband microwave region of X (8–12 GHz) and Ku band (12–18 GHz). From SEM micrographs, the porous network was unfolded that enriches the absorption behaviour. The EMI shielding effectiveness of − 17.1 dB was observed for PVC/PMMA/GeO_2 nanocomposite film with 10 wt % GeO_2 loading and the nanocomposite film with 8 wt% of GeO_2 loading showed the potential to attenuate electromagnetic waves through absorption up to 75%. Hence, the EMI shielding results demonstrate that the PVC/PMMA/GeO_2 nanocomposite films can be used as an absorption dominating shielding materials.

1 Introduction

In today's lifestyle, it is impossible to live without technology, especially the devices that connect people through communication such as mobile phones, laptops, radios, etc. All the electronic devices that we use absorb or radiate electromagnetic (EM) waves and affect the performance of other electronic circuits thus creating interference. Even the environment and living systems are also disturbed by these EM waves [1]. The source of EM radiations is both natural as well as human-world. The easy accessibility of electronic gadgets enables rapid inflation of electromagnetic noise in the atmosphere. The human body gets affected when exposed to such an atmosphere. The EM radiations are transmitted and most of the radiations get absorbed by the body, thus causing ailment like skin rashes, muscle soreness and sometimes leading to infertility [2, 3]. Therefore, electromagnetic interference (EMI) has been considered as one of the serious issues in the recent times and finding an efficient shielding material that facilitates shielding in both X and Ku bands (8–18 GHz) has a major contribution in the modern day communication system [4, 5]. In recent years, an intensive research work has been carried out to explore new and remarkable shielding materials which are microwave absorbers (MA) as well as environmentally friendly [6–11]. Initially, many metal-based shielding materials were used conventionally but due to their rigidity and corrodibility,

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EFFECT OF FIBER ORIENTATION ON THE DELAMINATION BEHAVIOUR OF GLASS-CARBON HYBRID INTERFACE

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ABSTRACT

The delamination behavior of glass-carbon hybrid laminate with glass and carbon fiber on either side of the mid-plane was studied using double cantilever beam test. The stacking sequence and fiber orientation of the hybrid laminate was taken as [G_0/G_{135}/G_{90}/G_{45}/C/C//G/G/G_{45}/G_{90}/G_{135}/G_0]. Three different laminates were obtained by changing the fiber orientation of the mid-layers as C/C//G/G. Laminates were prepared by hand lay-up technique and post cured by compression. The test was conducted as per ASTM standard D5528. The strain energy release rate G_{Ic} calculated using modified beam theory method was found to be higher for the laminate with mid-layers as C_{90}//G_0 in comparison with that of the other two laminates. Fractographic analysis of the delaminated surfaces using scanning electron microscope indicates hackles, striations and fiber fracture. Hackles that provides more resistance to crack propagation leading to increase in inter laminar fracture toughness are observed in the glass fiber side of the specimen with C_{90}//G_0 interface.

KEYWORDS*: *Glass, Carbon, Hybrid, Delamination & Fracture

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Original Article

INTRODUCTION

In structural applications Fiber Reinforced Polymer (FRP) composites are used in the form of laminates. These layered composites are fabricated by binding multiple layers together. They suffer from delamination failure due to poor inter laminar fracture toughness. The effect of delamination will further increase when the adjacent layers are stacked with different fiber type. In hybrid laminates stacked with carbon/glass fiber the specimens failed by brittle cracking, crack growth in waves and large displacement [1]. Inter laminar fracture toughness was found to be higher for the inter-ply hybrid composites in comparison with that of the single-fiber composites. The crack growth was dominated by Mode I fracture [2]. Double Cantilever Beam (DCB) test was found to be a viable method to measure the interlaminar mode I fracture resistance. In DCB test the opening displacement between two DCB arms, reaction force at the pulling point and the delamination crack length can be obtained [3]. The critical strain energy release rate (G_{IC}) calculated using these data indicate the resistive force required to create two new surfaces [4].

In carbon-epoxy laminates G_{Ic} was found to be better for the specimens with 0^o//90^o interface when compared to that of the specimens with 0^o//0^o interface at the mid-plane. But, the delamination migrates towards the neighboring layers by extending in the transverse direction [5]. This phenomenon of crack migrating from one lamina to an adjacent lamina may deviate the result from true fracture toughness value [6]. In carbon-epoxy laminates with 0^o//θ^o fiber orientation at the mid-plane, fiber bridging occurred. This increased with increase in θ

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Energy consumption analysis of Virtual Machine migration in cloud using hybrid swarm optimization (ABC–BA)

K. Karthikeyan[1] · R. Sunder[2] · K. Shankar[3] · S. K. Lakshmanaprabu[4] · V. Vijayakumar[5] · Mohamed Elhoseny[6] · Gunasekaran Manogaran[7]

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Abstract
A cloud data center consumes more energy for computation and switching servers between modes. Virtual Machine (VM) migration enhances the execution of cloud server farm in terms of energy proficiency, adaptation to internal failure, and accessibility. Cloud suppliers, be that as it may, ought to likewise enhance for amounts like energy consumption and administrations costs and in this manner, trying to have all the Virtual Machines with the least measures of physical equipment machines conceivable. The part of virtualization is critical and its execution is subjected to VM migration and machine allotment. A greater amount of the energy is caught up in the cloud; consequently, the use of various calculations is required for sparing energy and productivity upgradation in the proposed work. In the proposed work, the Naive Bayes classifier with hybrid optimization using Artificial Bee Colony–Bat Algorithm (ABC–BA) was implemented to reduce the energy consumption in VM migration. The proposed method was evaluated in CloudSim and the performances were compared using performance index such as success &failure rate, and energy consumption. It is observed from the implementation results that the proposed method reduces energy consumption compared to other existing methods. From the implementation outcomes of the proposed work, it was understood that the model was able to achieve the minimum energy consumption and failure rate i.e., 1000–1200 kWh, 0.2 with maximum success rate and accuracy of 1 and 97.77%.

Keywords Cloud computing · Virtual Machine · Failure detection · Prediction · Optimization · And energy consumption

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Extended author information available on the last page of the article

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ACCEPTED MANUSCRIPT

Enhanced Electromagnetic Absorption in NiO and $BaTiO_3$ Based Polyvinylidenefluoride Nanocomposites

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Abstract:

The electromagnetic interference (EMI) shielding effectiveness and the intrinsic electrical properties of polymeric material filled with two different nanostructured fillers were investigated. The polymeric material being polyvinylidene fluoride (PVDF) and nickel oxide (NiO) and barium titanate ($BaTiO_3$) were used as nanofillers. The PVDF/NiO/$BaTiO_3$ nanocomposite films were prepared with the variable concentration of nanofillers using solvent casting method. The structural and morphological analysis of PVDF/NiO/$BaTiO_3$ nanocomposite films was carried out using Fourier transform Infrared spectroscopy (FTIR), X-ray diffraction (XRD) and Scanning electron microscopy (SEM). To understand the EMI shielding effectiveness, the absorption was studied in the Ku-band frequency range (8 Hz- 12 Hz). The FTIR analysis shows the interaction between the phases at varying concentrations of nanofillers and the XRD analysis shows characteristic peaks of all the constituents of PVDF/NiO/$BaTiO_3$ nanocomposites. SEM micrographs of PVDF/NiO/$BaTiO_3$ nanocomposite film reveal homogeneous dispersion of both NiO and $BatiO_3$ in the PVDF matrix. The impact of variable concentration of nanofillers on the overall shielding effectiveness (SE) was also investigated with the shielding effectiveness of -11.5dB.

Keywords: Polymer nanocomposites, EMI shielding, PVDF, $BaTiO_3$, NiO

1. Introduction

Polymer nanocomposites (PNCs) are the class of nanomaterials possessing elevated conductivity at lower filler loadings, low density, designing flexibility, better aspect ratio and simplicity of processing [1]. These parameters put PNCs in perfect alignment for use as shielding materials from electromagnetic interference (EMI) in devices like mobile phones, computers, and aircraft electronics in addition to medical and military fields [2]. The combination of polymeric materials such as polyvinylidene fluoride (PVDF), polyaniline (PANI), polystyrene (PS) etc. with different types of higher aspect ratio conductive nanofillers like nickel oxide (NiO), barium titanate ($BaTiO_3$), graphene etc. have been reported for EMI shielding applications [3]. The presence of fillers of nanosize dimensions exhibit more efficient EMI shielding than the fillers at microscale dimensions [4]. Due to exceptional rise in the field of electronics, the main hindrance comes in the form of interference of electromagnetic nature like in speakers or other electronic devices [5].

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Experimental Analysis of Inclined Solar Water Heater with Baffles

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This work presents the experimental analysis of solar water heater using baffles and flat absorber. Experiments are conducted with different water flow rates of water inside the baffled basin with the flat absorber. A flow rate of water was increased by 2, 4, and 8 times that an initial mass flow rate of water. Experimental results show that the water temperature is higher in the case of a water heater with baffles as compared to flat plate absorber. The maximum water temperature with minimum and maximum flow rates were found to be 65 ^{C} and 53 ^{C}, respectively with baffles held as path deviator. Also, the exit temperature of water depends on the solar intensity, absorber temperature and ambient condition.

1. Introduction

Due to rapid population growth and industrial developments, fossil fuels are depleting which results in the need, research and development of renewable energy sources. For industrial and domestic applications, the solar water heater has become one of heating application to harness solar energy as well as for increased comfort for humans. Several geometries are used in solar water heating which includes a spiral tube, helical tube and serpentine tubes. To increase the efficiency of solar water heating system several methods are employed which includes nanofluids, evacuated tubes, collectors connected in series and parallel. Concentrating collectors are expensive and only used for applications operating at a higher temperature. For moderate temperatures flat plate collectors connected in parallel and series (Devanarayanan et al., 2014; Hossain et al., 2011; Jaisankar et al., 2011; Jamar et al., 2016; Kee et al., 2017; Lin et al., 2015; Mostafaeipour et al., 2017; Shukla et al., 2009; Singh et al., 2016; Smyth et al., 2006; Deng et al., 2015) discovered the performance for the new Flat Plate Collector (FPC) with mica heat pipe absorber Solar Water Heater (SWH). The test outcomes demonstrated that the daily thermal energy gains on the three days in various seasons are 13.43 MJ/m^2, 11.05 MJ/m^2, and 7.42 MJ/m^2 separately, compared to the sun-powered illumination of 18.9 MJ/m^2, 17.2 MJ/m^2, and 14.7 MJ/m^2. Next, the daily average thermal efficiencies are 71.05%, 64.25%, and 50.49%, individually. Xue (2016) designed an ETC with Phase Change Material (PCM) and it was reported that this novel system produced the maximum efficiency of 45%. (Hadjiat et al., 2018) integrating the Compound Parabolic Concentrator (CPC) with SWH. This set-up reached the maximum water temperature of 74° C. (Taheri et al., 2013) researched the compact solar water heater and it was submitted that this compact system reached the efficiency up to 70%. (Pandya et al., 2017) designed a new V-through SWH and they studied the effect of dust particles on collector surface and collector cover surface. It was reported that the optimum collector cover surface is 25°. Dust particles reduced the SWH performance by limiting the solar intensity input to the SWH. (Al-Kayiem et al., 2014) incorporated the PCM nanocomposite with the SWH. It was reported that SWH with and without PCM produced the maximum efficiency of 47.6 and 51%, respectively. The PCM enhances the SWH efficiency up to 5 to 8.5% higher than the normal SWH. (Al-Madani 2006) experimentally investigated the performance of the SWH and he reported that this SWH has the

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DOI:10.3303/CET1871224

Proof for Sl no 61

Curtin University, Australia

Prof. Arun Dharmarajan, Visiting Professor at School of Life Science, BSACIST

June, 10, 2017

Dr. Sahol Hamid Bin Abu,
Vice Chancellor,
B. S. Abdur Rahman Crescent University,
Vandalur, Chennai – 600 048

To

Prof. Arun Dharmarajan
Curtin Health Innovation Research Institute (CHIRI)
Curtin University, Australia

Dear Dr. Dharmarajan,

It is my immense pleasure to invite you as an Adjunct Faculty /Visting Professor at the School of Life Sciences B. S. Abdur Rahman Crescent University, Vandalur, Chennai, India.

It is my fervent hope that your participation as visting professor will immensely benefit the faculty and students of our university both in teaching and research in Life Sciences.

The visting professor position is initially for a period of two years from the date of your acceptance and is extendable for a further period. The remuneration will be paid according to the university norms.

Please convey your acceptance of this invitation at your earliest convenience to the Dean, School of Life Sciences, B. S. Abdur Rahman Crescent University, Vandalur, Chennai,

I look forward to a mutually enriching and rewarding relationship.

Thanking You
With best wishes,

Yours Sincerely,

Dr. Sahol Hamid Bin Abu, Vice Chancellor,

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Research Article Open Access

Screening Indian Medicinal Plants to Control Diabetes – An *In silico* and *In vitro* Approach

Fazeela Mehaboob Begum SM[1], **Zakia Fathima S**[1], **Priya S**[1], **Sundararajan R**[2] **and Hemalatha S**[1*]

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[2]*Purdue University, West Lafayette, IN-47907, USA*

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Abstract

Aim: The goal of this study is to analyze the compounds with high binding affinity to Peroxisome Proliferator-Activated Receptor Gamma (PPARγ) by molecular docking and analyze the resulting medicinal plant by *in vitro* analysis.

Background: Diabetes Mellitus is a multifactorial disease leading to the several complications and thus, demanding for a therapeutic approach. Medicinal plants with several anti-diabetic compounds play an important role in treating diabetes. In this study, we report twenty eight compounds from fifteen Indian medicinal plants by targeting PPARγ, using an *in silico* approach. PPARγ is involved in adipocyte differentiation, glucose homeostasis, lipid storage and also improve insulin sensitivity and glucose tolerance and thus, helping in the treatment of diabetes. The goal of this study is to analyze the compounds with high binding affinity by molecular docking.

Results: The qualified herbal ligand Andrographolide has high binding potential against the target protein receptor, PPARγ. The resulting ligand was also found to be fit with good druggable character, as per Lipinski's rule of five. Thus, this ligand could be a potential drug candidate for treating diabetes mellitus. The resulting medicinal plant was subjected to *in vitro* analysis where phytochemical evaluation, anti-oxidant activity, anti-diabetic activity, anti-inflammatory activity and the anti-glycation activity of the five different solvent extracts were determined. The results obtained indicated that the extracts possess a significant level of activity and are concentration dependent.

Keywords: Diabetes; PPARγ; Molecular docking; Andrographolide

Introduction

Diabetes Mellitus is a metabolic disorder of proteins, fats and carbohydrate metabolism which is characterized by high fasting and post prandial blood sugar levels. Diabetes mellitus results either from less production of insulin or insulin dysfunction [1].

The disease is estimated to increase from 4% in the year 1995 to 5.4% by the year 2025 [2]. Early diagnosis and adequate treatment is very important for management of the disease. Complications include diabetic ketoacidosis, coronary heart diseases, macro-angiopathy, micro-angiopathy, neuropathy, retinopathy, cataracts and renal failure [3].

Peroxisome proliferator–activated receptors (PPARs) belonging to the nuclear receptor family are ligand-activated transcription factors which bind to specific DNA response elements as heterodimers with the retinoid-X receptor (RXR) and control glucose and lipid metabolism, offering excellent therapeutic approach for treating the diabetes [4]. Specifically, PPARγ, one of the isoforms, is highly sensitivity and glucose tolerance [5].

Considering the side effects and exorbitant cost of the many current medicines, in the past few years, herbal medicines are gaining momentum in treating various diseases because of their natural origin and less or no side effects.

Nearly 21,000 plants have been listed by the World Health Organization, which have numerous medicinal purposes around the world. Among these 2500 species are in India, out of which 150 species are used commercially on a fairly large scale [6].

For the current study, 15 Indian medicinal plants having anti-diabetic effect, that are used include: *Azadirachta indica*, *Andrographis paniculata*, *Swertia Chirata*, *Indigofera aspalathoides*, *Ocimum basilicum*, *Anethum graveolens*, *Momordica charantia*, *Trigonella foenum-graecum*, *Cinnamomum verum*, *Aegle marmelos*, *Emblica officinalis*, *Coccinia grandis*, *Ficus religiosa*, *Murraya koenigii*, *Punica granatum*.

PPARγ is considered as legitimate target to design anti diabetic drugs and PPARγ agonists are effective to control diabetes, however due to side effects of these existing drugs there is a pressing need for the retrieval of new ligands/agonists with antidiabetic activity with minimum or no side effects. Using bioinformatic approach, the novel ligands are identified from Indian herbal plants.

The goal of this present work is to use an *in silico* approach to predict the binding potential of these bioactive compounds with the target receptor (PPARγ) by molecular docking. The best scored compounds identified from these herbal sources can act as potential drug candidates to control diabetes, and the resulting plant was further subjected to *in vitro* analysis where phytochemical analysis, anti-oxidant activity, anti-diabetic activity, anti-inflammatory activity and the anti-glycation activity of the five different solvent extracts were determined.

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ORIGINAL RESEARCH

Secret image sharing scheme with encrypted shadow images using optimal homomorphic encryption technique

K. Shankar[1] · Mohamed Elhoseny[2] · R. Satheesh Kumar[3] · S. K. Lakshmanaprabu[4] · Xiaohui Yuan[5]

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Abstract
Secret Image Sharing (SIS) scheme is to encrypt a secret image into 'n' specious shadows. It is unable to reveal any data on the secret image if at least one of the shadows is not achieved. In this paper, wavelet-based secret image sharing scheme is proposed with encrypted shadow images using optimal Homomorphic Encryption (HE) technique. Initially, Discrete Wavelet Transform (DWT) is applied on the secret image to produce sub bands. From this process, multiple shadows are created, encrypted and decrypted for each shadow. The encrypted shadow can be recovered just by choosing some subset of these 'n' shadows that makes transparent and stack over each other. To improve the shadow security, each shadow is encrypted and decrypted using HE technique. For the concern on image quality, the new Oppositional based Harmony Search (OHS) algorithm was utilized to generate the optimal key. From the analysis, it shows that the proposed scheme provide greater security compared to other existing schemes.

Keywords Secret image sharing · Shadow · Homomorphic encryption · Discrete wavelet transform · Harmony search (OHS) algorithm · PSNR

1 Introduction

The data security is a one-in-everything preeminent squeezing issue for which few analysts investigated in depth to have an overview about it (Rani and Mary 2016). The security of change in the shrouded information can be retrieved through two ways such as encoding and data hiding (Liu and Ke 2018). A mix of these two strategies can be utilized to build information security (Karolin and Meyyapan 2015). However, security can be approached from various perspectives like password, confirmation, distinguishing proof (Singh et al. 2018), watermarking systems (Thakur et al. 2018b; Kumar et al. 2018a, b) and so on (Nagdive and Raut 2015). In such a manner, diverse image cryptosystems were prescribed earlier in light of the fact that encryption is seen as an effective and direct strategy to secure private information (Linju and Mathews 2016). Encryption and decryption of the information are observed as the perfect ways to ensure the data is secure and respected. Share period for the visual cryptography ought to be in the manner such that it can conceived through watermarking using some watermarking procedures. One can use these watermarked offers for recuperating the covered information (Singh et al. 2016).

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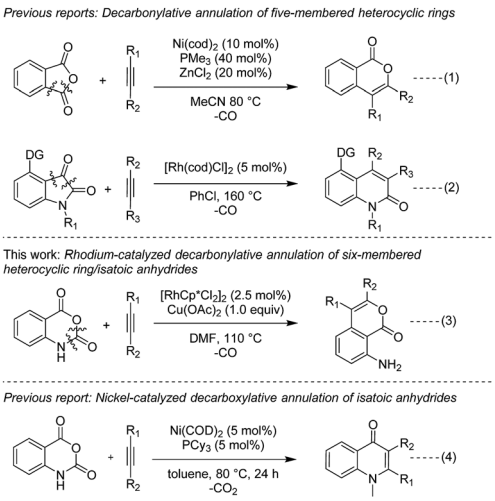
Rhodium(III)-catalysed decarbonylative annulation through C–H activation: expedient access to aminoisocoumarins by weak coordination†

Sivakalai Mayakrishnan,[a] Yuvaraj Arun,[ab] Narayanan Uma Maheswari*[a] and Paramasivan Thirumalai Perumal*[ac]

Rhodium-catalysed decarbonylative annulation of isatoic anhydrides with alkynes through C–H activation for the synthesis of aminoisocoumarins was developed. This enables the gram-scale transformation to iodoisocoumarin which is a vital building block in transition-metal-catalysed cross couplings. These compounds exhibit blue-emitting luminescence properties.

In recent years, transition metal catalysed divergent C–H bond functionalization has highlighted its potential in organic synthesis and profoundly impacted on synthetic strategies.[1] Expanding the synthetic tool box to allow for the selective functionalization of different C–H bonds in a given substrate has been a long-standing goal in methodology development.[2] Rh-Catalysed C–H activation has attracted many research groups with great interest in the construction of C–C and C–X bonds.[3]

Despite the huge development in C–H activation, only a few metal-catalyzed decarbonylative annulations have been reported. Initially, decarbonylative annulations were reported in strained four-membered cyclobutanone systems.[4] Subsequently, Matsubara *et al.* reported the first Ni-catalyzed decarbonylative annulation of less-strained five-membered anhydrides or phthalimides with alkynes for isoquinolones or isocoumarins [Scheme 1, eqn (1)].[5] Recently, a directing-group-assisted decarbonylative annulation of five-membered isatin with alkyne for 2-quinolinone was reported by Dong *et al.* [Scheme 1, eqn (2)].[6] In addition, despite the growing developments in Rh-catalyzed reactions, still very limited reports are available on C–H activation/alkyne annulation by weakly coordinating directing groups. Moreover, weakly coordinating anhydrides add value as an ideal alternative to carboxylates due to their weak Lewis basicity, which decreases the coordination power of a metal thus diminishing the stability in the transition state.[7] The evaluation of carboxylate directing groups could potentially lead to the most consistent method for the direct C–H functionalization of readily accessible synthetic building blocks.[8]



Scheme 1 Transition-metal-catalysed decarbonylative/decarboxylative annulations.

In this context, we report the first Rh-catalyzed decarbonylative annulation of less-strained six-membered isatoic anhydrides with alkynes assisted by weakly coordinating anhydride groups for the synthesis of aminoisocoumarins [Scheme 1, eqn (3)]. Previously, Matsubara *et al.* reported the Ni-catalyzed decarboxylative annulation of isatoic anhydrides [Scheme 1, eqn (4)].[9] Interestingly, we report decarbonylative annulation of isatoic anhydrides using an Rh catalyst. Importantly, this developed decarbonylative annulation delivers a feasible synthetic route for the synthesis of aminoisocoumarins. The naturally abundant isocoumarin products exhibit a wide range of biological properties[10] like anticancer, anti-HIV, antibacterial, antifungal, anti-inflammatory,

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† Electronic supplementary information (ESI) available: Experimental section and characterization. CCDC 1815391. For ESI and crystallographic data in CIF or other electronic format see DOI: 10.1039/c8cc07167e

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Colloids and Surfaces B: Biointerfaces
Volume 102, 1 February 2013, Pages 232-237

Synthesis of anisotropic silver nanoparticles using novel strain, *Bacillus flexus* and its biomedical application

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Abstract

Synthesis of metallic nanoparticles has attracted by bacterial based production and alternative to physical and chemical approaches. The present work was focused to nominate a bacterial strain for synthesis of potential silver nanoparticles. The target was achieved by screening of 127 isolates from silver mining wastes. A strain designated S-27 found to be a potential candidate for rapid synthesis of silver nanoparticles among tested microorganisms. It was subjected to molecular characterization by 16S rDNA sequence analysis. It was found that S-27 belonging to *Bacillus flexus*. Synthesis of silver nanoparticles was achieved by addition of culture supernatants with aqueous silver nitrate solution, immediately it turns to brown colour solution showed a peak at 420 nm corresponding to the plasmon absorbance of silver nanoparticles by UV–vis spectroscopy. Various instrumentation techniques, such as AFM, FESEM, XRD and FTIR, were adopted to characterize the synthesized nanoparticles. Anisotropic nanoparticles, such as spherical and triangular shaped nanoparticles, have been synthesized and sizes were found to be 12 and 65 nm,

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Title: Quality and productivity improvement through spot welding process optimisation in automobile body shop

Authors: G. Selvam; S. Arockia Doss Prince; V. Surya Prakash; T. Rohit

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Abstract: Optimised geometry weld spot distribution for different configurations of automobile body sub-assemblies, is a critical activity in any automobile body shop process planning. For an ideal body shop planning, it has to be planned in a systematic approach so that the maximum productivity with high quality is being achieved. For this, the optimised planning has to be made for number of spots welded in a geometry station. The lesser the number of spots, the higher will be the dimensional variations of the assembly; the greater the number of spots, the lesser will be the productivity of the sub-assembly lines. The aim of this paper is to identify an optimised spot quantity for different sizes of parts with different surface contacts. To identify the optimum spot quantity, an industrial experiment was conducted using Taguchi method (L27 OA). Dimensional variations of the samples were recorded in two stages: 1) post-geometry spot welding; 2) post re-spot welding; and the measured data was thoroughly analysed. Recommendations for the optimised number of spots for geometry spot weld stage were made for different assembly configurations. These recommendations are discussed in detail. This study will aid the process planners to distribute the appropriate number of spots in the geometry welding stations.

Keywords: body-in-white; BIW; productivity; quality; geometry spot; re spot; Taguchi method; DOE; process optimisation; body shop; weld shop; surface contact; dimensional stability.

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Synthesis of novel PVA–starch formulation-supported Cu–Zn nanoparticle carrying carbon nanofibers as a nanofertilizer: controlled release of micronutrients

Journal of Materials Science

May 2018, Volume 53, Issue 10, pp 7150–7164 | Cite as

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Biomaterials
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Abstract

Recent applications of nanotechnology in agriculture have successfully demonstrated the utility of nanomaterials as a potential plant-growth regulator. Practical application of nanomaterial-based fertilizers in agricultural lands requires a suitable substrate to effectively disperse the nanomaterials. In this study, a polymeric formulation of PVA–starch was synthesized as a substrate for the slow release of the Cu–Zn micronutrient carrying carbon nanofibers (CNFs). The Cu–Zn/CNFs were in situ dispersed in the PVA–starch blend during a polymerization step. The effectiveness of the prepared nanofertilizer was demonstrated using chickpea as a model plant and different doses, viz. 0.25, 0.50, 1.0, 2.0 and 4.0 g of PBMC per kg of soil (garden) up to 30 days. The dissolution of PBMC increased with increasing amounts of starch in the PBMC matrix, indicating the biodegradability of PVA in the blend. Scanning electron microscopy and elemental analysis confirmed the translocation of the Cu–Zn/CNFs from roots to shoots

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Surface Roughness Evaluation of Milled Surfaces by Image Processing of Speckle and White-Light Images

Advances in Manufacturing Processes pp 141-151 | Cite as

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Conference paper
First Online: 11 September 2018

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Abstract

An experimental approach for surface roughness measurement based on the speckle images caused by a laser beam on the milled surfaces and the white-light images of the same surfaces is presented. Since the surface slope at every point of the surface influences the speckle pattern, the surface roughness parameters R_{da} and R_{dq} were used for comparison. A CMOS camera, LASER and LED light sources were used for capturing speckle and white-light images of the milled surfaces. From the image pixel intensity matrix, a signal vector was generated and was used for the image metric. It is found that standard deviation and mean of the image signal vector correlate well with R_a, R_{da} and R_{dq} values measured by a standard Taylor Hobson surface roughness tester. The correlation was found to be better for speckle images than the white-light images.

Keywords

Surface roughness Machining Vision system Image processing Speckle images Statistical parameters

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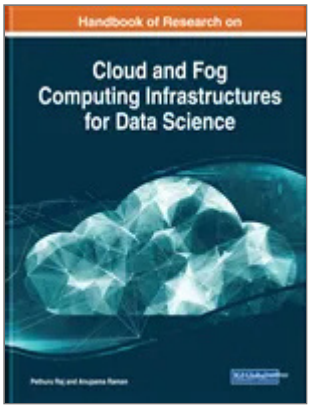

Remote Elderly Health Monitoring System Using Cloud-Based WBANs

D. Najumnissa Jamal (B. S. Abdur Rahman Crescent Institute of Science and Technology, India), S. Rajkumar (Bhairava Centre for Technology and Research, India) and Nabeena Ameen (B. S. Abdur Rahman Crescent Institute of Science and Technology, India)

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Abstract

Monitoring the physical condition of patients is a major errand for specialists. The development of wireless remote elderly patient monitoring system has been intensive in the past. RPM (remote patient monitoring) is reliant on the person's inspiration to deal with their wellbeing. The flow of patient data requires a group of medicinal services suppliers to deal with the information. RPM sending is reliant on a wireless telecommunication infrastructure, which may not be accessible/practical in provincial territories. Patients' data are shared as service on cloud in hospitals. Therefore, in the current research, a new approach of cloud-based wireless remote patient monitoring system during emergency is proposed as a model to monitor the critical health data. The vital parameters are measured and transmitted. In this chapter, the authors present an extensive review of the significant technologies associated with wireless patient monitoring using wireless sensor networks and cloud.

Chapter Preview

Top

Scope

While the study involves various aspects of the care scenario, this chapter presents the WBAN options available currently, Cloud Computing platforms that enable M2M interaction and also interaction with different health-care and medical information systems in the health-care ecosystem to enable effective RPM and relevant care delivery and aspects in possible emergency care scenarios that necessitate data availability.

Cloud Computing for Patient Monitoring

Cloud computing is characterized as the arrival of computing administrations—servers, stockpiling, databases, organizing, software, examination and the web (“the cloud”). Corporate contributing these computing administrations are called cloud suppliers and normally charge for cloud computing administrations in light of use, like charging for water or power at home.

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Optimal feature-based multi-kernel SVM approach for thyroid disease classification

K. Shankar[1] · S. K. Lakshmanaprabu[2] · Deepak Gupta[3] · Andino Maseleno[4] · Victor Hugo C. de Albuquerque[5]

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Abstract
Thyroid diseases are across the board around the world. In India as well, there is a critical issue caused because of this disease. Different research studies estimate that around 42 million individuals in India suffer from the ill effects of "thyroid diseases." Diagnosis of health situations is an energetic and testing undertaking in the field of therapeutic science. Our proposed model is to classify this thyroid data utilizing optimal feature selection and kernel-based classifier process. We will create classifications models and its group show for classification of data using "multi kernel support vector machine." The novelty and objective of this proposed model as feature selection, it's used to enhance the performance of classifying process with the help of improved gray wolf optimization. Reason for this optimal feature selection as the insignificant features from unique dataset and computationally increment the performance of the model. The proposed thyroid classification results in the accuracy, sensitivity, and specificity of 97.49, 99.05 and 94.5%, compared to the existing model. This performance measure is computed from the confusion matrix with the diverse measures contrasted with individual models and in addition to the existing classifier and optimization techniques.

Keywords Thyroid diseases · Feature selection · Optimization · Gray wolf · Classification

1 Introduction

The thyroid is a relentless and multifarious contagion happened in view of high-level hormones secreted in the thyroid gland. The thyroid gland is inclined to a few exceptionally unmistakable issues, some of which are to a great degree basic [1]

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ORIGINAL ARTICLE

Intelligent hybrid model for financial crisis prediction using machine learning techniques

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Abstract
Financial crisis prediction (FCP) plays a vital role in the economic phenomenon. The precise prediction of the number and possibility of failing firms acts as an index of the growth and strength of a nation's economy. Traditionally, several methods have been presented for effective FCP. On the other hand, the classification performance and prediction accuracy and data legality is not good enough for practical applications. In addition, many of the developed methods perform well for some of the particular dataset but not adaptable to different dataset. Hence, there is a requirement to develop an efficient prediction model for better classification performance and adaptable to diverse dataset. This paper presents a cluster based classification model, comprises of two stages: improved K-means clustering and a fitness-scaling chaotic genetic ant colony algorithm (FSCGACA) based classification model. In the first stage, an improved K-means algorithm is devised to eliminate the wrongly clustered data. Then, a rule-based model is selected to design to fit the given dataset. At the end, FSCGACA is employed for seeking the optimal parameters of the rule-based model. The proposed algorithm is employed to a collection of three benchmark dataset which include qualitative bankruptcy dataset, Weislaw dataset and Polish dataset. A detailed statistical analysis of the dataset is also given. The results analysis ensured that the presented FCP model is superior to other classification model based on the different measures and also found to be more appropriate for diverse dataset.

Keywords FCP · K-means algorithm · Genetic algorithm · Ant colony optimization

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SCIENTIFIC REPORTS

OPEN

In vitro cytotoxicity activity of novel Schiff base ligand–lanthanide complexes

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A Schiff base ligand (SBL), N^2, N^3-bis (anthracen-9-ylmethylene) pyridine-2, 3-diamine, was synthesized through the condensation of 2,6-diaminopyridine and anthracene-9-carbaldehyde using a 1:2 ratio. ^{1}H NMR spectra confirmed the observation of non-involvement aromatic carboxylic proton in SBL. A novel series of lanthanide (i.e., praseodymium (Pr), erbium (Er), and ytterbium (Yb))-based SBL metal complexes was successfully synthesized, and their functional groups were elaborately demonstrated using UV–visible, Fourier transform infrared (FT-IR), and fluorescence spectroscopy analyses. FT-IR spectral studies revealed that SBL behaved as a bidentate ligand and it was structured with metal ions by the two azomethine nitrogens. The synthesized SBL-based metal complexes were elaborately performed for cytotoxicity activity versus Vero, human breast cancer (MCF7), and cervical (HeLa) anticancer cell lines.

After the innovative success of cisplatin as a medically recognized antitumor drug, medicinal chemists began interdisciplinary research on metal complexes for interaction with DNA/RNA, biomolecules, and proteins as antitumor drugs[1,2]. On the other hand, the use of platinum (Pt) metal-based cisplatin drug in medicinal purposes causes numerous side effects, which remains a challenge to overcome to prepare efficient anticancer drugs[3–5]. Medicinal inorganic chemistry offers an extensive possibility for the design of novel drugs based on the coordination and redox properties of metal complexes to fight against cancer[6,7]. Currently, various metal complexes, including copper, lanthanum, and ruthenium, complexes, are considered as the most capable replacements for classical cisplatin-type drugs[7–17].

For decades, Schiff bases have been considered important ligands due to their coordination chemistry, and they can be easily prepared and linked with a different kind of metal ions[18]. Due to the existence of an amine group, analogous to the natural biological systems, Schiff bases show a crucial role in observing the conversion mechanism and racemization reaction in biological systems[19–25]. Schiff bases have been used for various essential biological activities including antitumor, anti HIV, antibacterial, antifertility activities, antimosquito larval, anti-inflammatory, and anticancer[26–33]. Gokhale *et al.*[34] examined the activity of the ligand-based distorted square planar copper(II) complex, cis-[dichloro (N1-(2-benzyloxybenzylidene)pyridine-2-carboxamidrazone) copper(II)], against the human breast cancer cell line MCF-7 using the MTT method. Among the various metal complexes, lanthanide-based metal complexes have been deeply examined owing to their low poisonousness and high biological activities after bonding with ligands. In recent years, the research community has shown great interest in the synthesis of lanthanide-based complexes due to their applicability in DNA interaction and anticancer activity[35–37]. Wang *et al.*[38] have reported a Schiff base La(III) complex prepared from kaempferol and diethylenetriamine interaction with DNA by intercalation mode and observed stronger La(III) complex binding and cleaving capacities with DNA than ligands by *in vitro* cytotoxic behaviors against HepG-2 cell lines and HL-60 cells (the human leukocytoma). Zaho *et al.*[39] have described a La(III) (N′N-bis-(1-carboxy-2-methylpropyl)-1,10-phenanthroline-2,9-dimethanamine) complex for antitumor activity *in vitro* against KB (human nasopharyngeal carcinoma) cells, BGC-823 (human stomach carcinoma) cells, Bel-7402 (human liver carcinoma) cells, HCT-8 (human coloadenocarcinoma) cells, and HL-60 cells. Neelima *et al.*[9] have screened the Schiff base ligand (SBL) and its La(III)

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frontiers in Cellular and Infection Microbiology

ORIGINAL RESEARCH
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In silico Identification of the Indispensable Quorum Sensing Proteins of Multidrug Resistant *Proteus mirabilis*

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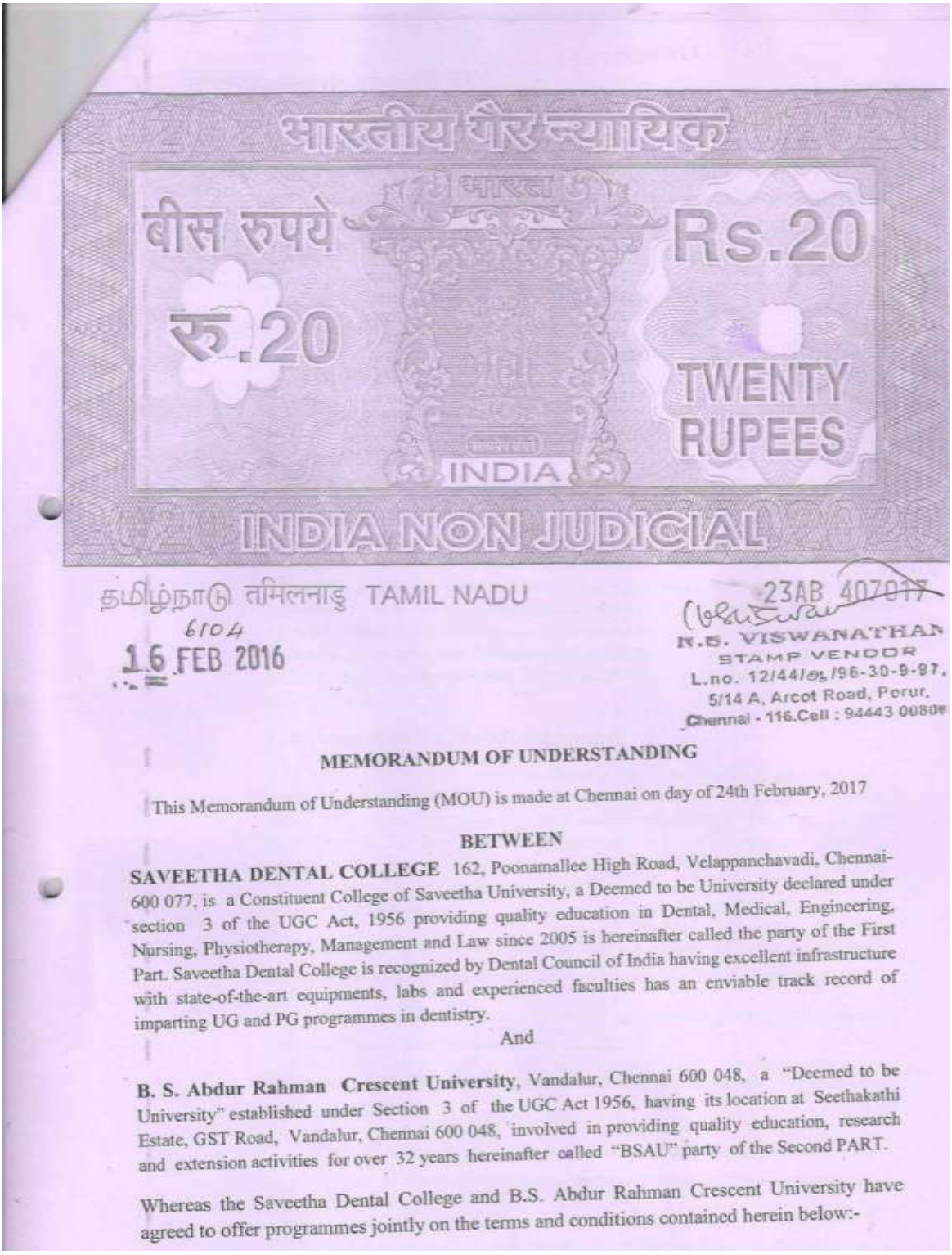
Catheter-associated urinary tract infections (CAUTI) is an alarming hospital based disease with the increase of multidrug resistance (MDR) strains of *Proteus mirabilis*. Cases of long term hospitalized patients with multiple episodes of antibiotic treatments along with urinary tract obstruction and/or undergoing catheterization have been reported to be associated with CAUTI. The cases are complicated due to the opportunist approach of the pathogen having robust swimming and swarming capability. The latter giving rise to biofilms and probably inducible through autoinducers make the scenario quite complex. High prevalence of long-term hospital based CAUTI for patients along with moderate percentage of morbidity, cropping from ignorance about drug usage and failure to cure due to MDR, necessitates an immediate intervention strategy effective enough to combat the deadly disease. Several reports and reviews focus on revealing the important genes and proteins, essential to tackle CAUTI caused by *P. mirabilis*. Despite longitudinal countrywide studies and methodical strategies to circumvent the issues, effective means of unearthing the most indispensable proteins to target for therapeutic uses have been meager. Here, we report a strategic approach for identifying the most indispensable proteins from the genome of *P. mirabilis* strain HI4320, besides comparing the interactomes comprising the autoinducer-2 (AI-2) biosynthetic pathway along with other proteins involved in biofilm formation and responsible for virulence. Essentially, we have adopted a theoretical network model based approach to construct a set of small protein interaction networks (SPINs) along with the whole genome (GPIN) to computationally identify the crucial proteins involved in the phenomenon of quorum sensing (QS) and biofilm formation and thus, could be therapeutically targeted to fight out the MDR threats to antibiotics of *P. mirabilis*. Our approach utilizes the functional modularity coupled with k-core analysis and centrality scores of eigenvector as a measure to address the pressing issues.

Keywords: *Proteus mirabilis*, urinary tract infection, quorum sensing, eigenvector centrality, k-core analysis

Collaboration with Saveetha Dental College

MoU signed



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MEMORANDUM OF UNDERSTANDING

This Memorandum of Understanding (MOU) is made at Chennai on day of 24th February, 2017

BETWEEN

SAVEETHA DENTAL COLLEGE 162, Poonamallee High Road, Velappanchavadi, Chennai-600 077, is a Constituent College of Saveetha University, a Deemed to be University declared under section 3 of the UGC Act, 1956 providing quality education in Dental, Medical, Engineering, Nursing, Physiotherapy, Management and Law since 2005 is hereinafter called the party of the First Part. Saveetha Dental College is recognized by Dental Council of India having excellent infrastructure with state-of-the-art equipments, labs and experienced faculties has an enviable track record of imparting UG and PG programmes in dentistry.

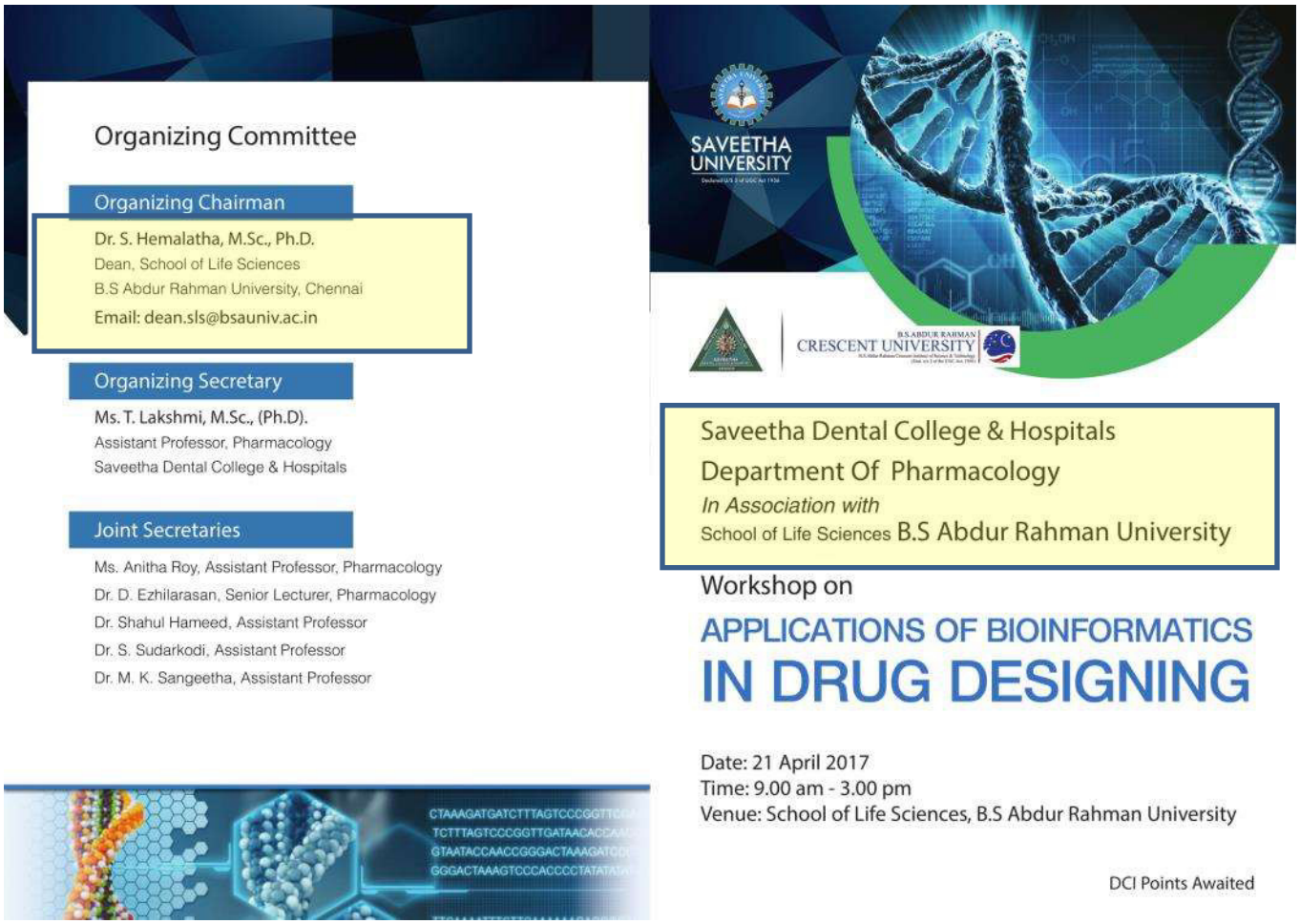
And

B. S. Abdur Rahman Crescent University, Vandalur, Chennai 600 048, a "Deemed to be University" established under Section 3 of the UGC Act 1956, having its location at Seethakathi Estate, GST Road, Vandalur, Chennai 600 048, involved in providing quality education, research and extension activities for over 32 years hereinafter called "BSAU" party of the Second PART.

Whereas the Saveetha Dental College and B.S. Abdur Rahman Crescent University have agreed to offer programmes jointly on the terms and conditions contained herein below:-

Proof for Sl no 74

Workshop on applications of bioinformatics in drug designing organized by Saveetha Dental College & Hospitals, Department of Pharmacology, in association with School of life sciences, BSACIST



Proof for Sl no 75

Dr. S. Hemalatha is an **adjunct faculty** at Saveetha University, Chennai

SAVEETHA UNIVERSITY

(Established under Section 3 of the UGC Act 1956 vide
Notification No. F.9-3/2002 - U.3 dated 18.03.2005 of the Government of India)

Date: 18.02.2017

To
Dr. S. Hemalatha, Ph.D,
Professor & Dean,
School of Lifesciences,
B.S. Abdur Rahman University,
Chennai.

Dear,

Greetings from Saveetha Dental College and Hospitals

I wish to inform you that the Saveetha Dental College and Hospitals is honored to appoint you as Distinguished Adjunct faculty to our Institution.

I am to inform that the University wishes to share your knowledge and expertise in the Research & Development pertaining to your Specialty. You may be required to visit the University once or twice in an academic year for the said purpose at your convenience. A team of faculty members from the Saveetha Dental College and Hospitals of this University will be with you to coordinate and assist.

Your travel & accommodation will be taken care by the University during your stay at Chennai and suitable honorarium will also be paid. Please indicate your acceptance by returning a signed duplicate copy of this appointment order.

Looking forward to a long and rewarding working relationship and the University will endeavor to support your work every way.

With warm regards

Mrs. R.V. Geetha
Asso. Dean of Faculty

Dr. Deepak Nallaswamy
Director of Academics

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Strain Analysis of AA6063 Aluminum Alloy by Tube Hydroforming Process

A. S. Selvakumar, B. Surya Rajan, M. A. Sai Balaji and B. Selvaraj

Abstract Tube hydroforming process is used to create parts from aluminum extrusions which reduce structural weight. Different approaches for the formability improvement in the hydroforming process are summarized. In this work, extruded aluminum (annealed) tubular specimen made up of AA 6063 alloy bulged from the diameter of 38–54 mm using hydroforming technique. The objective of this work is to analyze thickness distribution at bulging region along lateral (x) and longitudinal (y) directions. The parameters considered are axial feed (12 mm/min), tube thickness (1.5 mm), fluid pressure (9.6 N/mm^2) and die semi-cone angle (20°). The forming characteristics such as thickness distribution (along x and y) and bulged diameter were studied using toolmakers microscope and coordinate measuring machine. Maximum shear thinning is observed in the largest diameter of the bulged portion of the tube.

Keywords Hydroforming · Annealing · Thickness distribution
Forming pressure · Tube bulging · Formability

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Review of different methods employed in pyramidal solar still desalination to augment the yield of freshwater

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ABSTRACT

Water plays a major part in all our regular activities. Requirement for freshwater is growing regularly, because of improved living standards. Some of the earth's regions are under severe stress due to a lack of water. The potable water needs of mankind can only be satisfied if salt water, which is plentiful, can be converted into drinkable water by desalination. Surfaces used for the evaporation and condensation processes play an important role in the performance of solar stills. Compared with basin-type solar stills, pyramid-shaped stills have larger condensation areas. In this review, various research works carried out on pyramid solar stills are discussed. The main objective of this review is that it will motivate researchers to investigate and promote pyramid solar still technology for appropriate development. The daily distilled water production from the passive and active pyramid solar still is in the range between 2–7 L/m^2 and 3–7 L/m^2, respectively.

Keywords: Pyramid solar still; Passive and active mode; Yield enhancement

* Corresponding author.

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Research Article

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Future MICROBIOLOGY

Revealing the dual role of gallic acid in modulating ampicillin sensitivity of *Pseudomonas aeruginosa* biofilms

Rekha Yamini Kosuru[1], Md Aashique[1], Aisha Fathima[1], Amrita Roy**,[1] & Soumen Bera*,[1]

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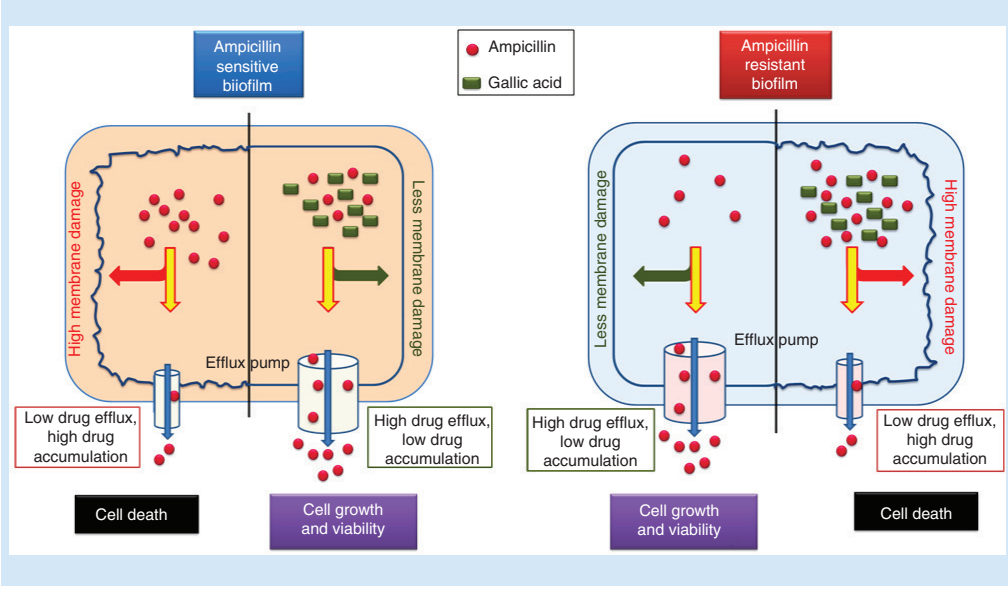
Aim: To understand the effects of gallic acid (GA) on ampicillin (Amp) sensitive or resistant strain of *Pseudomonas* sp. and also in modulating the corresponding biofilms. **Methodology:** The cell viability was determined by broth dilution, dry weight and CFU assays. Biofilm formation was measured by crystal violet assay while oxygen consumption rate was measured to verify the metabolic status of the cells. The membrane damage and drug efflux/accumulation were studied by fluorimetric assays. **Results:** GA transformed the Amp resistant cells, both planktonic and biofilms, into highly sensitive one by inducing membrane damage and enhancing accumulation of drug, whereas the Amp sensitive cells gained resistance against Amp. **Conclusion:** Use of GA as an antimicrobial compound should be analyzed more critically depending on the drug dosages, drug sensitivity as well as types of bacterial strains being studied.

Graphical abstract:



First draft submitted: 4 July 2017; Accepted for publication: 13 October 2017; Published online: 15 February 2018

Keywords: ampicillin • bacterial biofilm • drug efflux and drug accumulation • drug resistance • gallic acid • membrane potential • oxygen consumption assay

The discovery of penicillin in 1928 and commercialization of this antibiotic have revolutionized the battle against infectious diseases. Latter, various groups of antibiotics have been identified, isolated and implemented in curing microbial diseases; however, recent emergence of drug resistant bacteria, especially *Pseudomonas*, *Salmonella*,

ACCEPTED MANUSCRIPT

Recent Advances in Electromagnetic Interference Shielding Properties of Metal and Carbon Filler Reinforced Flexible Polymer Composites: A Review

Sowmya Sankaran[a], Kalim Deshmukh[a], M. Basheer Ahamed[a,*], S. K. Khadheer Pasha[b]

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Abstract

The rapid proliferation and elevated usage of electronic devices have led to a meteoritic rise in electronic pollutions such as electronic noise, electromagnetic interference (EMI) and radiofrequency interference which leads to improper functioning of electronic devices. Metals and their alloys can serve as the best EMI shielding materials but their heavy weight, high cost and low corrosion resistance have limited their applications in EMI shielding. The emergence of flexible polymer composites have substituted the metal and metal alloy based EMI shielding materials due to their unique features such as superior electrical, dielectric, thermal, mechanical and magnetic properties that are highly useful for suppressing the electromagnetic noises. In this review article, the EMI shielding effectiveness of flexible polymer composites comprising of metals and various forms of carbon nanofillers such as carbon black, carbon nanofibers, carbon nanotubes, graphite, graphene, graphene oxide, graphene nanosheets, graphene nanoribbons and graphene nanoplatelets have been deeply reviewed.

Keywords: EMI shielding effectiveness; flexible polymer composites; metals; carbon nanofillers

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Performance and Emission Characteristics of a Diesel Engine Fueled with Diesel and Orange Oil Blends Using Different Bowl-In Piston Geometries

Niklesh Reddy P, Santosh Kumar Paruvada, and Abhijeet Killol NIT Rourkela

Geetha Murugan B.S. Abdur Rahman Crescent Instit

Khayum Naseem and Murugan Sivalingam NIT Rourkela

Citation: Niklesh Reddy P., Paruvada, S.K., Killol, A., Murugan, G. et al., "Performance and Emission Characteristics of a Diesel Engine Fueled with Diesel and Orange Oil Blends Using Different Bowl-In Piston Geometries," SAE Technical Paper 2018-01-0915, 2018, doi:10.4271/2018-01-0915.

Abstract

Biomass derived fuels have a potential to replace fossil fuels that are used in transportation. Orange oil is considered as one of the possible alternative biofuels for compression ignition (CI) engines, as it is renewable and available in a significant quantity throughout the world. It is a biomass derived fuel obtained from orange skin, which has 90% D-limonene. In this study an orange oil diesel blend is used as a test fuel in a single cylinder, four stroke, direct injection (DI) diesel engine with a power output of 4.4 kW at a rated speed of 1500 rpm to assess the performance and emission parameters of the engine, when the engine is run with three different piston geometries. The experimental results of the performance and emission parameters of the engine for the orange oil operation were compared with those of the diesel operation of the same engine and presented in this paper.

Introduction

Achieving higher engine efficiency and utilizing the renewable fuels to a maximum possible extent are the two methods that are mainly focused in many countries for mitigating greenhouse gas (GHG) emissions. Although, biodiesel and alcohols are currently utilized as alternative transportation fuels in many developed and some of the developing countries, exploration of different sources for production of these two biofuels and utilizing them as transportation fuels is still continuing. Apart from utilization of these biofuels, other biofuels such as orange oil and turpentine oil have recently been explored for their suitability as substitute fuels for compression ignition (CI) engines. Orange oil was tested for its suitability as an alternative fuel for CI engines by Purushothaman and Nagarajan [1, 2]. A series of tests in the form of sole orange oil, different percentages of orange oil diesel fuel blends, orange oil diethyl ether dual fuel mode were performed in a single cylinder, four stroke, air cooled, direct injection (DI), diesel engine developing power of 4.4 kW at a rated speed of 1500 rpm. It was reported that the efficiency increased with increase in percentage of orange oil in the blend. CO and HC emissions reduced for orange oil compared to that of diesel operation at the entire operation. Smoke emission reduced marginally for orange oil than the diesel fuel, while NO emission increased at full load. When DEE was used as an ignition improver and inducted in suction at low quantities with orange oil as a pilot fuel, HC and CO emissions increased, while NO emission decreased at full load. It is suggested that, there must be a compromise between the fuel efficiency, NO and smoke emissions. There are more research works to be carried out to establish the possibility of using orange oil in CI engines.

Engine modifications affect the engine performance [3, 4]. Combustion and emissions were greatly influenced by the swirl ratio, and which makes the distribution of fuel/air equivalence ratio and the flow fields also accordingly change in the combustion chamber. Before spray, the squish primarily controls the turbulent kinetic energy distribution, while after spray; the combustion reverse squish and the swirl have a great impact on the in-cylinder temperature. Effect of swirl with turbulence induced on the piston surface showed better results and reduced emissions. A simulation work was carried out to study the effects of the piston bowl geometry on the combustion and emission characteristics of a diesel engine fueled with biodiesel which was produced from waste cooking oil with a major composition of palm oil, under medium load conditions [5]. Three different bowl geometries namely: the baseline omega combustion chamber (OCC), hemispherical combustion chamber (HCC) and shallow depth combustion chamber (SCC) were considered with same compression ratio of 18.50. The simulation results indicated that in terms of performance, the SCC was found to be favorable at low engine speeds as it had high indicated power compared to that of OCC and HCC, while for this geometry the NO emission was found to be higher due to high temperature and pressure during the combustion process. At high engine speeds, OCC was

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Proof for Sl no. 85 University of Missouri, USA

MoU with University of Missouri, USA

MU CONTRACT NO. 21A 000 368

Amendment 1
B S Abdur Rahman Crescent University
Chennai, Tamil Nadu
India
Contract #013444-MNCT-1700
And
The Curators of
The University of Missouri
For the
University of Missouri-Columbia
USA

Pursuant to their institutional collaborations, the above universities establish the following amendment to the Memorandum of Understanding:

- Per Crescent University request, Drs. Anandhi Upendran and Raghuraman Kannan will deliver guest lectures on "Biomedical Innovations and Entrepreneurship" to undergraduate biotechnology students at Crescent University during summer and winter sessions. Guest lectures will be limited to 15 lecture hours per session for each faculty.

- The guest lectures are considered as services rendered by MU faculty to Crescent University. MU would send an invoice to CU after completion of guest lectures. A service contract will be established for the same.

- Crescent University will offer credits and "Life Sciences, Innovation and Entrepreneurship" certificate to students who complete guest lectures and a six month intern either at MU or in India

- Crescent University transcript and certificate will use "guest lectures provided by MU faculty" in their transcripts and certificate

- MU school of Medicine will allow up to 5 students to complete 3-month internship (Fall, spring or summer) at MU.

Joint International Conference with University of Missouri, USA

International conference on antimicrobial resistance breakers and diagnostic biomarkers was organized in association with University of Missouri on December 22,23,2017

(In picture from left: Dr. S.Hemalatha, Professor and Dean, School of Life Sciences, BSACIST, Invited speaker from University of Missouri, Dr. V. Murugesan,. Registrar (BSACIST)

Indonesian Journal of Electrical Engineering and Computer Science
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Intrinsic ZnO/Al-doped ZnO Homojunction: Structural and Optical Properties

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ABSTRACT

Intrinsic zinc oxide (ZnO)/Al-doped ZnO (AZO) homojunction film was prepared using two-step immersion processes. The film was characterized using field emission scanning electron microscopy, X-ray diffraction (XRD), Raman spectroscopy, and ultraviolet–visible spectrophotometer to investigate their structural and optical properties. The surface morphology image displays that the ZnO deposited on the nanorod surfaces in layer form with average diameter of nanorods about 95 nm. The structural properties of XRD pattern demonstrate that the film possessed good crystallinity with the preferred orientation at (002) plane. The film also possessed excellent absorption in the ultraviolet (UV) region with optical band gap energy of 3.22 eV. These results indicate that the film has a good potential for optical-based device such a UV sensor.

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1. INTRODUCTION

Zinc oxide (ZnO) is an n-type which is used in various applications include sensors, solar cells, light emitting diodes, and transistors [1-4]. These wide applications are benefited from its properties such as wide bandgap energy, non-toxic, low cost, and also able to be produced into nanoscale structures. Previous studies reported that ZnO can be produced into various kinds of nanostructures such as nanowires, nanorods, nanospheres, nanoflowers, and nanoflakes. However, one-dimensional structures (nanorod and nanowires) are more promising in device fabrications due to ease of electron transfer and reducing grain boundary-related defect [5]. To date, there are lots of fabrication methods that are used to produce ZnO nanostructures such as metal organic chemical vapour deposition (MOCVD), sputtering, electrodeposition, thermal chemical vapour deposition, and hydrothermal [6]. Among the fabrication methods, water-based preparation is favourable due to simple process and low temperature use. Besides, this method also capable of producing high quality nanostructure films, comparable to the methods which use high temperature and high vacuum conditions.

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BMC Complementary and Alternative Medicine

RESEARCH ARTICLE Open Access

Gelidiella acerosa inhibits lung cancer proliferation

Fazeela Mahaboob Begum S.M.[1], Kalai Chitra[2], Benin Joseph[2], Raji Sundararajan[3] and Hemalatha S.[1*]

Abstract

Background: Lung adenocarcinoma is the most common subtype of Non small cell lung cancer in which the PI3K/Akt cascade is frequently deregulated. The ubiquitous expression of the PI3K and the frequent inactivation of PTEN accounts for the prolonged survival, evasion of apoptosis and metastasis in cancer. This has led to the development of PI3K inhibitors in the treatment of cancer. Synthetic PI3K inhibitors undergoing clinical and preclinical studies are toxic in animals. Hence, there is a critical need to identify PI3K inhibitor(s) of natural origin.
The current study aims to explore the efficacy of the red algae *Gelidiella acerosa*on inhibition of cell proliferation, migration and the expression of cell survival genes in lung adenocarcinoma cell line A549.

Methods: The phytoconstituents of *Gelidiella acerosa* were extracted sequentially with solvents of different polarity, screened qualitatively and quantitatively for secondary metabolites and characterized by GC-MS. The in-vitro studies were performed to check the efficacy of the extract on cell proliferation (MTT assay), cell invasion (scratch assay and colony formation assay), apoptosis (fluorescent, confocal microscopy and flow cytometry) and expression of apoptosis and cell survival proteins including PI3K, Akt and GSK3β and matrix metalloproteinase MMP2 and MMP9 by Western blot method. The antitumor activity of GAE was analyzed in a tumor model of Zebrafish.

Results: The outcomes of the in vitro analysis showed an inhibition of cell proliferation, induction of apoptosis, inhibition of cell migration and colonization by the crude extract. The analysis of protein expression showed the activation of caspases 3 and Pro apoptotic protein Bax accompanied by decreased expression of Bcl-2 and Bcl-XL. On the other hand, subsequent activation of GSK3β and down regulation of PI3K, Akt were observed. The decreased expression of MMP2 correlated with the antimetastatic activity of the extract. The in vivo studies showed an inhibition of tumor growth by GAE in Zebrafish.

Conclusion: The phytoconstituents of algal extract contributed to the anticancer properties as evidenced by in vitro and in vivo studies. These phytoconstituents can be considered as a natural source of PI3K/Akt inhibitor for treatment of cancers involving the PI3K cascade.

Keywords: *Gelidiella acerosa*, PI3K, Akt, GSK3β, Caspase 3, Bax, Bcl-2, Bcl-XL, Tumor model of zebrafish

Background

Lung cancer is a heterogeneous disease which has taken a death toll of 1.6 million in 2015 [1]. The two major classes of lung cancer are Non Small cell lung cancer (NSCLC) and Small cell lung cancer. Of these, the NSCLC accounts for 85% of lung cancer cases. Histologically, NSCLC includes three subclasses, namely small cell carcinoma, large cell carcinoma and adenocarcinoma. Among these, the lung adenocarcinoma constitutes 40% of NSCLC cases [2]. The 5-year survival rate of NSCLC varies from 1 to 45%, depending on the extent of metastasis. Molecular profiling studies have identified the PI3K/Akt cascade as a frequently targeted pathway in NSCLC [3, 4].

The phosphoinositide kinases 3 (PI3Ks) are groups of proteins that regulate cell growth, survival, metabolism and glucose homeostasis [5]. Recent studies have shown that PI3K and its components are frequently mutated in human cancers which in turn contribute to the aberrant activation of the PI3K/AKT/mTOR pathway in cancer. Hence, the PI3K cell survival pathway became the most

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Mitochondrial miRNAs in Diabetes: Just the Tip of the Iceberg

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[3]Division of Exercise Physiology, West Virginia University School of Medicine, Morgantown, WV.

Running Title: Mitochondrial miRNA in mitochondrial metabolism.

Word Count: 4634

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Research Article

Novel anticancerous compounds from *Sargassum wightii: In silico* and *in vitro* approaches to test the antiproliferative efficacy

S. M. Fazeela Mahaboob Begum[1], S. Priya[1,2], Raji Sundararajan[3], S. Hemalatha[1]

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Correspondence: S. Hemalatha, School of Life Sciences, B.S. Abdur Rahman University, Chennai, Tamil Nadu, India. E-mail: hemalatha.sls@bsauniv.ac.in

ABSTRACT

Non-small cell lung cancer (NSCLC) contributes to 80% of lung cancer death. The poor survival rate is contributed by the uncontrolled proliferation, evasion of apoptosis, ubiquitous expression of cell survival genes, and resistance to anticancer therapies. This prompts the search for novel and potent drugs for the effective treatment and management of NSCLC. Marine seaweeds are rich in novel bioactives widely employed in pharma, medical, cosmetic, and food industries. For the current study, the ethyl acetate extract of *Sargassum wightii* is utilized to test antiproliferative efficacy against the NSCLC cell line A549. From ethyl acetate extract, two compounds, namely, n-hexadecanoic acid and l-(+)-ascorbic acid 2,6 dihexadecanoate were identified by mass spectrometry analysis. These compounds interacted with the cell survival protein PI3K which is upregulated in most of human cancers. The *in silico* results demonstrated that the algal compounds interacted with the target PI3K with a C score of 5. The *in vitro* antiproliferative activity of the ethyl acetate extract was analyzed by MTT assay. The apoptotic hallmarks including fragmentation of nuclei and DNA were observed in treated cells. The real-time polymerase chain reaction analysis of gene encoding PI3K showed the downregulation of the gene. The current results suggest that the compounds of *S. wightii* have antiproliferative activity and can control lung cancer through induction of apoptosis.

Keywords: Non-small cell lung cancer, *Sargassum wightii,* antiproliferative property, n-hexadecanoic acid, l–(+)-ascorbic acid 2, 6 dihexadecanoate

Introduction

Lung cancer is the major cause of cancer mortality worldwide accounting for 1.5 million deaths in 2012.[1] It constitutes 13% of the newly diagnosed cancer cases in 2015.[2] Among the major two types of lung cancer, the non-small cell lung cancer (NSCLC) contributes to 80% of lung cancer deaths which urges the need for novel therapies in the effective treatment and management of NSCLC.[3]

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Website: www.japer.in	**E-ISSN:** 2249-3379

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Source of Support: Nil, **Conflict of Interest:** None declared.

Apoptosis or programed cell death maintains the balance between cell proliferation and cell death. Uncontrolled proliferation results in oncogenesis. In NSCLC cell lines, the deletion or inactivation of the tumor suppressor genes directly contributes to the uncontrolled proliferation and prolonged survival of cancer cells.[4] Hence, drugs that can inhibit uncontrolled proliferation and induce apoptosis may be effective in the management and treatment of cancer.

A number of FDA-approved anticancer drugs are derived from the sea including cytarabine, eribulin mesylate, and trabectedin. This has triggered the pharmaceutical industries to focus on marine natural products, and many marine bioactives have entered into the pre-clinical and clinical trials.[5] Marine seaweeds are a rich source in novel bioactives which are widely employed in pharma, medical, cosmetic, and food industries. The marine brown algae of genus *Sargassum* is reported to possess antithrombotic, antiplatelet, antiviral, and anticancer properties.[6-8] In the current study, the marine brown algae *Sargassum wightii* was extracted, and the phytoconstituents were analyzed for the antiproliferative efficacy against the NSCLC cell line

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Hydrothermal synthesis, characterization and luminescence properties of $CaGd_2(MoO_4)_4:Eu^{3+}$ ovoid like structures

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Abstract

3

Biopolymer Composites With High Dielectric Performance: Interface Engineering

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1 Introduction

The field of polymer composites has blossomed in the last two decades because of growing importance in the field of computing, aerospace, biotechnology, electrical, electronic, and many other applications. The ascent in this field largely depends on the development of novel composite materials with improved properties as well as with desired shape and size. In this regard, polymer composite is an important addition in the area of nanoscience which plays an important role in modern science and technology. Polymer composites are the materials in which at least one dimension of the reinforcement phase is in the nanometer range (<100 nm). There have been tremendous research efforts devoted toward the development of novel functional materials by taking advantage of combined properties of constituent materials [1–7]. Polymer composites offer the unique possibilities of improving the physical and chemical properties of polymeric materials by incorporation of low loadings of nanosized fillers. Nanofillers can be 3D spherical and polyhedral particles such as colloidal silica, 2D nanofibers such as nanotube or nanowhiskers or 1D disk–like clay particles. Depending on the nanofiller used and the composition of composites, it is possible to design materials with improved electrical, mechanical, thermal, barrier, and flammability properties. Polymer composites based on layered materials such as clays exhibit properties which are far superior to the constituent materials. The enhancement in the composite properties makes them extremely interesting to design and develop [8].

The main challenge in designing and developing polymer composites is to improve interfacial adhesion between the inorganic phase (layered structure nanofiller) and the polymer matrix. This is because the polymer matrix is relatively incompatible with

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DOI 10.1007/s10854-016-5616-9

Newly developed biodegradable polymer nanocomposites of cellulose acetate and Al_2O_3 nanoparticles with enhanced dielectric performance for embedded passive applications

Kalim Deshmukh[1] · M. Basheer Ahamed[1] · Rajendra R. Deshmukh[2] · S. K. Khadheer Pasha[3] · Kishor Kumar Sadasivuni[4] · Anji Reddy Polu[5] · Deepalekshmi Ponnamma[6] · Mariam Al-Ali AlMaadeed[6] · K. Chidambaram[3]

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Abstract In this study, biopolymer nanocomposites of cellulose acetate (CA) and Al_2O_3 nanoparticles (Al_2O_3 NPs) were successfully obtained using solution blending method. The effect of Al_2O_3 NPs loading on the microstructure, morphology, thermal and dielectric properties of CA/Al_2O_3 nanocomposites was investigated using FTIR, XRD, TGA, optical microscopy, SEM, AFM and impedance spectroscopy technique. The FTIR results infer good interaction between CA and Al_2O_3 NPs. The XRD and microscopic studies demonstrated that Al_2O_3 nanoparticles were homogeneously dispersed in the CA matrix. The TGA results indicate that the onset degradation temperature of CA/Al_2O_3 nanocomposites is shifted towards higher temperature in the presence of Al_2O_3 NPs. The contact angle measurements infer reduction in the wettability of CA matrix with increasing Al_2O_3 NPs loading. On the other hand, the dielectric properties of CA were improved due to an incorporation of Al_2O_3 NPs. The dielectric constant increases from 8.63 (50 Hz, 30 °C) for neat CA matrix to 27.57 (50 Hz, 30 °C) for CA/Al_2O_3 nanocomposites with 25 wt% Al_2O_3 loading. Similarly, the dielectric loss also increases from 0.26 (50 Hz, 30 °C) for neat CA matrix to 0.64 (50 Hz, 30 °C) for CA/Al_2O_3 nanocomposites with 25 wt% Al_2O_3 NPs loading. However, very low values of tan δ (below 1) were observed for all the samples. These results suggest that CA/Al_2O_3 nanocomposites with improved dielectric properties seem to be a promising candidate for designing electronic devices such as embedded passives.

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1 Introduction

Over past two decades, biopolymers from renewable sources have attracted the attention of researchers working in both academic and industrial fields because of the growing concern about the environmental pollution [1, 2]. Biodegradable polymers which are derived from renewable to natural resources are gradually replacing the traditional synthetic or petroleum based polymers because of their inherent properties such as biodegradability and biocompatibility [3]. Cellulose is one of the most abundantly available biopolymers which are renewable, biodegradable, biocompatible and inexhaustible source of raw materials [4, 5]. Pristine cellulose is not thermoplastic and it decomposes before melting because of the high degree of intra and intermolecular hydrogen bonding interaction between the hydroxyl groups of its main chains [6, 7]. To overcome this problem, a large number of cellulose derivatives including esters [8], ethers [9, 10] and graft copolymers [11, 12] have been synthesized till date. Most of the cellulose based studies are centered on its derivatives such as methylcellulose (MC), cellulose acetate (CA) and

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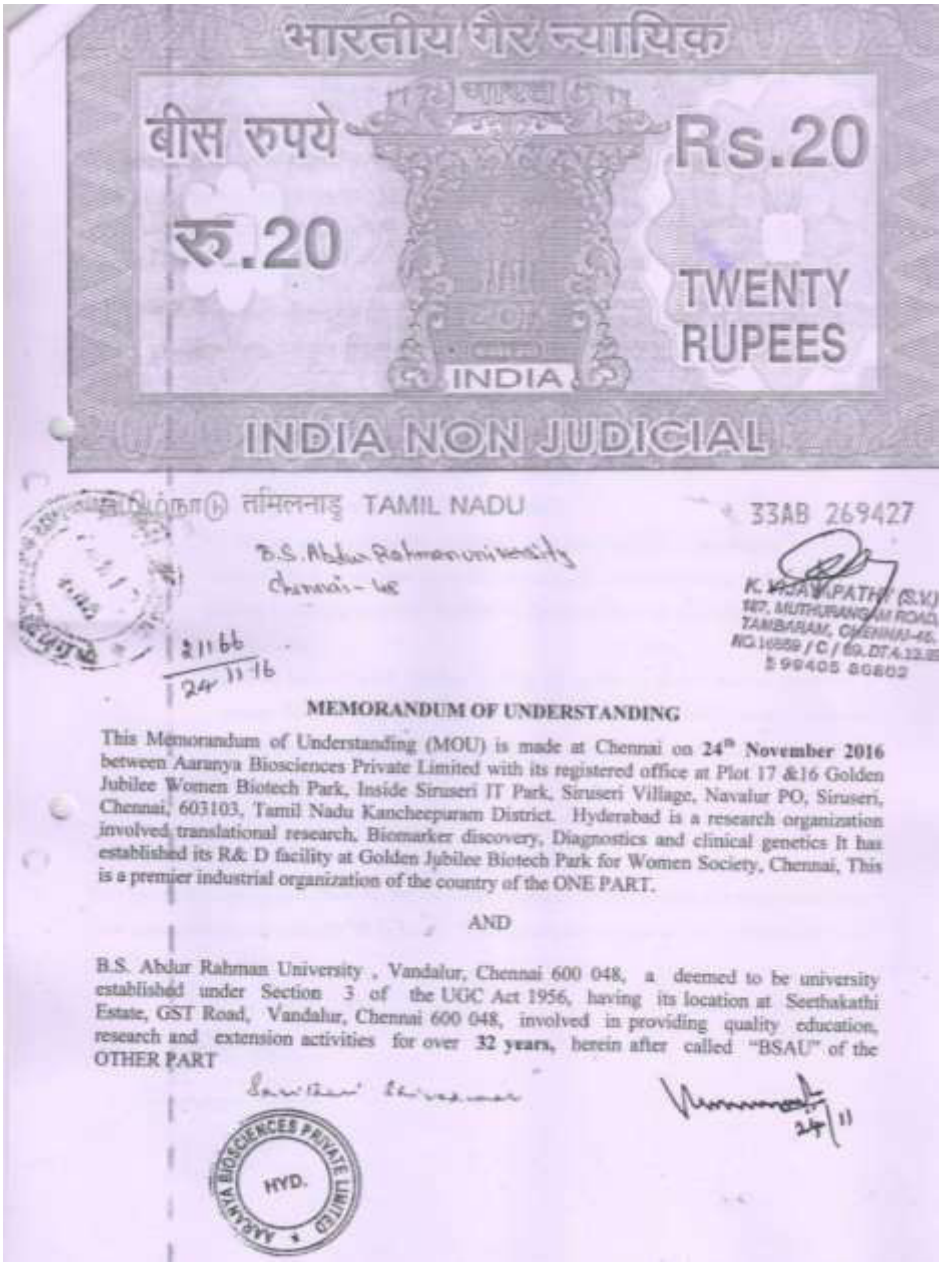

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MEMORANDUM OF UNDERSTANDING

This Memorandum of Understanding (MOU) is made at Chennai on **24th November 2016** between Aaranya Biosciences Private Limited with its registered office at Plot 17 &16 Golden Jubilee Women Biotech Park, Inside Siruseri IT Park, Siruseri Village, Navalur PO, Siruseri, Chennai, 603103, Tamil Nadu Kancheepuram District. Hyderabad is a research organization involved translational research, Biomarker discovery, Diagnostics and clinical genetics It has established its R& D facility at Golden Jubilee Biotech Park for Women Society, Chennai, This is a premier industrial organization of the country of the ONE PART.

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B.S. Abdur Rahman University , Vandalur, Chennai 600 048, a deemed to be university established under Section 3 of the UGC Act 1956, having its location at Seethakathi Estate, GST Road, Vandalur, Chennai 600 048, involved in providing quality education, research and extension activities for over **32 years,** herein after called "BSAU" of the OTHER PART

24/11

AARANYA BIOSCIENCES PRIVATE LIMITED HYD.

June, 10, 2017

Dr. Sahol Hamid Bin Abu,
Vice Chancellor,
B. S. Abdur Rahman Crescent University,
Vandalur, Chennai – 600 048

To

Dr. Savithiri Shivakumar
Executive Director
Aaranya Biosciences Private Limited, Chennai

Dear Dr. Savithri,

It is my immense pleasure to invite you as an Adjunct Faculty /Visting Professor at the School of Life Sciences B. S. Abdur Rahman Crescent University, Vandalur, Chennai, India.

It is my fervent hope that your participation as visting professor will immensely benefit the faculty and students of our university both in teaching and research in Life Sciences.

The visting professor position is initially for a period of two years from the date of your acceptance and is extendable for a further period. The remuneration will be paid according to the university norms.

Please convey your acceptance of this invitation at your earliest convenience to the Dean, School of Life Sciences, B. S. Abdur Rahman Crescent University, Vandalur, Chennai,

I look forward to a mutually enriching and rewarding relationship.

Thanking You
With best wishes,

Yours Sincerely,

Dr. Sahol Hamid Bin Abu, Vice Chancellor,

Allele specific interaction between glutathione peroxidase 1 and manganese superoxide dismutase affects the levels of Bcl-2, Sirt3 and E-Cadherin

Dede N. Ekoue[1], Soumen Bera[2], Emmanuel Ansong[1], Peter C. Hart[1], Sofia Zaichick[1], Frederick E. Domann[3], Marcelo G. Bonini[1,4], Alan M. Diamond[1,*]

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JUST ACCEPTED

Hindawi
Journal of Nanomaterials
Volume 2018, Article ID 8612158, 14 pages
https://doi.org/10.1155/2018/8612158

Research Article

Biofabrication of Zinc Oxide Nanoparticle from *Ochradenus baccatus* Leaves: Broad-Spectrum Antibiofilm Activity, Protein Binding Studies, and *In Vivo* Toxicity and Stress Studies

Nasser A. Al-Shabib,[1] **Fohad Mabood Husain**,[1] **Iftekhar Hassan**,[2] **Mohd Shahnawaz Khan**,[3] **Faheem Ahmed**,[4] **Faizan Abul Qais**,[5] **Mohammad Oves**,[6] **Mashihur Rahman**,[7] **Rais Ahmad Khan**,[8] **Altaf Khan**,[9] **Afzal Hussain**,[10] **Ibrahim M. Alhazza**,[2] **Shazia Aman**,[11] **Saba Noor**,[12] **Hossam Ebaid**,[2] **Jameel Al-Tamimi**,[2] **Javed Masood Khan**,[1] **Abdul Rehman M. Al-Ghadeer**,[7] **Md Khurshid Alam Khan**,[7] **and Iqbal Ahmad**[5]

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Biofilms are complex aggregation of cells that are embedded in EPS matrix. These microcolonies are highly resistant to drugs and are associated with various diseases. Biofilms have greatly affected the food safety by causing severe losses due to food contamination and spoilage. Therefore, novel antibiofilm agents are needed. This study investigates the antibiofilm and protein binding activity of zinc nanoparticles (ZnNPs) synthesized from leaf extract of *Ochradenus baccatus*. Standard physical techniques, including UV-visible spectroscopy Fourier transform infrared spectroscopy and X-ray diffraction and transmission electron microscopy, were used to characterize the synthesized OB-ZnNPs. Synthesized OB-ZnNPs demonstrated significant biofilm inhibition in human and food-borne pathogens (*Chromobacterium violaceum*, *Escherichia coli*, *P. aeruginosa*, *Klebsiella pneumoniae*, *Serratia marcescens*, and *Listeria monocytogenes*) at subinhibitory concentrations. OB-ZnNPs significantly reduced the virulence factors like violacein, prodigiosin, and alginate and impaired swarming migration and EPS production. OB-ZnNPs demonstrated efficient binding with HSA protein and no change in their structure or stability was observed. In addition, *in vivo* toxicity evaluation confirmed that OB-ZnNPs possessed no serious toxic effect even at higher doses. Moreover, they were found to have excellent antioxidant properties that can be employed in the fields of food safety and medicine. Hence, it is envisaged that the OB-ZnNPs can be used as potential nanomaterials to combat drug resistant bacterial infections and prevent contamination/spoilage of food.

Hindawi
Evidence-Based Complementary and Alternative Medicine
Volume 2017, Article ID 1468957, 16 pages
https://doi.org/10.1155/2017/1468957

Research Article

Cytotoxicity and Proapoptotic Effects of *Allium atroviolaceum* Flower Extract by Modulating Cell Cycle Arrest and Caspase-Dependent and *p53*-Independent Pathway in Breast Cancer Cell Lines

Somayeh Khazaei,[1] Roslida Abdul Hamid,[1] Vasudevan Ramachandran,[2] Norhaizan Mohd Esa,[3] Ashok Kumar Pandurangan,[4] Fatemeh Danazadeh,[1] and Patimah Ismail[1]

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Breast cancer is the second leading cause of cancer death among women and despite significant advances in therapy, it remains a critical health problem worldwide. *Allium atroviolaceum* is an herbaceous plant, with limited information about the therapeutic capability. We aimed to study the anticancer effect of flower extract and the mechanisms of action in MCF-7 and MDA-MB-231. The extract inhibits the proliferation of the cells in a time- and dose-dependent manner. The underlying mechanism involved the stimulation of S and G2/M phase arrest in MCF-7 and S phase arrest in MDA-MB-231 associated with decreased level of *Cdk1*, in a *p53*-independent pathway. Furthermore, the extract induces apoptosis in both cell lines, as indicated by the percentage of sub-G0 population, the morphological changes observed by phase contrast and fluorescent microscopy, and increase in Annexin-V-positive cells. The apoptosis induction was related to downregulation of *Bcl-2* and also likely to be caspase-dependent. Moreover, the combination of the extract and tamoxifen exhibits synergistic effect, suggesting that it can complement current chemotherapy. LC-MS analysis displayed 17 major compounds in the extract which might be responsible for the observed effects. Overall, this study demonstrates the potential applications of *Allium atroviolaceum* extract as an anticancer drug for breast cancer treatment.

1. Introduction

After lung cancer, breast cancer is the second leading cause of cancer death among women worldwide. Among more than one million new cancer cases, breast cancer contains 18% of all female cancers globally [1]. Despite significant advances in therapy, breast cancer remains a critical health problem worldwide. Moreover, the current breast cancer treatments are expensive, not widely available, and limited by side effects and resistance to the treatment. Therefore, natural products could be the alternative and novel anticancer agents [2, 3]. Natural crude extracts and biologically active compounds isolated from plant species used in traditional medicine can be prolific resources for new drugs [4]. *Allium atroviolaceum (A. atroviolaceum)*, an herbaceous, perennial, bulbous plant, is a species in the genus *Allium* which belongs to the Alliaceae family. It is distributed in Crimea, Caucasus (Ante-Caucasus, Daghestan, and Trans-Caucasus), middle Asia (Mountainous Turkmenistan, Syr-Darya foothill areas), and Iran [5]. *A. atroviolaceum* is used as food (vegetable) and

Chapter 10

Dielectric Spectroscopy

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CHAPTER OUTLINE

10.1 INTRODUCTION TO DIELECTRIC SPECTROSCOPY

Dielectric spectroscopy (DS) or impedance spectroscopy, also known as electrochemical impedance spectroscopy, is frequently used to study the response of a sample subjected to an applied electric field of fixed or changing frequency [1−3]. DS describes the dielectric properties of a material as a

Spectroscopic Methods for Nanomaterials Characterization. http://dx.doi.org/10.1016/B978-0-323-46140-5.00010-8
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Fuzzy firefly clustering for tumour and cancer analysis

P.K. Nizar Banu , Ahmad Taher Azar , H. Hannah Inbarani

https://doi.org/10.1504/IJMIC.2017.082941

Published online 21 March 2017

Abstract PDF

Abstract

Swarm intelligence represents a meta-heuristic approach to solve a wide variety of problems. Searching for similar patterns of genes is becoming very essential to predict the expression of genes under various conditions. Firefly clustering inspired by the behaviour of fireflies helps in grouping genes that behave alike. Contrasting hard clustering methodology, fuzzy clustering assigns membership values for every gene and predicts the possibility of belonging to every cluster. To distinguish highly expressed and suppressed genes, the research in this paper proposes an efficient fuzzy-firefly clustering by integrating the merits of firefly and fuzzy clustering. The proposed method is compared with other swarm optimisation based clustering algorithms. It is applied on five gene expression datasets. The clusters resulting from the proposed algorithm provide interpretations of different gene expression patterns present in the cancer datasets. Experimental results show the excellent performance of fuzzy-firefly clustering to separate co-expressed and co-regulated genes.

Keywords: fuzzy firefly algorithm, fuzzy clustering, metaheuristics, gene expression data, particle swarm optimisation, PSO, fuzzy PSO, fuzzy logic, swarm intelligence, tumour prediction, cancer prediction, cancerous genes, tumours

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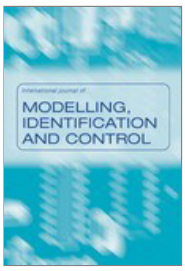

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- tumours

By Author

Accepted Article

Title: Gallic acid and gallates in human health and disease: Do mitochondria hold the key to success?

Running Title: Gallic acid modulates mitochondrial functions in human health and diseases

Authors: Rekha Yamini Kosuru[1], Amrita Roy[1], Sujoy K Das[2,3] and Soumen Bera*[,1]

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Conflict of Interest Statement

None declared

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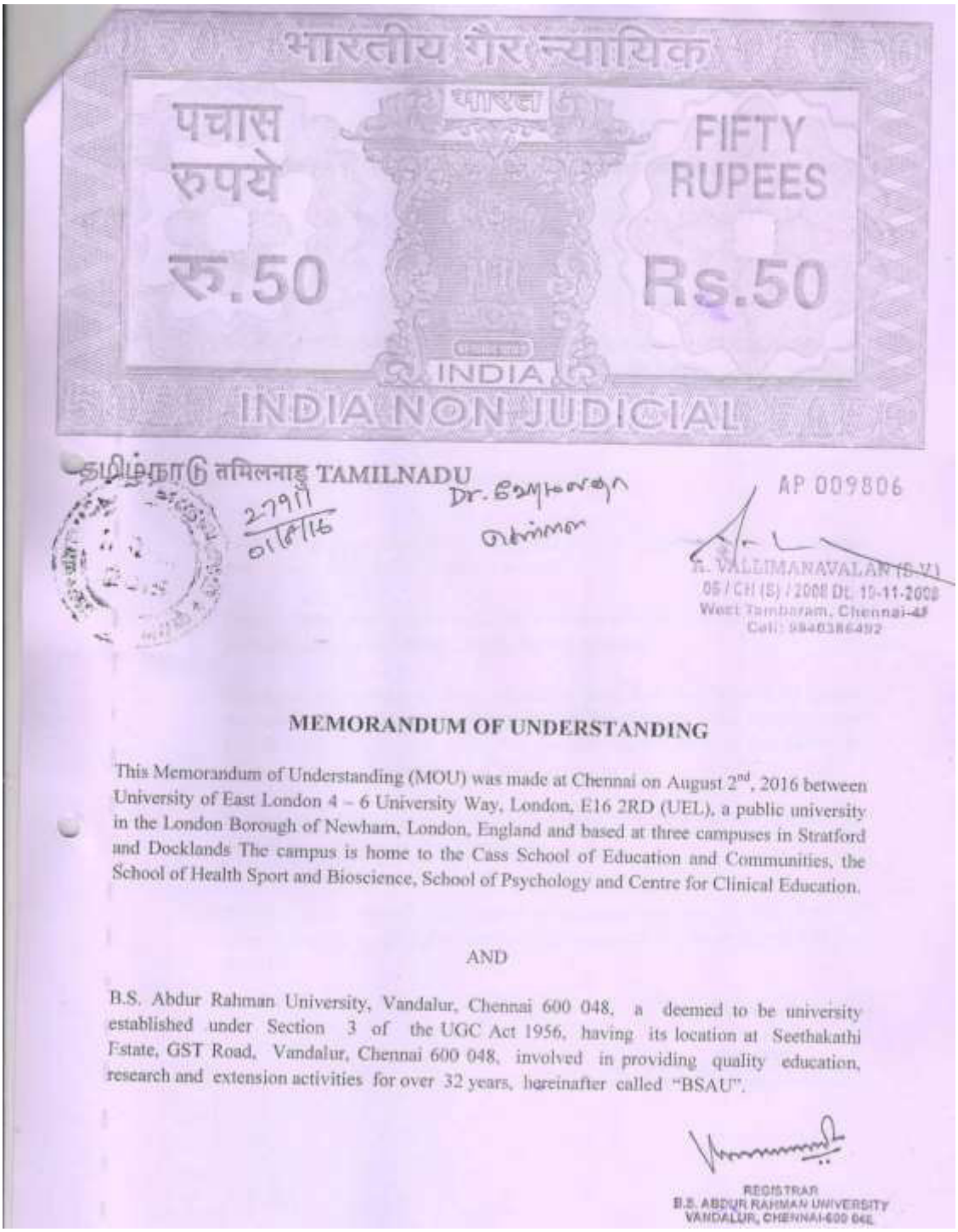

MEMORANDUM OF UNDERSTANDING

This Memorandum of Understanding (MOU) was made at Chennai on August 2nd, 2016 between University of East London 4 – 6 University Way, London, E16 2RD (UEL), a public university in the London Borough of Newham, London, England and based at three campuses in Stratford and Docklands The campus is home to the Cass School of Education and Communities, the School of Health Sport and Bioscience, School of Psychology and Centre for Clinical Education.

AND

B.S. Abdur Rahman University, Vandalur, Chennai 600 048, a deemed to be university established under Section 3 of the UGC Act 1956, having its location at Seethakathi Estate, GST Road, Vandalur, Chennai 600 048, involved in providing quality education, research and extension activities for over 32 years, hereinafter called "BSAU".

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Implementation of Lean Approaches in Proto Body Build to Improve Productivity and Flexibility

2017-28-1965

Published 07/10/2017

Ganesan Selvam and Surya Prakash Vaidhyanathan
Mahindra Research Valley

Prince Arockia Doss Sebastian
B S Abdur Rahman University

Mohamed Zaheer Abdulla and Vedantham Baskaran
Mahindra Research Valley

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Abstract

Lean approaches are being implemented in various manufacturing facilities across the globe. The application of lean approaches are extended to Body proto build shop to maximize the efficiency of the shop with lesser floor space and optimized equipment. Weld fixture, Weld equipment and assembly tools are the major tools required essentially for proto BIW assembly. This paper explains how the Weld equipment planning was carried out with lean approaches and implemented effectively in proto body assembly shop. The implemented lean concepts are compared with Italy and Japanese proto body build makers to validate the frugal planning of the facility for the said intent. The implemented facility is capable of producing more than a model at a time. Weld parameter selection for weld gun, gun movement to the fixture with minimized change over time and movable weld gun gantry are the lean approaches implemented.

Introduction

Lean manufacturing defines the value of the product for a service from a customer point of view. Most of the organizations wasting their resources up to 95%. Even the best Lean manufacturer wasting their resources up to 30%. So, it is obvious that there are series wastes that are hidden or yet to be discovered in the organizations. Efficiency of the system increases with the reduction of wastes and reducing the percentage of Non Value-Added activity (NVA). A proper planning and execution by an organization develops the waste elimination culture in the system and with the employees. To identify the waste and categorize them into avoidable and un-avoidable, we have to think about removing the waste from the system. And we must clearly understand that Lean Manufacturing always talks about removing, not minimizing.

Inventory management is an important aspect to reduce capital cost and revenue cost of an industry. Excess inventory is considered as one of the wastes in Lean Manufacturing principle. Nowadays, Inventory control is in practice in various industries. Introduction of inventory control approach in process planning will benefit by advance reduction of in- appropriate tools and materials in the system. This study is mainly focusing on the optimization of weld guns for Automobile Proto Body Shop. Optimization is considered at the planning stage itself.

Weld guns are used to weld two or three overlapping steel panels together by using an electric arc to melt the top panel, fusing it to the bottom panel. The panels involved must be clear of any rust, paint, grease, or other materials and must fit tightly together. This is critical for the weld strength.

Weld guns are the second most expensive equipment in most of the proto body shop after weld fixtures. The standard weld guns can be selected from the gun libraries to weld different parts but the criticality starts from product design; number of guns will get increase with respect to complexity of the joineries. The proto body assembly guns should be highly compatible for different Body-in-white (BIW) joinery configurations. The use of minimum guns for maximum weld configurations shows the capability of weld guns selection.

Literature Review

As stated by Ashish gupta et al [1], during process planning stage in an automotive Vehicle Development Process (VDP) one of the critical task is to select tools such as weld guns and fixture from large tool library and assign them to individual manufacturing operation. Software packages merely pick and validate individual library items to find a solution. Further, no design assistance is provided to configure a valid new tool. Currently in automotive industry, the tool selection process is manual, local & subjective. It leads to

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Performance and Emission Characteristics of a Diesel Engine Fueled with Diesel and Orange Oil Blends Using Different Bowl-In Piston Geometries

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Abstract

Biomass derived fuels have a potential to replace fossil fuels that are used in transportation. Orange oil is considered as one of the possible alternative biofuels for compression ignition (CI) engines, as it is renewable and available in a significant quantity throughout the world. It is a biomass derived fuel obtained from orange skin, which has 90% D-limonene. In this study an orange oil diesel blend is used as a test fuel in a single cylinder, four stroke, direct injection (DI) diesel engine with a power output of 4.4 kW at a rated speed of 1500 rpm to assess the performance and emission parameters of the engine, when the engine is run with three different piston geometries. The experimental results of the performance and emission parameters of the engine for the orange oil operation were compared with those of the diesel operation of the same engine and presented in this paper.

Introduction

Achieving higher engine efficiency and utilizing the renewable fuels to a maximum possible extent are the two methods that are mainly focused in many countries for mitigating greenhouse gas (GHG) emissions. Although, biodiesel and alcohols are currently utilized as alternative transportation fuels in many developed and some of the developing countries, exploration of different sources for production of these two biofuels and utilizing them as transportation fuels is still continuing. Apart from utilization of these biofuels, other biofuels such as orange oil and turpentine oil have recently been explored for their suitability as substitute fuels for compression ignition (CI) engines. Orange oil was tested for its suitability as an alternative fuel for CI engines by Purushothaman and Nagarajan [1, 2]. A series of tests in the form of sole orange oil, different percentages of orange oil diesel fuel blends, orange oil diethyl ether dual fuel mode were performed in a single cylinder, four stroke, air cooled, direct injection (DI), diesel engine developing power of 4.4 kW at a rated speed of 1500 rpm. It was reported that the efficiency increased with increase in percentage of orange oil in the blend. CO and HC emissions reduced for orange oil compared to that of diesel operation at the entire operation. Smoke emission reduced marginally for orange oil than the diesel fuel, while NO emission increased at full load. When DEE was used as an ignition improver and inducted in suction at low quantities with orange oil as a pilot fuel, HC and CO emissions increased, while NO emission decreased at full load. It is suggested that, there must be a compromise between the fuel efficiency, NO and smoke emissions. There are more research works to be carried out to establish the possibility of using orange oil in CI engines.

Engine modifications affect the engine performance [3, 4]. Combustion and emissions were greatly influenced by the swirl ratio, and which makes the distribution of fuel/air equivalence ratio and the flow fields also accordingly change in the combustion chamber. Before spray, the squish primarily controls the turbulent kinetic energy distribution, while after spray; the combustion reverse squish and the swirl have a great impact on the in-cylinder temperature. Effect of swirl with turbulence induced on the piston surface showed better results and reduced emissions. A simulation work was carried out to study the effects of the piston bowl geometry on the combustion and emission characteristics of a diesel engine fueled with biodiesel which was produced from waste cooking oil with a major composition of palm oil, under medium load conditions [5]. Three different bowl geometries namely: the baseline omega combustion chamber (OCC), hemispherical combustion chamber (HCC) and shallow depth combustion chamber (SCC) were considered with same compression ratio of 18.50. The simulation results indicated that in terms of performance, the SCC was found to be favorable at low engine speeds as it had high indicated power compared to that of OCC and HCC, while for this geometry the NO emission was found to be higher due to high temperature and pressure during the combustion process. At high engine speeds, OCC was

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ACCEPTED MANUSCRIPT

Preparation and characterization of T-permeation barrier on RAFM steel: Influence of HDA melt composition and superheat

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Abstract

The present work aims to prepare an Al_2O_3/Fe-Al-Si Tritium Permeation Barrier (TPB) on Reduced Activation Ferritic-Martensitic Steel (RAFMS) an ideal material for Test Blank Module (TBM) by employing hot dip aluminizing (HDA), annealing and oxidation processes. Hydrogen adsorption/desorption behavior of barrier was tested using electrochemical and thermal spectrometry techniques for qualitative determination of H_2 permeation resistance of barrier coating. The results confirmed a five-time increase in permeation resistance of RAFMS with coating compared to uncoated RAFMS. Three different HDA melts with varying Si concentration of 1%, 6%, and 11% were used for understanding the impact of Si concentration in the Al melt and the superheat of the Al melt on the microstructure, hardness, adhesion strength, permeation and corrosion resistance of the HDA and the oxidized HDA coatings.

Keywords: `Tritium permeation barrier, Hydrogen permeation, Hot dip aluminizing, RAFM steel, Alloying effect, Doping effect, Superheat`

1. Introduction

The recent progress in the Test Blanket Modules experiment in ITER fusion power reactor requires the development of Tritium Permeation Barriers for its

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ORIGINAL PAPER

Solution-processed white graphene-reinforced ferroelectric polymer nanocomposites with improved thermal conductivity and dielectric properties for electronic encapsulation

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Abstract The recent surge in graphene research has stimulated interest in the investigation of various two-dimensional (2D) nanomaterials, including 2D boron nitride (BN) nanostructures. Among these, hexagonal boron nitride nanosheets (h-BNNs; also known as white graphene, as their structure is similar to that of graphene) have emerged as potential nanofillers for preparing thermally conductive composites. In this work, hexagonal boron nitride nanoparticles (h-BNNPs) approximately 70 nm in size were incorporated into a polyvinylidene fluoride (PVDF) matrix with different loadings (0–25 wt.%). The PVDF/h-BNNP nanocomposites were prepared by a solution blending technique and characterized using Fourier transform infrared spectroscopy (FTIR), X-ray diffraction (XRD), thermogravimetric analysis (TGA), polarized optical microscopy (POM) and scanning electron microscopy (SEM). In addition, the thermal conductivity and dielectric properties of the nanocomposites were investigated. The incorporation of h-BNNPs in the PVDF matrix resulted in enhanced thermal conductivity. The highest value, obtained at 25 wt.% h-BNNP loading, was 2.33 W/mK, which was five times that of the neat PVDF (0.41 W/mK). The thermal enhancement factor (TEF) at 5 wt.% h-BNNP loading was 78%, increasing to 468% at 25 wt.% h-BNNP loading. The maximum dielectric constant of approximately 36.37 (50Hz, 150 °C) was obtained at 25 wt.% h-BNNP loading, which was three times that of neat PVDF (11.94) at the same frequency and temperature. The aforementioned results suggest that these multifunctional and high-performance nanocomposites hold great promise for application in electronic encapsulation.

Keywords Hexagonal boron nitride · Thermal conductivity · Electronic encapsulation

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Introduction

In recent years, there has been growing interest in two-dimensional (2D) layered materials such as graphene and hexagonal boron nitride, because of their high specific surface area and attractive properties [1–3]. Hexagonal boron nitride (h-BN) is the most popular polymorph of boron nitride (BN), given its unique engineering properties resulting from its ultrathin structure. It is a white-coloured ceramic material which is an isoelectric and iso-structural analogue of graphene [4]. As it is structurally analogous to graphene, h-BN is generally known as “white graphene”, and consists of alternating boron and nitrogen atoms in a honeycomb lattice with a lattice constant of ~ 0.25 nm [4, 5]. The in-plane boron and nitrogen atoms in h-BN are bounded by strong covalent bonds, while the out-of-plane layers are held together by van der Waals

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Studies on the Electrical Properties of Graphene Oxide-Reinforced Poly (4-Styrene Sulfonic Acid) and Polyvinyl Alcohol Blend Composites

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In the present study, graphene oxide (GO)-reinforced poly (4-styrenesulfonic acid) (PSSA)/ polyvinyl alcohol (PVA) blend composite films were prepared using colloidal blending technique at various concentrations of GO (0–3 wt.%). The morphological investigations of the prepared composites were carried out using polarized optical microscopy and scanning electron microscopy. The electrical properties of composites were evaluated using an impedance analyzer in the frequency range 50 Hz to 20 MHz and temperature in the range 40–150°C. Morphological studies infer that GO was homogeneously dispersed in the PSSA/PVA blend matrix. Investigations of electrical property indicate that the incorporation of GO into PSSA/PVA blend matrix resulted in the enhancement of the impedance (Z) and the quality factor (Q-factor) values. A maximum impedance of about $4.32 \times 10^6 \Omega$ was observed at 50 Hz and 90°C for PSSA/PVA/GO composites with 3 wt.% GO loading. The Q-factor also increased from 8.37 for PSSA/PVA blend to 59.8 for PSSA/PVA/GO composites with 3 wt.% GO loading. These results indicate that PSSA/PVA/GO composites can be used for high-Q capacitor applications.

Keywords: PSSA; PVA; graphene oxide; impedance; Q-factor.

1. Introduction

In recent years, the graphene and its allotropes have kindled profound interest among the scientific community, owing to their unique and superior properties such as large specific area ($\sim 2630\,m^2/g$), ultra-high Young modulus (1 TPa), excellent optical transparency ($\sim 97.7\%$), high fracture strength (130 GPa), outstanding electrical (720 S/m) and

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Article

Synthesis, Characterization and Antimicrobial Activities of Copper, Nickel, Cobalt, Chromium Complexes Derived from (*Z*)-4-Fluoro-*N*-(2,7-dimethylhept-6-enylidene) benzenamine

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Melonal is a relatively unexplored ingredient in the field of chemistry with excellent sensory properties. The synthesis and characterization of novel transition 3d metal complexes of copper(II), nickel(II), cobalt(II) and chromium(III) involving the Schiff base of melonal were explored to examine their biological activity. Characterization of the complexes was carried out using matrix-assisted laser desorption/ionization-time-of-flight (MALDI-TOF), gas chromatography-mass spectrometry (GC-MS), thermogravimetric analysis (TGA), UV-Visible and infrared (IR) spectrophotometry. The antimicrobial studies were conducted against six bacterial strains and six fungi. The minimum inhibition concentration observed was compared against the standard antibiotic gentamycin and the anti-fungal drug amphotericin. The activity studies indicated that cobalt(II) complex exhibited activity better than standard drug amphotericin against *Penicillium chrysogenum*. Molecular docking study confirms the protein binding and supports the experimental finding. Binuclear cobalt(II) and chromium(III) bridging complexes of Schiff base ligand were obtained.

Keywords: azomethine, chromium(III) complex, melonal, bridging complex, docking, DFT

Introduction

Melonal (2,6-dimethyl-5-heptenaldehyde) is less explored in the field of chemistry and an interesting aldehyde used in sensory science. Melonal is credited with excellent sensory properties. It is widely used in flavor and fragrance industries for its fruity melon taste and odor. We have prepared Schiff base involving this melon aldehyde and 4-fluoro aniline. Over the years, antibiotic compounds have been used to manage infections resulting from various environments.[1] These powerful agents interfere with the growth and reproduction of organisms like bacteria, fungi, parasites, virus, etc. Besides providing resistance against some fungal and bacterial strains, a limited number of compounds are available for the treatment of fungal and bacterial infections.

In general, Schiff bases have been used in the preparation of many drugs and they possess a broad spectrum of biological activities such as antifungal,[2] antibacterial,[3] anti-inflammatory and anticancer activities.[4-7] In this context, with the aim of developing new antifungal and antibacterial compounds, we report the synthesis, characterization of a novel Schiff base and its metal complexes and their antifungal, antibacterial properties. While the antibacterial studies exhibit moderate activity against the species studied, antifungal studies revealed an interesting result. The antifungal activity studies indicated that cobalt(II) complex exhibited activity better than standard drug amphotericin against *Pencillium chrysogenum.*

The present work is the study of copper(II), nickel(II), cobalt(II), chromium(III) metal complexes of the Schiff base derived from 2,6-dimethyl-5-heptenaldehyde and 4-fluoro aniline. The work is supported by density functional theory (DFT) and molecular docking studies. The binding affinity is confirmed by docking Schiff base ligand with PAF protein. The activity predictions were conducted using Hex scores for ligand and its metal complexes. The theoretical studies undertaken strengthen the experimental results.

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Resource

Toward the human cellular microRNAome

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MicroRNAs are short RNAs that serve as regulators of gene expression and are essential components of normal development as well as modulators of disease. MicroRNAs generally act cell-autonomously, and thus their localization to specific cell types is needed to guide our understanding of microRNA activity. Current tissue-level data have caused considerable confusion, and comprehensive cell-level data do not yet exist. Here, we establish the landscape of human cell-specific microRNA expression. This project evaluated 8 billion small RNA-seq reads from 46 primary cell types, 42 cancer or immortalized cell lines, and 26 tissues. It identified both specific and ubiquitous patterns of expression that strongly correlate with adjacent superenhancer activity. Analysis of unaligned RNA reads uncovered 207 unknown minor strand (passenger) microRNAs of known microRNA loci and 495 novel putative microRNA loci. Although cancer cell lines generally recapitulated the expression patterns of matched primary cells, their isomiR sequence families exhibited increased disorder, suggesting DROSHA- and DICER1-dependent microRNA processing variability. Cell-specific patterns of microRNA expression were used to de-convolute variable cellular composition of colon and adipose tissue samples, highlighting one use of these cell-specific microRNA expression data. Characterization of cellular microRNA expression across a wide variety of cell types provides a new understanding of this critical regulatory RNA species.

[Supplemental material is available for this article.]

MicroRNAs are an established class of small regulatory RNAs that, within the RISC complex, bind mRNAs and repress protein production (Valencia-Sanchez et al. 2006). In this role, they control essential cell processes in health and disease (Ambros 2004; Mendell and Olson 2012). Despite all that is known about microRNA processing and function, the cellular localization of microRNAs is still widely underappreciated. An understanding of which cells express which microRNAs is useful as we move toward microRNA therapeutics (Janssen et al. 2013) and microRNA biomarkers (Mitchell et al. 2008). Knowing a microRNA's full localization pattern will maximize efficacy and minimize off-target effects of therapeutics and will better rationalize candidate biomarkers (Haider et al. 2014).

MicroRNA expression has been predominantly characterized in tissues, with no comprehensive cellular studies. Initial tissue studies sequenced individual clones or used array methods providing low-depth coverage of abundant microRNAs (Lagos-Quintana et al. 2002; Barad et al. 2004; Liu et al. 2004; Baskerville and Bartel 2005). The most thorough of these microRNA localization projects performed small RNA library sequencing (RNA-seq) on over 250 libraries from 26 organ systems. However, this nascent effort sequenced only ~1200 reads per library (Landgraf et al. 2007). While providing valuable insights into the relationship of

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ORIGINAL PAPER

White graphene reinforced polypyrrole and poly(vinyl alcohol) blend nanocomposites as chemoresistive sensors for room temperature detection of liquid petroleum gases

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Abstract The authors describe the preparation of PVA/hBNNP nanocomposites/hBNNP nanocomposite film by solution casting from poly(vinyl alcohol) (PVA), water soluble polypyrrole (WPPy), and using hexagonal boron nitride nanoparticles (hBNNP) as a reinforcing filler element. The structural, optical and electrical properties of the material are characterized by FTIR, X-ray diffraction, UV-vis spectroscopy, scanning electron microscopy, atomic force microscopy, thermogravimetric analysis, and by electrochemical impedance spectroscopy. The nanocomposite films are shown to be viable chemiresistive sensors for sensitive and selective detection of liquid petroleum gas (LPG). The effect of hBNNP loading on the sensing performance was investigated. The nanocomposite films possess good mechanical flexibility and improved tensile strength. These PVA/WPPy/hBNNP nanocomposite film showed a maximum sensitivity (S, defined as a signal change compared to pure air) to LPG of up to S = 0.25% at a 600 ppm concentration at room temperature with response/recovery times of ~30/32 min for 6 wt% hBNNP loading in a PVA/WPPy matrix. The nanocomposite with 6 wt% filler loading shows good selectivity for LPG over vapors of benzene, chloroform, ethanol and acetone. Therefore, this sensor film is a good candidate for qualitative detection of LPG.

Keywords White graphene · Nyquist plot · Conducting polymer sensor · Gas leakage detection · LPG sensor

Introduction

Conducting polymers have attracted much interest as novel materials for potential applications in electronic devices, capacitors,

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Effect of Reduced Graphene Oxide Reinforcement on the Wear Characteristics of Electroless Ni-P Coatings

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Electroless composite coatings with various concentrations of reduced graphene oxide (rGO) particles were deposited onto mild steel substrate. The effects of adding rGO particles by varying their concentration from 0 to 100 mg/L on morphology, composition, microhardness, adhesion, wear and friction of the electroless composite coatings were investigated. Among the various parameters that influence the tribological behavior, sliding velocity was varied within a specific range for definite concentrations of rGO to obtain enhanced wear resistance in this study. The micrographs of the worn surfaces and indented spots were examined for the nature of wear mechanism and interfacial adhesion. The wear rate increased with increasing sliding velocity but was relatively stable for coatings with lower concentrations of rGO.

Keywords electroless coating, indentation, microhardness, wear

1. Introduction

Graphene is a part of the carbon nanomaterial family with exceptional properties like high electron mobility, high thermal conductivity, high tensile strength and high nominal surface area. Owing to their extraordinary characteristics, the potential of these materials was extensively studied in different fields of engineering (Ref 1-3). This particular variety of carbon nanomaterial has become one of the most adopted materials in coatings technology because of its abundant availability, naturally. It has effectively begun to replace carbon nanotubes (CNT) in many applications. This versatile carbon allotrope has catered to various applications in the fields like bioengineering, composite materials, energy technology and nanotechnology, yet, researchers are looking for a cheaper, simpler, more efficient and better yielding method of producing graphene, which can be scaled up massively compared to currently available methods, and be financially suitable for industrial or commercial applications. The diversity of the carbon materials had spread so quickly with researchers paying more attention toward synthesizing newer materials and derivatives of carbon-based compounds. Of these, the attributes of graphene oxide (GO) have made it a desirable component in the plating industry due to their ability to improve the tribological behavior of the coated substrate (Ref 4). As the scope of these materials widened, industries and researchers focussed to discover ways of redefining the development of high-quality graphene sheets. One way of achieving this was by reducing graphene oxide to produce reduced graphene oxide (rGO). The reduced graphene oxide is a material that resembles graphene but contains residual oxygen and other heteroatoms as well as structural defects. There are a number of techniques by which reduced graphene oxide (rGO) can be prepared, though these methods are all based on thermal, chemical or electrical means (Ref 5). In addition to being components in electronic devices, rGO has been used in nanocomposite materials, polymer composite materials, energy storage, biomedical applications and catalysis. The properties of this compound (rGO) can be enhanced to suit several commercial applications by either producing new compounds as a result of combination of rGO with other two-dimensional materials or by treating rGO with other chemicals (Ref 6). Recent studies have reported that graphene oxide when used as a third-phase particle in electroplating displayed good hardness and improved thermal conductivity (Ref 7). In addition, electroless coatings with carbon-based nano-materials have exhibited higher wear resistance, higher hardness and lower frictional coefficient (Ref 8, 9).

Even though, there are several coating solutions catering to a wide range of applications, electroless Ni-P plating has now become one of the most favored technique in meeting the industrial demands due to its cost-effectiveness and simple coating process. The ability to coat intricate shapes, contours, non-conductors, ceramics and even plastics has placed this variety of functional coatings at a superior level. The extensive use of electroless nickel coatings has always been in the area of automotive and aircraft applications like fluid flow control valves, piston heads, engine shafts, turbine parts, differential ball shafts, fuel injectors, knuckle pins and many associated components that require exceptional anti-corrosion and wear-resistant properties (Ref 10-12). The idea of co-depositing inert particles in the deposits took advantage of their ability to improve coating hardness, coating uniformity, corrosion behavior and wear resistance (Ref 13). The type and nature of the particles incorporated into the coating matrix determine the exploitable properties acquired for specific applications (Ref 14). Particles when embedded into the metal matrix can bring new functionality to existing substrate materials (Ref 15).

Electroless plating is now being widely accepted as the most promising coating solution as it has exhibited potential to improve the wear characteristics and friction behavior with

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SPECIAL SECTION ON REAL-TIME EDGE ANALYTICS FOR BIG DATA IN INTERNET OF THINGS

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Effective Features to Classify Big Data Using Social Internet of Things

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ABSTRACT Social Internet of Things (SIoT) supports many novel applications and networking services for the IoT in a more powerful and productive way. In this paper, we have introduced a hierarchical framework for feature extraction in SIoT big data using map-reduced framework along with a supervised classifier model. Moreover, a Gabor filter is used to reduce noise and unwanted data from the database, and Hadoop Map Reduce has been used for mapping and reducing big databases, to improve the efficiency of the proposed work. Furthermore, the feature selection has been performed on a filtered data set by using Elephant Herd Optimization. The proposed system architecture has been implemented using Linear Kernel Support Vector Machine-based classifier to classify the data and for predicting the efficiency of the proposed work. From the results, the maximum accuracy, specificity, and sensitivity of our work is 98.2%, 85.88%, and 80%, moreover analyzed time and memory, and these results have been compared with the existing literature.

INDEX TERMS Internet of Things, social Internet of Things, machine Learning, big data, feature selection.

I. INTRODUCTION

Developing IoT enabled technologies and their solutions are a major challenge. However, IoT is about the pervasive collection and sharing of data towards a common goal [1]. In IoT, the data refers to attribute values such as variables or integer values; and event refers to when certain conditions are met or when certain states are reached [2], [4]. IoT service allows certain functions to be carried out through a predefined interface [5], [6]. Some researchers are particularly interested in identifying risk issues arising during discovering and integrating data within IoT [7]. Recently, the SIoT have been developed; another utilization of Internet of Things (IoT). The SIoT is a larger social network, connecting people and people, people and objects, and objects and objects [8]. Thus creating the opportunities which bring several challenges to data processing systems for improving data collection, cleaning and storage, and performing real-time analytics [9]. Moreover, in the current scenario of Big Data, various standards and platforms have been introduced by relational database vendors and can be used for data aggregation as well as data analysis [10], [11]. The "big data and SIoT is the perfect representation of social systems and the IoT to characterize human progression [12].Various feature selection algorithms have been proposed; which can be classified into two broad categories, i.e., filter approaches, and wrapper approaches. In filter-based approach, the filtration process is performed before classification process because of the independent usage nature of classification algorithms [13].

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Paper

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Gold catalyzed synthesis of tetrahydropyrimidines and octahydroquinazolines under ball milling conditions and evaluation of anticonvulsant potency

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Dedicated with respect to Dr. P. T. Perumal for his 35 years of contribution to synthetic organic chemistry

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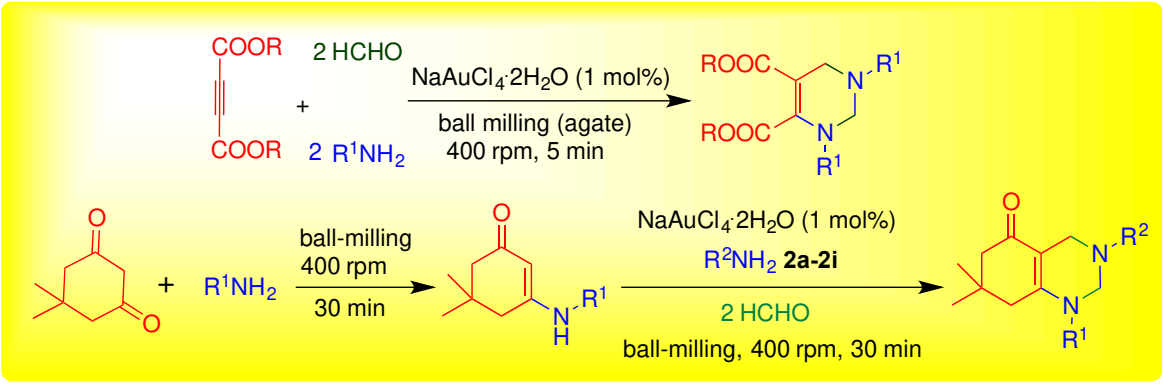
Abstract

A fast, mechanochemical and solvent-free synthesis of substituted tetrahydropyrimidines and octahydroquinazolines under Au(III)-catalysis has been developed. The practical feasibility, eco-friendliness and operational simplicity of this chemistry is exemplified by ball milling three components such as formaldehyde, amines and 2-butynedioates/dimedone in a shaker mill for as little as five minutes, thus avoiding the requirement of undesirable solvents and long reaction times. Moreover, this protocol furnishes the target compounds in high yields without any side products and in some cases offers products with excellent regioselectivity. Out of the 26 compounds screened for anticonvulsant potency, 11 compounds exhibited comparable activity against a standard drug.



Keywords: Mechanochemistry, gold catalysis, multicomponent reaction, tetrahydropyrimidines, octahydroquinazolines, anticonvulsant

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ACCEPTED MANUSCRIPT

SYNTHESIS AND PROPERTIES OF SPINEL $ZnFe_2O_4$ NANOPARTICLES BY FACILE CO-PRECIPITATION ROUTE

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Abstract

Ferrite nanoparticles have engaged considerable attention in the recent times owing to their incomparable biological applications and also viability in the scientific and technological areas of research. Nanosized spinel ferrites are the most rivet class of materials, that have significantly modulated the consideration of research humanity due to their exceptional structural, optical and magnetic properties. These properties are catered in $ZnFe_2O_4$ which make it an appropriate contender in the field of electronics, areas of applied optics and telecommunication. A plausible and economically viable co-precipitation method has been the center of attention in recent years to synthesize these nanoparticles. The synthesized samples are characterized by powder X-ray diffraction which evidenced the prevalence of sharp diffraction peaks, attributed to its significant crystalline nature and crystallite size has been estimated to be 11.04 nm. TEM micrograph revealed the size and profile of the nanoparticles. The structural characterization clearly reveal their cubic nature and notable crystallinity. The FT-IR measurements carried out in the range of 4000-400 cm^{-1} elucidate the presence of functional groups. UV-visible spectral analysis (UV-vis) reveals the optical property and hence optical band gap is found out using Kubelka-Munk plot. The PL studies divulge the excitation wavelength, which facets out the recombination of holes and electrons. The room temperature retentivity and coercivity have been estimated using

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Journal Name

ARTICLE

Solvent-free implementation of two dissimilar reactions using recyclable CuO nanoparticle under ball-milling conditions: Synthesis of new oxindole-triazole pharmacophores

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Synthesis of new hybrid pharmocophores by merging Baylis-Hillman and click chemistry together under ball-milling conditions was accomplished. The substrate scope of the reaction was broad to include alkyl, benzyl and aryl groups. Catalytic amount of CuO nanoparticle (CuONP <50 nm) used to effect the click reaction can be easily recovered by simple centrifugation and was found to be catalytically active for almost 6 cycles. The highlights of our protocol are (i) solvent-free reaction conditions, (ii) short reaction time, (iii) no rigorous solvent extraction, (iv) good to excellent chemical yields, (v) 100% atom economy, (vi) CuONP recyclability, (vii) good enantioselectivity and (viii) no need for high temperature. Overall, the developed protocol significantly broadens the scope of mechanochemistry by operating two dissimilar reactions with equal aplomb in a sustainable fashion. Biological assay and *in silico* studies of the synthesized compounds were also evaluated to showcase their efficacy as antimicrobial agents.

Introduction

The upsurge of organic mechanochemical reactions has received paramount importance within the purview of green chemistry.[1] Thanks to the mechanical activation of covalent bonds by ball-mills, a plethora of organic transformations are possible nowadays.[2] Especially, multicomponent reactions (MCRs) with the aid of mechanochemistry is of great value to pharmaceutical industries,[3] since the specified medicinal targets can be prepared in a proficient and eco-friendly manner by circumventing the use of solvents.[4] With these knowledge based facts on the advantages of mechanochemistry coupled with our previous experience in the synthesis of pharmaceutically relevant molecules,[5] we envisaged to prepare novel and potential medicinal targets in a sustainable fashion. Having mentioned, 3-substituted-3-hydroxy-2-oxindole is an interesting scaffold present in various biologically active medicinal agents and natural products.[6] The therapeutic potential of these compounds are the consequent of C3-substituent and the absolute configuration of C3-stereogenic center.[7] Thanks to the broad spectrum of pharmacological activities, efficient and practical synthetic routes of these structural units has been of substantial interest to organic and medicinal chemists.[8] On the other hand, 1,2,3-triazoles exhibit attractive biological activities and is deliberated as a privileged structure not only in medicinal chemistry but also in synthetic chemistry because of their easy synthesis *via* click chemistry.[9] In addition, 1,2,3-triazole core exhibits stability towards acidic/basic hydrolysis as well as oxidative/reductive conditions, thus reflecting a high aromatic stabilization and comparative resistance to metabolic degradation.[10] Moreover, these heterocycles possess high dipole moment, hence capable of forming hydrogen bonds which in turn favors the binding with biomolecular targets.[11] Based on the aforementioned specifics, we became interested in an eco-benign synthesis of single molecular entities that possess both 3-substituted-3-hydroxy-2-oxindole as well as triazole sub-units. Towards this end, we envisioned a three component assemblage for the synthesis of target **4**, which apparently could be accomplished from N-propargyl isatins **1**, maleimides **2** and azides **3** by taking advantage of mechanochemistry (Scheme 1). Herein, we report a hybrid pharmacophore approach for the synthesis of new oxindole-triazoles under ball-milling conditions using copper oxide nanoparticle as catalyst. The results of this green synthesis, substrate scope, enantioselectivity, catalyst recovery, biological evaluation and molecular docking were disclosed in this article.

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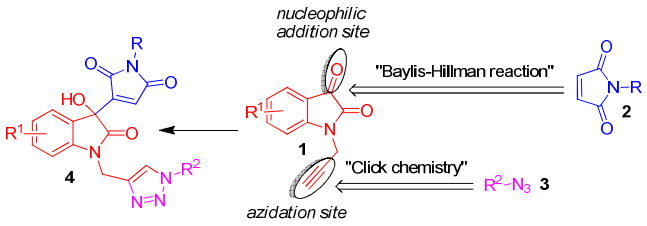
† Footnotes relating to the title and/or authors should appear here.
Electronic Supplementary Information (ESI) available: ^{1}H, ^{13}C NMR spectrum, HRMS, crystal parameters, HPLC charts, docking pose of all compounds. CCDC 1493827 See DOI: 10.1039/x0xx00000x



Scheme 1 Synthetic design of targeted pharmacophore **4**

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Green Chemistry Accepted Manuscript

Catal Lett
DOI 10.1007/s10562-017-2214-2

Oxidation of Aniline to Nitrobenzene Catalysed by 1-Butyl-3-methyl imidazolium phosphotungstate Hybrid Material Using *m*-chloroperbenzoic Acid as an Oxidant

R. Meenakshi[2] · K. Shakeela[1] · S. Kutti Rani[2] · G. Ranga Rao[1]

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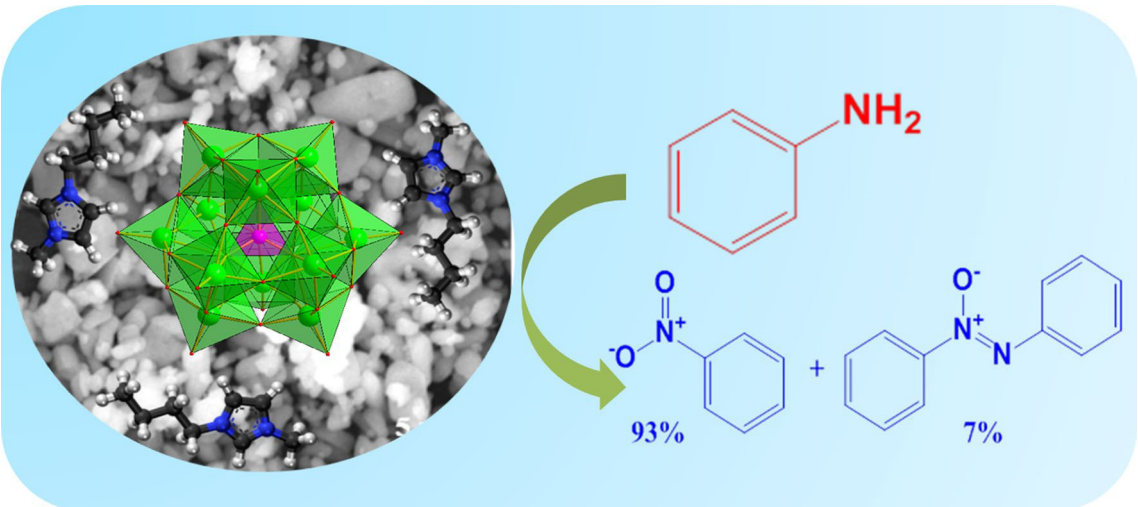
Abstract Keggin ion based hybrid materials, $[BmIm]_3[PW_{12}O_{40}]$, $[TBA]_3PW_{12}O_{40}$ and $[BuPy]_3PW_{12}O_{40}$, were prepared by proton exchange with organic cations, 1-butyl-3-methyl imidazolium ion, tetrabutylammonium ion and butylpyridinium ion, respectively. The formation of hybrid materials was confirmed by FTIR, PXRD, SEM, TG-DTA, DSC analysis. These hybrid compounds are active for oxidation of aniline using m-chloroperbenzoic acid as an oxidant. Among the three hybrid compounds, 1-butyl-3-methyl imidazolium phosphotungstate was found to be the best and efficient catalyst for selective aniline oxidation to nitrobenzene. It is a recoverable and reusable catalytic system. The redox property of the phosphotungstate cluster in the hybrid material is involved in the catalytic activity.

Graphical Abstract



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Keywords Phosphotungstic acid · Ionic liquid · Hybrid material · Oxidation · Aniline

1 Introduction

Ionic liquids (ILs) are the salts which can melt below 100 °C, exclusively contain ionic species. They have been

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Influence of synthesis conditions on the photocatalytic activity of mesoporous Ni doped $SrTiO_3/TiO_2$ heterostructure for H_2 production under solar light irradiation

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ACCEPTED MANUSCRIPT

EFFECT OF REDUCED GRAPHENE OXIDE (rGO) ON CORROSION AND EROSION-CORROSION BEHAVIOUR OF ELECTROLESS Ni-P COATINGS

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Accepted manuscript

ABSTRACT

Protective coatings have been gaining prominence in research related to graphene based compounds over the recent years. The present study aims to reveal the novel anti-corrosive properties of the coatings achieved by co-depositing the carbon allotropes. Electroless Ni-P-rGO coatings were successfully obtained on low carbon steel substrates by adding various concentrations of rGO particles to the conventional electroless Ni-P bath. The coated specimens were characterized for its morphology and composition corroborated by X-ray diffraction and microhardness analysis. The corrosion and erosion corrosion behaviour of the Electroless Ni-P-rGO coatings were studied using potentiodynamic polarization and electrochemical impedance spectroscopy (EIS) in 3.5 wt. % sodium chloride solution. The erosion corrosion behaviour of the coatings for different concentrations of rGO particles was examined using a slurry pot tester. The addition of rGO particles had considerably improved the corrosion and erosion resistance and the best results were achieved at an optimum concentration of 50 mg/L of rGO in the bath.

Keywords: Electroless coatings; reduced grapheme oxide; Surface analysis; Slurry erosion; Corrosion.

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Journal Name

COMMUNICATION

Diels-Alder trapping of in situ generated Dienes from 3,4-dihydro-2*H*-pyran with *p*-Quinone catalysed by *p*-Toluenesulfonic acid

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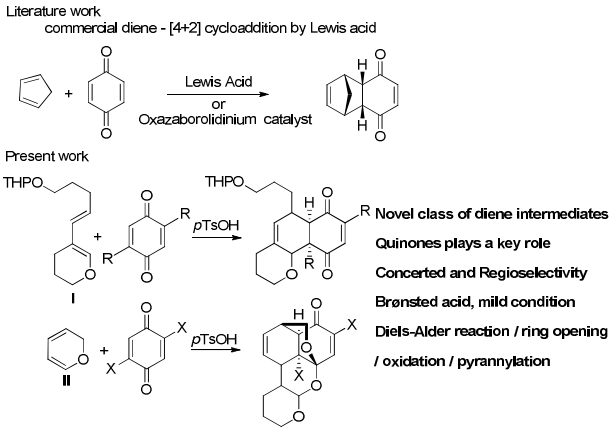
www.rsc.org/

Radhakrishnan Mohan Raj,[a] Kalpattu K. Balasubramanian[b] and Deivanayagam Easwaramoorthy[a]

This comprehensive study portrays that *p*-toluenesulfonic acid is the efficient catalyst for the reaction between *p*-quinones and 3,4-dihydro-2*H*-pyran, than the Lewis acids. The products were accomplished by the Diels-Alder cycloaddition and their mechanistic pathway have been formulated. The impact of C_2 and $C_{2,5}$ substituents of the *p*-quinones on the cycloaddition reaction has been explored. Remarkably, it is the first report to explore this kind of in situ generated dienes for Diels-Alder cycloaddition reaction.

Quinones are a large class of compounds endowed with rich and fascinating chemistry.[1] Naturally occurring quinones and hydroquinones are subunits in many biological compounds[2] and possess a variety of biological properties including antitumoral,[3] HIV transcriptase inhibition[4] and immunomodulation.[5] Indeed via Diels-Alder reactions ,the most powerful versions of [4 + 2]-cycloaddition, the 1,4-benzoquinone and various quinone subcategory have been exploited in numerous well known synthesis of natural products (eg. steroids, reserpine, ibogamine, dendrobine, and gibberellic acid).[6] Quinone, a dienophile not only incorporates an extraordinary confluence of functional groups but also displays a high selectivity in reactions with various dienes. This is quite interesting due to the fact that, apart from their electron deficient nature, quinones also contain useful chemical functionality that can form the basis for further transformations after the Diels-Alder reaction.

Numerous reports states that [4+2] cyclic adduct has been obtained as the result of Diels-Alder reaction between various commercial dienes and quinones, catalyzed by either Lewis acid / Brønsted acid, or metal complexes (Scheme 1).[6-9] The asymmetric synthesis of the natural product angiogenesis Inhibitor (+)-epoxyquinol A and related epoxyquinoid dimers has been reported using 2*H*-pyran monomers.[10] This inspired us to explore Diels-Alder reaction between *p*-quinone and more reactive unique species of 2*H*-pyran a non commercially available diene. Hence the focus was on the in situ generation of 2*H*-pyran (II) through the oxidation of 3,4-dihydro-2*H*-pyran. On the other hand another intermolecular diene (I)[11] was obtained from 3,4-dihydro-2*H*-pyran in *p*TsOH, in which case the *p*-quinones has not involved.



Scheme 1. Diels-Alder reaction of *p*-quinones with diene.

Initially, the reaction was performed between 1,4-benzoquinone (**1a**) and 3,4-dihydro-2*H*-pyran (**2**) with the mole ratio of 1:1 in the presence of CF_3COOH (1 mole%) in dichloromethane at 40°C with oxygen atmosphere. The new compound (**3a**) was obtained with an yield of 13% along with unreacted 1,4-benzoquinone (80%). The trial experiment was conducted with different mole ratios (1-4.5) of 3,4-dihydro-2*H*-pyran (**2**). When increasing the mole ratio of **2**, the consumption of quinone was also increased. At the mole ratio of 4.5, the yield of **3a** was 26% along with **4a** (11%). At 15 mol % of the CF_3COOH catalyst, the yield of **3a** was increased to 47% and **4a** (19%) along with the unreacted 1,4-benzoquinone which was recovered in 48 h (Table 1, entry 1). All the compounds obtained were characterized thoroughly by various spectral techniques.

The disappearance of the ^{13}C NMR signals at 185.5, 184.7 ppm

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Organic & Biomolecular Chemistry Accepted Manuscript

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Research Article

Cytotoxicity and Proapoptotic Effects of *Allium atroviolaceum* Flower Extract by Modulating Cell Cycle Arrest and Caspase-Dependent and *p53*-Independent Pathway in Breast Cancer Cell Lines

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Breast cancer is the second leading cause of cancer death among women and despite significant advances in therapy, it remains a critical health problem worldwide. *Allium atroviolaceum* is an herbaceous plant, with limited information about the therapeutic capability. We aimed to study the anticancer effect of flower extract and the mechanisms of action in MCF-7 and MDA-MB-231. The extract inhibits the proliferation of the cells in a time- and dose-dependent manner. The underlying mechanism involved the stimulation of S and G2/M phase arrest in MCF-7 and S phase arrest in MDA-MB-231 associated with decreased level of *Cdk1*, in a *p53*-independent pathway. Furthermore, the extract induces apoptosis in both cell lines, as indicated by the percentage of sub-G0 population, the morphological changes observed by phase contrast and fluorescent microscopy, and increase in Annexin-V-positive cells. The apoptosis induction was related to downregulation of *Bcl-2* and also likely to be caspase-dependent. Moreover, the combination of the extract and tamoxifen exhibits synergistic effect, suggesting that it can complement current chemotherapy. LC-MS analysis displayed 17 major compounds in the extract which might be responsible for the observed effects. Overall, this study demonstrates the potential applications of *Allium atroviolaceum* extract as an anticancer drug for breast cancer treatment.

1. Introduction

After lung cancer, breast cancer is the second leading cause of cancer death among women worldwide. Among more than one million new cancer cases, breast cancer contains 18% of all female cancers globally [1]. Despite significant advances in therapy, breast cancer remains a critical health problem worldwide. Moreover, the current breast cancer treatments are expensive, not widely available, and limited by side effects and resistance to the treatment. Therefore, natural products could be the alternative and novel anticancer agents [2, 3]. Natural crude extracts and biologically active compounds isolated from plant species used in traditional medicine can be prolific resources for new drugs [4]. *Allium atroviolaceum (A. atroviolaceum)*, an herbaceous, perennial, bulbous plant, is a species in the genus *Allium* which belongs to the Alliaceae family. It is distributed in Crimea, Caucasus (Ante-Caucasus, Daghestan, and Trans-Caucasus), middle Asia (Mountainous Turkmenistan, Syr-Darya foothill areas), and Iran [5]. *A. atroviolaceum* is used as food (vegetable) and

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DOI 10.1007/s40735-017-0103-2

Agarose as an Efficient Inhibitor for Aluminium Corrosion in Acidic Medium: An Experimental and Theoretical Study

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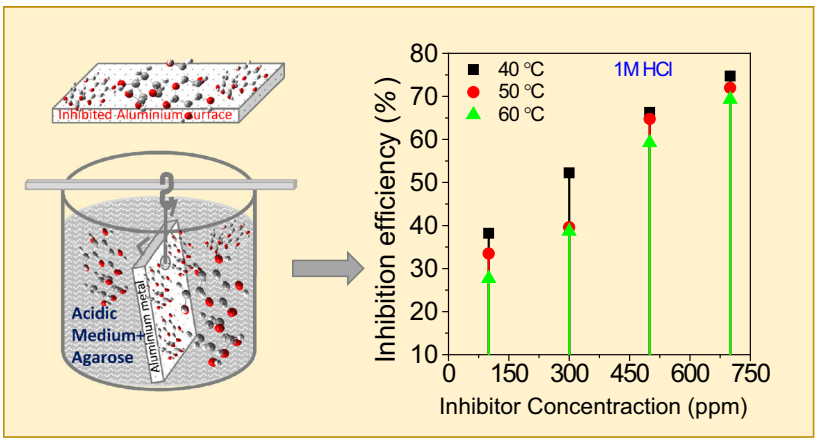
Abstract The inhibition efficiency and mechanism of agarose on aluminium corrosion in 1 M HCl, 0.5 M H_2SO_4 and 0.5 M H_3PO_4 solutions were studied by means of conventional weight loss method, Tafel polarisation electrochemical impedance spectroscopy and scanning electron microscope. The inhibition efficiency (%IE) was observed to increase with addition of agarose concentration, and it adversely decreases with increasing temperature. Moreover, the maximum inhibition efficiency of ~81% is achieved for agarose concentration of 700 ppm in 1 M HCl. Potentiodynamic polarisation curves showed that agarose acts as a mixed-type inhibitor. The absorption isotherm calculations revealed that interactions of agarose on aluminium surface are physisorption and typically obey the Temkin adsorption isotherm. The quantum chemical calculations reveal that active sites promote the agarose to anchor on aluminium surface due to mostly presence of hydroxyl group.

Graphical Abstract



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Keywords Aluminium corrosion · Acid solutions · EIS · Polarisation · SEM · Acid inhibition

1 Introduction

Aluminium is one of the most commonly used metals in earth's crust due to its extremely high electrical and thermal properties with ductility. In particular, pure aluminium and aluminium-based alloys are known for their lightweight,

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Studies on the Mechanical, Morphological and Electrical Properties of Highly Dispersible Graphene Oxide Reinforced Polypyrrole and Polyvinylalcohol Blend Composites

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Abstract

In the present study, water soluble polypyrrole (WPPy)/polyvinyl alcohol (PVA)/graphene oxide (GO) composite films were prepared via colloidal blending method at different GO loadings varying from 0 – 3 wt% . The dispersion of GO in the WPPy/PVA blend matrix was examined using polarized optical microscopy (POM) and scanning electron microscopy (SEM). It was observed that the tensile strength of the composite film was changed considerably due to the incorporation of GO in the WPPy/PVA blend. The electrical properties, viz. impedance (Z), phase angle (θ) and quality factor (Q), were evaluated using the precision impedance analyser in the wide frequency (50 Hz to 20 MHz) and temperature (40°C to 150°C) ranges. The impedance was notably increased from 7.8 x $10^5\Omega$ (50 Hz, 70°C) for the WPPy/PVA blend to 1.37 x $10^7\Omega$ (50 Hz, 40°C) for the WPPy/PVA/GO composites with 3 wt% GO loading. On the other hand, the phase angle was gradually increased from 99.7° (20 MHz, 140°C) for WPPy/PVA blend to 199.8° (20 MHz, 80°C) for WPPy/PVA/GO composites with 3 wt% GO loading. Furthermore, the Q factor also increased from 14. 9 (10 MHz, 120°C) for WPPy/PVA blend to 108.8 (10 MHz, 150°C) for WPPy/PVA/GO composites with 3 wt% GO loading. These composites can be a promising material for electronic applications.

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Keywords: Graphene oxide, PVA, WPPy, electrical properties, Q-factor.

1.. Introduction

Graphene is a mother of all carbon materials and is considered to be the rising star among the materials community because of its intriguing properties such as high specific surface area, high electron mobility, exceptional thermal conductivity, superior mechanical properties and good biocompatibility [1]. In recent years, graphene has been used for numerous exciting applications such as transparent conductors, flexible electronics, field effect transistors, solar cells, fuel cells, batteries, sensors and biosensors, biomaterials and water purification [1-4]. However, the poor exfoliation into individual graphene sheets, poor dispersion in organic solvents and frail interactions with polymer matrix, limits its widespread applications as nanofiller in polymer composites [5, 6]. These demerits of graphene can be easily overcome by chemical conversion of graphite into graphene oxide (GO). GO is a precursor material for the synthesis of graphene. The oxygen bearing functional groups such as hydroxyl, ketonic, carbonyl, and epoxide are situated often on the basal planes and at edges of GO surface [7].

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Structural and mechanical properties of diglycine perchlorate single crystals

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Good quality diglycine perchlorate (DGPCL) single crystals were grown by slow evaporation solution growth method using the combination of glycine and perchloric acid in the ratio of 2:1. Single crystal X-ray diffraction and mechanical characterization of the grown single crystals of diglycine perchlorate were analyzed in this article. Lattice parameters, space group and crytal system were found from single crystal X-ray diffraction analysis. All the cell parameters and space group are in a good agreement with the reported values. Mechanical properties, such as Vicker's microhardness number, work hardening index, standard hardness value, yield strength, fracture toughness, brittleness index and elastic stiffness constant values, were determined using Vicker's microhardness tester.

Keywords: *X-ray diffraction; work hardening coefficient; yield strength; stiffness constant*

1. Introduction

Organic materials can exhibit high nonlinear optical efficiency due to their high optical susceptibilities and large electro-optic coefficient [1]. However, those materials are mechanically weak in nature. Crystals of such materials are used in optoelectronic applications [2–4]. The hardness characteristics of the materials also play an important role in optoelectronic devices fabrication. Glycine, an aminoacid organic material, has high nonlinear optical properties [5]. To increase the hardness of the material and make it more suitable for optoelectronic devices fabrication [6], perchloric acid was mixed with glycine. Diglycine perchlorate crystalline material was grown by slow evaporation solution growth method. The study of the growth as well as XRD and microhardness characterization of diglycine perchlorate single crystals were performed and reported in this article. The sample crystals of diglycine perchlorate were subjected to structural and mechanical studies by using single crystal X-ray diffractometer and Vicker's microhardness tester. The hardness of a crystal is generally defined as its resistance to structural breakdown under applied stress. Mechanical properties, such as Vicker's microhardness number, work hardening index, standard hardness value, yield strength, fracture toughness, brittleness index and elastic stiffness constant values, give valuable information on the physical strength and deformation characteristics of a material [7]. Chemical forces in a crystal resist the motion of dislocations as it involves displacement of atoms. This hardness is an intrinsic hardness of a crystal. The hardness properties are associated with the structure of a crystal material and hardness studies are carried out to understand plasticity of the crystal [8]. Microhardness studies of various crystals using Vicker's indentor have been reported by many researchers [9, 10]. Thus, in this study, various hardness parameters were determined for diglycine perchlorate single crystal using Vicker's microhardness tester.

2. Experimental

2.1. Crystal growth

Slow evaporation solution growth method was used to grow diglycine perchlorate single crystals.

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Performance Analysis of Gene Expression data using Biclustering Iterative Signature Algorithm

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***Abstract*— In biological domain have various research problems, from which analysis of gene expression data is one of the complex issue, and lot of research in progress. In data mining cluster is unsupervised learning, which is helpful to analysis gene expression data using various algorithms such as partition and hierarchal are basic clustering methods. In proposed work the gene expression data are tested with Biclustering ISA and Bimax and performance of result is visualized and the experimental result show the Biclustering ISA has demonstrate a coherent manifestation contour only in the surfeit of subset of microarray experiments and produced momentous result.**

Keywords— Clustering; Bi-max; Biclustering; Iterative Signature Algorithm (ISA); Expression View; Gene.

I. INTRODUCTION

Data Mining is process of finding or extracting new data from the existing data, in which clustering is major task, which organize the data into groups. Each group is called as cluster, based on the certain similarity characteristic. Using clustering the big dataset is split into smaller parts, like one group will contains similar data, and another group contains dissimilar data. This clustering has various real times applicable for various applications such as machine learning algorithms, medicine, pattern recognition, biology, communication, computer vision and remote sensing [1]. There are different clustering algorithms are proposed, from which Hard C-Mean (HCM) is one of the prototype based algorithm widely. In which each object exactly assigned one cluster. In which three step process is followed first step consider any matrix, from which second step need to calculate center vectors, final step is update characteristic function based on the tolerance level [2]-[3]. In real world data set mostly with noisy and outlier, need some preprocessing techniques to remove the noisy, also the existing FCM is another important clustering methods, in which resulting membership values will not reflect degree of corresponding data [4]. In fuzzy clustering will integrate possibility and probabilistic membership functions, by which reduce the noisy and outliers sensitivity of fuzzy C-Mean clustering, also clusters are coincident one with another. It also consists of three parameters like fuzzy boundary, crisp lower approximation and centroid [5]-[6]. The subordinate approximation influences the uncertainty of the finishing separation. The cluster model is depends on the weighting standard of the crisp lower rough calculation and fuzzy border [7]-[8]. In recent days lot of technologies used produce high throughput in explore gene expression data, which follows various data mining classification and clustering algorithm for medical diagnostic area [9]. Classification of gene expression data various genomics functions are used to classify samples according to characters of data. In the majority gene expression data, the quantity of instruction samples is very miniature compared to the huge quantity of genes implicated in the experiments [10]-[11]. When processing genes small fraction of genes only consider from the large amount of genes. Additionally, a small subset of genes is attractive in mounting gene-expression-based analytic tools for delivering accurate, trustworthy and interpretable outcome [12].

The biological experiments will reduce the cost of the gene selection results that will greatly analyze the large number of genes in different functional ways. Therefore, identifying a condensed set of the mainstream relevant genes is the objective of gene collection. In the gene selection progression, best possible gene subset is always relative to a confident condition. In broad, special criteria may guide to diverse finest gene subsets [13]. They are many standing methods offered for gene subset selection such as k-nearest neighbors and support vector machine to analyze the sensitive facility of a gene subset. A classification tool will mostly plunge into three categories such as language bias, search bias and combination of both. It determination be used to split the concealed instances. The hypothesis space is used to portrayed the data, which is based on the language bias, and hence the distance measure the sub set of gene is applied using discerning ability on disease diagnosis. When applied to gene expression data analysis, clustering algorithms can be useful on mutually gene and sample proportions. The predictable attribute-clustering

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Optical Analysis of Iron-Doped Lead Sulfide Thin Films for Opto-Electronic Applications

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Iron-doped lead sulfide thin films were deposited on glass substrates using successive ionic layer adsorption and reaction method (SILAR) at room temperature. The X-ray diffraction pattern of the film shows a well formed crystalline thin film with face-centered cubic structure along the preferential orientation (1 1 1). The lattice constant is determined using Nelson Riley plots. Using X-ray broadening, the crystallite size is determined by Scherrer formula. Morphology of the thin film was studied using a scanning electron microscope. The optical properties of the film were investigated using a UV–vis spectrophotometer. We observed an increase in the optical band gap from 2.45 to 3.03 eV after doping iron in the lead sulfide thin film. The cutoff wavelength lies in the visible region, and hence the grown thin films can be used for optoelectronic and sensor applications. The results from the photoluminescence study show the emission at 500–720 nm. The vibrating sample magnetometer measurements confirmed that the lead sulfide thin film becomes weakly ferromagnetic material after doping with iron.

Keywords: Lead sulfide; optical band gap; solar cell; optoelectronics; VSM; squareness.

1. Introduction

Lead sulfide (PbS), an IV–VI compound semiconductor, is an attractive material due to its small band gap (0.41 eV, for bulk material),[1] which can be blue shifted through the formation of nanocrystallites.[2] PbS thin films are used in technological

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Influence of CuO nanoparticles and graphene nanoplatelets on the sensing behaviour of poly(vinyl alcohol) nanocomposites for the detection of ethanol and propanol vapors

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Abstract
Poly(vinyl alcohol)/copper oxide/graphene nanoplatelets (PVA/CuO/Gr-NPls) nanocomposite based chemiresistive alcohol sensors were fabricated using colloidal blending method. The PVA/CuO/Gr-NPls nanocomposite films were characterized using Fourier transform infrared spectroscopy, X-ray diffraction, UV–Vis spectroscopy, thermogravimetric analysis, scanning electron microscopy, atomic force microscopy and the sensing behaviour of PVA/CuO/Gr-NPls nanocomposite films was evaluated for volatile organic compounds (VOCs). The improvement in the thermal, mechanical and VOCs sensing properties of nanocomposite film was observed attributing to the homogeneity of the nanocomposites and strong interfacial interaction between Gr-NPls, CuO and PVA matrix. The sensors were analyzed in the concentration range from 1800 to 4000 ppm. It was observed that PVA/CuO/Gr-NPls nanocomposite film exhibited excellent propanol sensing at a room temperature, typically at an applied voltage of 10 V when compared with other VOCs. Thus, the strong interaction between CuO and Gr-NPls helps in achieving excellent reinforcement effect in a PVA matrix for fabrication of high performance nanocomposite films for VOC's sensing applications.

1 Introduction

To protect the environment and human health, it is important to limit exposure of product and material that contains volatile organic compounds (VOC's). These VOC's come in a significant number of indoor sources including furnishings, building material such as paint, carpet and vinyl flooring. Exhaust VOC's from automobiles has created a strong demand for the development of VOC's sensor devices [1]. The demand for portable VOC's sensing devices with low cost and low power consumption is dramatically increasing due to the need for monitoring emissions and concentration of air pollution in the environment, homeland security and medical application [2, 3]. For decades, a thin film VOC's sensors based on semiconducting metal oxide elements like SnO_2, ZnO, NiO, CuO, In_2O_3, etc are used as chemiresistive sensors [4, 5]. The main disadvantage of single semiconducting metal oxide sensors is high operating temperature and low selectivity to various VOC's having similar chemical characteristic. These drawbacks of metal oxide based sensors can be overcome by an incorporation of micro/nanoparticles in the conductive polymer matrix leading to formation of conductive polymer nanocomposites (CPCs)

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Review

A Comprehensive Review on the Chemotherapeutic Potential of Piceatannol for Cancer Treatment, with Mechanistic Insights

Mohamed Ali Seyed, Ibrahim Jantan, Syed Nasir Abbas Bukhari, and Kavitha Vijayaraghavan

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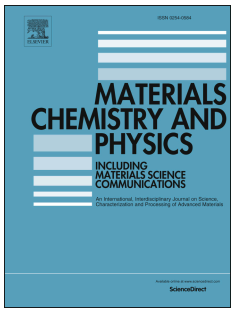

Graphene oxide reinforced poly (4-styrenesulfonic acid)/polyvinyl alcohol blend composites with enhanced dielectric properties for portable and flexible electronics

Kalim Deshmukh, M. Basheer Ahamed, Kishor Kumar Sadasivuni, Deepalekshmi Ponnamma, Mariam Al-Ali AlMaadeed, S.K. Khadheer Pasha, Rajendra R. Deshmukh, K. Chidambaram

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Charge compensation assisted enhancement of photoluminescence in combustion derived Li^+ co-doped cubic ZrO_2:Eu^{3+} nanophosphors

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Physical Chemistry Chemical Physics Accepted Manuscript

Abstract

Red light emitting cubic $Zr_{0.99}Eu_{0.01}O_2$: Li^+ (0 – 9 mol%) nanoparticles are synthesized by a low temperature, self-propagating solution combustion method using oxalyl di-hydrazide (ODH) as fuel. In this study, we report systematic investigation of the effect of lithium ion (Li^+) concentration on the structural properties and the photoluminescence of zirconia. With increasing lithium concentration, the crystallinity of the samples increases and the lattice strain decreases. The higher crystallinity is likely due to charge compensation achieved by replacing one Zr^{4+} ion by a Eu^{3+} and a Li^+ ion. Scanning electron micrographs (SEM) reveals mesoporous structure characteristic of combustion derived nanomaterials. Photoluminescence (PL) spectra show that the intensity of the red emission (606 nm) is highly dependent on Li^+ ion concentration. Furthermore there is a promising enhancement in the associated lifetime. Upon Li^+ doping, the PL intensity of the samples is found to increase by two folds compared to un-doped sample. Variation of PL intensity with Li^+ concentration is attributed to the differences in probability of non-radiative recombination (relaxing). Intensity parameters (Ω_2, Ω) and radiative properties such as transition rates (A), branching ratios (β), stimulated emission cross-section (σ_e), gain bandwidth ($\sigma_e \times \Delta\lambda_{eff}$) and optical gain ($\sigma_e \times \tau$) are calculated using the Judd–Ofelt theory. The calculated values suggest that in optimally co-doped samples, in addition to improved crystallinity and charge compensation, the lowering of Eu^{3+} site symmetry and increase in covalency of Eu-O bonding due to interstitial Li is responsible for the observed enhancement in PL intensity.

Keywords: Cubic ZrO_2, nanophosphor, solution combustion, photoluminescence, J-O parameters, CIE

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Eco-Friendly Synthesis of Graphene Oxide Reinforced Hydroxypropyl Methylcellulose (HPMC)/Polyvinyl Alcohol (PVA) Blend Nanocomposites Filled with Zinc Oxide (ZnO) Nanoparticles for High-k Capacitor Applications

Kalim Deshmukh, M. Basheer Ahamed, R. R. Deshmukh, S. K. Khadheer Pasha, K. Chidambaram, Kishor Kumar Sadasivuni, Deepalekshmi Ponnamma & Mariam Al-Ali Al-Maadeed

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Journal of Applied Polymer Science

Fumed SiO_2 nanoparticle reinforced biopolymer blend nanocomposites with high dielectric constant and low dielectric loss for flexible organic electronics

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ABSTRACT: In the present study, fumed silica (SiO_2) nanoparticle reinforced poly(vinyl alcohol) (PVA) and poly(vinylpyrrolidone) (PVP) blend nanocomposite films were prepared via a simple solution-blending technique. Fourier transform infrared spectroscopy (FTIR), ultraviolet–visible spectroscopy (UV–vis), X-ray diffraction (XRD), and scanning electron microscopy (SEM) were employed to elucidate the successful incorporation of SiO_2 nanoparticles in the PVA/PVP blend matrix. A thermogravimetric analyzer was used to evaluate the thermal stability of the nanocomposites. The dielectric properties such as dielectric constant (ε) and dielectric loss (tan δ) of the PVA/PVP/SiO_2 nanocomposite films were evaluated in the broadband frequency range of 10^{-2} Hz to 20 MHz and for temperatures in the range 40–150 °C. The FTIR and UV–vis spectroscopy results implied the presence of hydrogen bonding interaction between SiO_2 and the PVA/PVP blend matrix. The XRD and SEM results revealed that SiO_2 nanoparticles were uniformly dispersed in the PVA/PVP blend matrix. The dielectric property analysis revealed that the dielectric constant values of the nanocomposites are higher than those of PVA/PVP blends. The maximum dielectric constant and the dielectric loss were 125 (10^{-2} Hz, 150 °C) and 1.1 (10^{-2} Hz, 70 °C), respectively, for PVA/PVP/SiO_2 nanocomposites with 25 wt % SiO_2 content. These results enable the preparation of dielectric nanocomposites using a facile solution-casting method that exhibit the desirable dielectric performance for flexible organic electronics. © 2016 Wiley Periodicals, Inc. J. Appl. Polym. Sci. **2016**, *133*, 44427.

KEYWORDS: biodegradable; biopolymers & renewable polymers; blends; dielectric properties

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INTRODUCTION

Polymer nanocomposites have emerged as a new class of materials widely used in academic, industrial, and technological applications because of their enhanced optical, thermal, electrical, and mechanical properties.[1–3] A nanocomposite consists of the matrix, which is the continuous phase, and the reinforcing filler, which is the dispersed phase. The integration of inorganic nanoparticles into a polymer matrix combines the properties of both inorganic nanoparticles and the polymer and thus generates advanced and new functions for the polymer nanocomposites.[4,5] Inorganic nanoparticle–filled polymer nanocomposites have potential applications in various fields, such as flexible light emitters, energy storage, magnetic storage, membranes for gas separation, and optical power limiters.[6–11] The final properties of these polymer nanocomposites depend on the properties of the individual phases, their relative contents, and the geometry of the dispersed phase (shape, size, and orientation of the inorganic nanoparticles).[12] With this renewed interest in nanocomposites, researchers began seeking new strategies to engineer materials that can combine the desirable properties of nanoparticles and of polymers for the formation of polymer nanocomposites. However, a number of key challenges exist in producing polymer nanocomposites with the desired properties.[13] The greatest hindrance to the large-scale production and commercialization of polymer nanocomposites is the unavailability of

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ORIGINAL PAPER

Graphene oxide reinforced polyvinyl alcohol/polyethylene glycol blend composites as high-performance dielectric material

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Abstract Novel flexible dielectric composites composed of polyvinyl alcohol (PVA), polyethylene glycol (PEG), and graphene oxide (GO) with high dielectric constant and low dielectric loss have been developed using facile and eco-friendly colloidal processing technique. The structure and morphology of the PVA/PEG/GO composites were evaluated using Fourier transform infrared spectroscopy (FTIR), Raman spectroscopy, UV-vis spectroscopy (UV-vis), X-ray diffraction (XRD), scanning electron microscopy (SEM), and atomic force microscopy (AFM). The dielectric behavior of PVA/PEG/GO composites was investigated in the wide range of frequencies from 50 Hz to 20 MHz and temperature in the range 40 to 150 °C using impedance spectroscopy. The dielectric constant for PVA and PVA/PEG (50/50) blend film was found to be 10.71 (50 Hz, 150 °C) and 31.22 (50 Hz, 150 °C), respectively. The dielectric constant for PVA/PEG/GO composite with 3 wt% GO was found to be 644.39 (50 Hz, 150 °C) which is 60 times greater than the dielectric constant of PVA and 20 times greater than the dielectric constant of PVA/PEG (50/50) blend film. The PVA/PEG/GO composites not only show high dielectric constant but also show low dielectric loss which is highly attractive for practical applications. These findings underline the possibilities of using PVA/PEG/GO composites as a flexible dielectric material for high-performance energy storage applications such as embedded capacitors.

Keywords High-k materials · Graphene oxide · Capacitor · Polymer blend · Biocomposite

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Introduction

With the continuous advancement of modern electronics, the demand and importance of eco-friendly multifunctional and flexible dielectric materials with excellent dielectric properties have become more stringent. Among these, lightweight materials with high dielectric constant and ultra low dielectric loss have aroused tremendous research enthusiasm because of their manifold applications such as high-k gate dielectrics, high charge storage devices, actuators, artificial muscles, and electronic packaging [1–4]. The main challenge in designing such dielectric devices especially those for energy storage are the simultaneous achievement of a high dielectric constant as well as low dielectric loss. Polymer-based dielectrics are the suitable candidate for energy storage applications because of their excellent properties such as high flexibility, easy processability, low dielectric loss, high electric breakdown strength, and low cost [5–7]. However, despite innumerable merits, some polymers have very low dielectric constant ($k < 5$) which is not sufficient for energy storage application. Thus, increasing the dielectric constant of polymers is the key issue for

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Impedance spectroscopy, ionic conductivity and dielectric studies of new Li^+ ion conducting polymer blend electrolytes based on biodegradable polymers for solid state battery applications

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Abstract New solid polymer blend electrolyte films based on biodegradable polymer blend comprising of polyvinyl alcohol (PVA) and poly (*N*-vinyl pyrrolidone) (PVP) doped with different wt% of lithium carbonate (Li_2CO_3) salt have been prepared by solution casting method. The resulting PVA/PVP/Li_2CO_3 polymer blend electrolyte films have been characterized by various analytical techniques such as FTIR, UV–vis, XRD, TGA, polarized optical microscopy and scanning electron microscopy. The FTIR and XRD analysis confirmed the complex formation between PVA/PVP blend and Li_2CO_3 salt. The ionic conductivity and the dielectric properties of PVA/PVP/Li_2CO_3 polymer blend electrolyte films were investigated using an impedance spectroscopy. It was observed that the ionic conductivity of PVA/PVP/Li_2CO_3 electrolyte system increases as a function of Li_2CO_3 concentration. The highest ionic conductivity was found to be 1.15×10^{-5} S cm^{-1} for polymer blend electrolyte with 20 wt% Li_2CO_3 content. On the other hand, the dielectric results revealed the non-Debye type of behaviour. The dielectric constant values indicate a strong dielectric dispersion in the studied frequency range which increases as the Li_2CO_3 content increases. The dielectric constant as high as 1200 ($\varepsilon = 1201.57$, 50 Hz, 150 °C) and the dielectric loss well below 4 ($\tan \delta = 3.94$, 50 Hz, 150 °C) were obtained for polymer blend electrolytes with 25 wt% Li_2CO_3 salt. Thus, the results obtained in the present study suggest that the PVA/PVP/Li_2CO_3 polymer blend electrolyte system seems to be a promising candidate for solid state battery applications.

1 Introduction

Solid polymer electrolytes have received scientific and technological importance in the last few decades because of their potential applications in various fields such as electrochromic displays, fuel cells, solar cells, sensors, supercapacitors and most importantly rechargeable solid state lithium batteries [1–4]. Lithium batteries have attracted a great deal of attention because of their high energy density, good processability and improved safety [5, 6]. The batteries comprising of solid polymer electrolytes have proven to be cost effective, safe under harsh conditions, environmentally acceptable, provides limitless design flexibility and high performance [7, 8]. It is well known that solid polymer electrolytes have several advantages such as light weight, easy fabrication of thin films of desired shape and size, elimination of leakage current, good mechanical strength, excellent physical and chemical stability and tremendous flexibility in design over their liquid counterparts [9]. However, there are few technical problems with solid polymer electrolytes which include low ambient temperature conductivity, cationic

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Regular Article

Influence of (Co-Mn) co-doping on the microstructures, optical properties of sol-gel derived ZnO nanoparticles

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Abstract. A systematic investigation on the synthesis, characterization, optical and magnetic properties of (Co-Mn) co doped ZnO nanoparticles synthesized by sol-gel method is reported. Structural, Optical and magnetic properties of present sample have been characterized by X-ray diffraction (XRD), UV-VIS-NIR spectroscopy and VSM techniques. The single- phased wurtzite structure has been confirmed by XRD analysis. The nanoparticles nature of the samples and their crystallinity has been investigated by TEM measurements. Optical studies revealed red shift (3.315–3.289 eV) with increasing Mn doping concentration in the absorbance spectrum. Magnetization studies showed that $Zn_{0.7}Co_{0.2}Mn_{0.1}O$ exhibits ferromagnetic behavior.

1 Introduction

Diluted magnetic semiconductors (DMSs) with reduced dimensions and ferromagnetic ordering above room temperature (RT) have been attracted great interest for their promising application in emerging field of spintronics and many other spin based devices. DMS have attractive attention in spintronics due to possibility to utilize both charge and spin degree of freedom in some materials having wide bandgap semiconductor such as ZnO, GaAs, TiO_2 and GaN. These semiconductors when doped with transition metals show ferromagnetism at RT [1–5]. Above RT, ferromagnetic ordering could be achieved by doping the semiconductor with a very small quantity of transition metal (TM) elements. Doping of semiconductors with TM elements such as Fe, Mn, Co etc. offers a viable means of tuning ferromagnetism [6–8] and optical band gap [9–11]. Specially, Zinc oxide, an optically transparent II- VI semiconductor, is well known electro-optic and piezoelectric with hexagonal wurtzite structure, wide direct band gap (∼3.37 eV), excellent mechanical characteristics, and exciton binding energy (∼60 MeV) has been become promising candidate after theoretical studies [12,13]. ZnO is now being potentially used as an important photonic and electronic material for various gas sensors, acoustic wave devices, ultraviolet light- emitters, etc. [14–19]. Thereafter, quite controversial results on transition metal elements doped ZnO has been reported by many research groups [20–23]. Kim et al. revealed RT ferromagnetism (RTFM) in $Zn_{1-x}Co_xO$ thin films due to impurity in form of Co clusters [20]. An excellent work by Liang et al. shows high electron mobility and positive magnetoresistance in some Co doped ZnO nanowires [23]. Tamura et al. reported RTFM in Fe-doped ZnO thin film while Mn and Co doped ZnO did not show any ferromagnetic behavior. It has suggested that co doping of Nd ions in Mn doped ZnO is one of the possible ways to introduce new energy levels in band gap and to mediate electron spins of magnetic dopants [24]. Recently, Mn-doped ZnO has been extensively studied for its expected ferromagnetism and magento-optical applications at RT. But Mn doping even at low level suppress the luminescence of $Zn_{1-x}Mn_xO$ [25]. The suppression of blue and ultraviolet luminescence may be attributed due to quick decrement of isolated Mn^{2+} with increasing concentration [26]. The research group [27] presented the RTFM of PLD fabricated (Mn, Co.) co-doped ZnO thin films but they did not explain its origin. Another research group [28] synthesized (Co, Mn) doped ZnO nanoparticles for antibacterial applications only. According to research reports, the transition metals with partially filled d states have been used as magnetic atoms in DMS [29]. In this case Co^{2+}

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Modeling and Simulation of Distribution Network with the Integration of Distribution Generator using Matlab

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Abstract

Background: Due to increasing power demand across the country, the usage of renewable systems is being increased. One such efficient and compactly available renewable energy is solar power. In this paper, a clear view of harnessing maximum DC solar power output and converting it to AC is discussed. **Methods:** A method of grid interconnection of solar powered inverter is presented with IEEE-15 bus system as an example model using Matlab simulation. **Findings:** A detailed analysis of bus voltage, load current and line current is made with the simulated model. **Applications/Improvements:** The data obtained could be used for fine optimization of the position in which the distribution generator interconnection is to be made.

Keywords: IEEE-15, Grid Interconnection, Solar Power

1. Introduction

Solar power is the most abundant and easily available power based on the present global warming conditions[1]. Harvesting solar power seems to be simple but it also has a major disadvantage of varying power output with variation of irradiance and temperature[2]. In order to overcome this variation in power output, Maximum Power Point Tracking (MPPT) is been employed wherever solar panels are used[3]. The DC power is then converted to AC power using inverter circuit. Distributed generators connected to grid have become very popular due to its high reliable nature[4]. If the AC power output is to be interconnected with the grid, then Phase Locked Loop (PLL)[5] control has to be employed to generate firing pulse to inverter. PLL ensures synchronization of inverter and grid.

In this paper, solar panel is mathematically modeled using simulink of matlab and a DC-DC buck converter is used to employ MPPT. Then a normal three phase inverter is used to convert DC to AC. The firing pulse to inverter is given based on the PLL synchronization control. In order to interconnect the inverter output to the grid, the AC voltage is stepped up to 11KV, which is the standard primary distribution voltage. Then, IEEE-15 bus system

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Spectroscopic investigations of Sm^{3+} doped $Ca_{0.5}La(MoO_4)_2$ phosphor for solid state lighting applications

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Abstract The Sm^{3+}- doped $Ca_{0.5}La(MoO_4)_2$ were successfully synthesized by the solid state reaction method. Indexed powder X-Ray diffraction pattern suggests the scheelite tetragonal crystal structure. Surface Morphology of the sample shows polyhedral morphology and the average particle size estimated from SEM image is 5.5 µm. The energy dispersive X-ray analysis confirms the existence of Ca, La, Mo, O, and Sm elements. The room temperature photoluminescence (PL) emission spectra of Sm^{3+}- doped $Ca_{0.5}La(MoO_4)_2$ with various concentrations upon 404 nm excitation were recorded. The PL emission spectra show three intense emission peaks at 565, 600 and 647 nm were owing to the f–f electronic transitions of 4f electrons of Sm^{3+} attributed to the transitions $^4G_{5/2}\rightarrow{}^6H_{5/2}$, $^4G_{5/2}\rightarrow{}^6H_{7/2}$ and $^4G_{5/2}\rightarrow{}^6H_{9/2}$ respectively. Among them, bright orange-red visible emission is obtained due to $^4G_{5/2}\rightarrow{}^6H_{9/2}$ transition. The decay time and color chromaticity co-ordinates were estimated. From the obtained results, the prepared powder phosphor $Ca_{0.5}La(MoO_4)_2$: Sm^{3+} stands as a suitable candidate for the display and solid state lighting applications.

1 Introduction

To date, so many research works are carried out in the domain of solid state lighting technology. From the past few years the Solid state lighting (SSL) technology is the vast area of interest because of its need on day to day lighting applications. The phosphor converted LEDs (pc-LEDs) are more important in LED manufacturing technology [1–3]. Due to more energy saving, high stability and high throughput of the White light-emitting diodes (LEDs) in solid state light sources (SSL) are superior to incandescent lamps and fluorescent lamps [4–6]. From the recent scenario, generally there are two methods to produce the White light from LED. Pumping tricolor phosphors (red, green, blue) with near UV- LED chip is the most important method to achieve white LEDs, and an another method is to pump the yellow phosphor especially YAG:Ce^{3+} with blue-LED chip [7–9]. Nowadays, the phosphors are commercially available like Y_2O_2S:Eu^{3+} for red, $BaMgAl_{10}O_{17}$:Eu^{2+} for blue. These commercial phosphors are need to be improved for white LED applications as they are pertaining to several problem such as chemical stability, color rendering index, persistence, formation, and efficiency of these phosphors [8, 9].

Scheelite-type crystalline structures of molybdate compounds possess molybdenum atoms which are organized tetrahedrally express the favorable applications in the field of opto-electronics. In MoO_4^{2-}, it has the tetrahedral symmetry structure in which Mo ions are located at the center and are surrounded by four O^{2-} ions, because of this coordinated system it has very stable structure [10–12]. Nowadays, rare-earth doped molybdates have been studied extensively based on the practicable applications in several areas such as high-performance optical devices, laser systems, scintillation detector etc., [13–15]. Among all rare

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Striking multiple synergies in novel three-phase fluoropolymer nanocomposites by combining titanium dioxide and graphene oxide as hybrid fillers

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Abstract In this study, novel three-phase polymer nanocomposites comprising of polyvinylidene fluoride (PVDF), titanium dioxide (TiO_2) nanoparticles and graphene oxide (GO) were prepared using colloidal blending. The PVDF/TiO_2/GO nanocomposites were characterized by FTIR, XRD, TGA, optical microscopy, SEM, AFM and contact angle analysis. The dielectric properties of these three-phase polymer nanocomposites were investigated using broadband dielectric spectroscopy in the frequency range 50 Hz–20 MHz and temperature in the range 40–150 °C. The FTIR and XRD results infer good interaction between the constituents of nanocomposites. The microscopic studies infer homogeneous dispersion and distribution of TiO_2 nanoparticles and GO within the PVDF matrix. A notable improvement in the thermal stability of PVDF was observed by the addition of TiO_2 and GO as hybrid fillers. The dielectric performance of PVDF/TiO_2/GO nanocomposite films was significantly improved as compared to PVDF/TiO_2 (90/10) nanocomposite film. The dielectric constant increases from 18.57 (50 Hz, 150 °C) for PVDF/TiO_2 (90/10) nanocomposite film to 165.16 (50 Hz, 150 °C) for PVDF/TiO_2/GO nanocomposite film containing 7 wt% TiO_2 and 3 wt% GO loading. In addition, the dielectric loss also increases from 1.71 (50 Hz, 150 °C) for PVDF/TiO_2 (90/10) nanocomposite film to 3.68 (50 Hz, 150 °C) for PVDF/TiO_2/GO nanocomposite film containing 7 wt% TiO_2 and 3 wt% GO loading. These intriguing properties of PVDF/TiO_2/GO nanocomposites could shed some light on the incorporation of different types of hybrid fillers in a suitable polymer matrix for the development of novel three-phase nanocomposites as intelligent materials for embedded passive applications.

1 Introduction

Graphene is a rising star of materials community and has been described as the mother of all graphitic carbon materials because of being considered as a building block for carbon allotropes of every other dimension [1, 2]. Graphene is a two-dimensional (2D) flat monolayer of sp^2 hybridized carbon atoms which are tightly packed into a honeycomb lattice. Graphene has stimulated enormous research interest because of its unique and fascinating properties such as quantum Hall effect [3], high specific surface area (2630 $m^2\ g^{-1}$) [4], good optical transparency (~97.7 %) [5], high Young modulus (1 TPa) [6], fracture strength of 130 GPa [7], electrical conductivity up to 720 S m^{-1} [7] and thermal conductivity of 5 $Wm^{-1}\ K^{-1}$ [8]. Due to its superior properties, graphene holds great promise for a broad range of potential applications in next-generation technologies such as nanoelectronics, sensors, batteries, nanocomposites, supercapacitors and hydrogen storage [9]. To harness these properties for the practical applications, one possible route would be to

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Synergistic Effect of Vanadium Pentoxide and Graphene Oxide in Polyvinyl alcohol for Energy Storage Application

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Synthesis, Characterization and Thermal Studies of Poly(5-Indanyl Methacrylate)

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Abstract : A monomer of 5-indanylMethacrylate (5-IMA), has been synthesized from the precursor viz., 5-indanol and characterized by Fourier transform infrared (FT-IR), Nuclear Magnetic Resonance Spectroscopic Techniques ^{1}H-NMR and^{13}C-NMR.Homopolymerization of 5-IMA is carried out in benzene by free radical Solution polymerization at 70°C using Benzoyl Peroxide. Then the Homopolymer of Poly (5-Indanyl Methacrylate) wascharacterized by Fourier transform infrared (FT-IR), Nuclear Magnetic Resonance Spectroscopic Techniques (^{1}H-NMR) spectroscopy. Analysis of the thermal properties of the Poly(5-IndanylMethacrylate) by Thermogravimetric analysis (TGA) and Differencial Scanning Calorimetry Analysis (DSC) is also reported.
Keywords: 5-indanyl Methacrylate, TGA and DSC.

1. Introduction:

We have studied in a lot of poly (methacrylates) the influence of the chemical structure of the repeating unit on its conformational parameters. The rigidity of the chain is a property that determines many characteristics of the polymers in both solidstates as well as in solution. The use of homopolymers and copolymers especially designed with functional active groups as lateral substituent of the main chain is a topic increasing and interest. [1-2]. These kinds of macromolecules possess significant importance from both a fundamental and an applied point of view. Polymers aromatic acrylates and methacrylate are highly reactive monomers due to the presence of the aromatic ring and thus form and interesting class of polymers. Phenylmethacrylates find application in the preparation of many polymeric reagents and as electro - active polymers [3-4]. Methacrylate monomers consisting of an alkyl group, an acrylate ester group, and a functional carboxyl group can react with a wide range of monomers and functionalized molecules providing flexible polymer chains. Alkyl methacrylates are clear and volatile liquids that are slightly soluble in water and highly soluble in alcohols, ethers, and organic solvents (Wright, 1981; Braden et al., 1997; Parker et al., 1998).Aromatic acrylates and methacrylate are highly reactive monomers due to the presence of the aromatic ring and thus form an interesting class of polymers. Methacrylates based polymers are a type of important materials and wide applications drive efforts to prepare materials with highly improved properties. The advantage of methacrylate based polymers is its high thermal, chemical and mechanical stability, Which makes them best candidates for applications that require adhesion to various substrates, abrasion resistance, flexibility, toughness and excellent resistance to chemicals, solvents, and water. The degradation temperature of such Polymers could have high temperature as 500^{o}C.Aliphatic methacrylic ester containing ester group functionality [5] and the synthesis of bicyclic aromatics, such as isomeric acetonaphthyl methacrylate, and their polymers [6]

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A Secure Client Aware Certification for Mobile Cloud Offloading Decision

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Abstract: The advancements in smartphones with excellent feasibility and networking capabilities paved the way for rising leap in mobile communication, but their limitations incline users to next level paradigm called Mobile Cloud Computing. Despite the cloud services reaching far greater heights, the issues of to security and privacy needs to be addressed. Therefore, our proposed Client Aware Certification (CAC) model ensures to identify the authenticity of client devices connected to the cloud based on the behaviour predictability and security checks. A resource broker identifies the trustworthiness of the client devices before offloading any task. Integrity check, privacy protection, and access patterns are some of the attributes considered for offloading decision. The model achieves better security, privacy, and performance for resource migration. Identity management and certification feature ensure a better predictability with secure virtual communication. The model is experimented with AWS cloud platform and tested for a video conversion application.

Keywords: Mobile cloud computing, Computation offloading, Identity management, Client awareness.

1. Introduction

The incredible transformation and radical innovations in the organizational substructures of computing, particularly cloud computing, have been making history with on-demand services. Cloud computing, in essence, refers to the delivery of resources over the internet. Additionally, the computer's processing power is a shared pool of resources that can be accessed whenever needed, at any time, with a network. Cloud computing can provide the infrastructure necessary for integrating applications, monitoring and storing data, and client delivery. Cloud services are popular due to the reduced costs and complexity of the software, hardware and networks involved - the other potential benefits being scalability, reliability, and efficiency. The interaction between the mobile and the cloud is facilitated by the creation of large volumes of data. Mobiles are, intrinsically, constrained when it comes to storing and processing huge amounts of data and, consequently, with a handshake linking wireless access in mobiles and cloud services, Mobile Cloud Computing (MCC) has stamped its use in this integrated sector/segment/enterprise. In recent years, we have been experiencing massive upgrades in the realm of mobile computing, with promising applications in wireless access, music, maps, and much more. Mobile phones – and smartphones, in particular - are becoming smarter by the day with their value-adds, and this is accompanied by breakneck growth. The mobile phone is, indubitably, rightly considered to be a major and influential invention of the twentieth century. Since the creation of the first mobile phone, there has been a steady escalation in its technological aspects with the passing of each decade. Incredibly, the initial prototype of all handheld devices permitted only vocal communication, whereas today's smartphones

Design and Analysis of Grid Connected PV Generation System

T.D. Sudhakar, K.N. Srinivas, M. Mohana Krishnan and R. Raja Prabu

Abstract As there is a power shortage across any country, usage of renewable energy sources is being encouraged nowadays. This energy produced has to be properly synchronized with the grid to ensure safety and energy continuity. In this paper, the standard procedure for grid interconnection is discussed and the impact of not following the procedure is shown using the voltage and current waveforms. Later a step by step procedure for designing a MPPT algorithm based PV generation system connecting to the grid is developed. The developed system feeds a common load, as the micro grid systems feeds the local loads. The system takes care of all the specified guidelines while feeding the load, which is proved by using the voltage and current waveforms. Therefore this paper acts as guide in developing renewable energy based grid connected system.

Keywords Renewable energy · Grid interconnection · MPPT · PV generation

1 Introduction

The basic thing needed for grid synchronization is that the voltage magnitude, phase sequence and frequency of the interconnecting power source must be same as that of the grid. A basic integration of solar panel based distribution generator (DG) with grid is shown in Fig. 1.

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Antioxidants and Redox Signaling
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Exo-miR-15a Transfer from the Pancreas Augments Diabetic Complications by Inducing Oxidative Stress

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Hydrodynamics of Superparamagnetic Iron Oxide Nanoparticles

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Abstract

Superparamagnetic iron oxide nanoparticles have found particular interest in magnetic drug targeting, hyperthermia, and magnetophoresis, where their flow behavior in the presence and absence of magnetic field is of particular interest. Magnetite nanoparticles of diameter 6.5 nm have been synthesized by co-precipitation of Fe2+ and Fe3+ ions at room temperature. They exhibit high magnetization (~ 70-75 emu/g) even when chelated with citric acid. Hydrodynamics of these nanoparticles has been studied in water medium at flow rates similar to those observed in blood vessels under the influence of different magnetic fields up to 0.5 Tesla and at different distances from the tube wall. An experimental setup has been fabricated in-house comprising a straight test section, a peristaltic pump for pumping water, a permanent magnet mounted at different distances from the test section, and a CMOS camera mounted 90 degrees from the magnet to image the nanoparticles under the influence of magnetic and flow fields. The observed time-lapse images indicate that in the absence of an external magnetic field, the magnetic interactions between the nanoparticles are not strong enough to withstand the normal and shear forces arising from flow. Thus, most of the particles get washed away. Chelating the nanoparticles with citric acid disperses the nanoparticles more effectively, and also aid in flow of the nanoparticles away from the region of visualization. On the other, in the presence of a magnetic field, most of the nanoparticles are attracted to the wall of the tube closest to the magnet and are retained for longer durations. Yet, it is also seen that the hydrodynamic forces are able to gradually remove the retained nanoparticles. The developed setup is an effective means to study the hydrodynamics of iron oxide nanoparticles, particularly in relevance to emerging applications.

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Polyvinyl alcohol (PVA)/polystyrene sulfonic acid (PSSA)/carbon black nanocomposite for flexible energy storage device applications

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Abstract Herein, we report the preparation and characterizations of polyvinyl alcohol (PVA) and polystyrene sulfonic acid (PSSA) blend nanocomposites reinforced with carbon black nanoparticles (CBNPs). The structural changes, interaction between CBNPs and the PVA/PSSA blend matrix were identified by Fourier transform infrared spectroscopy (FTIR) and X-ray diffraction (XRD) studies. The surface morphology of PVA/PSSA/CBNP nanocomposite films were evaluated using polarized optical microscopy (POM) and scanning electron microscopy (SEM) and the mechanical properties were evaluated using bench top tester. In addition, the dielectric properties of PVA/PSSA/CBNP nanocomposite films with different loadings of CBNPs were carried out in the frequency range 50 Hz to 20 MHz at various temperatures ranging from 40 to 150 °C. The dielectric constant as high as 1851 (50 Hz, 150 °C) was obtained for the PVA/PSSA/CBNP nanocomposite film with 5 wt% CBNPs loading and for the same compositions the dielectric loss was about 3.9 (50 Hz, 150 °C. The dielectric results demonstrate that the dispersion of CBNPs has a significant control on the percolation threshold of nanocomposites. The enhanced dielectric performance of these nanocomposites infers that CBNPs are ideal nanofillers for the development of novel high-k materials with low percolation threshold for flexible energy storage applications.

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1 Introduction

In recent years, there is an increasing interest in the flexible dielectric composite materials with high dielectric constant and low dielectric loss due to their important applications in various fields such as charge storage capacitors, electrostriction artificial muscles and for drug delivery [1–5]. The dielectric constant of polymer nanocomposites can be improved effectively by incorporating electrically conducting phase into the polymer matrix as the concentration of conducting phase approaches the percolation threshold [6, 7]. For polymer nanocomposites, the percolation threshold is an important phenomenon and it is observed when the conducting particles of dispersed phase come in close contact with each other and a continuous path extends throughout the system as the volume fraction of dispersed phase approaches critical value [8, 9]. At the percolative concentration, the polymer composites undergo an insulator-conductor transition. Therefore, the composites near the percolation threshold can become a capacitor. The dielectric constant of such composites is generally much larger as compared to neat polymer matrix. For designing such materials with good performance, both the fillers and polymers are very important [10]. Some factors concerning the nature of conducting particles and the properties of polymer matrix must also be considered. The filler content must be as low as possible in order to avoid problems concerning poor processability, poor mechanical properties, high cost

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Ruthenium Bipyridine Dichloride Complex Sensitized Cadmium Doped TiO_2 and SnO_2 Nanocrystals

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Abstract : Many semiconductor oxide layers were coated over TiO_2 which acts as the photoanodic materials in Dye Sensitized Solar Cells (DSSCs). A suitable dye sensitizer coated over the suitable photoanodic material could be used in DSSC to increase the efficiency to a higher rate. This paper deals with the photoconductivity and electrical studies of the cadmium doped TiO_2 and SnO_2 nanocrystals coated with the $[Ru(bipy)_2(C_6H_5NHNH_2)]Cl_2$ as the dye sensitizer which could be used in DSSC in future.
Keywords : DSSC, Photoanode, Photoconductivity, Dye sensitizer.

1. Introduction

The rapidly increasing fossil fuel consumption and excessive greenhouse gas emissions have put significant pressure on exhaustive global energy demand. Photoelectrochemical cells have led to the development of efficient and low-cost dye sensitized solar cells (DSSCs) at the laboratory level. DSSCs have emerged as an attractive choice for solar energy harvesting since their invention[1-5]. Many efforts had been carried out to improve the cell performance by (a) increasing the cell conductivity, (b) minimizing the electron recombination at TiO_2-dye interface, (c) enhancing the regeneration kinetics at the cathode, (d) enhancing the photovoltage by changing the redox mediator electrolyte, (e) improving the light harvesting efficiency by using reflection/scattering layers, plasmonic materials, or new dyes. Recently, improving the conversion efficiency of DSSCs by doping one kind of metal ion in TiO_2 which act as the photoanode had been mostly investigated[6]. The role of cadmium ions in the DSSC is of particular interest. The incorporation of cadmium into the host TiO_2 and SnO_2 lattices increases the conductivity. Among the sensitizers which could be used in DSSCs, the Ruthenium complexes and organic dyes have the best photovoltaic performances both in terms of conversion yield and long term stability[7-16].

In the present study, 5 mole % Cd^{2+} doped TiO_2 (CTO) and 5 mole % Cd^{2+} doped SnO_2 (CSO) were identified as the better semiconductor oxide layer and was coated with phenyl hydrazine substituted Ruthenium $(Bi\text{-}pyridine)_3]Cl_2$ complex (PHRBP) which could be used in DSSCs in future.

2. Materials and Methods:

Cadmium doped TiO_2 and SnO_2 (CTO and CSO) nanocrystals was synthesized by microwave solvothermal method[17,18] and phenyl hydrazine substituted Ruthenium $(Bi\text{-}pyridine)_3]Cl_2$ complex (PHRBP) was synthesized by refluxing method[19]. Also, in the present study, $[Ru(bipy)_2(C_6H_5NHNH_2)]Cl_2$ complex was coated as the dye sensitizer over the Cadmium doped TiO_2 and SnO_2 (CTO and CSO) nanocrystals compacted as disc shaped pellet. In the present study dark & photo current were recorded for $[Ru(bipy)_2(C_6H_5NHNH_2)]Cl_2$

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SC-TPDP Protocol to secure Multi-Cloud Storage from XSS Attacks

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Abstract

Cloud computing are in demand for various technical needs. The way the data processing is done to reach cloud servers and the way of making the service protective and free form XSS Attack determines the success**.** The objective of this study is to design a method which can moderate XSS attacks. **Methodology:** The integrity testing protocol must be efficient in order to save the cost. From these two points, the proposed secure cloud transmission protocol SC-TPDP is developed and designed which moderates XSS attacks. This framework design facts will help in increasing a secure protocol for the customers who are using cloud computing technologies over unconfident internet. Remote data reliability testing model: SC-TPDP (Secure Cloud Transmission provable data Possession) in multi-cloud storage. Based on the bilinear pairings, a SC-TPDP protocol is designed. **Findings/Improvements:** The proposed SC-TPDP protocol is provably secure under the efficient of the Blowfish Algorithm. In addition to the advantage of removal of certificate management, the SC-TPDP protocol is also efficient and flexible. Based on the client's authorization, the proposed SC-TPDP protocol can recognize private verification, delegated verification, public verification and tracking attackers/hackers from client authorization. **Application:** The SC-TPDP protocol focuses on securing cloud provable data possession in multi-cloud storage from XSS attack. This protocol is secure and minimizes the attacker's entry, thus protecting cloud end user from XSS attack.

Keywords: Blowfish Cryptography, Cloud Computing, Hackers Protection, Provable Data Possession, SC-TPDP, TOTP, XSS Attack Protection

1. Introduction

A large has been composed and mentioned about Cloud Computing Technology, by IT experts, industry and business leaders and independent specialists. While some trust, it is a disturbing development representing the next stages in the evolution of the Internet; others trust it is interest, as it uses earlier recognized computing technologies. From a user viewpoint, cloud computing provides a means for obtaining computing services without any need for deep understanding of the core technology being used. From an organizational viewpoint, cloud computing delivers services for consumer and business needs in an absolute way, providing endless scale and great quality of service to short-term fast improvement and decision making. According to the Sercombe and National Institute of Standards and Technology, techniques for cloud computing, it has four different deployment models openly isolated, community, public and hybrid as well as three different delivery models that are used within a particular deployment model. These delivery models are the SaaS (Software as a Service), PaaS (Platform as a Service) and IaaS (Infrastructure as a Service). This paper efforts on the problems related to the ability delivery model of cloud computing. The paper describes the various security issues of cloud computing such as XSS attacks with detail to its facility delivery model

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SVM-based wavelet selection for fault diagnosis of monoblock centrifugal pump

V. Muralidharan , V. Sugumaran

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Published online 11 January 2017

Abstract PDF

Abstract

In the present study, the application of SVM algorithm in the field of fault diagnosis and condition monitoring is discussed. The continuous wavelet transforms are calculated for different families and at different levels. The computed transformation coefficients form the feature set for the classification of good and faulty conditions of the components of centrifugal pump. The classification accuracies of different continuous wavelet families at different levels are calculated and compared to find the best wavelet for the fault diagnosis of the monoblock centrifugal pump.

Keywords: monoblock centrifugal pumps, SVM, support vector machines, fault diagnosis, continuous wavelet transforms, CWTs, pump faults, condition monitoring, classification

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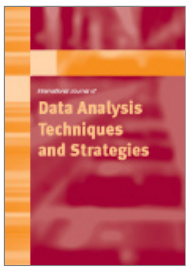

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By Author

- V. Muralidharan
- V. Sugumaran

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ORIGINAL ARTICLE

The effectiveness of an NaF rinse containing fTCP on eroded enamel remineralization

Andressa Feitosa B. de Oliveira[1] · **Sapna M. Mathews**[2] · **Karthikeyan Ramalingam**[3] · **Bennett Amaechi**[2]

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Abstract
Objective The authors investigated the effectiveness of a functionalized tricalcium phosphate (fTCP) combined with a low fluoride level in a mouthrinse to reharden eroded enamel lesions.
Methods Ninety enamel slabs attached in pairs to removable appliances were randomly assigned to three treatment groups ($n=30$/group): (T1) NaF rinse (225 ppm F + 40 ppm fTCP), (T2) NaF rinse (225 ppm F; ACT®), and (T3) no mouthrinse (saliva). While wearing the in situ appliance for 14 days, subjects brushed their teeth with 1100 ppm F toothpaste (Crest©) for 2 min, rinsed with 15 ml of water for 10s, and then rinsed with 15 ml of their assigned treatment mouthrinse. Treatment efficacy was evaluated using surface microhardness (SMH) and transverse microradiography (TMR). Intra- and intergroup comparisons ($\alpha=0.05$) were performed using the *t*-test and ANOVA followed by the Tukey test (HSD).
Results With SMH, intragroup comparison (t-test) indicated significant rehardening of the eroded lesion with exposure to T1 ($p<0.001$) and T2 ($p<0.01$) but not with T3 However, with TMR, remineralization was only significant ($p=0.01$) with T1, but not with T2 and T3. In the intergroup comparison with percentage change in SMH, T1 was significantly different from T3 ($p<0.01$; Tukey HSD) but not from T2, and T2 was significantly different from T3. Intergroup comparison based on percentage mineral gain showed that T2 ($p=0.02$) and T3 ($p=0.01$) differed significantly from fTCP, but not between each other.
Conclusion Addition of low level fluoride to functionalized β-tricalcium phosphate promoted rehardening of eroded enamel lesions.

Keywords Fluoride · Tricalcium phosphate · Erosion · Enamel · Remineralization

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Introduction

Dental erosion is defined as a loss of tooth structure by acid dissolution of non-microbiological origin (Imfeld 1996). With regards to etiology, erosion has been associated with increasing consumptions of acidic food (e.g., apples and oranges) and beverages (e.g., sports drinks, orange juice, soft drinks, coffee, etc.) or the attack of stomach acids during acid reflux and/or vomiting (Lussi 2006). The continuous and repeated acid insults result in complete removal of the minerals and irreversible tissue loss (Voronets et al. 2008). It is a relatively difficult lesion to treat, considering that while relatively lower fluoride

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Theoretical docking and antifungal studies of salicylaldehyde derived schiff base

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ABSTRACT

Schiff base was synthesized by the condensation of 4, 4'diamino benzanilide and salicylaldehyde in ethanol using acetic acid as catalyst and characterized by UV, IR and Proton NMR spectral studies. Quantitative structure activity relationship (QSAR) of the Schiff base such as stability, PSA and Clog P values and bond orders of all bonds were calculated by Spartan 14 wave function tool at semi empirical PM3 basis set. Using the same tool HOMO, LUMO energies and gap between them was calculated as well. Docking study of the synthesized Schiff base was done for the following proteins such as SeminaRibonuclease, G.T.paseHRes, Phosphoglycerate Kinase, Glutathione S-transferase and Proto-Oncogene Tyrosine-Protein Kinase through Mcule online tool. Schiff base ligand docking score were also calculated by submitting smiles notation and it showed best docking scores. Preliminary antifungal study of the Schiff base was also done on readymade TLC plate and the study revealed that a concentration of 250 ppm showed minimum inhibition against *Botrytis cinerea*.

Key words: salicylaldehde, DiaminoBenzanilide, QSAR, docking, *B.cinerea* antifungal study

1. INTRODUCTION

Hugo Schiff started the revolution on Schiff bases by the condensation of amine with ketone or aldehyde in the year of 1864. Somany Schiff bases and their applications such as antimicrobial (Mounika, 2010; Venkatesh, 2011), antioxidant (Wei, 2006) and analgesic (Sondhi, 2006) were reported so far. Due to the electron donating tendency of imine functional group, Schiff bases are used in metal complex preparation. This study foot forwarded the synthesis of Schiff base by well-known method and it was characterized by IR and Proton NMR. Molecular formula confirmed by ultimate analysis method approximately. Same Schiff base structure was studied computationally through SPARTAN '14 tool by Semi-Empirical Program PM3 basis set. The same structure docking database calculated through online Mcule tool over five protein data set. This technique mainly combines algorithms like molecular dynamics, Monte Carlo Stimulation, fragment based search methods. These studies are used to define the interaction of two molecules and to find the best orientation of ligand which would form a complex with overall minimum energy. A molecule which is called ligand locked with protein cavity. These protein cavities become dynamic when come in contact with any external compounds and are thus called as energetic sites. Various poses showed different docking scores, from that best score was recorded. The prepared Schiff base preliminary antifungal character against *Botrytis cinerea (B.Cinera)* was studied on readymade silica gelplate.

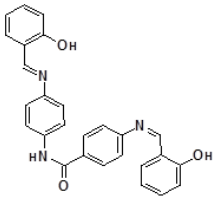

Figure.1.structure of (4Z)-4-(2-hydroxybenzylideneamino)-N-((E)-4-(2-hydroxybenzylideneamino) phenyl)benzamide

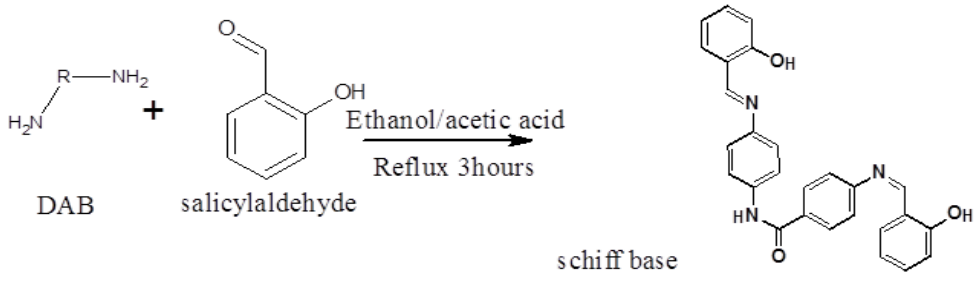

Figure.2.Synthesis of Schiff base

Vertical Multi Roller Burnishing on Copper and Aluminum Metal

SThamizhmanii, Rasool Mohideen, Sulaiman

***Abstract*— Burnishing is cold working and chipless machining carried out to improve surface roughness, surface hardness, fatigue, compressive stress and corrosion resistance by using sliding speed, feed rate and depth of penetration. The process smooths out peaks and valleys on the surface. This paper described the process carried out by multi-roller burnishing fitted in housing and rotated freely in a horizontal axis. The work material used was copper and aluminum. The process produced good surface roughness and hardness at high rotation of spindle coupled with high feed rate and constant depth of penetration.**

***Key words*— Burnishing, Cold working chip-less, Hardness, Vertical burnishing, Surface roughness, Surface hardness**

I. Introduction

Roller burnishing is an iterative mechanical process, mostly used on a lathe / milling machine to induce superficial plastic strain to reduce the surface roughness of cylindrical machined parts with some advantages. This operation avoids costly supplementary grinding operations. Additionally, this finishing procedure has less impact on the environment than most other processes. The roller burnishing principle is to use, instead of a cutting tool, a free roller that will sweep the cylindrical surface of the machined part. A force, whose direction is normal to the machined cylinder, is applied to the roller in order to generate high local stresses that will induce the plastic strain necessary to smooth surface irregularities. Burnishing is a cold working process in which plastic deformation occurs by applying a pressure through a very hard and smooth roller or ball on a metallic surface. Improvements in surface finish surface hardness, wear resistance, fatigue resistance, yield and tensile strength and corrosion resistance can be achieved by the application of this process [1-3]. Most authors have been involved in studying the effects of burnishing force, burnishing feed, burnishing speed and number of burnishing tool passes on metallic components [4-6]. An increase in initial surface roughness will cause an increase in the final surface roughness of the ball burnished work pieces. An increase in the initial surface hardness will cause a decrease in the reduction of surface roughness, and in the total amount of the increase in surface hardness [7]. Rajasekariah and Vaidyanathan [8] advised that an increase in initial surface roughness should lead to a sharp reduction in the quality of the burnished surface. Later, Murthy and Kotiveerachari confirmed these results using higher burnishing forces [2, 8]. Adel Mahmood Hasan and Ayman Mohammad Maqableh [9] have found that an improvement in surface finish and an increase in surface hardness can be achieved in subjecting the metallic components by ball burnishing. SThamizhmanii et al. [10] stated that the surface roughness has increased as the spindle rotation, feed and depth of penetration increased for aluminum, brass and copper. If the over lapping of the roller is maintained, and then it is possible to achieve lower surface roughness value. SThamizhmanii et al. [11] have conducted experiment in burnishing process on Titanium alloy metal by applying suitable process parameters. It was found that surface hardness also increased as the spindle speed, feed rate and depth of penetration was increased. A higher surface hardness value obtained at 1400 spindle rotation with 300 feed rate and 0.35 mm depth of penetration.

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II. EXPERIMENTAL PROCEDURE

A. *Experimental details*

The commercially available copper block and aluminum was machined to 100 x 45 x 45 x 100 mm rectangular block. The machining was done in a CNC MAZAK milling machine and the initial surface harness and surface roughness was measured. The initial hardness was 107 HV for copper and 106 HV for aluminum and surface roughness was 4.2 microns as machined. A multi-roller burnishing tool is fitted with hardened rollers in housing and is rotate freely in a horizontal axis. The rollers are projected by 1 mm from the housing surface. The principles operation of burnishing is shown in the figure 1 (a) and (b). The asperities of the surface are smoothed down to almost flat surface. The surface roughness was measured using Mitutoyo SJ 400 model. The surface hardness was measured using Highwood –digital micro hardness tester – make HWMMT-X3 manufactured by TTS unlimited INC, of Japan. The Vickers hardness was measured with 1000 kg load. Table 1 shows operating parameters.

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Vertical Multi Roller Burnishing on Copper and Aluminum Metal

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***Abstract*— Burnishing is cold working and chipless machining carried out to improve surface roughness, surface hardness, fatigue, compressive stress and corrosion resistance by using sliding speed, feed rate and depth of penetration. The process smooths out peaks and valleys on the surface. This paper described the process carried out by multi-roller burnishing fitted in housing and rotated freely in a horizontal axis. The work material used was copper and aluminum. The process produced good surface roughness and hardness at high rotation of spindle coupled with high feed rate and constant depth of penetration.**

***Key words*— Burnishing, Cold working chip-less, Hardness, Vertical burnishing, Surface roughness, Surface hardness**

I. Introduction

Roller burnishing is an iterative mechanical process, mostly used on a lathe / milling machine to induce superficial plastic strain to reduce the surface roughness of cylindrical machined parts with some advantages. This operation avoids costly supplementary grinding operations. Additionally, this finishing procedure has less impact on the environment than most other processes. The roller burnishing principle is to use, instead of a cutting tool, a free roller that will sweep the cylindrical surface of the machined part. A force, whose direction is normal to the machined cylinder, is applied to the roller in order to generate high local stresses that will induce the plastic strain necessary to smooth surface irregularities. Burnishing is a cold working process in which plastic deformation occurs by applying a pressure through a very hard and smooth roller or ball on a metallic surface. Improvements in surface finish surface hardness, wear resistance, fatigue resistance, yield and tensile strength and corrosion resistance can be achieved by the application of this process [1-3]. Most authors have been involved in studying the effects of burnishing force, burnishing feed, burnishing speed and number of burnishing tool passes on metallic components [4-6]. An increase in initial surface roughness will cause an increase in the final surface roughness of the ball burnished work pieces. An increase in the initial surface hardness will cause a decrease in the reduction of surface roughness, and in the total amount of the increase in surface hardness [7]. Rajasekariah and Vaidyanathan [8] advised that an increase in initial surface roughness should lead to a sharp reduction in the quality of the burnished surface. Later, Murthy and Kotiveerachari confirmed these results using higher burnishing forces [2, 8]. Adel Mahmood Hasan and Ayman Mohammad Maqableh [9] have found that an improvement in surface finish and an increase in surface hardness can be achieved in subjecting the metallic components by ball burnishing. SThamizhmanii et al. [10] stated that the surface roughness has increased as the spindle rotation, feed and depth of penetration increased for aluminum, brass and copper. If the over lapping of the roller is maintained, and then it is possible to achieve lower surface roughness value. SThamizhmanii et al. [11] have conducted experiment in burnishing process on Titanium alloy metal by applying suitable process parameters. It was found that surface hardness also increased as the spindle speed, feed rate and depth of penetration was increased. A higher surface hardness value obtained at 1400 spindle rotation with 300 feed rate and 0.35 mm depth of penetration.

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II. EXPERIMENTAL PROCEDURE

A. *Experimental details*

The commercially available copper block and aluminum was machined to 100 x 45 x 45 x 100 mm rectangular block. The machining was done in a CNC MAZAK milling machine and the initial surface harness and surface roughness was measured. The initial hardness was 107 HV for copper and 106 HV for aluminum and surface roughness was 4.2 microns as machined. A multi-roller burnishing tool is fitted with hardened rollers in housing and is rotate freely in a horizontal axis. The rollers are projected by 1 mm from the housing surface. The principles operation of burnishing is shown in the figure 1 (a) and (b). The asperities of the surface are smoothed down to almost flat surface. The surface roughness was measured using Mitutoyo SJ 400 model. The surface hardness was measured using Highwood –digital micro hardness tester – make HWMMT-X3 manufactured by TTS unlimited INC, of Japan. The Vickers hardness was measured with 1000 kg load. Table 1 shows operating parameters.

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One dimensional well-aligned CdO nanocrystal by solvothermal method

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ABSTRACT

Cadmium oxide (CdO) is a category of the practical semiconductor metal oxides, which is widely applied in various scientific and industrial fields because of its catalytic, optical, and electrical properties. CdO nanocrystal was successfully synthesized by a virtue of a single source precursor method at mild reaction conditions between cadmium oxide, and element iodine by a solvothermal route. X-ray powder diffraction (XRD), ultraviolet spectroscopy studies (UV–vis), Fourier Transform Infrared analysis (FTIR), scanning electron microscopy (SEM), μ-Raman spectroscopy and cyclic voltammogram (CV) were used to characterize the CdO nanocrystals. The ultra-violet visible absorption peaks of CdO exhibited a large blue shift and the luminescent spectra had a strong and broad emission band centered at 228 nm. The various functional groups present in the CdO nanocrystals were identified by FTIR analysis. Intense PL was also observed with some spectral tuning possibly giving a range of emission photon energies approximately spanning from 2.5 to 3.4 eV. Scanning electron microscopy and μ-Raman microscopy images indicated that the morphology of the product is spherical nanoparticles with an average particle size of 46 nm with standard deviation. The electrochemical response of CdO which is proved the nano-cadmium has high functionality due to the small size and it has higher electrochemical activity without any modifications. The above studies demonstrate the potential for the utilization of cadmium nitrite nanocrystal in visible opto-electronics applications.

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1. Introduction

Recently, one-dimensional (1D) nanostructures have stimulated much attention because of their fascinating applications for well-defined interconnects and building blocks for nanodevices. The use of an anisotropic crystal structure to induce the 1D growth is the simplest route for the formation of 1D nanostructure [1–4]. Cadmium oxide (CdO), is a known n-type semiconductor with a direct band gap of 2.3–2.5 eV and an indirect band gap of 1.36–1.98 eV. In recent years, nanoparticles have attracted great interest because of their unique chemical and physical properties, which are different from those of either the bulk materials or single atoms [5]. Among these nanoparticles, it is, especially, metal oxide nanoparticles that exhibit the technological importance for solar cell, chemical sensor and liquid crystal display [6–8]. Cadmium oxide nanostructures are applied in solar cells, gas sensors, transparent electrodes and photodiodes, catalysts, photocatalysts and optoelectronic devices [9–11]. The numerous structures of cadmium oxide in nanoscale have been reported such as nanoparticles, nanowires [12], thin films, nanoneedles, nanotubes [13], nanorods [14]. There are several techniques to prepare these materials such as sonochemical [15], micro-emulsion [16], hydrothermal/solvothermal method and mechanochemical process [17]. It seemed that, in the process of the synthesis, complex conditions and long synthesis time might be required for these technologies. Herein, we investigate the CdO nanoparticles with almost uniform size and shape in high yields are synthesized by virtue of this method.

2. Experimental section

All chemical reagents used in this experiment were of analytical grade (E-Merck, 99.99%), were procured commercially and were used without further purification. In 3 g of cadmium nitrate, 1 g of NaOH and 0.5 g of iodine was placed in a round bottom flask and stirred for 3 h at room temperature (RT). After synthesis white crystalline products were collected by centrifugation, washed with distilled water and ethanol several times and dried at 90 °C in a vacuum for 7 h. The X-ray powder diffraction (XRD) experiments were measured on a RigaKu D/max-RB diffractometer with Ni-filtered graphite monochromatized Cu kα radiation

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Computing with membranes and picture arrays

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Abstract

Splicing systems were introduced by Tom Head [3], [4] on biological considerations to model certain recombinant behaviour of DNA molecules. An effective extension of this operation to images was introduced by Helen Chandra et al. [5] and *H* array splicing systems were considered. A new method of applying the splicing operation on images of hexagonal arrays was introduced by Thomas et al. [12] and generated a new class of hexagonal array languages HASSL. On the other hand, *P* systems, introduced by Paun [6] generating rectangular arrays and hexagonal arrays have been studied in the literature, bringing together the two areas of theoretical computer science namely membrane computing and picture languages. *P* system with array objects and parallel splicing operation on arrays is introduced as a simple and effective extension of *P* system with operation of splicing on strings and this new class of array languages is compared with the existing families of array languages. Also we propose another *P* system with hexagonal array

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ORIGINAL ARTICLE

Evaluation of drilled hole quality in Al 2024 alloy

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Abstract This paper deals with experimental investigation in the role of different coating, point angle, cutting parameters (cutting speed and feed rate) on the hole quality (hole size, surface roughness, roundness and radial deviation of produced hole) in drilling of Al 2024 alloy. The parameters of hole quality are analyzed under varying cutting speeds (30, 45 and 60 m/min), feed rates (0.15,0.20 and 0.25 mm/rev), depths of cut (2, 15 and 25 mm) and drills (uncoated point angle:118°, TiN Pa:118°, TiAlN Pa:118°, Co 5% Pa:130°, TiN Pa:130°). This study includes dry drilling with 10 mm HSS drills with an axial depth of cut of 30 mm. This study indicate that results of the radial deviations show a similar tendency with the hole size. Hence, it can also be concluded from the experimental results that the radial deviations are effected tool vibrations during drilling. The results of this work show that cutting parameters and coatings have different effects on hole quality. However, when dry drilling aluminum alloys, HSS Co 5% drills show good performance compared to an uncoated, TiN and TiAlN coated drills. Besides, effective results have been obtained using low cutting speed and feed rate. Additionally, the best hole quality obtains from near the bottom of the produced hole.

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Keywords Aluminum alloy · Dry drilling · Hole quality · Cutting parameters · Radial deviation

1 Introduction

Aluminum is used in many industries to make different products. Thereby it is significant to the world economy. Structural components made from aluminum and aluminum alloys are vital to the aerospace industry and very important in other areas of transportation and building in which durability, strength and light weight are expected.

Drilling process is widely used in aerospace, aircraft and automotive industries. Although modern metal cutting methods improve in manufacturing industry, including drilling, electron beam machining, ultrasonic machining, electrolytic machining and abrasive jet machining, conventional drilling still remains one of the most common machining processes because of economical reasons and simplicity.

On the one hand, in this type of processes those denominated cutting fluids with objects are usually applied to the cooling of the tool and the elimination of the effects due to high temperatures. On the other hand, in the last few years, regulations concerning the environment have forced the development of cutting fluids of low environmental impact together with the search for machining methods that avoid or minimize their use [1, 2].

In this process, drill performance and hole quality are mainly dependent on cutting parameters and drilling tools. Because of this reason, many researchers have been focused on understanding and determining the best machining process of this alloy. Eventually, many numerical and experimental technique developed and used by researchers in the past decade in order to determine and predict

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Research Article

A Non-Markovian Multistage Batch Arrival Queue with Breakdown and Reneging

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The present investigation deals with analysis of non-Markovian queueing model with multistage of services. When the server is unavailable during the system breakdown (or) vacation periods, we consider reneging to prevail. Supplementary variable techniques have been adopted to obtain steady state system length distributions. The numerical illustrations are provided to validate the tractability of performance measures as far as computational aspect is concerned. Numerical results in the form of graphical representation are also presented. Practical large scale industry applications are described to justify our model.

1. Introduction

Vacation queueing models play a major role in manufacturing and production, computer and communication, and service and distribution systems. Many models for customer's impatience in queueing systems have been studied in the past, and the source of impatience has always been considered to be either a long wait already experienced at a queue or a long wait anticipated by a customer upon arrival. Queueing models enable organizations to implement critical production strategies or tactics aimed at reducing costs on increasing revenues. By examining the methods of operations research and especially queueing theory, new models can be developed and existing ones can be extended.

One of the earliest works on balking and reneging was by Haight [1, 2] and Barrer [3], which was the first to introduce reneging in which they studied deterministic reneging with single server Markovian arrival and service rates. Montazer-Haghighi et al. [4] studied a Markovian mutiserver queueing system with balking and reneging. A two-stage batch arrival queueing system where customers receive a batch service in the first and individual service in the second stage was studied by Doshi [5] in the past.

Furthermore [6], Chodhury examined an $M^{[x]}/G/1$ queueing system with a set-up period and a vacation period. This paper deals with an $M^X/G/1$ queueing system with a vacation period which comprises an idle period and a random set-up period. The server is turned off each time when the system becomes empty. At this point of time the idle period starts. As soon as a customer or a batch of customers arrive, the setup of the service facility begins which is needed before starting each busy period. In this paper the steady-state behaviour of the queue size distributions at stationary (random) point of time and at departure point of time is studied. Also, explicit expressions for the system state probabilities and some performance measures of this queueing system are derived analytically. Finally, the probability generating function of the additional queue size distribution due to the vacation period as the limiting behaviour of the $M^X/M/1$ type queueing system is derived.

Madan [7] investigated a batch arrival queueing system, where the server provides two stages of heterogeneous service with a modified Bernoulli schedule under N-policy. The server remains idle till the queue size becomes N (≥ 1). As soon as the queue size becomes at least N, the server instantly starts working and provides two stages of service

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A NOVEL HYBRID AUTHENTICATION METHOD BASED ON ORIENTATION MAPS AND SERVER AIDED SIGNATURE FOR M COMMERCE SECURED TRANSACTIONS

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ABSTRACT

Mobile commerce (m-commerce) refers to the ability to perform wireless commerce transactions using mobile applications in mobile devices. It is an innovative concept and is emerging in a context of an established norms, regulations and standards. This paper presents a study of adoption determinants for mobile commerce, focusing on end-users of a mobile commerce pre-paid service. The main objective of the study is twofold; to determine an algorithm that improves security and decreases the time delay for processing of an adoption model by applying it to the results of the study. In order to investigate the field of mobile commerce service adoption, information related to its' end-users was gathered. The framework was applied to the results of the study in order to validate its concepts. We proposed a model based biometric identification with SAS algorithm to obtain digital signature over the conventional method of merely algorithms to acquire signature. Biometric Identification Systems are widely used for unique identification of humans mainly for verification and identification. Biometrics is used as a form of identity access management and access control. Fingerprints are considered to be the best and fastest method for biometric identification. Hence we have adopted the finger print recognition for improving security. They are secure to use, unique for every person and do not change in one's lifetime. The findings of the case study indicate strong support for triangulating the three perspectives namely secured access, lesser processing delay and better signature generation method. The results of the same have been analysed and presented in this paper.

Keywords: *M Commerce, Biometric Authentication, RSA Signature, SAS Signature, Feature Extraction*

1. INTRODUCTION

M commerce involves the use of mobile devices to transact, communicate and entertain M-commerce is defined as "The delivery of trusted transaction services over mobile devices for the exchange of goods and services between consumers, merchants and financial institutions. Mobile Commerce is an evolving area of E Commerce, where users can interact with the service providers through a mobile and wireless network, using mobile device for information retrieval and transaction processing. M-Commerce services and applications can be adopted through different wireless and mobile networks, with the aid of several mobile devices. However, constraints of both mobile networks anddevice influence their operational performance. Therefore, there is a strong need for taking into consideration those constraints in the design and development phases of M Commerce services and applications. Another important factor in designing M Commerce services and applications is the identification of mobile user's requirements. Furthermore, M Commerce services and applications need to be classified based on the functionality they provide to the mobile users.

This kind of classification results in two major classes: the directory and the transaction-oriented services and applications. Today M-commerce has enabled Voice messaging systems, emails

Science Publications

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An Economic System for Screening of Diabetic Retinopathy Using Fundus Images

G.S. Annie Grace Vimala and S. Kaja Mohideen

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Abstract

Delayed length of time of the diabetes may influence the tiny blood vessels of the retina bringing about Diabetic Retinopathy (DR). It is one of the major root causes of the blindness across the globe. Routine eye screening of patients with diabetes serves to discover DR at the early stage. The conventional visual assessment protocol is time consuming and laborious. Hence, the computer aided system for DR detection can reduce the burden of the ophthalmologist and improve the accuracy. In this work, we have proposed an automatic method for screening exudates based on image processing methods which utilized color component, morphology and intensity in retinal digital fundus images. The retinal fundus image of the affected eye was recorded with a fundus camera (Visupac, CARL-ZEISS FF 450 plus) for 60 south Indian women. For each image the ground truth result was collected from two glaucoma experts with more than 10 years of experience. Then the quantitative evaluation of the proposed algorithm has been carried out using these ground truth results. We achieved the highest segmentation accuracy of 93%, F-score of 88.2%, precession and recall of 93.1 and 89.3% respectively when the ground truth results were considered as

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Batch Arrival Queueing System with Two Stages of Service

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Abstract

This Paper studies batch arrival queue with two stages of service. Random breakdowns and Bernoulli schedule server vacations have been considered here .After a service completion, the server has the option to leave the system or to continue serving customers by staying in the system. .It is assumed that customers arrive to the system in batches of variable size, but served one by one. After completion of first stage of service, the server must provide the second stage of service to the customers. Vacation time follows general distribution, while we consider exponential distribution for repair time.We obtain steady state results in explicit and closed form in terms of the probability generating functions for the number of customers in the queue, average number of customers ,and the average waiting time in the queue.

Mathematics Subject Classification: 60K25, 60K30

Keywords: Batch arrival, Bernoulli Schedule, Random breakdown, Steady state, Queue size

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ANALYSIS OF TRAFFIC FLOW IN CONGESTED CITIES USING CELLULAR AUTOMATA

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ABSTRACT

The present study is to model heterogeneous traffic at a congested place in Chennai using Cellular Automata (CA) and traffic simulator VISSIM. Vehicle type, its volume, density, average velocity, dimensions of study area and signal cycle length are used as input parameters for computer simulator VISSIM to find the dynamics of vehicular traffic. The output obtained substantiates that there will be decrease in delay time and increase in maximum achievable velocity when there is reduction in 2W (Two Wheeler) population. In fact, if no 2W is allowed then the delay time will be reduced to 70.70% and the maximum achievable velocity will be increased to 34.33%. Using CA rules, simulation was carried out on the traffic flows in roads of length 100 (small system) and 1000(large system). The results obtained show that small systems behave differently from long ones and the traffic reaches a maximum of 420 when the density is 0.1 for small systems and 323 when the density is 0.09 for large system.

Keywords: *Cellular Automata, Heterogeneous Traffic, Vehicular Traffic, Single-Lane Traffic Flow, Simulation.*

1. INTRODUCTION

In a developing country like India vehicular traffic is a major problem since the growth of traffic is exponential and traffic conditions are heterogeneous. Chennai is one of the cities with heavy traffic congestion and a chaotic transport system. This is due to the roaming of more than 7 million inhabitants, 55000 taxis, 18000 buses and 1 million private cars in the city streets. In spite of introducing mass transportation system, erecting pedestrian bridges, making one-ways and restricting the movement of heavy vehicles in peak hours the management could not solve this problem. Unless the dynamics of vehicular traffic and the behavior of drivers are known it is impossible to solve this problem. To study effectively the dynamics of vehicular traffic, Mathematical modeling and computer simulation techniques can be used. In this present study microscopic models such as Cellular Automata (CA) and traffic simulator VISSIM are used to study the dynamics of vehicular traffic and the behavior of drivers.

1.1 Objectives of the Study

The main aim of the present study is modeling of traffic flow at a congested place in Chennai, using CA and traffic simulator VISSIM. Based on the congested report of the traffic department of Chennai city, Spencer intersection is chosen as our study area. Using various primary traffic surveys, vehicle type, its volume, density, average velocity, dimensions of study area, signal cycle length etc are identified and are used as input parameters for computer simulator VISSIM to find the dynamics of vehicular traffic. Basic rules for the CA model are discussed from these dynamics of vehicular traffic. Three different traffic flow conditions viz traffic condition with 25% less two wheeler (2W) traffic, 50% less 2W traffic and 100% less 2W traffic are studied using VISSIM. The output obtained by using the computer simulation software VISSIM is easily interpretable. Very useful basic CA rules are presented for future microscopic modeling of heterogeneous traffic in Chennai city.

1.2 Description

Some of above mentioned input parameters are taken from various traffic surveys and the rest are obtained by manual counting. The width and the length of the roads in the study area are measured using survey tapes and odometer. For the sake of convenience the roads are taken as straight stretch with no curves. Using the above input parameters the traffic flow is simulated in VISSIM software

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Anatomical Investigation on the leaves of *Piper betle* (L) var. Sirugamani 1(SGM1) links an Ethnomedical important Medicinal plant and its Pharmacognostic relevance.

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Abstract: *Piper betle* L. var. Sirugamani(SGM1) (Piperaceae) is a deep green heart shaped leaves have many uses in Indian and Chinese ethnomedicine. In this study we aim to establish the pharmacognostic profile of betel leaves to assist in the standardization for quality, purity and for the identification of sample. The fresh and dried leaves were evaluated to determine the macro and micromorphological characters using light and Scanning Electron Microscope (SEM) in which usual leaf tissues, cyclocytic stomata in lower epidermis and apostomatic upper epidermis, glandular trichomes (pearl glands), secretory cells were observed. The leaves were also subjected to elemental analysis by an Energy Dispersive X-ray Spectrometer (EDS or EDAX) which was in connection to the SEM. EDS results showed higher potassium content and thus the leaves may be useful in the maintenance of electrical excitability of nerves and muscles.
Keywords: *Piper betle*, betel leaf, Scanning Electron Microscope, Energy Dispersive X-ray Spectrometer.

Introduction

Piper betle (Synonym: *Piper peepuloides* Wall and *Piper chavya* Ham; Eng betel leaf Hindi: Pan, Tambuli; Tamil: Vettilai;) Family – Piperaceae is a perennial, dioecious, creeper, probable native of Malaysia, cultivated in India for its leaves used for chewing. There are about 100 varieties of betel vine in the world, of which about 40 are found in India and 30 in West Bengal[1]. In spite of its alienness, the plant is much more popular in India than in any other country of the world since the antiquity. Betel leaves from different regions vary in smell and taste. The leaf was used in Peninsular Malaysia for masticatory and also for relieving constipation in children and poulticing ulcerated noses. Leaves were often heated and applied to the chest to relieve cough and asthma[2]. The leaves were rolled up, covered with oil as a suppository and as purgative in new borns[3]. Orally used as aphrodisiac[4].The leaves contain good amount of B vitamin (particularly nicotinic

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Condition monitoring of Self aligning carrying idler (SAI) in belt-conveyor system using statistical features and decision tree algorithm

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ABSTRACT

Self aligning carrying idler (SAI) is a key component of belt-conveyor has two main functions: power transmission, controlling the belt sway and change the direction of conveyor belt. As the SAI is found to be critical in heavy duty conveyor systems, it becomes an essential activity to monitor its smooth functioning. To ensure this, condition monitoring of SAI needs to be carried out which basically forms a classification problem. Self aligning carrying idler consists of the following components such as bearing, shaft, labyrinth seal and outer roller. The SAI was analyzed with the following cases such as SAI running at good condition (Good), SAI with bearing fault (BF), SAI with shaft fault (SF), SAI with labyrinth fault (LF) and SAI with outer roller fault (RF). From the experimental setup, the vibration signals were acquired for different conditions of SAI. Some useful features were extracted using statistical measures. The features were classified by decision tree algorithms. The classification results are presented in the conclusion part. The effort is to apply the statistical features and decision tree classifier to SAI and examine whether would it be made online.

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1. Introduction

Self aligning carrying Self aligning carrying idler (SAI) is a key component of belt-conveyor system may undergo different types of failures because of startling forces, inadequate lubrication and futile sealing. The components that often fail in Self aligning carrying Self aligning carrying idler (SAI) are: bearing, shaft outer roller. The failure of these components directly affects the performance of the belt conveyor system. Hence, one must have a system to detect the failure in advance and alert the operator in order to avoid heavy damage to the system. The different faults considered for this study are SAI running at good condition (Good), SAI with bearing fault (BF), SAI with shaft fault (SF), SAI with labyrinth fault (LF) and SAI with outer roller fault (RF). In the conventional methods like oil condition and thermal state monitoring methods, the faults are detected after they were developed and reach a state to create a great impact in the system. As an alternate, Fast Fourier Transform (FFT) based methods were used for the applications of this kind. In FFT based methods the signals were analyzed in frequency domain. The main disadvantage in the FFT based methods was that it can work effectively only for the stationary signals (i.e.) the signal for which the characteristic frequency will not change with respect to time. However, as the application considered for the

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Debugging Using MD5 Process Firewall

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***Abstract*—An Operating system (OS) is software that manages computer hardware and software resources by providing services to computer programs. One of the important user expectations of the operating system is to provide the practice of defending information from unauthorized access, disclosure, modification, inspection, recording or destruction. Operating system is always vulnerable to the attacks of malwares such as computer virus, worm, Trojan horse, backdoors, ransomware, spyware, adware, scareware and more. And so the anti-virus software were created for ensuring security against the prominent computer viruses by applying a dictionary based approach. The anti-virus programs are not always guaranteed to provide security against the new viruses proliferating every day. To clarify this issue and to secure the computer system, our proposed expert system concentrates on authorizing the processes as wanted and unwanted by the administrator for execution. The Expert system maintains a database which consists of hash code of the processes which are to be allowed. These hash codes are generated using MD5 message-digest algorithm which is a widely used cryptographic hash function. The administrator approves the wanted processes that are to be executed in the client in a Local Area Network by implementing Client-Server architecture and only the processes that match with the processes in the database table will be executed by which many malicious processes are restricted from infecting the operating system. The add-on advantage of this proposed Expert system is that it limits CPU usage and minimizes resource utilization. Thus data and information security is ensured by our system along with increased performance of the operating system.**

***Keywords*—Virus, worm, Trojan horse, back doors, Ransomware, Spyware, Adware, Scareware, Sticky Software,Process Table, MD5,CPU Usage and Resource Utilization**

I. INTRODUCTION

We are very familiar with how rapidly internet web sites, personal computers, laptops, cell phones and other mobile devices have transformed both business and society in the recent years. Malware is a colossal threat to both computers and websites[5]. Malware is a software that is used to disrupt the operation of the system, gather sensitive information, or gain access to private computer systems and the website. They often appear in the form of executable code that requires a process to be run for it to corrupt the operating system. Operating system appears as an interface between the user and the hardware components of the system and so the user is capable of running any application irrespective of whether it is clean or not. Because of this deficiency operating system is not capable of restricting malicious software and consequently information and data security is not ensured. An unfolding to this problem was the discovery of antivirus software. Anti-virus software is a program or a set of programs that are designed to prevent, search for, detect malicious software's like viruses, worms, Trojan horses, backdoors, sticky software, adware etc[6]. Anti-virus software uses the dictionary based approach wherein it detects a virus by mapping it to the volatile dictionary of known viruses that have been identified by the authors of the anti-virus software. If a specimen of code in a file matches with any of the virus code in the dictionary, then it is considered as a malware. Although the dictionary based approach [13] is considered to be effective, however the problem of malwares is multiplying [7]. Viruses have evolved into several breeds by taking many forms over polymorphic and metamorphic states. The anti-virus software's installed are contemporary so that its database contains the list of only timely viruses. With this hitch in mind we can say that anti-virus software are not capable of detecting all the types of virus and cannot ensure security completely [8]. A solution to this problem is our expert system which preserves data by building a process firewall which allows only authorized and required processes and restricting the other processes. By following this approach malwares are not permitted to corrupt the system and our knowledge, data, information security is ensured. Our expert system uses MD5 message-digest hash code algorithm to efficiently create this process firewall. MD5 is just one of many hashing algorithms. It was developed by Ronald Rivest in 1991. Message Digest 5 (MD5) is a one way functions that produce a "hashcode" [15]. Essentially, it maps something with a lot of bits down to just 128 bits in such a way that collisions are as rare as possible. It does have a greater collision risk than SHA1. However, it is quicker to generate an MD5 digest than SHA1 [18]. MD5 message digest algorithm is used when we are compelled to generate more digests.

Our expert system provides security at two levels:

1. Single Host Protection
2. Local Area Network Protection

Design of Area Efficient and Low Power Multipliers using Multiplexer based Full Adder

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***Abstract*: This paper presents the modification of existing prominent multipliers like Wallace multiplier and Truncated Multiplier in order to improvise them in terms of power and area. In the existing Wallace multiplier architecture, the Carry Save Adder is replaced with Modified Carry Save Adder (MCSA)and further the full adder in the MCSA is implemented using Multiplexer. Similarly the regular full adder in the Truncated multiplier has been replaced with mux based full adder to achieve low area and power. Simulation of 8 x 8 Multiplier has been carried out with Modelsim 6.3c and Synthesis is carried out by Xilinx10.1. Results obtained show that the proposed modified multipliers offer low power and reduced area than the existing Multipliers.**

***Keywords:* Wallace Multiplier, Truncated Multiplier, Low Power multiplier, Switching Activity Reduction, MUX based full adder.**

I. INTRODUCTION

Designing a multiplier with reduction in area and power is a demanding problem nowadays. In a general purpose processor, the major sources of power dissipation are the adders and multipliers. Fast multipliers are the main components of many high performance systems [5].

A multiplier is considered as an area consuming and slowest element. Its performance determines the performance of a system.. Hence it is necessary to design multipliers which require less area and consume low power. It is possible with modified Wallace and Truncated Multipliers. Generally an n x n multiplier produces 2n output bit. An n bit output multiplier plays a very important role in case of DSP applications where the same n bit input register can be used to save the output also [7].

Multiplication is nothing but a series of repeated addition. The number to be added is called as the multiplicand and the number of times that is to be added is called as the multiplier. The result is considered as the final Product. Multipliers can be decomposed into two parts: partial product generation and addition of them. The production of carry is the major speed limitation in any adder. Generally Carry Save Adder can be used for adding more than three n-bit binary numbers [8].

An n × n bit multiplier with n bit output is called as a truncated multiplier. By removing the lower n significant bit, some of the partial products are removed. Hence there is a reduction in area and power consumption. In many cases, there is a decrease in delay also [10].

II. FULL ADDER USING MULTIPLEXER

Any logic function, starting from gates to complex functions, can be implemented with Multiplexers. The full adder circuit whose truth table given in table 1 imlplemented using 4 : 1 Multiplexer is shown in figure 1.

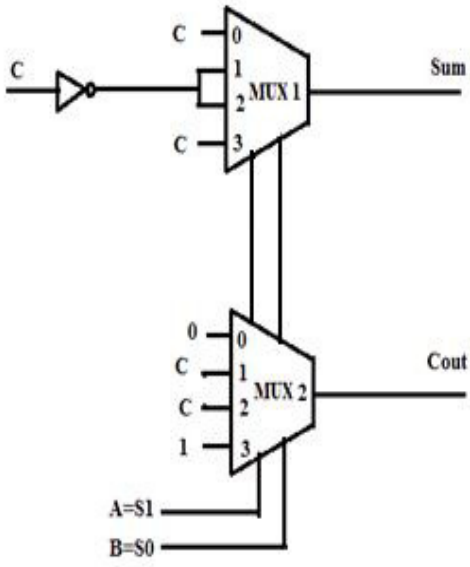

Fig.1 Full adder using 4:1 MUX.

Table 1 Truth of Table a Full adder.

A	B	C	Sum	Cout
0	0	0	0	0
0	0	1	1	0
0	1	0	1	0
0	1	1	0	
1	0	0	1	0
1	0	1	0	1
1	1	0	0	1
1	1	1	1	1

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Review Article

Emerging Anticancer Potentials of Goniothalamin and Its Molecular Mechanisms

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The treatment of most cancers is still inadequate, despite tremendous steady progress in drug discovery and effective prevention. Nature is an attractive source of new therapeutics. Several medicinal plants and their biomarkers have been widely used for the treatment of cancer with less known scientific basis of their functioning. Although a wide array of plant derived active metabolites play a role in the prevention and treatment of cancer, more extensive scientific evaluation of their mechanisms is still required. Styryl-lactones are a group of secondary metabolites ubiquitous in the genus *Goniothalamus* that have demonstrated to possess antiproliferative activity against cancer cells. A large body of evidence suggests that this activity is associated with the induction of apoptosis in target cells. In an effort to promote further research on the genus *Goniothalamus*, this review offers a broad analysis of the current knowledge on *Goniothalamin* (GTN) or 5, 6, dihydro-6-styryl-2-pyronone ($C_{13}H_{12}O_2$), a natural occurring styryl-lactone. Therefore, it includes (i) the source of GTN and other metabolites; (ii) isolation, purification, and (iii) the molecular mechanisms of actions of GTN, especially the anticancer properties, and summarizes the role of GTN which is crucial for drug design, development, and application in future for well-being of humans.

1. Background

Cancer continues to be one of the major causes of death worldwide, despite technological advancements in various fields during the last two decades [1, 2]. Current estimates from the American Cancer Society and from the International Union against Cancer indicate that 12 million cases of cancer were diagnosed last year, accounting for 8.2 million deaths in 2012 worldwide; these numbers are expected to double by 2030, of which 62% arise in developing countries (27 million cases with 17 million deaths) [1–4]. As many as 95% of all cancers are caused by life style (lack of physical activity, tobacco, and alcohol use) and may take as long as 20–30 years to develop [5]. Due to its complex nature, treatment such as surgery, chemotherapy, photodynamic therapy (PDT), and radiation varies according to each type, location, and stage [6].

Medicinal plants are widely used by majority of populations as primary healthcare to cure various diseases and illnesses and have high an economic impact on the world economy [7, 8]. The increasing interest and scope of the drug of natural origin provides opportunities for its exploration, investigation, and utilization for biological activity [9–11] and particularly considered as cancer preventive or anticarcinogenic agents if they show good availability, low toxicity, suitability for oral application, and a vast variety of mechanisms of their action to prevent or at least delay and inhibit multiple types of cancer [12]. Various bioactive compounds from plant extracts have been experimentally tested to expand the clinical knowledge for its biological effects. As such, natural products have provided a continuous source of novel chemical structures in the development of new drugs and approximately 119 pure compounds isolated from plants are being used as medicine throughout the world.

2. Plants as Source of Anticancer Agents

Plants have a long history of use in the treatment of cancer. More than 3000 plant species have been reported to be

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Short communication

Epitaxial zinc oxide, graphene oxide composite thin-films by laser technique for micro-Raman and enhanced field emission study

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Abstract

We made an attempt to form a high quality epitaxial zinc oxide, diamond-like-carbon and graphene oxide composite thin-film on device substrate *p*-Si(1 0 0) using third-harmonic (Nd:YAG Ultraviolet) laser at single footstep. Pulsed laser deposition (PLD) technique using 366 nm (energy ~ 150 mJ), vacuum 10^{-6} mbar has been used to grow these films in reactive gas oxygen with argon (O_2|Ar) ambiance. Synthesized thin-films were investigated systematically by fingerprint technique of confocal micro-Raman and field emission studies. As synthesized pure ZnO, nanocomposite thin films like DLC/ZnO and GO/ZnO shows the enhanced field emission (F-E) performances in this present study.
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Keywords: Transition Metal Oxides; Nanocomposites; Thin-Films; Electrical Properties; Optical Microscopy

1. Introduction

In the past few decades, we have witnessed a reinforcement and subsequent rapid expansion in the research on metal oxides (MOs) like zinc oxide (ZnO) and carbon family as a semiconductor. ZnO nanowire/rod and graphene (carbon) are two of the most widely studied functional nanomaterials; both of them are good candidates for the value added technologically important applications like electrical and optical devices fundamental information [1–6]. Due to the extremely large surface areas and the pseudocapacitance rising from charge transfer between the electrolyte and electrode through fast Faraday redox reaction, ZnO NW are promising in the application of supercapacitors [7–17]. On the other hand, graphene has extremely high electron mobility, excellent rate capability, reversibility, energy storage, bio-medical and high chemical stability; it has improved field emission, electrochemical performance compared with other carbon family materials such as activated carbon, diamond-like carbons (DLC), carbon nanotubes (CNTs), etc [18]. Despite its extraordinary properties, it is worth mentioning that the pure graphene is not worthy for practical functional applications because of its zero band-gap, low carrier density and chemical inertness [19].

However, the application of materials depends significantly on their intrinsic properties. Hybridization of different materials offers a powerful way to enhance the application of graphene by enabling versatile and tailor-made properties with high performance far beyond those of the individual materials. The perfect structure of graphene shows low chemical reactivity, therefore graphene oxide (GO), one of the derivatives of graphene that contains a range of reactive oxygen functional groups, is considered to be a good candidate for chemical functionalization [4–5]. Diverse inorganic nanoparticles MOs such as SnO_2, TiO_2, WO_3, V_2O_5, Fe_2O_4, CdS,

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Full length article

Fault diagnosis of monoblock centrifugal pump using SVM

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ABSTRACT

Monoblock centrifugal pumps are employed in variety of critical engineering applications. Continuous monitoring of such machine component becomes essential in order to reduce the unnecessary break downs. At the outset, vibration based approaches are widely used to carry out the condition monitoring tasks. Particularly fuzzy logic, support vector machine (SVM) and artificial neural networks were employed for continuous monitoring and fault diagnosis. In the present study, the application of SVM algorithm in the field of fault diagnosis and condition monitoring is discussed. The continuous wavelet transforms were calculated for different families and at different levels. The computed transformation coefficients form the feature set for the classification of good and faulty conditions of the components of centrifugal pump. The classification accuracies of different continuous wavelet families at different levels were calculated and compared to find the best wavelet for the fault diagnosis of the monoblock centrifugal pump.

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1. Introduction

As centrifugal pumps play a vital role in many critical applications, the continuous availability of such mechanical components become absolute essential. The pumps are the key elements in waste water treatment plants, food industry, agriculture, oil & gas industry, paper & pulp industry *etc*. In a monoblock centrifugal pump, the performance of bearing and impeller has direct effect on the desired pump characteristics. Faulty bearing, defect on the impeller and cavitation are main sources of many serious problems such as noise, high vibration *etc*. Cavitation can cause more undesirable effects, such as deterioration of the hydraulic performance (drop in head capacity and efficiency), damage of the pump by pitting, erosion and structural vibration. Vibration signals are widely used in condition monitoring of centrifugal pumps. Fault detection is achieved by comparing the signals and the similarities of monoblock centrifugal pump running under normal and faulty conditions. The faults considered in this study are bearing fault (BF), impeller fault (IF), bearing and impeller fault (BFIF) together and cavitation (CAV). In conventional condition monitoring, the vibration analysis is carried out with Fast Fourier Transform (FFT). With the help of seismic or piezoelectric transducers, the level of vibration can be measured. For complex systems involving many components, it is difficult to compute characteristic fault frequencies. Even if characteristic frequencies are available the vibration signals are highly non-stationary in nature and FFT based methods may not be suited for such processes. In the machine learning approach the data acquisition system is used to capture the vibration signals. From the vibration signal relevant features can be extracted and classified using a classifier. The step by step procedure for classification of faults is presented in Fig. 1.

H.Q. Wang et al., (2007) presented a fault diagnosis method for a centrifugal pump with frequency domain symptom parameter by using wavelet transform (feature extraction), rough sets (rule generation) and fuzzy neural network (classification) to detect faults and distinguish fault types at early stages [1].

V. Muralidharan and V. Sugumaran (2012) have reported the comparative performance of Naive Bayes and Bayes net algorithm for monoblock centrifugal pump. This paper mainly deals the flexibility of Bayes algorithm as a classifier [2]. V. Muralidharan, V. Sugumaran and N.R. Sakthivel (2011) proposed the application of SVM classifier for the decomposed wavelet features and also the classification performances. This study deals the decomposition of signals using discrete wavelet transforms [3,10]. Kemal Polat and Salih Gunes (2009) proposed a novel hybrid classification system based on J48 algorithm and one-against-all approach to classify the multi-class problems including dermatology, image segmentation

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Hexamine Assisted Hydrothermal Synthesis of Eu^{3+} Activated $Na_{0.5}La_{0.5}MoO_4$ Microstructures: Synthesis, Structure and Morphological Investigations

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Keywords: Hydrothermal route, hexamine, self-assembly, photoluminescence

Abstract

Highly uniform and self-assembled spheroid-like microstructures of $Na_{0.5}La_{0.5}MoO_4:Eu^{3+}$ were successfully synthesized by hexamine assisted hydrothermal route at 180 °C for 24 hours with neutral pH (7~8). Scanning electron microscope, X-ray diffraction pattern and energy dispersive X-ray analysis were used to characterize the morphology, crystal structure, size, and elements of the particles. It is found that, the particle size was well-controlled by increasing the molar concentration of the chelating agent hexamine. While, irradiating at 395 nm UV light, the emission spectra of micro-spheres shows remarkable characteristic dominance of red emission which is attributed to the transition $^5D_0 \rightarrow {}^7F_2$. Furthermore, the synthesized homogeneous and well-crystallized $Na_{0.5}La_{0.5}MoO_4:Eu^{3+}$ microstructures will serve as an excellent phosphor candidate to produce high-quality luminescence for display devices in future.

1. Introduction

Self-aggregated 3D micro/nanostructures with well controllable size and morphology have attracted and become hot research topic of investigation. In the recent years, momentous advancement has been made in the self-organization of hierarchical architectures for the fabrication of micro/nanostructured materials and devices. Especially, monodispersed and self-organized three dimensional superstructures and their size dependent properties have initiated worldwide intense research due to their potential applications in fluorescent probes for biological staining, high-performance luminescence device, highly efficient catalysts, opto-electronic device, and biomedical applications based on their novel electronic and optical properties [1,2]. For example, Sheaf-like orthorhombic $Gd_2(MoO_4)_3:Eu^{3+}$ nanostructures [3], rugby-like $Na_{0.5}La_{0.5}MoO_4:Eu^{3+}$ micro structures [4], ordered nanorods composed of nanoparticles of $NaLa(MoO_4)_2:Eu^{3+}$ [5], self-assembled 3D flower-like $NaY(MoO_4)_2:Eu^{3+}$ structures [6], etc., Therefore, the development of a reliable and convenient synthetic route that can control the shape of nanostructures under ambient conditions must be important for lighting and display applications. Among the conventional solution based technique, hydrothermal route has lot of advantages which include simplicity, convenience and its being an innovative route to synthesis various micro/nanostructures at a relatively low temperature.

In recent years, lanthanide-doped luminescent micro/nano-sized particles have received much attention for their wide applications on high-resolution displays, integrated optical systems, and substitute for organic dyes, solid-state lasers, and especially biological labels. In particular,

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Immobilization of Cytochrome c on the Cylindrical Mesoporous Silica Extrudates

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Siliceous and aluminum containing C_{12}-MCM-41, C_{16}-MCM-41 and SBA-15 mesoporous molecular sieves were synthesized in the powder (P) form by hydrothermal method. These materials were shaped into cylindrical extrudate (Ex) form by compounding with additives such as bentonite (binder), methyl cellulose and water. The adsorption of cytochrome c (cyt c) onto the extrudates of these mesoporous molecular sieves was studied at different solution pH. It was observed that maximum adsorption was found to be near the isoelectric point (pI) of the protein. The extrudates of SBA-15 showed a maximum amount of cyt c adsorption capacity and this may be due to the high pore volume and large pore diameter compared to other C_{12}-MCM-41(Ex) and C_{16}-MCM-41(Ex). Incorporation of aluminium in to the siliceous material showed maximum adsorption of cyt c compared to pure siliceous materials. The observed consequence may be due to the strong electrostatic interaction between the negative charges on the aluminium sites and positively charged amino acid residues of cyt c.

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Keywords: Mesoporous Materials, Powder, Extrudate, Cytochrome c, Adsorption.

1. INTRODUCTION

Adsorption of enzyme on inorganic matrices is practically an important tool to improve the stability of enzyme under some extreme conditions.[1] Microporous zeolites and zeotype molecular sieves, possessing regular pore structure, have been widely used as industrial adsorbents, but they are not accessible by the large biomolecules such as proteins, enzymes, vitamins and drugs due to their restricted micro pore system. Extensive research has been performed on the immobilization of larger biomolecules on porous supports which find applications as biosensors and biocatalysts.[2–4] However, sol–gels were found to be unsuitable for adsorption of biomolecules due to their variable pore size distribution.[2]

The discovery of a new family of mesoporous silica molecular sieves (M41S) such as MCM-41 and MCM-48 has opened new window in many areas of chemistry and materials science.[5] These mesoporous molecular sieves possess large surface area (up to 1000 m^2 g^{-1}), narrow pore size distribution and high pore volume with the pore diameter in the range of 2 to 10 nm, which made these materials to be one of the most attractive for a wide range of application in adsorption, catalysis, sensor, drug delivery, bio-medical applications and bio-separation processes.[6–12] SBA-15 has uniform tubular channels ranging from 5 to 30 nm.[13] Several research papers have reported the pore structure of SBA-15 and assessed the possibility of tuning the pore diameter.[14] Although mesopores are large enough to accommodate protein molecules, the mesoporous powdered materials obtained from the hydrothermal process, could not be used directly for industrial applications. The fine powder of mesoporous materials is in the particle size range of 1–10 μm and invariably need to be shaped into bodies such as granules, spheres and extrudates (Ex) prior to their use as adsorbents or catalysts in commercial fixed bed reactors and/or adsorption columns, in order to avoid pressure drop and to enhance high mechanical strength.[7,15–17] The preparation of extrudates is usually done by the addition of inorganic binder viz., bentonite, attapulgite, kaolin and organic binders such

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Lag and anticipating synchronization in one way coupled Chua's circuit

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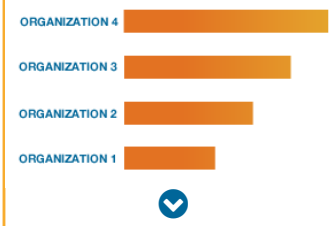

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Laser performance of rhodamine B and methyl violet B base dye mixture in solid and liquid media

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The performance of a distributed feedback dye laser (DFDL) by employing methyl methacrylate (MMA) co-doped with rhodamine B and methyl violet B base dyes was investigated. The dye mixture was incorporated into a solid polymeric matrix and then in a liquid medium and a laser pulse was pumped into it using a 532 nm Nd:YAG laser. Characteristics of energy transfer DFDL and its output powers on various pump powers and acceptor concentration were evaluated both theoretically and experimentally. Slope efficiency of the dye laser as well as wavelength tunability in both liquid and solid media was studied.

Keywords: Amplified spontaneous emission; distributed feedback dye laser; methyl violet B base; rhodamine B.

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1. Introduction

The merits of dye lasers, such as their low cost and high tunability as compared to several multi-wavelength commercial lasers, are well discussed in literature.[1,2] In 1968, soon after the discovery of organic dye lasers, Peterson and Snavelly[3] demonstrated the feasibility of a dye mixture for laser excitation using a flash lamp. For the solid host of laser dyes, several materials have been suggested, such as polymers,[4,5] porous glasses, organically modified silicates, silicate nanocomposites and polycom glass. These solid host materials have high lasing efficiency and photostability[6–13] and also the concentration quenching of dye is effectively reduced when organic molecules are embedded in a rigid matrix.[14,15] A synthetic polymer host for laser dyes has been known to have several advantages, such as compactness, manageability, low toxicity or flammability, and control of flow fluctuations and solvent

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Optical, theoretical and mechanical studies on sodium acid phthalate crystal

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ABSTRACT

The semiorganic crystal of sodium acid phthalate (NaAP) single crystals was grown in the solvent of water by slow evaporation method at room temperature. The single crystal X-ray diffraction studies showed the crystal belongs to orthorhombic system. The optical absorption spectrum reveals that the crystal has good transparency in entire visible region. The hardness number of the material is measured by microhardness tester. The fluorescence green colour emission exhibits is semiorganic. The SHG efficiency of NaAP crystal confirms NLO behaviour of green colour emission to provide frequency doubling process for photo electronic applications.

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1. Introduction

Nonlinear optical materials have attracted many researchers because of its key functions in frequency doubling, optical modulation, optical switching, optical logic, and optical memory for the emerging technologies in the areas such as telecommunications, signal processing and optical interconnections [1]. Organic NLO materials have large nonlinear optical susceptibilities but possess poor mechanical and thermal properties. These difficulties were overcome by semiorganic NLO materials [2]. The title materials of sodium acid phthalate single crystals are semiorganic in nature which is grown by slow evaporation technique at normal room temperature. Although the NaAP was already reported, the crystallization has been improved in the present work. Also, the optical, theoretical and mechanical properties were reported for the first time.

2. Experimental

2.1. Synthesis and crystal growth

The sodium acid phthalate salt was synthesized by analar grade of sodium bicarbonate and phthalic acid at 1:1 ratio dissolved in an aqueous solution using magnetic stirrer which is then filtered by Wattmann filter paper and covered by a plastic sheet with some holes at the top to limit the evaporation and kept in dust free atmosphere, at room temperature. After slow evaporation, the NaAP crystals grown in beaker though they were further purified by repeated recrystallization carried out to minimize the impurities of the raw material. After 10 days of growth, the well transparent with the dimensions $10 \times 8 \times 2\,mm^3$ of NaAP crystals was prepared and is shown in Fig. 1.

3. Characterization studies

3.1. Single crystal X-ray diffraction analysis

The grown NaAP single crystal was subjected to single crystal X-ray diffraction analysis using ENRAF NONIUS CAD-4 single crystal X-ray diffractometer. The determined cell parameters $a = 6.60$ Å, $b = 9.08$ Å, $c = 25.84$ Å; $\alpha = \beta = \gamma = 90^\circ$ and the cell volume $V = 1548$ Å^3 are in close agreement with reported values [3,4]. The grown title crystal belongs to orthorhombic system. The valence electron plasma energy, $\hbar\omega_p$ is given by

$$\hbar\omega_p = 28.8\left(\frac{Z\rho}{M}\right)^{1/2} \quad (1)$$

where $Z = ((8 \times ZC) + (6 \times ZH) + (1 \times ZNa) + (4 \times Zo)) = 63$ is the total number of valence electrons, ρ is the density and M is the molecular weight of the grown crystal. Explicitly $\hbar\omega_p$ dependent Penn gap and the Fermi energy, is given by

$$E_p = \frac{\hbar\omega_p}{(\varepsilon_\infty - 1)^{\frac{1}{2}}} \quad (2)$$

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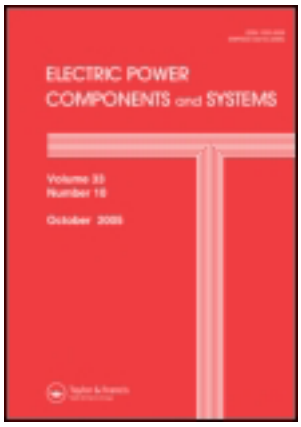

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Optimal Reconfiguration in Radial Distribution System Using Gravitational Search Algorithm

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Photochemically deposited and post annealed copper indium disulphide thin films

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ABSTRACT

Copper indium disulfide (CIS) thin films were deposited using novel photochemical deposition (PCD) technique by selective deposition parameters. In this work CIS film deposition was made by cationic, anionic precursor solution concentration ratio 1:1:2. Na_2EDTA was used as a chelating agent. The as deposited CIS films were post annealed at different temperatures up to 400 °C in vacuum. The as deposited and annealed CIS films were examined to reveal the structural, optical, morphological, compositional and electrical properties by X-ray diffraction, Raman analysis, UV–Vis spectroscopy, Scanning Electron Microscopy, TEM, EDX and Hall effect respectively. From the XRD and Raman studies the Cu–Au ordering was confirmed both in as deposited and annealed films. The crystallite size increases with increasing of annealing temperature and the surface structuring shows rod like microstructure.

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1. Introduction

Energy demand arises due to the needs higher than its production. Hence, we need electrical energy from economical and ecofriendly way. Production of electrical energy from renewable energy

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BIG DATA VISUALISATION IN IMMERSIVE VIRTUAL REALITY ENVIRONMENTS: EMBODIED PHENOMENOLOGICAL PERSPECTIVES TO INTERACTION

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Abstract

Ever-increasing human-computer interactions with various tracking technologies are creating unprecedented amounts of data. The amount and complexity of this 'big data' creates various challenges for its storage, analysis and presentation, but at the same time, big data is suggested to open up opportunities for those who can leverage it. This paper will discuss using immersive virtual reality environments for visualising, interacting and making sense of big data. It reveals that many of the developed applications do not justify their approaches to presentation or interaction. A phenomenological perspective of embodied perception and interaction is discussed to ground future developments.

Keywords:

Human-Computer Interaction, Software Development, Visualisation, Big Data, Immersive Virtual Environment, Phenomenology, Embodiment

1. INTRODUCTION

Several authors have proclaimed that the time of big data is upon us. More ubiquitous mobile devices and applications, social networks, faster Internet speeds, and increasing and free cloud storage generate a digital ecosystem that allow users to generate unprecedented amounts of data [13]. Various forms of sensors and other tracking technologies contribute to the data flux, creating a complex Internet of Things [2]. Everything from mouse clicks, uploaded images, written messages to geographical data are stored in ever-growing databases and waiting to be explored further.

Big data is suggested to provide better insights of human behaviour and the world in general, and to lead to better segmenting of users and decision-making in various sectors of life from business to education. Murdoch and Detsky (2013) proclaimed in the area of healthcare that information is one of the primary inputs of modern industries. Because of this, the application of big data is inevitable, and it has the power to change and improve an industry. In the education sector, data mining and student cognitive modelling has been proposed to predict students' undesired behaviour and performance, assist in better grouping, and in giving automated feedback to both students and instructors [27]. Big data has been argued to give a better overall picture of company's supply chain, and lead to better understanding of customers, new innovations [32], and supply chain optimisation [19]. Dumbill (2012) argued that big data and its potential analytical insights are transferring information systems from the periphery of organisational development to the fore of it. Contemporary organizations are an informational loop where customer interactions with products and services can be analysed and inform further development. Organisations that effectively employ big data managing and analysis methods are suggested to gain a competitive advantage.

Meanwhile, big data poses also practical challenges. How to store, manage, retrieve, analyse and present this fast, varied and ever-increasing amount of data [28]? How to do it faster when for example bandwidth or processing power might be limiting factors? Also the lack of experienced experts and well-established software creates a barrier for the efficient use. Questions in ethics and privacy have also been raised. Some fear big data might be misused to control people [7], or that the underlying assumptions of the usefulness of big data might actually be misleading [8]. Various human contexts have randomness in their interactions. Does it make sense to trust such seemingly imprecise environments? There is potential to draw wrong conclusions as much as right conclusions.

Also, what does it mean when product users become research objects, perhaps sometimes even against their own better judgment [26]? As customers' purchase and interact with various products and services, what are the ethical implications of selling and profiting from customer data? This raises a question of who has access to the data: researchers, private companies or even governments?

Some question the underlying assumptions and the promise of big data, including how it might reinforce existing inequalities in the world. Does its premise, "more is more", reduce the accepted definitions of what is knowledge and valuable research, and have unjustifiably big effect in decision-making? How are big data samples formed and analysed, based on what questions, and how to ensure the data really reflect a certain population? [15], [25].

Varying definitions leave open questions about what exactly is big data. Eg. Dumbill (2012) defined it as,

> …data that exceeds the processing capacity of conventional database systems. The data is too big, moves too fast, or doesn't fit the strictures of your database architectures. To gain value from this data, you must choose an alternative way to process it. [13].

Fosso Wamba et al. (2015) examined big data in the use of state emergency services in New South Wales Australia. From several earlier definitions, they proposed an integrated definition of big data as

> …a holistic approach to manage, process and analyse 5 Vs (i.e. volume, variety, velocity, veracity and value) in order to create actionable insights for sustained value

An *in vitro* study of electroporation of leukemia and cervical cancer cells

Raja Prabu Ramachandran, S. Madhivanan, Raji Sundararajan, Cindy Wan-Ying Lin and Kavitha Sankaranarayanan

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Abstract: Cancer therapies mainly target the uncontrolled proliferation of the cancerous cells. A translational therapy for inoperable, chemo- and radio-resistant tumors is electroporation-based chemotherapy, known as electrochemotherapy, a physical means of using electrical pulses in conjunction with minimal doses of the chemo drug to achieve proliferation control. It is applicable to all histologies of tumors and its efficacy depends on a variety of factors, including the electric field intensity, the pulse duration and the number of pulses. In this chapter, we describe the optimization of pulse parameters for effective electroporation of leukemic and cervical cancer cell lines. Human promyelocytic leukemia (HL60), human acute myeloid leukemia (KG1) and human cervical (ME180) cancer cell lines were subjected to electroporation in the presence of various doses of FDA approved chemo drug, Bleomycin. The effect of curcumin and electroporation is also tested for HL60 cells. The results indicate that by using electroporation, chemo drug molecules could be uploaded into these cells to control proliferation. This promises to be a very useful tool for treating patients suffering from chemo-refractive tumors.

Key words: Leukemia, cervical cancer, HL60 cell line, KG1 cell line, ME180 cell line, Bleomycin, curcumin, dose curve, voltage pulses, viability.

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Synthesis and characterization of Silver Nano rod like Structures by Green Synthesis method using Curcumin Longa

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Abstract: In this study, silver nano-rod like structures were biosynthesized from aqueous silver nitrate ($AgNO_3$) through a simple and eco-friendly route using Turmeric powder extracts, which acted as a reducing agent. Characterizations of nano-Structures were done using different techniques, which included Rutherford Backscattering (RBS), Particle Induced X-Ray Emission (PIXE), Scanning electron microscope (SEM), Energy dispersive Analysis X-ray (EDAX) and Fourier-transform infrared spectroscopy (FTIR).RBS and PIXE were used for elemental and compositional analysis. RBS and PIXE showed the presence of Ag in the sample. SEM confirmed their rod like morphology. Presence of silver ions (Ag+) was revealed with the help of EDAX. The FT-IR spectra were recorded to identify the possible bio molecules responsible for the reduction of the Ag+ ions from aqueous $AgNO_3$Solution.
Key Words: $AgNo_3$, RBS,PIXE, SEM, FT-IR and bio molecules.

Introduction

Metallic Nano materials have gained tremendous interest over past few decades. Amongst these, silver nanostructures have attracted much attention especially due to its antibacterial application[1]. Its broad spectrum of antibacterial and anti-fungicidal activity has made it extremely popular in a diverse range of consumer products, including plastics, soaps, pastes, food and textiles, increasing their market value[1]. Nano silver can be used in liquid form such as colloids in paints and spray or contained in a shampoo and be used in polymer[2-4]. The properties of Nano Silver are directly dependent on its aspect ratio. Many modern methods are being used in developing controlled shape of one dimensional nanostructure such as silver wire[5], silver rod[5], silver Nano disks[6] and silver triangular Nano rings[7]. The hydrothermal process[8], sol gel method[9] are used conventionally. The main disadvantage of these synthetic methods is that they involve hectic procedure, involvement of hazardous chemicals and their yield is relatively very low. Hence there is requirement of ecofriendly bioprocessing protocols for the synthesis of Ag nanostructures. More potential research is carried out to increase yield and to use relatively less toxic or no toxic solvents and also obtain a controlled growth of crystals

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Carbonization of Electrospun Polyimide/*f*-Multiwalled Carbon Nanotubes Nanofiber Webs by RF-Induction Heating

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This study reports carbonization of electrospun polyimide nanofiber webs reinforced with acid-functionalized multiwalled carbon nanotubes, and the effect of carbonization and CNT-reinforcements on their electrical conductivity. Pyromellitic dianhydride (PMDA), 4,4′-Oxydianiline (ODA) and 4,4′-(4,4′-isopropylidene diphenyl-1,1′-diyl dioxy) dianiline (IDDA) were copolymerized in Dimethyl formamide (DMF) solvent to form a viscous poly (amic acid) (PAA) solution. The PAA solutions were prepared with incorporation of acid functionalized MWCNTs (0, 1 and 2 wt%). The PAA solution was electrospun into nanofiber web and was heated up to 300 °C for imidization to form polyimide (PI) nanofiber web. In this study, radio-frequency induction heating method was utilized to carbonize the nanofiber web by heat treatment at 900° and 1000 °C under nitrogen atmosphere and the yield decreased from 54% at 900 °C to 51% at 1000 °C. The carbonized nanofiber (CNF) webs were characterized by Fourier Transform Infrared spectroscopy, Raman spectroscopy, X-ray diffractometer and scanning electron microscopy. The tensile strength of PI/*f*-MWCNT (2 wt%) nanofiber web increased twice of neat PI nanofiber web. The electrical conductivity of CNF webs increased mildly with increasing heat treatment temperature, viz., 2.21 and 2.28 S/cm, for CNF at 900° and 1000 °C respectively. This conductivity increased to 5.73 and 16.90 S/cm for CNF with 1% *f*-MWCNT and CNF 2% *f*-MWCNT at 1000 °C respectively.

Keywords: Polyimide Nanofiber, Radio-Frequency Induction Heating, Carbon Nanofiber, Scanning Electron Microscopy, Electrical Conductivity.

1. INTRODUCTION

Aromatic polyimides have excellent thermal and chemical resistance compared to other polymers. They also have very good mechanical and electrical properties. Because of these properties, polyimides are widely used in thermal insulation, microelectronics and aerospace applications. In general, polyimides are prepared from the precursor poly (amic acid), which is obtained by reacting the monomers of dianhydride and diamine in a polar aprotic solvents such as NMP (*N*-methyl-2-pyrrolidone), DMF (*N*,*N*-dimethyl formamide), DMAc (*N*,*N*-Dimethyl Acetamide).[1–3]

In recent years, polymer nanofibers are widely produced by electrospinning technique, with the fibers having diameters in the range of a few nanometers to several micrometers. The nanofibers are prepared from polymer solutions or melts, and have large surface area and small pores. Because of these advantages, polymer nanofiber webs are used in many fields such as defence, biomedical, textiles, agriculture, and membrane applications. Even though many methods are used to prepare polymer nanofibers such as melt blow spinning, solution blow spinning, wet spinning[4,5] etc., the electrospinning is an easier method and is cost effective.[6–9] Loading of carbon nanotube in polyimide matrix composites has been motivated largely by the increase in electrical conductivity that occurs due to CNT network formation.[10–12] In our past research studies, we have developed polyimide nanofibers with *f*-SWCNT and graphene oxide using electrospinning method.[13,14]

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Cryogenic Treatment of SG Iron for Disc Brake Application

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Abstract

Cryogenic treatment has a good potential to significantly increase the service life of automotive components, where friction and wear are the major factors in their operation leading to failure. Cryogenic treatment changes the surface as well as the core properties of the component in comparison with other treatments. It has significant improvement in wear and toughness. Numerous studies have been conducted on cryogenic treatment of steels and tool steels showing significant improvements in wear resistance, only minimal work has been done in cast irons. In this study, the effect of cryogenic treatment on the wear resistance, hardness, tensile strength, toughness and microstructure of spheroidal graphite iron was assessed. The deep cryogenic treatment was carried out at 87K for 12h and annealed in the chamber itself. The samples were tempered at 473K for 1 h. The hardness, toughness and tensile strength of base material, cryotreated and cryotreated tempered samples were measured using Rockwell hardness, Impact testing machine and Universal testing machine respectively. Wear studies were performed using pin-on-disc wear testing machine with EN 31 steel as the disc. There was a significant increase in hardness, toughness and tensile strength due to cryogenic treatment. The results indicate an improvement in the wear rate of SG iron of 6.1-38.2% due to cryogenic treatment where significant wear has occurred and further improved to 52.9% due to tempering after cryogenic treatment. This finds suitable for disc brake application in automobiles.

Introduction

The term cast iron refers to an alloy of iron containing more than 2.0 percentage of carbon. Ductile iron is one form of cast iron which is ductile and it offers the designer a unique combination of high strength, wear resistance, fatigue resistance, toughness and ductility in addition to good castability, machinability and damping properties. Unfortunately these properties of SG iron are not widely well known because of the misconception about its brittle behaviour [1, 2].

SG iron is an alloy of iron and carbon having nodules or spheroids of graphite embedded in a ferrite-pearlitic matrix. The nodules are compact spheres and are sharp and regular. The graphite occupies about 10-15% of the total material volume and because graphite has negligible tensile strength, the main effect of its presence is to reduce the effective cross-sectional area, which means that ductile iron has tensile strength, modulus of elasticity and impact strength proportionally lower than that of a carbon steel of otherwise similar matrix structure. The matrix may vary from a soft ductile ferritic structure through a hard and higher strength pearlitic structure to a hard higher and comparatively tough martensitic structure. General engineering grades of ductile iron commonly have the structures which are ferritic, ferritic/pearlitic or pearlitic. Controlled processing of the molten iron precipitates graphite as spheroids rather than flakes. The round shape of the graphite eliminates the material's tendency to crack and helps prevent cracks from spreading [3].

Experiments have shown that cryogenic treatment can improve the properties of SG iron. Combining the tensile strength, impact strength, hardness and wear resistance of SG iron it provides a great opportunity to create superior components at reduced cost. The life of the material is increased to many folds with cryogenic treatment [4].

Cryogenic treatment comprises of cooling the material over a period of few hours to the temperature of sub zero range, holding at this temperature for a long time and then returning to room temperature. The process is based on the predetermined thermal cycle that involves cooling of the engineering component/material in a completely controlled cryogenic chamber. The material is slowly cooled to 87 K and soaked at the deep cryogenic temperature for 20 hour. The material is then allowed to slowly return to the ambient temperature. The complete cryogenic cycle would take up to 20-25 hours.

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Crystal structure of 3,9,9-trimethyl-2,3,3a,4,9,9a-hexahydro-1*H*-cyclopenta-[*b*]quinolin-4-ium chloride

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The title molecular salt, $C_{15}H_{22}N^+\cdot Cl^-$, arose as an unexpected product of the reaction between aniline and melanol in the presence of HCl. The central heterocyclic ring has a half-chair conformation and the five-membered ring has an envelope conformation, with the C atom linked to the N atom as the flap. In the crystal, the ions are linked by N—H···Cl hydrogen bonds, generating chains propagating in the [100] direction. The crystal studied was a merohedral twin with a 0.64 (3):0.36 (3) domain ratio.

Keywords: crystal structure; quinoline; N—H···Cl hydrogen bonds.

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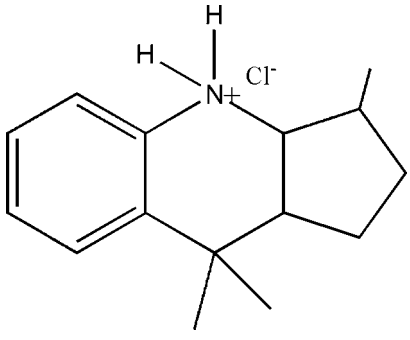
1. Related literature

For biological background, see: Szymański *et al.* (2012). For further synthetic details, see: Alaghaz *et al.* (2014).



2. Experimental

2.1. Crystal data

$C_{15}H_{22}N^+\cdot Cl^-$
M_r = 251.78
Orthorhombic, $P2_12_12_1$
a = 7.0291 (5) Å
b = 10.3313 (8) Å
c = 18.9425 (14) Å
V = 1375.60 (18) Å^3
Z = 4
Mo $K\alpha$ radiation
μ = 0.26 mm^{-1}
T = 298 K
0.35 × 0.30 × 0.30 mm

2.2. Data collection

Oxford Diffraction Xcalibur Sapphire3 diffractometer
7372 measured reflections
3334 independent reflections
3013 reflections with $I > 2\sigma(I)$
R_{int} = 0.028
Standard reflections: 0

2.3. Refinement

$R[F^2 > 2\sigma(F^2)]$ = 0.039
$wR(F^2)$ = 0.123
S = 0.95
3334 reflections
165 parameters
H atoms treated by a mixture of independent and constrained refinement
$\Delta\rho_{max}$ = 0.26 e Å^{-3}
$\Delta\rho_{min}$ = −0.23 e Å^{-3}
Absolute structure: Flack x determined using 1165 quotients $[(I^+)-(I^-)]/[(I^+)+(I^-)]$ (Parsons *et al.*, 2013)
Absolute structure parameter: 0.36 (3)

Table 1
Hydrogen-bond geometry (Å, °).

D—H···A	D—H	H···A	D···A	D—H···A
N1—H1A···Cl1	1.05 (4)	2.07 (4)	3.1201 (19)	173 (3)
N1—H1B···Cl1^{i}	0.93 (3)	2.17 (3)	3.0943 (19)	174 (3)

Symmetry code: (i) $x+\frac{1}{2}, -y+\frac{3}{2}, -z+1$.

Data collection: *CrysAlis PRO* (Oxford Diffraction, 2010); cell refinement: *CrysAlis PRO*; data reduction: *CrysAlis PRO*; program(s) used to solve structure: *SHELXS97* (Sheldrick, 2008); program(s) used to refine structure: *SHELXL2014*/7 (Sheldrick, 2015); molecular graphics: *ORTEP-3 for Windows* (Farrugia, 2012) and *Mercury* (Macrae *et al.*, 2008); software used to prepare material for publication: *SHELXL97* (Sheldrick, 2008).

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Facile Synthesis of Nickel Oxide Nanoparticles using Solvothermal Method and Their implementation in Sensor Applications

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Abstract : In the present study, NiO nanoparticles with average particle size of 35 nm were successfully prepared by solvothermal method. Thecrystal microstructure,composition, morphologyand particle size distribution of product was analyzed by using X-ray diffraction (XRD),Fourier transform infrared spectroscopy (FTIR), scanning electron microscopy (SEM) and EDAX. A sensor for detection of vapors of volatile organic compounds (VOCs) such as ethanol, isopropyl alcohol and acetone is tested using NiO nanoparticles. One of the key features of the sensor is the use of nanostructured NiO material which has been synthesized using a novel low cost process. Considerable reduction in the operating temperature of the sensor has been achieved by using nanostructured NiO material. The maximum sensitivity of sensor was observed for Ethanol.
Keywords : NiO nanoparticles, Solvothermal method, Structural properties, Gas sensors.

1. Introduction

Numerous studies have been conducted to investigate extensively favorable material for metal oxide gas sensor (MOGS) application. This study demonstrated that Nano crystalline nickel oxide provides high sensitivity, low operating temperature and favorable response in gas sensor.

NiO is an interesting P-type semiconductor which has band gap around 3.6 to 3.8eV [1]. It is used as gas sensing material in metal oxide gas sensors and electro chromic material in display devices[2]. There are numerous techniques for synthesis the NiO nanoparticles such as Spray-pyrolysis, Thermal-decomposition, sol-gel techniques[3], Microwave pyrolysis [13], Solvothermal [4]. Among these methods Solvothermal is effective and facile method with low cost technique for synthesis the relatively high specific surface area at low temperature will favor pure transition metal oxide [4]. This Solvothermal method has surmount obstacles posed by high cost special equipment, high purity, low energy consumption and large-scale production [4]. In order to enhance gas sensing properties of the synthesized powder were characterized by XRD, FTIR ,SEM and EDAX techniques to study the structural, optical and electrical properties of the material.The working principle of metal oxide gas sensor is associated with the charge of electrical conductivity due to absorption/desorption of

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RESEARCH ARTICLE

Heterogeneity of Equilibrium Molten Globule State of Cytochrome *c* Induced by Weak Salt Denaturants under Physiological Condition

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Abstract

While many proteins are recognized to undergo folding via intermediate(s), the heterogeneity of equilibrium folding intermediate(s) along the folding pathway is less understood. In our present study, FTIR spectroscopy, far- and near-UV circular dichroism (CD), ANS and tryptophan fluorescence, near IR absorbance spectroscopy and dynamic light scattering (DLS) were used to study the structural and thermodynamic characteristics of the native (N), denatured (D) and intermediate state (X) of goat cytochorme *c* (cyt-*c*) induced by weak salt denaturants (LiBr, LiCl and $LiClO_4$) at pH 6.0 and 25°C. The LiBr-induced denaturation of cyt-*c* measured by Soret absorption ($\Delta\varepsilon_{400}$) and CD ($[\theta]_{409}$), is a three-step process, N ↔ X ↔ D. It is observed that the X state obtained along the denaturation pathway of cyt-*c* possesses common structural and thermodynamic characteristics of the molten globule (MG) state. The MG state of cyt-*c* induced by LiBr is compared for its structural and thermodynamic parameters with those found in other solvent conditions such as LiCl, $LiClO_4$ and acidic pH. Our observations suggest: (1) that the LiBr-induced MG state of cyt-*c* retains the native Met80-Fe(III) axial bond and Trp59-propionate interactions; (2) that LiBr-induced MG state of cyt-*c* is more compact retaining the hydrophobic interactions in comparison to the MG states induced by LiCl, $LiClO_4$ and 0.5 M NaCl at pH 2.0; and (3) that there exists heterogeneity of equilibrium intermediates along the unfolding pathway of cyt-*c* as highly ordered (X1), classical (X2) and disordered (X3), i.e., D ↔ X3 ↔ X2 ↔ X1 ↔ N.

Introduction

The folding from the readily synthesized unfolded protein at ribosome to the native active state is remarkably fast despite the astronomical number of possible conformations available to polypeptides. All the proposed mechanisms for protein folding, i.e., the framework model, the

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Highly Dispersible Graphene Oxide Reinforced Polypyrrole/Polyvinyl alcohol Blend Nanocomposites with High Dielectric Constant and Low Dielectric Loss

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Abstract

In the present study, we report the fabrication and characterizations of flexible dielectric nanocomposites consisting of water soluble polypyrrole (WPPy)/polyvinyl alcohol (PVA)/graphene oxide (GO) at different GO loadings (0.5 - 3 wt %). The WPPy/PVA/GO nanocomposites were characterized using Fourier transform infrared spectroscopy (FTIR), Raman spectroscopy, UV-vis spectroscopy (UV), X-ray diffraction (XRD), thermogravimetric analysis (TGA), polarized optical microscopy (POM), Scanning electron microscopy (SEM) and atomic force microscopy (AFM). FTIR studies indicate the strong chemical interaction between GO and polymer systems. SEM results confirm that GO was homogeneously dispersed within the polymer matrix. The nanocomposites exhibit significant enhancement in the dielectric constant with low dielectric loss values as a function of GO loading which resulted from the fine dispersion of GO in the polymer matrix. The dielectric constant increases from (ε = 27.93, 50 Hz, 150^{o}C) for WPPy/PVA (50/50) blend to (ε = 155.18, 50 Hz, 150^{o}C) for nanocomposites with 3 wt % GO loading and the dielectric loss increases from (tan δ = 2.01, 50 Hz, 150^{o}C) for WPPy/PVA (50/50) blend to (tan δ = 4.71, 50 Hz, 150^{o}C) for nanocomposites with 3 wt % GO loading. Thus, these high-k WPPy/PVA/GO nanocomposites are potential flexible high-performance dielectric materials for electronic devices such as high-frequency capacitors or embedded capacitors.

Key words: high- k materials, nanocomposites, colloidal processing; dielectric properties

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Influence of surface roughness and melt superheat on HDA process to form a tritium permeation barrier on RAFM steel

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HIGHLIGHTS

- Surface modified RAFMS samples were subjected to HDA and thermal oxidation.
- Sample modified by SB process showed better coating and interface morphology.
- Aluminized samples at 740 °C for 2 min showed $Fe_2Al_9Si_2$ intermetallic phase.
- Oxidized samples showed Fe_2Al_8Si, $Fe_2Al_3Si_3$ and $Fe_3Al_2Si_3$ intermetallic phases.
- A uniform permeation barrier Al_2O_3 was formed on the coating of oxidized HDA samples.

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ABSTRACT

The most optimal candidate material for fabrication of Test Blanket Module (TBM) in the installation of ITER and future fusion reactors is Reduced Activation Ferritic Martensitic (RAFM) steel, yet one of the major challenges that need to be addressed with RAFM is minimizing the loss of tritium in a reactor environment through the formation of tritium permeation barrier. One of the most promising methods for the tritium permeation barrier is through duplex coating with Al_2O_3/Fe–Al which is well known to reduce tritium permeation rate by several orders of magnitude. The present work aims to form an alumina layer on RAFM steel by a two-step method, which consists of (i) Hot Dip Aluminizing (HDA) and (ii) conversion of Al into alumina by a subsequent oxidation process. In addition, the influence of surface roughness of the substrate, superheat condition of the Al alloy melt and its composition on microstructural properties of coating before and after oxidation were investigated using OM, SEM–EDS, XRD, indentation micro hardness and scratch test. The experimental results confirmed the formation of alumina layer on RAFM steel after the HDA and oxidation process. Moreover, the surface roughness of the substrate, melt superheat of Al alloy and its composition are found to have a significant influence on the microstructure, thickness, micro-hardness, nature of intermetallic compounds formed and adhesion strength of the coating.

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1. Introduction

India is a participant in the ITER project (International collaborative project to demonstrate sustained fusion reaction in a reactor environment) and would be installing TBM in ITER. Installation of TBM is a crucial step in ITER to demonstrate tritium (fuel for fusion reactor) breeding in a reactor environment. TBM is fabricated using RAFM steel, one of the candidate structural materials for a future fusion reactor. RAFM steel as TBM faces significant issues such as tritium permeation, corrosion due to Pb–Li coolant and Magneto Hydrodynamic effects (MHD), etc. [1,2]. Permeation of tritium through RAFM should be minimized to achieve the maximum yield of tritium produced in the breeder and also to avoid irradiation embrittlement and other

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Investigation of Microstructure, Morphology, Mechanical, and Dielectric Properties of PVA/PbO Nanocomposites

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ABSTRACT: The present article deals with the preparation and characterization of pure and lead oxide (PbO) nanoparticles embedded polyvinyl alcohol (PVA) films by using a colloidal processing technique. PbO nanoparticles were successfully synthesized using the simple precipitation method. Polymer/ceramic-based flexible and self-standing films were obtained and further characterized using various analytical techniques. The mechanical and dielectric properties were also investigated. The Fourier Transform Infrared Spectroscopy (FTIR) results indicate that the structural characterization of PVA is strongly affected by the incorporation of PbO. Thermal analysis results indicate that the thermal stability of the PbO-doped PVA film has improved as compared with the neat PVA film. The mechanical property of nanocomposites has improved significantly due to an increase in filler loadings, indicating that a good interaction exists between PbO nanoparticles and PVA matrix. The dielectric constant of PVA/PbO nanocomposites has significantly improved with comparatively low dielectric loss values, indicating that the nanocomposites can be considered as an attractive material for embedded capacitor applications. © 2015 Wiley Periodicals, Inc. Adv Polym Technol 2015, 00, 21616; View this article online at wileyonlinelibrary.com. DOI 10.1002/adv.21616

KEY WORDS: Atomic Force Microscopy (AFM), Composites, Fillers, Dielectric Properties, Infrared Spectroscopy

Introduction

Polyvinyl alcohol (PVA) is a semicrystalline, water soluble synthetic polymer, which has been predominantly used for various applications because of its easy processing, excellent chemical resistance, and physical properties.[1,2] These properties come from its hydroxyl group. PVA has been used for biomedical and biochemical applications because of its biocompatibility and bioadhesive characteristics.[3–5] The properties such as high water solubility, wide crystallinity range, and high crystal modulus are due to strong hydrogen bonding between hydroxyl groups. PVA has crystalline and amorphous regions, and the physical properties of PVA results from the crystal-amorphous interfacial effect.[6–8] PVA has good film-forming ability and a high density of reactive functional groups, which are favourable for cross-linking via irradiation, thermal, or chemical treatment.[9] PVA films show excellent flexibility and transparency as well as high oxygen and aroma barrier properties. PVA films also have good dielectric strength, good charge storage capacity, and electrical and optical properties, which are filler dependent. In addition, PVA contains a carbon backbone with the hydroxyl group attached to a methane carbon, which acts as a source of hydrogen bonding.[10]

Ceramic nanoparticles have attracted the attention of researchers all over the world not only because of their excellent chemical and physical properties but also because of their potential application in many fields. Lead (Pb) element has a lot of oxide forms including PbO, PbO_2 (α, β, and amorphous), Pb_2O_3, and Pb_3O_4.[11] PbO consists of two polymorphic forms having a wide band gap: α-PbO, a red tetragonal phase is stable at low temperature, and β-PbO, a yellow orthorhombic phase that is stable at high temperature.[12] Owing to their unique properties, lead oxides (PbOs) have widespread applications in

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ORIGINAL PAPER

The response of Ω-loop D dynamics to truncation of trimethyllysine 72 of yeast iso-1-cytochrome *c* depends on the nature of loop deformation

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Abstract Trimethyllysine 72 (tmK72) has been suggested to play a role in sterically constraining the heme crevice dynamics of yeast iso-1-cytochrome *c* mediated by the Ω-loop D cooperative substructure (residues 70–85). A tmK72A mutation causes a gain in peroxidase activity, a function of cytochrome *c* that is important early in apoptosis. More than one higher energy state is accessible for the Ω-loop D substructure via tier 0 dynamics. Two of these are alkaline conformers mediated by Lys73 and Lys79. In the current work, the effect of the tmK72A mutation on the thermodynamic and kinetic properties of wild-type iso-1-cytochrome *c* (yWT versus WT*) and on variants carrying a K73H mutation (yWT/K73H versus WT*/K73H) is studied. Whereas the tmK72A mutation confers increased peroxidase activity in wild-type yeast iso-1-cytochrome *c* and increased dynamics for formation of a previously studied His79-heme alkaline conformer, the tmK72A mutation speeds return of the His73-heme alkaline conformer to the native state through destabilization of the His73-heme alkaline conformer relative to the native conformer. These opposing behaviors demonstrate that the response of the dynamics of a protein substructure to mutation depends on the nature of the perturbation to the substructure. For a protein substructure which mediates more than one function of a protein through multiple non-native structures, a mutation could change the partitioning between these functions. The current results suggest that the tier 0 dynamics of Ω-loop D that mediates peroxidase activity has similarities to the tier 0 dynamics required to form the His79-heme alkaline conformer.

Keywords Cooperative substructure dynamics · Cytochrome *c* · Alkaline conformational transition · Conformationally gated electron transfer · Apoptosis

Abbreviations

ET	Electron transfer
gated ET	Conformationally gated electron transfer
GdnHCl	Guanidine hydrochloride
iso-1-Cyt*c*	Iso-1-cytochrome *c*
tmK	Trimethyllysine

Introduction

Tier 0 dynamics, which involves interconverison between conformers separated by a thermal barrier, is particularly important in protein function, often controlling access to functionally active conformers [1]. A detailed understanding of the structural factors that control tier 0 dynamics and thus the function of proteins is essential. Cytochrome *c* (Cyt*c*) has long been a protein of interest due to both its

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Article

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Tuning the Magnetic Properties of Iron Oxide Nanoparticles by a Room-Temperature Air-Atmosphere (RTAA) Co-Precipitation Method

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The ability of a room-temperature air-atmosphere (RTAA) co-precipitation method to tune the magnetic properties of iron oxide nanoparticles was investigated. It was demonstrated that superparamagnetic nanoparticles with different particle sizes ranging from 7 to 25 nm and magnetic properties with saturation magnetization between 2 to 75 emu g^{-1} can be synthesized by simply controlling the molar ratio of ferrous to ferric ions and the concentration of ammonium solution, without heat treatment or oxygen-level control. It was revealed that the tuning of the magnetic properties was associated with the compositional control between magnetite and maghemite. Ammonium concentration was also an important factor to obtain dispersed superparamagnetic (SPM) or ferrimagnetic (FM) nanoparticles.

Keywords: Magnetically Ordered Materials, Nanostructured Materials, Chemical Synthesis, Magentization.

1. INTRODUCTION

Superparamagnetic (SPM) and ferrimagnetic (FM) nanoparticles have many applications including magnetic drug targeting and cell separation. Depending on the specific needs for the applications, it is necessary to tune the magnetic properties of the nanoparticles. In particular, synthesizing uniform sized nanoparticles with tunable magnetization is very essential for targeted drug delivery and MRI contrast agents.[1,2] Among many magnetic materials, the most commonly used materials in nanoparticulate forms are magnetite (Fe_3O_4) and maghemite (γ-Fe_2O_3), due to their ease of synthesis and high saturation magnetization values.

In the past, iron oxide nanoparticles have been synthesized using a number of techniques[3,4] such as solvothermal,[5,6] chemical co-precipitation,[7–12] reverse precipitation,[13] sonochemical,[14] mechanochemical,[15] and electrochemical methods.[16] Among these approaches, chemical co-precipitation is particularly attractive because of its simplicity. However, in order for the method to become a low-cost production process at the industrial scale, the ability of this technique to control the composition, size, and magnetic properties of nanoparticles has to be demonstrated at room temperature and in an air atmosphere. In the last decade, many attempts were made to co-precipitate iron oxide nanoparticle from a solution containing ferrous (Fe^{2+}) and ferric (Fe^{3+}) ions under different conditions.[17–25] Although a few of them were carried out at room temperature under an air atmosphere,[14,26–28] the factors that influence the size and magnetic properties of nanoparticle during co-precipitation have not yet been fully investigated.

Past studies have indicated that the important variables determining the composition, size, and magnetic properties of iron oxide nanocomposites in a co-precipitation process are the molar ratio of ferrous to ferric ions, total concentration of iron ions, and pH. In particular, the molar ratio of Fe^{2+} to Fe^{3+} ions is considered important. In Fe_3O_4,

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Article

Comparative evaluation of the tribological properties of low-and medium-carbon steels after heat treatment and severe plastic deformation

December 2015

V. I. Semenov · L.Sh. Shuster · Song-Jeng Huang · Show all 6 authors · V.G. Shibakov

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Abstract

The paper presents the results of a comparative tribological study of structural steels with a carbon content of 0.1% and 0.45%. The following thee conditions are studied: Initial (hot rolled), after heat treatment (improvement) and after improvement with subsequent severe plastic deformation (SPD) processing by equal-channel angular pressing (ECAP). It is established that the materials after different types of processing have different structural states, and demonstrate different shear strength of adhesive bonds and adhesion (molecular) components of the friction coefficient in contact with the tool steel of the R18 type. At the same time, it is revealed that the greatest effect of hardening due to microstructure refinement is observed on the specimens of low-carbon steel. Medium-carbon steel after SPD processing has approximately the same tribological properties as after heat treatment.

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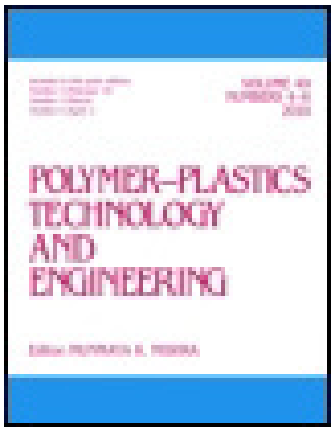

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Influence of K_2CrO_4 Doping on the Structural, Optical and Dielectric Properties of Polyvinyl alcohol/K_2CrO_4 Composite Films

Kalim Deshmukh[a], M. Basheer Ahamed[a], R. R. Deshmukh[b], Pundlik R. Bhagat[c], S. K. Khadeer Pasha[d], Aditya Bhagat[e], Rutwesh Shirbhate[e], Fastin Telare[e] & Chirag Lakhani[f]

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An Effective Assessment of Knowledge Sharing and E-Learning Portals

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ABSTRACT

In recent years, most of the companies have increasingly realized the importance of the knowledge sharing portal and E-Learning portals to provide competitive knowledge for their employees. The knowledge stored in these portals varies from technical, process and project knowledge functional or domain specific knowledge to face the competitiveness among other companies or organizations, especially in industrialized countries. More than three-fourths of organizations have focused on their investment in technology and process trends that encourage user collaboration through Knowledge sharing and e-Learning Portals. There are many number of challenges in evaluating the effectiveness of the E-Learning Portals and Knowledge Portals. The primary goal of this paper is to illustrate how a domain independent multi-dimensional metric model and metric database can be built to assess the effectiveness of the Web Based Knowledge and E-Learning Portals.

Keywords: E-Learning Portal, Effectiveness, Evaluation, Knowledge Sharing Portal, Metric Database, Multi-dimensional Model, Ranking, Rating

INTRODUCTION

Knowledge is defined that all that has been perceived or grasped by the mind; learning; enlightenment and also body of the facts and principles accumulated by mankind. Evaluation of the capabilities and effectiveness of the Web based E-Learning and Knowledge Portals is a challenging process. Based on many research works in this area, it has been identified that there are no proven reliable methods and metrics available to estimate the worth of the KM Systems (Kankanhalli & B.C.Y.Tan, 2005). So it is important to either enhance or develop new metrics, evaluation models. As the number of online users grows, it is important that the

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Design, Analysis and Performance Evaluation of Fractional Order Proportional Integral for Three Interacting Tank Process in Frequency Domain considered as Third Order System

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Abstract: Conventional Integer order Proportional Integral Derivative (IOPID) are the workhorse for the control of almost 90% of the Industrial processes due to its structural simplicity. With the application of fractional calculus in the field of control engineering, Fractional Order (FO) PID controllers are gaining popularity since it requires a slight modification of the integer order PID controller. Tuning of the Integer Order PID controller parameters are by well known techniques like Ziegler Nichols method, Cohen Coon Method, etc mostly time domain based and few frequency techniques are also available. In the present research work, an attempt has been made to tune the FOPI controller using Frequency domain specifications. Frequency domain specifications considered for the design includes the Phase Margin specification, Gain crossover frequency specification and robustness to gain variations. The proposed control schemes are applied to three interacting tank process represented as third order system and verified under servo, regulatory, servo-regulatory response and robustness conditions. Comparison of the time domain performance indices are performed to guarantee the superiority of the proposed scheme.

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Keywords: Fractional Order PI controller, Three Interacting Tank Process, Robustness to gain variations

1. INTRODUCTION

The control of liquid level in tanks and flow between tanks is a basic problem in the process industries. In many such cases the liquids are stored in one tank then sent to another tanks in a controlled manner. Often the tanks are so coupled together that the levels interact and this must be also controlled. It is well known fact that level and flow control in tanks are the heart of all chemical engineering systems. Thus the control in optimal way of these parameters in process industries also proves to be very beneficent from economic point of view. Petrochemical industries, pharmaceutical industries, food and beverages industries involves interacting tanks in series for their operations. Interacting tanks in series are higher order processes and mildly nonlinear in nature. Fractional calculus, the non-integer order involves arbitrary real or complex order integrals and derivatives. In recent past, fractional calculus has found widespread applications in the field of science and technology [1-5]. At present the second case IO (Integer order) plant with FO (fractional order) controller is realized for the three tank interacting system. Intuitively, with non-integer order controllers for integer order plants, there are more flexibility in adjusting the gain and phase characteristics than using IO controllers. These flexibilities make FO control a powerful tool in designing control system in both time and frequency domain. The $PI^{\lambda}D^{\mu}$ controller is the extension of conventional Integer order PID controller involving two more parameters μ and λ.

Two special cases of $PI^{\lambda}D^{\mu}$ controller are PI^{λ} controller [6] and PD^{μ} controller [7,8]. Parameter tuning are by either analytical method, which involves calculation of the parameters considering frequency domain specifications, such as phase margin, gain cross over frequency and robustness to the gain variation [9] or graphical method which involves plotting the stabilizing boundary curves in the parameter space of the controller [10]. Fractional MIGO based tuning rule for FOPI controller which used reduced order models of higher order process to take a First Order Plus Dead Time (FOPDT) form only, which is not sufficient to describe the complex dynamic behaviour of the real world problem [11]. From specified phase margin (ϕ_m), gain cross-over frequency (ω_{gc}) and robustness criteria, a tuning methodology for FOPI/FOPD controllers for controlling integer order systems have been discussed[12, 13]. A set of tuning rules is presented [14] for integer-order PID and fractional-order PID controllers for FOPDT model for minimum integral absolute error with minimum sensitivity constraint. Two schemes of fractional order proportional integral controllers for a class of fractional order systems [15] is discussed. A method to design classical PID controllers (with proper derivative action) for a class of fractional order plants with time delays is developed [16]. To achieve the desired specifications of a gain and phase margins for plants with time-delay that stabilized with FO-PID controller a lead compensator is designed [17].

Section 2 discusses about the information regarding three interacting tank process, mathematical modeling, state space formulation and computation of transfer function. Section 3 elaborates the design of FOPI controller considering frequency domain specification. Section 4 deals with analysis of the proposed FOPI controller for three interacting tank process considered as third order system followed by the conclusion.

2. Three Interacting Tank Process Description

The hydraulic system considered consists of three identical cylindrical tanks with equal cross-sectional area (A). These three tanks are connected by two cylindrical pipes of the same cross sectional area (α). The process liquid is pumped to the first interacting tank from the sump by pump-1 through the control valve-1 and the input flow to the first

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Directed Firefly algorithm for multimodal problems

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***Abstract*—Firefly Algorithm (FFA) is very recently introduced one of the Swarm Intelligence (SI) algorithms, developed by the inspiration from flashing light characteristics of fireflies. This algorithm assumes each firefly as potential solutions and brightness associated with them depends on their performance over optimizing problem. The Swarm of firefly get attracted towards the goal by following the brighter firefly and if no such firefly is found, they will move randomly. The basic FFA algorithm follows classical update strategy of attraction and movement of the swarm. This strategy may not produce good quality of results and seems to converge prematurely. The basic movement strategy of firefly may be modified and searching quality of FFA can be improved. This paper proposes novel fireflys movement update strategy. The basic FFA algorithm move the firefly randomly if brighter firefly is not found, this flaw is attended in this paper and thus proposed Directed Firefly Algorithm (DFA). The DFA directs the randomly moving firefly to search around the brightest firefly in the current iteration. To preserve the diversity and avoid premature convergence, the directing strategy is followed at certain refresh rate. The complete performance comparisons of the proposed algorithm are validated against various SI algorithms over standard test cases. The test suite comprises of complex, multimodal and scalable optimization problems, whose dimensions are varied form 10, 30 and 50. The proposed strategy has remarkably improved the quality of solution and convergence rate of proposed algorithm.**

***Keywords*—Global optimization, Firefly Algorithm, Multimodal, Robustness, Swarm Intelligence.**

I. Introduction

Optimization is a field that is invariably used in decision making by almost all the domains of human life including science and engineering. The circumstances and requirement in decision making has increased the complexity of the optimization problems, most of them may be classified as multimodal. This gives rise to a specialised optimization field called global optimization. Since optimization methods like simplex programming and derivative based methods [1], [2], [3] fails to make accurate decisions on such global optimization problems, hence alternative methods like Metaheuristics and Swarm Intelligence (SI) algorithms are preferred [4]. To address the increasing complexity in decision making, many SI algorithms have been developed in the literature like, algorithms based on honey bee's nectar searching characteristics [5], [6], based on egg laying characteristics of Cuckoo species [7], based on light flashing characteristics of fireflies [8] and based on food foraging behaviour of birds and its variants [9], [10], [11], [12]. The prey hunting of grey wolves are mimicked in Grey Wolf Optimizer (GWO) [13]. The cooperative searching characteristic is mimicked for solving global optimization problems [14]. There are many application where these algorithms are widely used as shown in [15], [16].

Very recently introduced SI algorithm is the Firefly algorithm (FFA) [8]. The basic motivation behind FFA algorithm is flashing characteristics of fireflies. Most of the basic SI algorithms including FFA, shows premature convergence and non-feasible solutions on complex multimodal global optimization problems. The FFA algorithm treats the position of every firefly as a possible solution. Every firefly is distinguished by itś brightness and it depends on how well they perform while optimizing a problem. The movement of the firefly is governed by the attraction of fireflies to the more brighter firefly. The attraction among the fireflies depends on their brightness. The less brighter firefly moves close to the more brighter one [8]. The attractiveness among swarm is proportional to the brightness and it is the function of distance between them. Thus the fireflies will alter their flight depending upon the brighter firefly and if no such firefly is found, they will move randomly. This random movement adds to more computation efforts as randomly moving firefly may be initialized anywhere in the entire search space and takes more time to converge to solution. This may further lead to premature convergence and non-feasible solution.

To improve the performance of basic FFA algorithm on complex environment, this paper proposes novel fireflys movement update strategy. The proposed modified strategy directs and forces the randomly moving firefly to search around the brightest firefly in the current iteration. Thus the proposed algorithm with modified strategy is called Directed Firefly Algorithm (DFA). To maintain the diversity nature in swarm and to overcome premature convergence, the directing strategy is followed at certain refresh rate. This strategy has remarkably improved the quality of solution. The proposed DFA algorithm is well tested for its performance against the state of the art algorithms over a wide range of complex benchmark problems chosen from [17]. Since the chosen problems are scalable in dimension, hence the dimension are set to 10, 30 and 50 for fair comparison. The results are recorded and used for comparison.

The paper is organized as follows: Section II briefly describes the FFA algorithm. Section III describes the proposed DFA algorithm. Section IV gives simulation setup used for performance comparison. Section V describes the simulation results followed by conclusions in Section VI.

II. Firefly algorithm

The Firefly algorithm (FFA) is one of the recently introduced SI algorithm in 2009 by Xin-She Yang in [8].

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Activities in collaboration with University of Malaya, Malaysia

Dr. S. Hemalatha collaborates with Dr. Tengku Ain Kamalden, Dr. Nurlisa k, University of Malaya, Malaysia, for research

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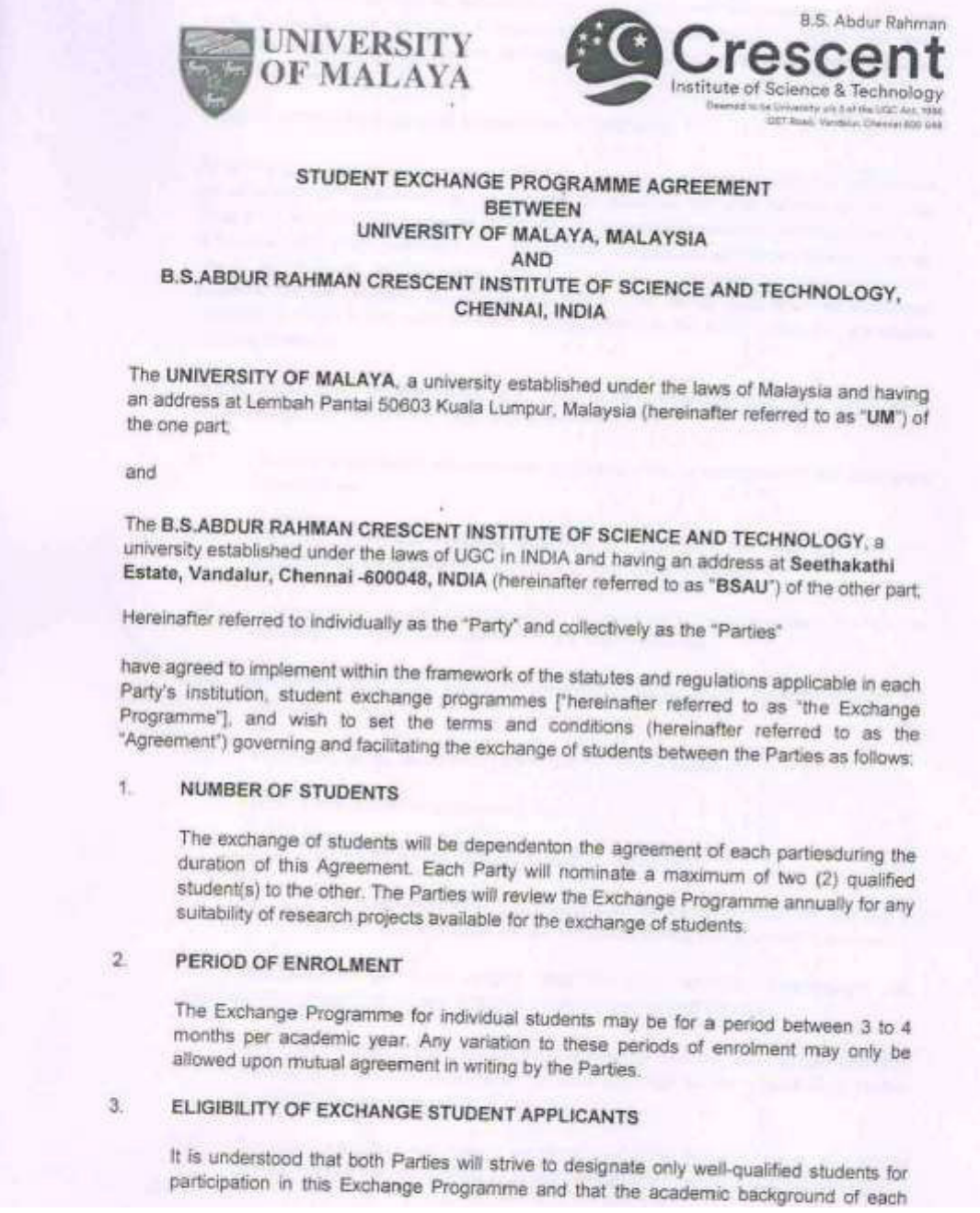

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B.S. Abdur Rahman Crescent Institute of Science & Technology

STUDENT EXCHANGE PROGRAMME AGREEMENT
BETWEEN
UNIVERSITY OF MALAYA, MALAYSIA
AND
B.S.ABDUR RAHMAN CRESCENT INSTITUTE OF SCIENCE AND TECHNOLOGY, CHENNAI, INDIA

The **UNIVERSITY OF MALAYA**, a university established under the laws of Malaysia and having an address at Lembah Pantai 50603 Kuala Lumpur, Malaysia (hereinafter referred to as "**UM**") of the one part;

and

The **B.S.ABDUR RAHMAN CRESCENT INSTITUTE OF SCIENCE AND TECHNOLOGY**, a university established under the laws of UGC in INDIA and having an address at **Seethakathi Estate, Vandalur, Chennai -600048, INDIA** (hereinafter referred to as "**BSAU**") of the other part;

Hereinafter referred to individually as the "Party" and collectively as the "Parties"

have agreed to implement within the framework of the statutes and regulations applicable in each Party's institution, student exchange programmes ["hereinafter referred to as "the Exchange Programme"], and wish to set the terms and conditions (hereinafter referred to as the "Agreement") governing and facilitating the exchange of students between the Parties as follows:

1. **NUMBER OF STUDENTS**

The exchange of students will be dependenton the agreement of each partiesduring the duration of this Agreement. Each Party will nominate a maximum of two (2) qualified student(s) to the other. The Parties will review the Exchange Programme annually for any suitability of research projects available for the exchange of students.

2. **PERIOD OF ENROLMENT**

The Exchange Programme for individual students may be for a period between 3 to 4 months per academic year. Any variation to these periods of enrolment may only be allowed upon mutual agreement in writing by the Parties.

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Invitation to deliver a talk in international conference

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07/02/2015

From

Dr. S. Hemalatha
Organizing Secretary, ICDB-2015
Dean, School of Life Sciences
B. S. Abdur Rahman University,
Vandalur, Chennai – 600 048.

To

Dr. Tengku Ain Fathlun Tengku Kamalden
Head, UM Eye Research Center (UMERC)
Department of Ophthalmology, Faculty of Medicine
University of Malaya, 50603 Kuala Lumpur, Malaysia
tafkamalden@gmail.com]

Dear Dr. Kamalden,

Sub: Invitation to deliver invited talk in International conference on Recent discoveries of diabetic biomarkers and challenges ahead, to be held on March 2-3, 2015 at B.S.Abdur Rahman University, Chennai, India-reg.

As the school of life Sciences is planning to organize International conference on Recent discoveries of diabetic biomarkers and challenges ahead on March 2-3, 2015 at B.S.Abdur Rahman University, Chennai, India, I invite you to deliver invited talk during the conference. I am glad to inform that local hospitality will be provided by the university during your visit.

Thank you for delivering the lecture during the conference and kindly confirm your participation in the conference.

Yours Sincerely,

Dr. S. Hemalatha

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07/02/2015

From

Dr. S. Hemalatha
Organizing Secretary, ICDB-2015
Dean, School of Life Sciences
B. S. Abdur Rahman University,
Vandalur, Chennai – 600 048.

To

Dr. Nurliza Khaliddin
Associate Professor in Ophthalmology,
Department of Ophthalmology, Faculty of Medicine
University of Malaya, 50603 Kuala Lumpur, Malaysia
nurlizakhaliddin@gmail.com

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S. Hemalatha

Dr. S. Hemalatha

Dr. V. MURUGESAN
Registrar

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A MUSLIM MINORITY INSTITUTION

LR.NO.03:REG-BSAU:2015 DATE: 13.01.2015

To

Dr. Tengku Ain Fathlun Tengku Kamalden
Head, UM Eye Research Center (UMERC)
Department of Ophthalmology, Faculty of Medicine
University of Malaya, 50603 Kuala Lumpur, Malaysia
tafkamalden@gmail.com

Dear Dr. Kamalden,

Sub: Invitation to deliver invited talk in International conference on "Recent discoveries ..... ahead" to be held on March 2-3, 2015 at B.S. Abdur Rahman University, Chennai, India - Reg.

****

The school of life Sciences is planning to organize an International conference on "Recent discoveries of diabetic biomarkers and challenges ahead" during March 2-3, 2015 at B.S. Abdur Rahman University, Chennai, India. I am pleased to invite you to deliver an invited talk in the conference. I am glad to inform that local hospitality will be provided by the University during your visit.

Thanking in anticipation of your consent. Kindly confirm your participation in the conference.

Yours Sincerely,

13/1

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LR.NO.02:REG-BSAU:2015 **DATE: 13.01.2015**

To

Dr. Nurliza Khaliddin
Associate Professor in Ophthalmology,
Department of Ophthalmology, Faculty of Medicine
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International Conference

International Conference on Recent discoveries of Diabetic biomarkers and challenges ahead (1CDB2015), Sponsored by ICMR and DST-SERB was organized on March 2-3, 2015

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Volume 16, Issue 2, July 2015, Pages 167-174

ORIGINAL ARTICLE

Energy efficient distributed cluster head scheduling scheme for two tiered wireless sensor network

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Abstract

Wireless Sensor Network (WSN) provides a significant contribution in the emerging fields such as ambient intelligence and ubiquitous computing. In WSN, optimization and load balancing of network resources are critical concern to provide the intelligence for long duration. Since clustering the sensor nodes can significantly enhance overall system scalability and energy efficiency this paper presents a distributed cluster head scheduling (DCHS) algorithm to achieve the network longevity in WSN. The major novelty of this work is that the network is divided into primary and secondary tiers based on received signal strength indication of sensor nodes from the base station. The proposed DCHS supports for two tier WSN architecture and gives suggestion to elect the cluster head nodes and gateway nodes for both primary and secondary

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Free Radical Mediated Oxidative Decarboxylation of L-Proline by Peroxomonosulphate in Neutral Medium-Catalytic Effect of Copper (II)

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Department of Chemistry, B.S. Abdur Rahman University, Vandalur, Chennai-48, India

Abstract: Kinetics and mechanism of copper (II) catalyzed and uncatalyzed oxidation of L-proline by peroxomonosulphate (PMS) in neutral medium (phosphate buffer, pH 6-8) was studied at 278K. The reaction proceeded through free radical pathway which was confirmed by the non oxidation of L-proline methyl ester by PMS at this condition. Variation of ionic strength had negligible effect on the rate of the reaction which ruled out the interaction between carboxylate group of L-proline with SO_5^{2-} of PMS. The initial step was the removal of CO_2 and formation of carbon free radical which on hydrolysis lead to the formation of the product 4-aminobutanal which was confirmed by IR and Mass spectral studies.
Keywords: L-Proline, PMS, copper (II) catalysis, free radical intermediate.

1. Introduction

Amino acids are one of the natural compounds which contribute an important role both as building blocks of proteins and as intermediates in metabolism. They are useful for the human nervous system, hormone production, and muscular structure aside from playing an important role in protein and enzyme synthesis. The unique structure of L-proline restricts the conformations that it can adopt within a peptide or protein, giving it a unique role in the secondary and tertiary structures of L-proline-containing proteins [1]. Proline is reported to be the world's smallest natural enzyme, and plays a binding role in collagen, which has high proline content [2]. From this biological point of view, L-proline, which is mostly present in the human body, also plays an important role in mimicking the biological reaction in our body because of their selectivity towards oxidants [3].

Peroxomonosulphate (PMS) is an inexpensive, eco-friendly oxidizing agent when compared with other oxidizing agents [4-8] due to its easy tendency to transfer oxygen. It is used to oxidize both inorganic [9], organic [10-12] and waste water [13-17]. Transition metal ion catalyzed oxidation of amino acids have been carried either in acetic medium [18-20] or alkaline medium [21, 22]. Copper complexes have occupied a major place in oxidation chemistry because of their abundance and relevance in biological chemistry [23,24].Hence, the present work is focused on the effect of Cu (II) in the oxidation of L-proline with PMS in neutral medium (phosphate buffer, pH 6-8) at 278K.

2. Experimental

2.1. Materials and methods

L-proline was obtained from Merck, India, and used as received. PMS was obtained from Aldrich, USA in the form of triple salt $2KHSO_5.KHSO_4.K_2SO_4$ (oxone) and the purity of the sample was found to be 98% when tested by iodometric estimation [25]. A fresh solution of PMS was prepared every time before starting the

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Green Synthesis and Characterization of Silver Nanoparticles using Aqueous Whole Plant Extract of *Vernonia cinerea L. a*nd its Biological Activities

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Abstract

The present investigation deals with the biosynthesis and characterization of silver nanoparticles using aqueous extract of whole plant *Vernonia cinerea L* and its antioxidant and antimicrobial activities.Parameters like concentration of reactants Silver Nitrate and whole plant extract was standardized to produce silver nano particles at 50°C.The maximum synthesis of AgNP was obtained in 5% plant extract, pH 6 and 1mM $AgNO_3$ within 1 hour at 50°C. AgNP's were characterized by using UV-Visible Spectroscopy, Thermo gravimetric analysis , Scanning Electron Microscopy and Fourier Transform Infrared spectroscopy .The synthesized AgNP exhibited hydroxyl free radical scavenging and reducing power activity. The synthesized AgNP exhibited antibacterial activity against pathogenic bacteria *Staphylococcus aureus* and *Escherichia coli* which was analysed by Disc diffusion method. The silver nanoparticles isolated from *V.cinerea* showed potent antifungal activity against *Candida albicans* and *Penicillium notatum* when compared to the plant extract.

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Keywords: Vernonia cinerea L; Silver Nanoparticles; UV-Visible Spectroscopy; Antioxidant activity; Antimicrobial activity.

1. Inroduction

Nanobiotechnology is defined as a field that applies the nanoscale principles and techniques to understand and transform bio-systems, which uses biological principles and materials to create new devices and systems integrated from nanoscale (Gericke et al, 2006).

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NASA/ADS

Surface modification of cadmium sulfide thin film honey comb nanostructures: Effect of in situ tin doping using chemical bath deposition ()

Wilson, K. C. (/search/?q=author%3A%22Wilson%2C+K.+C.%22);
Basheer Ahamed, M. (/search/?q=author%3A%22Basheer+Ahamed%2C+M.%22)

Even though nanostructures possess large surface to volume ratio compared to their thin film counterpart, the complicated procedure that demands for the deposition on a substrate kept them back foot in device fabrication techniques. In this work, a honey comb like cadmium sulfide (CdS) thin films nanostructure are deposited on glass substrates using simple chemical bath deposition technique at 65 °C. Energy band gaps, film thickness and shell size of the honey comb nanostructures are successfully controlled using tin (Sn) doping and number of shells per unit area is found to be maximum for 5% Sn doped (in the reaction mixture) sample. X-ray diffraction and optical absorption analysis showed that cadmium sulfide and cadmium hydroxide coexist in the samples. TEM measurements showed that CdS nanostructures are embedded in cadmium hydroxide just like "plum pudding". Persistent photoconductivity measurements of the samples are also carried out. The decay constants found to be increased with increases in Sn doping.

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Keywords:
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Mitochondrial miRNA (MitomiR): a new player in cardiovascular health.

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Abstract

Cardiovascular disease is one of the major causes of human morbidity and mortality in the world. MicroRNAs (miRNAs) are small RNAs that regulate gene expression and are known to be involved in the pathogenesis of heart diseases, but the translocation phenomenon and the mode of action in mitochondria are largely unknown. Recent mitochondrial proteome analysis unveiled at least 2000 proteins, of which only 13 are made by the mitochondrial genome. There are numerous studies demonstrating the translocation of proteins into the mitochondria and also translocation of ribosomal RNA (viz., 5S rRNA) into mitochondria. Recent studies have suggested that miRNAs contain sequence elements that affect their subcellular localization, particularly nuclear localization. If there are sequence elements that direct miRNAs to the nucleus, it is also possible that similar sequence elements exist to direct miRNAs to the mitochondria. In this review we have summarized most of the miRNAs that have been shown to play an important role in mitochondrial function, either by regulating mitochondrial genes or by regulating nuclear genes that are known to influence mitochondrial function. While the focus of this review is cardiovascular diseases, we also illustrate the role of mitochondrial miRNA (MitomiR) in the initiation and progression of various diseases, including cardiovascular diseases, metabolic diseases, and cancer. Our goal here is to summarize the miRNAs that are localized to the mitochondrial fraction of cells, and how these miRNAs modulate cardiovascular health.

KEYWORDS: ARN non codant; MitomiR; cardiovascular diseases; maladies cardiovasculaires; miARN; miRNA; mitochondria; mitochondrie; non-coding RNA

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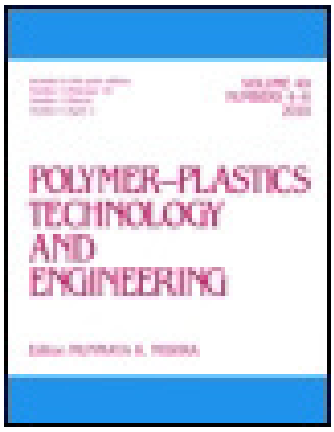

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Morphology, Ionic Conductivity and Impedance Spectroscopy Studies of Graphene Oxide Filled Polyvinylchloride (PVC) Nanocomposites

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Praise Worthy Prize

International Review of Mechanical Engineering (IREME)

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Numerical Investigation on Airflow Distribution of Automotive Radiator

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Abstract

In automobiles due to styling and packaging constraints there are several blockages in the upstream and downstream direction of radiator, which interrupts the uniform airflow distribution. However, airflow distribution on the radiator face plays a key role in improving its effectiveness. The objective of this work is to analyze the impact of airflow distribution and uniformity index with different types of blockages ahead of the radiator using Computational Fluid Dynamics (CFD) tool. Four different geometry blockages are considered for this study and analyzed further to arrive at the better Uniformity index. The different blockage geometries considered are horizontal, vertical, side to side and side to center. It is observed that side to side geometry blockage gives poor velocity distribution compared to others. Also CFD model is validated with experimental result and good agreement has been observed between predicted and measured velocity pattern over the radiator. In addition to this, a statistical study is conducted to analyze the influence of various parameters like fan speed and ram air speed along with types of blockage on the uniformity index. It is observed that, type of blockage have the significant impact on the uniformity index. The interpretations of this work can serve as a design guideline for the thermal system and styling engineers of automotive domain.

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Optical and spectral studies on pure and europium doped olgite type Na(Sr,Ba)PO_4 ceramics

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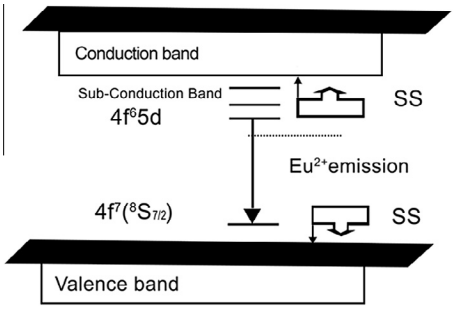
HIGHLIGHTS

- Eu^{2+} doped olgite ceramics samples were synthesized by a solid state reaction.
- SEM micrographs exhibits well dispersed and polyhedra morphological structure.
- EPR spectrum exhibits hyperfine structure of $^{151}Eu^{2+}$ and $^{153}Eu^{2+}$ isotopes.

GRAPHICAL ABSTRACT

Schematics of 5d excited stark level of Eu^{2+} doped olgite.



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ABSTRACT

Europium ion doped olgite type Na(Sr,Ba)PO_4 ceramics, a new generation of light emitting bulb, was prepared by a high temperature solid-state reaction method. The synthesized materials were subjected to various characterizations such as X-ray powder diffraction, Scanning electron microscopy and FT-IR spectra measurements. The EPR spectrum of the sample exhibits a well-resolved hyperfine structure of $^{151}Eu^{2+}$ and $^{153}Eu^{2+}$ isotopes and the *g* value has been calculated. Fluorescence spectra revealed that europium ions were present in divalent as well as in the trivalent oxidation states. The critical distance for energy transfer between Eu^{2+} and Eu^{2+} ion is calculated as 20 Å, which is in good agreement with that of experimental data. The FTIR analysis reveals all the vibrations of PO_4^{3-} ions.

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Introduction

Luminescent materials have attracted considerable interest towards the optoelectronics industry for a wide range of applications [1,2]. Phosphates are important multifunctional materials for a wide range of applications, such as lasers, optical amplifiers, photosensitivity, optical storage and bio-ceramic materials [3–6]. The phosphates have their host absorption edge at short wavelengths so that they are suitable for active Rare Earth (RE) ions. Recently near ultraviolet (n-UV) phosphors converted white light emitting diodes (pc-WLEDs) are expected to have many potential applications due to their excellent color rendering index, high color tolerance, and high conversion efficiency into visible light [7]. Eu^{2+} activated phosphates were known as a highly efficient blue emitting phosphor for near UV LED excitation [8,9].

In the alkali and alkali-earth metal phosphate system, the varied condensations of PO_4 groups give rise to the several structural

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Oxidative degradation of glycyl-glycine by PMS in the neutral medium

R. Sasikala, D. Easwaramoorthy, +1 author Srinivasalu Kutti Rani

Amino acids and peptides present in waste water may produce byproducts which are potentially unsafe and may lead to serious health and environmental problems. Removal of these parent compounds by the use of the environmentally benign oxidant can be of much use to the human kind and the environment. Degradation of these peptides can be done by the Oxidation of amino acid residues which is considered as one of the best degrading methods. The kinetics and oxidative degradation of dipeptide, glycol–glycine by peroxomonosulphate in neutral medium (phosphate buffer, pH 6-8) was studied at 278K. The rate was the first order in [PMS] and glycyl–glycine. Variation of ionic strength and effect of dielectric constant has no effect on the rate of the reaction. The main product of the reaction was confirmed as (2-oxo-acetylamino)-acetic acid (OAA) by IR and 13 C NMR. A suitable mechanism explaining the degradation of dipeptide by PMS is proposed in this paper. LESS

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ABSTRACT

FIGURES AND TABLES

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PERFORMANCE ANALYSIS OF AOMDV UNDER THE IMPACT OF RUSHING ATTACK

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Abstract

MANETS are mostly susceptible to various routing attacks due to its open access wireless medium. Several On-demand routing protocols have been designed to enable routing in MANET e.g. AODV, DSR, etc. The AOMDV is the enhanced AODV where in multipath is discovered to minimize the delay in data packet transmission. Most of the research works for reducing the routing attacks were carried out in on-demand routing protocols, but less attention was given on AOMDV. In this paper the impact of a rushing attack in AOMDV routing protocol is analyzed and its results were compared to a black hole in order to prove that the rushing attack is more significant than other routing attack. The overall performance of the AOMDV under the impact of rushing attack and black hole attack is studied using the NS2 simulator by calculating its packet delivery ratio, throughput, routing overhead and average end-to-end delay.

Keywords: MANET, AODV, AOMDV, Rushing attack, Black hole attack.

Introduction

The MANET [1] is a group of wireless nodes, which are dynamic, infrastructure less and uses unguided medium for data transmission. Since they don't have a fixed network topology they lack centralized control. The main applications of this type of networks are in dynamic business meetings, mining operations, robot data acquisition, rescue operations in battlefields and during times of natural disasters.

The main services rendered by a network layer protocol for any type of network are route establishment and congestion control. In MANET mobile network layer is responsible for packet delivery between source and destination. Since there is no

Article

Synthesis, characterisation and antibacterial activities of schiff base [New fuchsin] functionalised silver nanoparticles

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S. Kannaiyan · Easwaramoorthi · Andal Gopal

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Abstract

Syntheses of materials with antibacterial property are immense field of research in material science. In this paper biologically active new fuchsin based Schiff base (condensation reaction of new fuchsin and salicylaldehyde) was functionalised on green synthesized Ag nanoparticle. The Schiff base stabilized Ag nanoparticle wascharacterized by XRD, FT-IR, SEM and UV-Vis spectroscopy techniques. XRD pattern shows the formation of nanosilver with face-centered cubic structure. The FT-IR spectrum confirms the formation and stabilization of Schiff base over the Ag nanoparticle. SEM analysis confirms that particles areelongated in shape. Antibacterial activities ofprepared compounds were studied on Gram positive (Bacillus cereus, Staphylococcus aureus)and Gram negative (Escherichia coli, Klebsiellapneumonia) bacteria.The results revealed that Schiff base capped Ag nanoparticle showed high biological activity than Schiff base.

Weighted distance Grey wolf optimizer for global optimization problems

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***Abstract*—Grey Wolf Optimizer (GWO) is one of the recently introduced Swarm Intelligence (SI) algorithms, developed by the inspiration from grey wolves prey search characteristics. The GWO algorithm imitate the hierarchical leadership and hunting mechanism of grey wolves in nature. The GWO simulates the major steps of grey wolves like hunting, searching for prey, encircling and attacking. The GWO move the wolves pack toward prey by updating location vector, which is an average of best locations of the pack. This paper addresses the GWO issues and proposes the Weighted distance Grey Wolf Optimizer (wdGWO). In proposed wdGWO algorithm, the location update strategy is modified and weighted sum of best locations is used instead of just a simple average. The proposed algorithm is well tested over set of complex benchmark problems and the performance is comprehensively compared with SI algorithms counterpart. The dimensions of the problems are varied from 10 to 50 for fair comparison among basic state of-the-art. Simulation results supports the superior performance of the proposed algorithm.**

***Keywords*—Global optimization, Grey Wolf Optimizer, Multimodal, Convergence, Swarm Intelligence.**

I. Introduction

The Global Optimization (GO) has become inevitable for most of the optimization problems, due to day to day increasing complexity of real-world problems encompassing science and engineering. The GO comprises of many complex multimodal optimization problems, where most of the classical optimization algorithms generally fail or give infeasible solution [1], [2], [3]. One of the most successful and competitive GO methods are Swarm Intelligence (SI) algorithms. The SI algorithms are the optimizing paradigms developed by mimicking the searching behaviour from nature and used for solving complex optimization problems. There are many SI algorithms developed in the past decades to address GO problems. The SI algorithm that mimics the nectar searching behavior of honey bees may be found in [4], [5], egg laying and nest finding behaviour of Cuckoo species is developed in [6], light flashing characteristic of Firefly is modelled in [7] and food searching nature of birds can be found in [8], [9] and algorithm based on cooperative search may be found in [10].

Very recently introduced SI algorithm by Seyedali et. al. in 2014 is the Grey Wolf Optimizer (GWO) [11]. The basic motivation behind GWO algorithm is prey hunting mechanism of grey wolves. The GWO algorithm mimics the leadership hierarchy and hunting mechanism of grey wolves in nature. Using the hierarchy of wolves, GWO implement four main steps of hunting, searching, encircling, and attacking the prey [11]. The GWO defines mainly four types of grey wolves such as *alpha*, *beta*, *delta*, and *omega* to simulate the leadership hierarchy for hunting the prey. These wolves have the ability to identify location of prey. The movement of the whole pack of wolves will be guided by the above wolves. The location update of all the wolves in pack is done by simple averaging the three best location of the pack and whole pack follows it.

Most of the basic SI algorithms (including GWO), shows premature convergence and poor quality of solutions on global optimization problems, especially on complex multimodal problems, where multiple peaks are encountered. This paper proposes a weighted distance method for updating location vector of the pack, hence called Weighted distance Grey Wolf Optimizer (wdGWO). The location of the wolves in the pack is influenced by the weighted best locations of the leaders in the pack. The weights are calculated in every iteration based on the coefficient vectors.

The rest of paper is organized as follows: Section II briefly explains the GWO algorithm. Section III describes the proposed WdGWO algorithm. Section IV gives the detailed set used for simulation and inter algorithm comparison. Section V describes the obtained results followed by conclusions in Section VI.

II. Grey Wolf Optimizer

The Grey Wolf Optimizer (GWO) is a SI algorithm inspired by the prey hunting behavior of grey wolves in nature, introduced by Seyedali et. al. in 2014 [11]. The Grey wolves generally lives in a social group called pack. These wolves hunt the prey efficiently, since they follow very strict social hierarchy. In the hierarchy, they are divided among themselves as; $1)alphas$, $2)beta$, $3)omega$ and $4)delta$. The $alphas$ has highest level in hierarchy and $omega$ the lowest. The $alphas$ are the strongest in the pack and gives the orders to the group. These wolves have the ability to identify the location of prey and hence whole pack will move and attack. The prime steps of hunting are as in [11]; 1) 'Finding, chasing, and reaching prey', 2) 'Surrounding and harassing prey till it becomes standstill', and 3) 'Attacks the prey' [11]. The mathematical model of the wolves for prey hunting and attaching is developed as follows.

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MORPHOLOGICAL AND CRYSTALLOGRAPHIC PROPERTIES OF RARE EARTH OXIDES COATINGS DEPOSITED BY DOUBLE DUAL BEAM-PLD

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Various rare earth oxide nanostructures were synthesized for the first time by dual-double pulsed gas feeding/pulsed laser deposition. The optically transparent and insulating nanostructures do not exhibit the standard columnar configuration of rare earth oxide thin films but rather dense structures and a significant chemical stoichiometry. More precisely, they exhibit single crystallographic low temperature phases with preferential textures, generally similar to that of the bulk used powder targets. For the cubic fluorine type CeO_2 and Ho_2O_3 films, an epitaxial growth is observed with a special feature noticed in the case of the Eu_2O_3 nanostructure. For this latter, localized and very large oriented crystallites embedded in disordered packed pyramidal crystallites are observed.

Keywords: Double dual beam laser ablation; rare earth oxides; growth process; epitaxial growth.

1. Introduction

In their bulk form, rare earth oxides, characterized by their high melting temperature of the order of 2200°C, possess 3 types of polymorphs: type A "hexagonal", type B "monoclinic" and type C "centered cubic" while for higher temperatures, other crystallographic forms exist.[1] They are attractive laser host materials because of their superior thermo-mechanical properties, strong Stark-splitting and low phonon energies.[2] Laser operation of sesquioxide crystals doped with various rare earths has been demonstrated. Especially sesquioxides doped with trivalent ytterbium have

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Letter

Nanocauliflower like structure of CdS thin film for solar cell photovoltaic applications: *In situ* tin doping by chemical bath deposition technique

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Abstract

We report on surface morphology changes of *in situ* tin (Sn) doped cadmium sulphide (CdS) thin film nanostructures prepared on a glass substrate using the chemical bath deposition (CBD) technique. Sn-doping in the presence of triethanolammine (TEOA) as complexing agent resulted in the formation of nanocauliflower like structure of CdS thin film. X-ray diffraction (XRD) results indicated that Sn-doped CdS thin films show a hexagonal structure with a preferential orientation growth along the *c*-axis (0 0 2). The Sn^{4+} doping markedly influenced on the evolution of the CdS nanostructures, resulting in the formation of nanocracks due to the substitution of Cd^{2+} ions by larger-than-host Sn^{4+} ions as well as a drastic increase in electrical conductivity. An

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MORPHOLOGICAL AND CRYSTALLOGRAPHIC PROPERTIES OF RARE EARTH OXIDES COATINGS DEPOSITED BY DOUBLE DUAL BEAM-PLD

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Various rare earth oxide nanostructures were synthesized for the first time by dual-double pulsed gas feeding/pulsed laser deposition. The optically transparent and insulating nanostructures do not exhibit the standard columnar configuration of rare earth oxide thin films but rather dense structures and a significant chemical stoichiometry. More precisely, they exhibit single crystallographic low temperature phases with preferential textures, generally similar to that of the bulk used powder targets. For the cubic fluorine type CeO_2 and Ho_2O_3 films, an epitaxial growth is observed with a special feature noticed in the case of the Eu_2O_3 nanostructure. For this latter, localized and very large oriented crystallites embedded in disordered packed pyramidal crystallites are observed.

Keywords: Double dual beam laser ablation; rare earth oxides; growth process; epitaxial growth.

1. Introduction

In their bulk form, rare earth oxides, characterized by their high melting temperature of the order of 2200°C, possess 3 types of polymorphs: type A "hexagonal", type B "monoclinic" and type C "centered cubic" while for higher temperatures, other crystallographic forms exist.[1] They are attractive laser host materials because of their superior thermo-mechanical properties, strong Stark-splitting and low phonon energies.[2] Laser operation of sesquioxide crystals doped with various rare earths has been demonstrated. Especially sesquioxides doped with trivalent ytterbium have

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Original Articles

Synthesis of ZnSe Nano Particles, Deposition of ZnSe Thin Films by Electron Beam Evaporation and Their Characterization

R. Indirajith, M. Rajalakshmi, K. Ramamurthi, M. Basheer Ahamed & R. Gopalakrishnan

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Abstract

Zinc selenide (ZnSe) nano particles were synthesised by chemical route at 205°C and it was confirmed by powder X-ray diffraction analysis. Utilizing the synthesised nano particles as the source material, ZnSe thin films were deposited at various substrate temperatures (Room Temperature (RT), 150°C, 250°C, 350°C and 450°C) employing electron beam evaporation method. X-ray diffraction results show that the prepared films are amorphous in nature. Raman spectral analysis confirmed the formation of

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Thymoquinone suppression of the human hepatocellular carcinoma cell growth involves inhibition of IL-8 expression, elevated levels of TRAIL receptors, oxidative stress and apoptosis

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Abstract Hepatocellular carcinoma (HCC) is the fourth most common solid tumor worldwide. The chemokine interleukin-8 (IL-8) is overexpressed in HCC and is a potential target for therapy. Although the transcription factor NF-κB regulates IL-8 expression, and while thymoquinone (TQ; the most bioactive constituent of black seed oil) inhibits NF-κB activity, the precise mechanisms by which TQ regulates IL-8 and cancer cell growth remain to be clarified. Here, we report that TQ inhibited growth of HCC cells in a dose- and time-dependent manner, caused G2M cell cycle arrest, and stimulated apoptosis. Apoptosis was substantiated by activation of caspase-3 and -9, as well as cleavage of poly(ADP-ribose)polymerase. TQ treatments inhibited expression of NF-κB and suppressed IL-8 and its receptors. TQ treatments caused increased levels of reactive oxygen species (ROS) and mRNAs of oxidative stress-related genes, NQO1 and HO-1. Pretreatment of HepG2 cells with N-acetylcysteine, a scavenger of ROS, prevented TQ-induced cell death. TQ treatment stimulated mRNA expression of pro-apoptotic Bcl-xS and TRAIL death receptors, and inhibited expression of the anti-apoptotic gene Bcl-2. TQ enhanced TRAIL-induced death of HepG2 cells, in part by up-regulating TRAIL death receptors, inhibiting NF-κB and IL-8 and stimulating apoptosis. Altogether, these findings provide insights into the pleiotropic molecular mechanisms of TQ-dependent suppression of HCC cell growth and underscore potential of this compound as anti-HCC drug.

Keywords Thymoquinone · HCC · IL-8 · Oxidative stress · NF-κB · TRAIL · Apoptosis

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Introduction

Thymoquinone (TQ; 2-isopropyl-5-methyl-1,4 benzoquinone) is the predominant bioactive constituent present in the volatile oil of black seed (*Nigella sativa*), commonly used as a condiment in the Middle East [1]. It has antioxidant effects and has been shown to protect against heart, liver, and kidney damage in animal studies [2]. Recent studies reported that TQ exhibited inhibitory effects on cell proliferation of many cancer cell lines, including colon, ovarian, lung, and myeloblastic leukemias [3]. Notably,

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A CASE FOR HYBRID INSTRUCTION ENCODING FOR REDUCING CODE SIZE IN EMBEDDED SYSTEM-ON-CHIPS BASED ON RISC PROCESSOR CORES

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ABSTRACT

Embedded computing differs from general purpose computing in several aspects. In most embedded systems, size, cost and power consumption are more important than performance. In embedded System-on-Chips (SoC), memory is a scarce resource and it poses constraints on chip space, cost and power consumption. Whereas fixed instruction length feature of RISC architecture simplifies instruction decoding and pipeline implementation, its undesirable side effect is code size increase caused by large number of unused bits. Code size reduction minimizes memory size, chip space and power consumption all of which are significant for low power portable embedded systems. Though code size reduction has drawn the attention of architects and developers, the solutions currently used are more of cure than of prevention. Considering the huge number of embedded applications, there is a need for a dedicated processor optimized for low power and portable embedded systems. In the study, we propose a variation of Hybrid Instruction Encoding (HIE) for the embedded processors. Our scheme uses fixed number of multiple instruction lengths with provision for hybrid sizes for the offset and the immediate fields thereby reducing the number of unused bits. We simulated the HIE for the MIPS32 processors and measured code sizes of various embedded applications of MiBench and MediaBench benchmarks using an offline tool developed newly. We noticed up to 27% code reduction for large and medium sized embedded applications respectively. This results in reduction of on-chip memory capacity up to 1 mega bytes that is very significant for SoC based embedded applications. Considering the large market share of embedded systems, it is worth investing in a new architecture and development of dedicated HIE-RISC processor cores for portable embedded systems based on SoCs.

Keywords: Chip Space, Code Size, Instruction Encoding, Instruction Set Architecture, SoC

1. INTRODUCTION

An embedded system is not a general purpose computer. Instead, it is a preprogrammed system to perform one or more dedicated functions. In most embedded systems, size, cost and power consumption are critical than performance (Hennessy and Patterson, 2012). A large number of embedded systems such as cellular phones, cameras, toys are portable and battery operated and their design is based on System-on-a-Chip (SoC). As applications become increasingly complex, code memory consumes a large portion of the area in SoC architectures. Apart from increased chip space and cost, the power consumption also increases due to larger code memories. Hence minimizing code size is an essential requirement in Battery Operated Portable Embedded Systems (BOPES). In the study, we deal with reduction of code size at processor Instruction Set Architecture (ISA) level so that the code generated by the compiler is shorter.

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EVALUATION OF SERVICE TRANSACTIONS AND SELECTION OF QUALITY OFFERED SERVICES IN A BUSINESS ENVIRONMENT

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ABSTRACT

The application of service oriented architecture in business is to meet the best quality requirements to the customers and providers. Where, service evaluations are carried out based on the quality attributes of scalability, usability, security, performance. In past many evaluation systems have been proposed for business applications with different criteria. However, security metric to be considered this study proposes a new Analysis Estimator Service (AES) system to analyze and estimate the transaction data from the multiple scalable factors. For this purpose two types of estimations namely, Transaction Service (TS) and Quality Service (QS) Estimators are proposed to evaluate the transactions concerning Security and Quality. From this estimation analysis, it is observed that the transaction data achieves two beneficial advantages of secured data transmission and offered quality services to the customers. So in this proposed approach customers have the clear view to analyze and estimate the service data to-From the providers.

Keywords: Analyzer Estimator Service (AES) System, Transaction Security (TS) Estimator, Quality Service (QS) Estimator, Collector and Informer, Order and Agreement Approval

1. INTRODUCTION

Industries and companies provide a best service offers to their customers in the fields of grocery, healthcare, hospitality, insurance, education, technology and entertainment. In this process, multi options are listed to the customers so that they can select the best optional services, according to the user needs where the quality offers may vary with services. During the transaction of services, the data may get anonymous i.e., Customer may get the incorrect transaction reports, sudden substantial damages and the unavailability of services. To avoid such terms of inconvenience in accessing services, it is necessary to evaluate them both in the terms of security and service availability.

The major security issues in SOA:

- Authentication and authorization of services
- Stateless and distributed services

While considering the Security issues in Service Oriented Architecture, different kinds of vulnerabilities that affect the system are Denial of Service attacks (DoS), Repudiation, Disclosing the confidential information, man-in-middle attacks, session reply, spoofing, SQL injection and Data tampering. These attacks can be prevented using various methodologies. In most of these methods, some of the recent research challenges are discussed including security to prevent the hacking of services. The threats are prevented by generating service policies, providing confidentiality, Integrity, Authorization and Authentication since they guard the service transactions. Normally, in Service Oriented Architecture the communication between the service providers and consumers and the services are shown to the several consumers based on the

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Physical and optical study of potassium-doped meta-Nitroaniline crystal (mNAK)

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A nonlinear optical crystal of potassium-doped meta-Nitroaniline (mNAK) was grown by slow evaporation method using methanol as solvent. The growth mechanism was understood by chemical etching studies. The presence of potassium in the crystal was identified by energy-dispersive X-ray diffraction. Lattice parameters for the title crystal were determined by single-crystal X-ray diffraction and powder X-ray diffraction techniques, and the functional groups in the crystal were revealed by Fourier transform infrared study. Optical properties of the crystal were evaluated by UV-Vis-NIR transmission and absorption spectra in the range of 200–1000 nm. Thermal stability of the crystal was studied by thermo gravimetric analysis and differential thermal analysis. Mechanical properties of the crystal were analyzed using Vicker's microhardness technique. Second harmonic generation efficiency of the crystal was examined using pulsed Nd:YAG laser. Finally, the third-order nonlinear optical properties of the crystal were measured using single-beam Z-scan technique.

Keywords: Solution growth technique; etching studies; X-ray diffraction; nonlinear optical material; negative nonlinear crystal.

1. Introduction

Nonlinear optics (NLO) has been a major component in emerging photonic and optoelectronic technologies, including electro-optical devices, telecommunications, and optical information storage devices.[1,2] Among the features of single crystals of organic nonlinear optical materials demonstrated so far, second harmonic generation (SHG), optical parametric amplification and optical parametric oscillation in

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Reductive fluorescence quenching of DMP with aniline

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ABSTRACT

The photoinduced electron transfer (PET) between 8-(4-methoxyphenyl)-3,5-di[(E)-1-(4-methoxyphenyl)methylidene]-1,2,3,5,6,7-hexahydrodicyclopenta[b,e]pyridine (DMP) and aniline is studied in acetonitrile medium by using steady state and time resolved absorption and fluorescence spectroscopic methods. Bimolecular quenching rate constants (k_q) were calculated from the obtained linear Stern–Volmer plots from both steady state and time resolved measurements. The rate constant (k_q) for PET between DMP and aniline is $1.4 \times 10^{10}\ M^{-1}\ s^{-1}$, which is in diffusion control limit. The free energy change (ΔG^0) has been evaluated by using Rehm–Weller equation for the evidence of electron transfer from aniline to DMP. Direct evidence for the electron transfer reaction in the present system has been obtained by characterizing the aniline cation radical using nanosecond time resolved absorption measurements in the visible region. Further, this quenching mechanism is attributed to be reductive in nature i.e. electron transfer occurs from ground state aniline to excited DMP. This is the first example of reductive fluorescence quenching of DMP with aniline in acetonitrile ever known.

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1. Introduction

Natural photosynthesis applies photoinduced electron-transfer (PET) systems, where a relay of PET reactions evolves among chlorophyll (electron donor) and quinone (electron acceptor) moieties embedded in a transmembrane protein matrix, to attain a lifetime of the final charge separated (CS) state as long as seconds. The long-lived CS state leads to conversion of light into usable chemical energy [1]. Extensive efforts have so far been devoted being inspired from the natural photosynthetic systems to develop electron donor–acceptor (D–A) molecules that undergo PET reactions to afford CS states. So, the understanding of PET between D–A molecules has been a long-standing goal. In this context, the $Ru(bpy)_3^{2+}$ complexes represent an extremely popular choice for investigations of PET in combination with potent redox partners such as viologens and tertiary amines [2–6]. Such PET reaction between donor and acceptor molecules plays a significant role in solar energy conversion. A number of studies on PET fluorescence quenching have been performed using fluorophore and quencher, and it has been concluded that the quenching is due to partial ET (i.e. exciplex formation) in a non-polar or less polar solvent, and to complete ET (i.e. outer-sphere ET) in a highly polar solvent such as acetonitrile. This conclusion is based on the facts that exciplex fluorescence can be observed in non-polar or less polar solvent but not in acetonitrile [7], and that the quenching in acetonitrile occurs at a long distance (7 Å or greater) between the fluorophore and the quencher, yielding radical pairs [8,9]. Thus the electron transfer study in acetonitrile has been considered [10–12].

As we mentioned earlier, understanding PET between D–A molecules has been a long-standing goal, in this perspective, we focus our attention on PET reactions of distyrylpyrdine (A) with aniline (D). The PET reaction between many donor and acceptor moieties plays a significant role in solar energy conversion and storage devices [13–26]. Among the best known fluorescent molecules are xanthenes, coumarins, naphthalimides, cyanines, acridines, and phenoxazines [27]. However, to date there is no report available on PET reactions with distyrylpyridine. This system shows a high fluorescence quantum yield (0.45) and fluorescence lifetime in the range of 2–4 ns [28]. In addition, the dye sensitized solar cell (DSSC) community is actively seeking suitable acceptor and donor units to modify Porphyrin or Ru-complexes as efficient semiconductor sensitizers. Therefore, we have established a new acceptor moiety that can anchor to the TiO_2 surface through the pyridine ring as well. Of course it is well established that the carboxyl group (acceptor moiety) can anchor to the TiO_2 surface [29], however in recent reports show that the pyridine unit can also anchor to the TiO_2 surface [30]. So we think, this molecule may provide new insights in DSSC. Hence, understanding the dynamics of these molecules together with donor will provide new insights towards energy fields.

As a preliminary step, here we report on the electron transfer quenching of 8-(4-methoxyphenyl)-3,5-di[(E)-1-(4-methoxyphenyl)

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Schiff base complexes of rare earth metal ions: Synthesis, characterization and catalytic activity for the oxidation of aniline and substituted anilines

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ABSTRACT

Several new lanthanide complexes of Pr(III), Sm(III), Gd(III), Tb(III), Er(III) and Yb(III) with the sodium salt of the Schiff base, 2-[(5-bromo-2-hydroxy-benzylidene)-amino]-5-methyl-pentanoic acid, derived from leucine and 5-bromosalicylaldehyde have been synthesized. These complexes having general formula $[Ln(HL)(NO_3)_2(H_2O)]\cdot NO_3$ were characterized by elemental analysis, UV–vis., FT-IR, EPR, Mass spectrometry and Thermal analysis. The FT-IR spectral data suggested that the ligand behaves as a tridentate ligand with one nitrogen and two oxygen donor atoms, sequence towards central metal ion. From the analytical data, the stoichiometry of the complexes was found to be 1:1 (metal:ligand). The physicochemical data suggested eight coordination number for Ln(III) Schiff base complexes. Thermal behaviour (TGA/DTA) and fluorescence nature of the complexes were also studied. The Gd(III) Schiff base complex was found to be an efficient catalyst for the oxidation of aniline and substituted anilines under mild conditions.

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1. Introduction

Schiff base ligands have gained paramount importance due to their versatility like straight forward synthesis, electron donor property and multidentate nature, which results in very high binding constants for d- and f-block metals [1,2]. The condensation between $-NH_2$ group of the amino acids and carbonyl group of the aldehydes or ketones needs a special condition due to Zwitter ionic effect of amino acids. It has been observed that pH plays a vital role in the process of condensation [3,4]. The trivalent lanthanide ion, complexes with strongly chelating species containing highly electronegative donor atoms, forms stable complexes [5]. Lanthanide and lanthanide complexes have attracted a great deal of interest in recent years because they have applications as antioxidants [6], in medicinal inorganic chemistry [7,8], catalysis [9], luminescence chemical probes and sensors [10] and pharmacological activities [11,12]. Further the lanthanide complexes were found to exhibit extremely sharp emission [13].

Catalytic oxidation has gained much interest among the academic and industrial chemists [14]. Especially, oxidation of organic substrates by inexpensive, readily abundant, terminal and environmental friendly oxidants like aqueous H_2O_2, molecular oxygen are very attractive from the view point of industrial technology and synthetic purposes [15]. Concerning the green oxidant, hydrogen peroxide is one of the most powerful candidates besides oxygen, because of its high atom efficiency, and water is expected as the only by-product to be generated from the reaction [16,17].

Catalytic oxidation of amines to their corresponding oxygen containing derivative has attracted much attention during the past few decades [18]. Only few examples have been reported [19,20], among which, it was found that transition-metal-catalyzed oxidative reaction of anilines to corresponding azobenzene is highly desirable under atmospheric conditions [21].

Anilines are most widespread and principal contaminants of industrial waste waters. These comprise an important class of environmental contaminants and they are the building blocks for many textile dyes, agrochemicals and other class of synthetic chemicals. The reaction pathways of aromatic amines in natural systems are dominated by redox reactions with soil and sediment

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Synthesis, optical and thermal studies on novel semi organic nonlinear optical Urea Zinc Acetate crystals by solution growth technique for the applications of optoelectronic devices

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ABSTRACT

Urea Zinc Acetate (UZA), a novel semi organic nonlinear optical crystal having dimensions $30 \times 28 \times 10\ mm^3$ has been synthesized using slow evaporation technique. The lattice parameters for the grown crystals were determined using single crystal XRD. The presence of functional groups for the grown crystals was confirmed using Fourier Transform Infrared (FT-IR) spectroscopy. The optical absorption studies show that the material has wide optical transparency in the entire visible region. The thermal stability of the crystal was determined from thermo gravimetric and differential thermal analysis curve. The second harmonic generation was confirmed by Kurtz powder method and it is found to be 3 times than that of KDP crystal.

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1. Introduction

In recent years, second order nonlinear optical materials have attracted many researchers because of their potential applications in various emerging technological fields [1–7]. Today, crystal growth technology has advanced rapidly for the development of novel nonlinear optical materials (NLO) for various applications such as optical switching, frequency conversion and electro-optical modulation [8–13]. The organic NLO materials have large nonlinear optical coefficients compared to inorganic material, but their use is impeded by their poor mechanical and thermal properties and low laser damage threshold [14]. The inorganic NLO materials have excellent mechanical and thermal properties but possess relatively modest optical nonlinearities due to lack of extended π-electron delocalization [15]. In view of these problems, a new class of materials have been developed from organic and inorganic complexes called semi organic [14,16]. In these materials, high optical nonlinearity of pure organic compound is combined with the favorable mechanical and thermal properties of inorganic materials [14–18]. Semi organic crystals have large damage threshold, wide transparency range, less deliquescence, excellent nonlinear optical coefficient, low angular sensitivity and exceptional mechanical properties [19,20].

In the present work, Urea Zinc Acetate (UZA), a desirable semi organic nonlinear optical crystal, has been grown from aqueous solution using slow evaporation technique. The grown crystals were subjected to various characterizations such as single crystal X-ray diffraction analysis, Fourier Transform Infrared (FTIR) analysis, optical absorption studies, TG/DTA, and nonlinear optical studies and were discussed in detail.

2. Experimental

2.1. Materials

(AR grade) Urea and Zinc acetate purchased from Merck were used to synthesis the crystal. Triple distilled water was used as solvent.

2.2. Crystal growth

Single crystals of UZA were grown by dissolving (AR Grade) urea and zinc acetate in the ratio 1:1 using triple distilled water. Extreme care was taken to minimize the thermal and mechanical disturbances to the supersaturated solution. After continuous recrystallization and filtration, optically good quality single crystal having dimensions $30 \times 28 \times 10\ mm^3$ were obtained within a period of 7 weeks. The photograph of as grown crystal of Urea Zinc Acetate is shown in Fig. 1.

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Synthesis, spectral, electrochemical and catalytic properties of Ru(III) Schiff base complexes containing N, O donors

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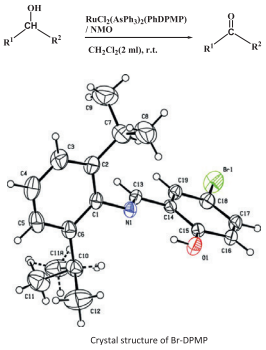
HIGHLIGHTS

- Synthesis, characterization of a new Schiff base and its Ru(III) complexes.
- Ru(III) complexes are paramagnetic with one unpaired electron and octahedral.
- Complexes are redox active based on metal centre.
- New complexes are effective catalyst for the oxidation of alcohols.

GRAPHICAL ABSTRACT



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ABSTRACT

A series of new hexa coordinated ruthenium(III) complexes of the type $[RuY_2(EPh_3)_2(X\text{-}DPMP)]$ (where Y = Br or Cl; E = P or As; DPMP = 2-[(2,6-Diisopropyl-phenylimino)-methyl]-phenol, X = H, Br, Cl, I and Ph) have been synthesized by equimolar $[RuY_3(EPh_3)_3]$ and the Schiff base ligands in benzene. The bidentate Schiff base ligands (X-DPMP) have been derived from condensation of 2,6-diisopropylaniline with mono and multisubstituted salicylaldehyde derivatives. The complexes have been characterized by elemental analysis, magnetic susceptibility, UV–Vis., IR and EPR spectral and electrochemical measurements. All the ruthenium(III) complexes are found to be stable, paramagnetic, low spin, redox active and display either quasi reversible or irreversible redox couples based on metal centre. They have exhibited catalytic activity for the oxidation of wide range of primary and secondary alcohols to corresponding aldehydes or ketones with moderate to high conversion in the presence of *N*-methylmorpholine-*N*-oxide (NMO) as co-oxidant.

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1. Introduction

The interest in the synthesis and characterization of transition metal complexes containing a Schiff base with nitrogen and oxygen donor atoms lies in their extensive applications in the fields of catalysis [1,2] and transformations [3,4], which can modify the structural and electronic properties of transition metal centers [5]. Transition metal complexes are powerful catalyst for organic

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Synthesizing Global Association Rules from Different Data Sources Based on Desired Interestingness Metrics

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Since business houses are generally global, the required data for their corporate decisions are spread over multiple branches at different regions. In such circumstances, local pattern analysis-based global pattern discovery has become an efficient strategy for mining their multiple data sources. The traditional support-confidence framework alone is not enough for assessing the interestingness of synthesized global association rules. In this context, numerous interestingness measures have been developed in the past to meet various situations. Depending on the requirement, local branches and the central head may choose desired interestingness metric for evaluating local frequent-itemsets and global association rules, respectively. In this paper, we present a generalized synthesis procedure for synthesizing global association rules, based on *any* interestingness metric, from the mined local patterns forwarded by multiple data sources. We have also shown that the synthesized metric values are quite close to the targeted mono-mining results. Examples and experimental studies establish the validity of our proposal.

Keywords: Interestingness measures; global rule synthesis; multi-database mining; association rule mining.

1. Introduction

Rapid strides made in the communication network technology and distributed database systems have led to the development of several multi-database systems for

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Effect of Schiff base as corrosion inhibitor on AZ31 magnesium alloy in hydrochloric acid solution

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Abstract: Schiff base derived from the condensation reaction of analar grade 1-amino-2-naphthol 4-sulphonic acid with cinnamaldehyde was prepared under microwave condition. The Schiff base was analysed by infrared spectroscopy. This Schiff base as a corrosion inhibitor of AZ31 magnesium alloy in 0.05 mol/L HCl solution was studied. The inhibition effect of the Schiff base compound (4Z)-4-(3-phenyl allylidene amino)-3-hydroxy naphthalene-1-sulfonic acid (AC) on AZ31 magnesium alloy corrosion was studied using mass loss, potentiodynamic polarization technique, electrochemical impedance spectroscopy methods. The potentiodynamic polarization curve shows that Schiff base AC inhibits both anodic and cathodic reactions at all concentration, which indicates it is a mixed type inhibitor. EIS results indicate that as the additive concentration is increased, the polarization resistance increases whereas double-layer capacitance decreases. The adsorption of AC on the AZ31 magnesium alloy surface in 0.05 mol/L HCl obeys the Langmuir adsorption isotherm.

Key words: Schiff base; AZ31 magnesium alloy; corrosion inhibitor; potentiodynamic polarization; electrochemical impedance spectroscopy

1 Introduction

Magnesium alloy is one of the lightest metallic alloys currently used, because of its low density (1.74 gm/cm^3) and high mechanical stiffness [1]. However, the mechanical benefits of magnesium are contrasted by a high corrosion rate as compared to aluminium or steel. Because of electrochemical potential of magnesium, as illustrated in galvanic series, it corrodes easily in the presence of sea water. The high corrosion property has relegated the alloy to be used in areas unexposed to the atmosphere, including car seat electronic boxes and structural members. The demands for the use of magnesium alloys, as structural materials in automobile industry, electronic products, vibrating plates of vibrating test machines and automotive wheels, have increased in recent years [2]. Consequently, this investigation relates to the field of corrosion inhibition of magnesium alloys, since the magnesium alloys are highly prone to corrosion.

Compounds containing an azomethine group (—C═N—) are known as Schiff bases. They are usually formed by the condensation of primary amine with carbonyl compounds [3] according to the reaction as follows:

$$R—NH_2+R—COH \rightarrow R—N═CH—R+H_2O \quad (1)$$

where R may be an aliphatic or aromatic group. The Schiff bases of aromatic aldehydes with an effective conjugated system are more stable [4].

The efficiency of an organic inhibitor on metallic corrosion does not only depend on the structural characteristics of the inhibitor but also on the nature of the metal and environment. The selection of suitable inhibitor for particular system is the difficult task because of the selectivity of the inhibitors and the wide variety of environments

The choice of the inhibitor is based on two considerations, firstly the economic consideration, and secondly, it should contain the electron cloud on the aromatic ring or the electronegative atoms such as N, O in the relatively long chain compounds [5].

One of the most vital processes in the field of prevention of corrosion and its control is the use of organic inhibitors. The crucial part in the mechanistic

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CARP-1 Functional Mimetics Are a Novel Class of Small Molecule Inhibitors of Malignant Pleural Mesothelioma Cells

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Abstract

Malignant pleural mesothelioma (MPM) is an asbestos-related thoracic malignancy that is characterized by late metastases, and resistance to therapeutic modalities. The toxic side-effects of MPM therapies often limit their clinical effectiveness, thus necessitating development of new agents to effectively treat and manage this disease in clinic. CARP-1 functional mimetics (CFMs) are a novel class of compounds that inhibit growth of diverse cancer cell types. Here we investigated MPM cell growth suppression by the CFMs and the molecular mechanisms involved. CFM-1, -4, and -5 inhibited MPM cell growth, in vitro, in part by stimulating apoptosis. Apoptosis by CFM-4 involved activation of pro-apoptotic stress-activated protein kinases (SAPKs) p38 and JNK, elevated CARP-1 expression, cleavage of PARP1, and loss of the oncogene c-myc as well as mitotic cyclin B1. Treatments of MPM cells with CFM-4 resulted in depletion of NF-κB signaling inhibitor ABIN1 and Inhibitory κB (IκB)α and β, while increasing expression of pro-apoptotic death receptor (DR) 4 protein. CFM-4 enhanced expression of serine-phosphorylated podoplanin and cleavage of vimetin. CFMs also attenuated biological properties of the MPM cells by blocking their abilities to migrate, form colonies in suspension, and invade through the matrix-coated membranes. Both podoplanin and vimentin regulate processes of cell motility and invasion, and their expression often correlates with metastatic disease, and poor prognosis. The fact that phosphorylation of serines in the cytoplasmic domain of podoplanin interferes with processes of cellular motility, CFM-4-dependent elevated phosphorylated podoplanin and cleavage of vimentin underscore a metastasis inhibitory property of these compounds, and suggest that CFMs and/or their future analogs have potential as anti-MPM agents.

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Competing Interests: We also confirm that Dr. Arun Rishi is currently a serving as editorial board member (Academic Editor) of PLoS One. This does not alter our adherence to PLOS ONE Editorial policies and criteria.

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Introduction

Malignant pleural mesothelioma (MPM) is a lethal asbestos-related malignancy [1]. Scores of workers have been exposed to asbestos throughout world. Since asbestos exposure has been identified as a risk factor in diseases including asbestosis, lung cancer and MPM [1], it is estimated that approximately 2,000–3,000 people will be diagnosed as MPM patients each year in the US. Although the use of asbestos has been significantly curtailed, the incidence of asbestos-related diseases including MPM is expected to continue in the next decade in the United States and Europe [3,4]. The multimodality treatment for MPM in the clinic often consists of surgery, adjuvant or neoadjuvant chemotherapy, and radiation [2]. Most chemotherapeutic agents are not very effective against MPM, with typical single-agent response rates of ≤20% [5]. The median survival of MPM patients ranges from 9–17 months, and remains unacceptably low [3]. Development of novel treatment strategies for MPM is therefore warranted to improve the survival outcome in patients and overcome resistance to currently available chemotherapies.

CARP-1, also known as CCAR1, is a peri-nuclear phosphoprotein that is a regulator of cancer cell growth and apoptosis signaling [6–8]. In addition to being a key transcriptional co-activator of p53 in regulating adriamycin (ADR)-dependent DNA damage-induced apoptosis, deprivation of serum growth factors also resulted in elevated CARP-1 expression [6–8]. Antisense-mediated

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Disulfiram Suppresses Growth of the Malignant Pleural Mesothelioma Cells in Part by Inducing Apoptosis

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Abstract

Dithiocarbamate compound Disulfiram (DSF) that binds with copper and functions as an inhibitor of aldehyde dehydrogenase is a Food and Drug Administration approved agent for treatment of alcoholism. Copper complexed DSF (DSF-Cu) also possesses anti-tumor and chemosensitizing properties; however, its molecular mechanisms of action remain unclear. Here we investigated malignant pleural mesothelioma (MPM) suppressive effects of DSF-Cu and the molecular mechanisms involved. DSF-Cu inhibited growth of the murine as well as human MPM cells in part by increasing levels of ubiquitinated proteins. DSF-Cu exposure stimulated apoptosis in MPM cells that involved activation of stress-activated protein kinases (SAPKs) p38 and JNK1/2, caspase-3, and cleavage of poly-(ADP-ribose)-polymerase, as well as increased expression of sulfatase 1 and apoptosis transducing CARP-1/CCAR1 protein. Gene-array based analyses revealed that DSF-Cu suppressed cell growth and metastasis-promoting genes including matrix metallopeptidase 3 and 10. DSF inhibited MPM cell growth and survival by upregulating cell cycle inhibitor p27Kip1, IGFBP7, and inhibitors of NF-κB such as ABIN 1 and 2 and Inhibitory κB (IκB)α and β proteins. DSF-Cu promoted cleavage of vimentin, as well as serine-phosphorylation and lysine-63 linked ubiquitination of podoplanin. Administration of 50 mg/kg DSF-Cu by daily i.p injections inhibited growth of murine MPM cell-derived tumors *in vivo*. Although podoplanin expression often correlates with metastatic disease and poor prognosis, phosphorylation of serines in cytoplasmic domain of podoplanin has recently been shown to interfere with cellular motility and migration signaling. Post-translational modification of podoplanin and cleavage of vimentin by DSF-Cu underscore a metastasis inhibitory property of this agent and together with our *in vivo* studies underscore its potential as an anti-MPM agent.

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Introduction

Malignant pleural mesothelioma (MPM) is an aggressive malignancy that is associated with past asbestos exposure. Millions of workers in the US and world over have been exposed to asbestos, and exposure to asbestos has been shown to increase the risk of several serious diseases including asbestosis, lung cancer and MPM [1]. It is estimated that there are 2,000 to 3,000 people diagnosed with MPM each year in the United States and the incidence of this disease is expected to increase in the next decade in United States and Europe [3,4]. MPM is a rapidly progressing thoracic cancer that is characterized with late metastases and poor prognosis [1]. MPM is highly resistant to conventional therapies that consist of multimodality treatment involving surgery, adjuvant or neoadjuvant chemotherapy, and radiation [2]. The median survival of MPM is about 9–17 months [3], and coupled with its increasing incidence and resistance to currently available chemotherapies, development of new treatments for MPM is urgently needed.

Disulfiram (DSF) is a member of the dithiocarbamate family comprising a broad class of molecules possessing an R1R2NC(S)SR3 functional group, which gives them the ability to complex metals and react with sulfhydryl groups [5–7]. DSF, an irreversible inhibitor of aldehyde dehydrogenase, is one of the two drugs approved by the Food and Drug Administration (FDA) for treatment of alcoholism [7]. Clinical trials have shown efficacy of

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ORIGINAL ARTICLE

Feature selection using swarm-based relative reduct technique for fetal heart rate

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Abstract Fetal heart rate helps in diagnosing the well-being and also the distress of fetal. Cardiotocograph (CTG) monitors the fetal heart activity to estimate the fetal tachogram based on the evaluation of ultrasound pulses reflected from the fetal heart. It consists in a simultaneous recording and analysis of fetal heart rate signal, uterine contraction activity and fetal movements. Generally CTG comprises more number of features. Feature selection also called as attribute selection is a process of selecting a subset of highly relevant features which is responsible for future analysis. In general, medical datasets require more number of features to predict an activity. This paper aims at identifying the relevant and ignores the redundant features, consequently reducing the number of features to assess the fetal heart rate. The features are selected by using unsupervised particle swarm optimization (PSO)-based relative reduct (US-PSO-RR) and compared with unsupervised relative reduct and principal component analysis. The proposed method is then tested by applying various classification algorithms such as single decision tree, multilayer perceptron neural network, probabilistic neural network and random forest for maximum number of classes and clustering accuracies like root mean square error, mean absolute error, Davies–Bouldin index and Xie–Beni index for minimum number of classes. Empirical results show that the US-PSO-RR feature selection technique outperforms the existing methods by producing sensitivity of 72.72 %, specificity of 97.66 %, F-measure of 74.19 % which is remarkable, and clustering results demonstrate error rate produced by US-PSO-RR is less as well.

Keywords Unsupervised · PSO · Feature selection · Relative reduct · Fetal heart rate · Cardiotocogram

1 Introduction

Classically, a graphical representation of fetal heart rate (FHR) signal is visually inspected by clinician, whose task is to identify and to classify the signal patterns. The interpretation of heart rate patterns obtained by fetal monitoring relies mainly on the definition of the basal level of the FHR signal and its variability. The basal level of FHR signal, called the baseline, is considered as the running average heart rate in the absence of external stimuli during periods of fetal rest. The FHR variability is defined in the aspect of its transient increase (acceleration pattern) or decrease (deceleration pattern). Accelerations are the result of fetal movements and to identify the fetal well-being, while decelerations are the symptoms of fetal distress usually indicating the risk of fetal hypoxia.

During the crucial period of labor, FHR monitoring is used as the main screening test of the fetal acid-base balance [1]. Visual analysis of FHR recording does not guarantee a correct assessment of the fetal state, and the accuracy of the interpretation depends on clinician's experience. It was concluded in [2], that the weakness of

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Growth and characterization of bis(thiourea) zinc carbonate (BTZC) a new nonlinear optical material by solution growth slow evaporation technique

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ABSTRACT

A new semi-organic nonlinear optical bis(thiourea) zinc carbonate (BTZC) material has been synthesized. BTZC single crystals were grown from aqueous solution by slow evaporation method. The grown crystals were characterized by single crystal X-ray diffraction (XRD), powder XRD, FTIR, UV–visible, thermal, and second harmonic generation (SHG) analysis. Single crystal XRD study has been carried out to identify the lattice parameters. FTIR studies confirm the functional groups present in the grown crystal. Optical transmission studies have confirmed that the grown crystal is highly transparent. Thermo gravimetric and differential thermal analyses reveal the good thermal stability of the material. The SHG conversion efficiency of BTZC was determined using Kurtz powder technique and found 1.3 times more than that of KDP.

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1. Introduction

Organic crystals have been extensively studied due to their nonlinear optical (NLO) coefficients being often larger than those of inorganic materials. Many new organic crystals have been found based on the predictive molecular engineering approach and have been shown to have potential applications in nonlinear optics. Some interest has been shown in the search for ultraviolet laser materials. Recently, there is considerable interest in the synthesis of new materials with large second-order optical nonlinearities because of their potential use in applications including telecommunications, optical computing, optical data storage, and optical information processing [1–8]. Such applications require materials with very large macroscopic second-order susceptibilities which are usually constituted from molecules with large molecular first hyper polarisability and oriented in a non-centrosymmetric arrangement.

BTZC is one of the semi-organic crystals that have been put to practical uses. It has larger nonlinear optical coefficients, a high degree of birefringence and relatively high laser damage threshold. Since BTZC transparency range extends to 260 nm in the short wavelength limit, it is one of the most promising materials for nonlinear optical applications in UV.

2. Experimental method

2.1. Synthesis

The required quantities of thiourea and zinc carbonate (AR grade) from Merck were used to synthesis the crystal. Triple distilled water was used as solvent.

2.2. Crystal growth

Single crystals of BTZC were grown by dissolving (AR grade) thiourea and zinc carbonate in the ratio 2:1 using Millipore water. The chemical reaction is as follows

$$2(CS(NH_2)_2)_2 + ZnCO_3 \rightarrow (Zn(CS(NH_2)_2)_2CO_3$$

Single crystals of bis(thiourea) zinc carbonate were grown by slow evaporation of the saturated solution at room temperature. After recrystallization and repeated filtration, optically good quality crystals having dimensions 21 mm × 14 mm × 5 mm was

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In-Situ Preparation and Characterization of Acid Functionalized Single Walled Carbon Nanotubes with Polyimide Nanofibers

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Nanofiber composites (Polyimide/f-SWCNT) of Pyromellitic dianhydride, 4,4′-Oxydianiline, and 4,4′-(4,4′-isopropylidene diphenyl-1,1′-diyl dioxy) dianiline (PMDA-ODA/IDDA) and surface-functionalized single walled carbon nanotubes (f-SWCNT) were made by electrospinning a solution of poly(amic acid) (PAA) containing 0–2 wt% f-SWCNT followed by thermal imidization. X-ray photoelectron spectroscopy spectra verified the oxidation of SWCNT surface after acid treatment, and indicated possible hydrogen bonding interactions between the f-SWCNTs and polyamic acid. High-resolution scanning electron microscopy images showed the average diameter of nanofibers to be below 150 nm, and transmission electron microscopy images showed that SWCNTs were aligned inside the polymer nanofiber. In thermogravimetric analysis, all composites showed increased thermal stability with increasing f-SWCNT content compared to neat PI. Storage modulus also increased from 124 MPa to 229 MPa from neat PI to 2% f-SWCNT composite.

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Keywords: Polyimides, Electrospinning, Nanofibers, X-Ray Photoelectron Spectra, Thermal Properties.

1. INTRODUCTION

Nanoparticles-dispersed polymer fiber composites are known to possess improved thermal and mechanical properties compared to neat polymer fibers. Carbon nanotubes (CNT) have been an attractive material for such enhancement even at low loading levels, due to their high aspect ratio (greater than 1000), low density, and high strength, alignment[1] and the large interfacial areas between them and the polymer matrix. The improvement in material properties increases when the nanotubes are well-dispersed and aligned with the polymer fibers.[2,3] Mechanical dispersion and surface modification of CNTs by covalent (acid or amine functionalization)[4] or non-covalent means (using small molecules as dispersants) are commonly used for improved CNT dispersion. Direct covalent sidewall functionalization of CNTs by acid or amine treatment is associated with a change of hybridization from sp^2 to sp^3, a simultaneous loss of π-conjugation system, and formation of –COOH, –OH or $–NH_2$ groups on the side walls of SWCNT.[5] Such functionalization may facilitate improved interactions with the polymer, and thereby improved properties of the composites. Another approach that has resulted in greater improvement of properties has been polymerization in the presence of the nanotubes rather than the mere dispersion of the nanotubes in a preformed polymer matrix.[6]

Many polymers have been used to prepare polymeric nanofibers for several applications.[7–11] Polyimides are well known polymers with an excellent thermal stability, mechanical and electrical properties. In addition to films, polyimide nanofibers may be produced by electrospinning technique, and several works have been reported for obtaining ultrafine, uniform and non-woven or aligned nanofibers.[12–16] Studies have also been reported on electrospinning functionalized polyimides such as porphyrinated polyimide nanofibers,[17,18] polyimide nanofibers reinforced with polymer films,[19,20] and nanoparticles such as silica, silver, europium, and Fe–FeO.[21–24] Chen et al. investigated

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Interactome analyses of *Salmonella* pathogenicity islands reveal SicA indispensable for virulence

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HIGHLIGHTS

- We build interactome of proteins comprising five *Salmonella* pathogenicity islands.
- We analyze them with and without two-component signal transduction networks.
- A step-by-step approach with centrality measures and *k*-core analyses are taken.
- Competitors from above analyses are confirmed by microarray data for indispensability.
- SicA, a chaperone protein from SPI-1, is found to beat even the close competitor InvF.

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Keywords:
Salmonella
Type III secretion system
Salmonella pathogenicity island
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ABSTRACT

Background: Serovars of *Salmonella enterica*, namely Typhi and Typhimurium, reportedly, are the bacterial pathogens causing systemic infections like gastroenteritis and typhoid fever. To elucidate the role and importance in such infection, the proteins of the Type III secretion system of *Salmonella* pathogenicity islands and two component signal transduction systems, have been mainly focused. However, the most indispensable of these virulent ones and their hierarchical role has not yet been studied extensively.

Results: We have adopted a theoretical approach to build an interactome comprising the proteins from the *Salmonella* pathogeneicity islands (SPI) and two component signal transduction systems. This interactome was then analyzed by using network parameters like centrality and *k*-core measures. An initial step to capture the fingerprint of the core network resulted in a set of proteins which are involved in the process of invasion and colonization, thereby becoming more important in the process of infection. These proteins pertained to the Inv, Org, Prg, Sip, Spa, Ssa and Sse operons along with chaperone protein SicA. Amongst them, SicA was figured out to be the most indispensable protein from different network parametric analyses. Subsequently, the gene expression levels of all these theoretically identified important proteins were confirmed by microarray data analysis. Finally, we have proposed a hierarchy of the proteins involved in the total infection process. This theoretical approach is the first of its kind to figure out potential virulence determinants encoded by SPI for therapeutic targets for enteric infection.

Conclusions: A set of responsible virulent proteins was identified and the expression level of their genes was validated by using independent, published microarray data. The result was a targeted set of proteins that could serve as sensitive predictors and form the foundation for a series of trials in the wet-lab setting.

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Investigations of optical, structural and antibacterial properties of Al-Cr Dual-doped ZnO nanostructures

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RESEARCH ARTICLE - CIVIL ENGINEERING

Macrocell Corrosion Studies of Coated Rebars

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Abstract The corrosion of steel in concrete and its subsequent consequence is a globally accepted multibillion dollar problem. The application of a protective coating to the steel rebars is one of the easy methods for controlling corrosion. The macrocell corrosion test analysed the performance of rebar coatings such as cement polymer composite coating, inhibited cement slurry coating, galvanizing and cement polymer anticorrosive coating exposed to severe chloride environment. The performance of 1 % intentionally damaged coated rebars were also studied. The type of rebar, the macrocell current behavior, the total corrosion current development and the percentage of corroded area were considered as performance evaluators. It is concluded that coated rebars could significantly prolong the onset of corrosion despite severe chloride environment. The 1 % intentionally damaged coating did not bring about any appreciable impact on the macrocell current development, irrespective of the type of rebar and the type of coating used. The performance of the newly developed cement polymer anticorrosive coating is better compared to the other established coatings. Thermo-mechanically treated rebars performed appreciably better than the cold-twisted deformed rebars, irrespective of the coating applied.

Keywords Protective coating · Steel rebar · Macrocell current · Coating damage · Corrosion control · Cold-twisted deformed rebars · Thermo-mechanically treated rebars · Corroded area · Total corrosion current · Cement polymer anticorrosive coating

الخلاصة

إن تآكل الصلب في الخرسانة و نتائجه اللاحقة مقبولٌ عالميا كمشكلة بمليارات الدولارات. ولعل طريقة تطبيق الطلاء الحامي لصناعة حديد التسليح تمثل واحدة من الطرق السهلة للتحكم في التآكل. ويحلل اختبار تآكل ماكروسيل أداء طلاءات حديد التسليح مثل طلاء إسمنت البوليمر المركب، وطلاء إسمنت الطين المعطل، وطلاء إسمنت البوليمر والتعبئة المانع للتآكل والمتعرضة لبيئة كلوريد شديدة. وقد درس أيضا أداء حديد تسليح مطلي ومتضرر عمدا بنسبة 1 ٪. واعتبر نوع حديد التسليح، وسلوك تيار ماكروسيل، وتيار التآكل الكلي المتنامي والنسبة المئوية للمساحة المتآكلة كمعايير لتقييم الأداء. وخلص إلى أن حديد التسليح المطلي يمكنه أن يطيل بشكل كبير وقت بداية التآكل على الرغم من بيئة الكلوريد الشديدة. والطلاء المتضرر عمدا بنسبة 1 ٪ لم يُحدث أي تأثير ملموس في تيار ماكروسيل المتنامي بغض النظر عن نوع حديد التسليح ونوع الطلاء المستخدم. ولعل أداء طلاء أسمنت البوليمر المانع التآكل والمطور حديثا هو أفضل مقارنة بالطلاءات الأخرى المعمول بها . وحديد التسليح المعالج حراريا وميكانيكيا (TMT) يقدم أداء أفضل بشكل ملحوظ من حديد التسليح البارد ذي الشكل الملتوي (CTD) بغض النظر عن الطلاء المطبق.

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1 Introduction

The corrosion of steel in concrete and its subsequent consequence, viz., deterioration of structures is a globally accepted multibillion dollar problem [1]. Due to high level of pH (12.5–13.7) of the solution contained in the pores of the concrete, steel is in passive condition. The corrosion of rebars occurs when this passivation is destroyed either by penetration of chloride ions to the metal–concrete interface or due to decrease of pH as a result of carbonation. The products of

Miniaturized Fractal Rat-race Band Pass Filters

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Abstract— **A miniaturized fractal rat-race bandpass filter based on signal-interference technique is presented. The proposed topology uses fractal rat-races operating as transversal filtering sections (TFS). Under signal-interference principle, the filtering action comes through the generation of multiple out-of-band power transmission zeros and constructive in-band signal combinations. The filter is implemented in two stages. Simulated results show that single stage gives an in-band input matching of better than 15 dB and in-band insertion loss of less than 1dB. Roll-off is around 25dB on lower frequency edge. Similarly, double stage filter has an improved in-band matching of better than 19 dB with an insertion loss of 0.9dB and 55 dB roll-off at the lower edge of the passband. The filter exhibits a pass band characteristic from 1.09GHz to 1.88GHz.**

Index Terms— **Band pass filter, fractal rat-race, transversal filter.**

I. Introduction

Microwave filters are key elements in the design of RF systems supporting modern communication systems. The application of hybrid-ring coupler in designing microwave band pass filters have been proposed in [1]. Several compact filter realizations exhibiting extremely large pass-band have been proposed using different configurations, such as microstrip or uni-planar configurations [2],[3].

In the microwave filter research area, filters based on signal-interference techniques have emerged as an alternative to classic filter arrangements consisting of electro-magnetic coupled resonators. In this scheme, filtering action derives from the feed forward combination [4] of two signal components coming from the input signal and propagating through the different signal propagation paths of the filter. By forcing in-band signal enhancements and out-of-band destructive combinations to produce power transmission zeros, high rejection and high selectivity bandpass responses are achievable.

One of the miniaturization techniques is implementation of fractal geometries. Fractal geometries are iteratively generated structures which have the ability to create smaller foot print. Fractal geometries have two common properties, space-filling and self-similarity [5],[6].

In this paper, a new TFS based fractal rat-race bandpass filter is proposed. A miniaturized filter structure is generated based on first order Sierpinski fractal geometry. The filter consists of two stages. Proposed filter is operating at a center frequency of 1.5GHz and exhibits pass-band characteristics from 1.09GHz to 1.88GHz. Single stage provides an in-band input matching of better than 15 dB and minimum in-band insertion loss of 1dB. Roll-off is around 25dB on lower frequency edge. Similarly, double stage filter has an improved in-band matching of better than 19 dB with an insertion loss of 0.9dB with 55dB roll-off.

The rest of this article is organized as follows. Section II details the design of TFS based fractal rat-race filter. Section III deals with filter optimization process and it also discusses the simulated results. Finally, in section IV conclusions are drawn.

II. Design of TFS Based Fractal Rat-race Filter

The rat-race coupler can be designed to operate as a filter using signal interference principle. The transversal filter section (TFS) consists of a rat-race operating in a non-conventional way: its direct and coupled ports are loaded with suitable open-ended stubs, whereas its input and isolated ports are taken, respectively, as the input and output terminals of the TFS [1]. This is done in order to generate two input-to-output signal propagation paths in the TFS. Thus through the feed-forward combination of two subcomponents coming from the input signal and travelling along different signal paths in the TFS output node, a large variety of band-pass filtering profiles can be achieved easily.

For reducing the footprint of the TFS filter, this paper presents a novel technique of using fractal rat-race which shows similar electrical characteristics as that of conventional 180˚ ring hybrid.

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ERRATUM

Erratum to: Potential visible light emitting rare-earth activated $Ca_{0.5}Y_{1-x}(MoO_4)_2$:xRE^{3+} (RE = Pr, Sm, Eu, Tb, Dy) phosphors for solid state lighting applications

V. Mahalingam[1] · J. Thirumalai[1] · R. Krishnan[1] · R. Chandramohan[2]

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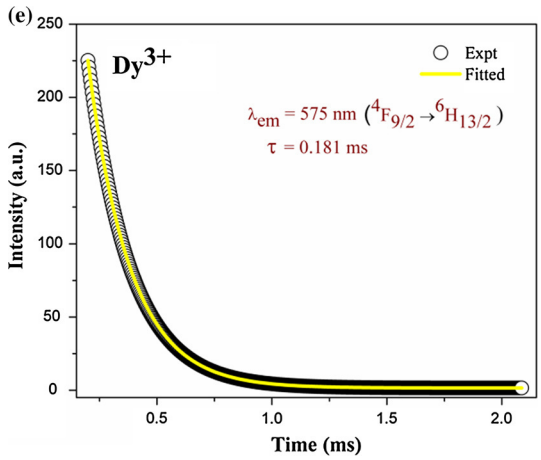
In the original publication, Fig. 9e and some values in Table 1 were incorrect. Therefore, the authors would like to make the following changes:

1. On page 849, Fig. 9e should be revised due to the reason that the decay profile plotted does not belong to the assigned transition. The revised Fig. 9e is given below.



2. On page 850, in Table 1, the lifetime value for $Ca_{0.5}Y_{(1-x)}(MoO_4)_2$:x$Dy^{3+}$ should be referred as $\tau = 0.181$ ms.
3. On page 850, in Table 1, the lifetime value for $Ca_{0.5}Y_{(1-x)}(MoO_4)_2$:x$Pr^{3+}$ should be referred as $\tau = 0.421$ µs.

The online version of the original article can be found under doi:10.1007/s10854-014-2473-2.

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Rough Set Based Feature Selection for Egyptian Neonatal Jaundice

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Abstract. This paper analyses rough set based feature selection methods for early intervention and prevention of neurological dysfunction and kernicterus that are the major causes of neonatal jaundice. Newborn babies develop some degree of jaundice which requires high medical attention. Improper prediction of diseases may lead to choose unsuitable type of treatment. Traditional rough set based feature selection methods and tolerance rough set based feature selection methods for supervised and unsupervised approach is applied for Egyptian neonatal jaundice dataset. Features responsible for prediction of Egyptian neonatal jaundice is analyzed using supervised quick reduct, supervised entropy based reduct and Unsupervised Tolerance Rough Set based Quick Reduct (U-TRS-QR). Results obtained demonstrate features selected by U-TRS-QR are highly accurate and will be helpful for physicians for early diagnosis.

Keywords: Neonatal Jaundice, Rough Sets, U-TRS-QR, Quick Reduct, Entropy.

1 Introduction

Neonatal jaundice is when a baby has high level of bilirubin in the blood. Bilirubin is a yellow pigment produced during normal breakdown of red blood cells. Normally, bilirubin is processed by the liver and then passed through the intestinal tract. Newborns still-developing lever may not be mature enough to remove bilirubin. Babies born before 38 weeks of gestation, babies who are not getting enough breast milk and babies whose blood type is not compatible with their mothers are at the highest risk for developing newborn jaundice. Physiological jaundice and Pathological jaundice are the two basic types of jaundice. Physiologic jaundice usually occurs on second or third day of life and disappears up to seventh day. Pathologic jaundice is a result of different causes such as hemolysis, infections and group incompatibilities between mother and child [1]. Increased bilirubin cause infant's skin and whiteness of the eyes to look yellow. Kernicterus, or bilirubin

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SIMPLE NONAUTONOMOUS WIEN-BRIDGE OSCILLATOR BASED CHAOTIC CIRCUIT

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Abstract-We propose a nonautonomous version of Wien-bridge oscillator with diode nonlinearity. It is a kind of simple circuit which exhibits chaotic behaviour. This oscillator circuit contains an operational amplifier, four resistors, two capacitors, a diode as a nonlinear element and external periodic force. This system exhibits various interesting dynamical phenomena like periodic, quasiperiodic and chaotic oscillations. The detailed analysis is carried out numerically by using two-parameter phase diagram in the forcing amplitude--frequency plane, one-parameter bifurcation diagram, Lyapunov exponents and phase portraits. Most of these numerical studies are in good agreement with observations from experiments.

I. INTRODUCTION

For the past few decades or so, a variety of nonlinear electronic circuits consisting of either real nonlinear physical devices or devices constructed with ingenious piecewise-linear elements have been utilized as veritable black boxes to explore different properties of chaotic dynamics [1-5]. They often provide a convenient framework for understanding the various mechanism underlying the onset of chaos. Also, the study of chaotic behavior in nonlinear circuits and systems has attracted great interest because of many possible applications in various fields of science, engineering, medical applications, neural networks and even music generation.

It is known that Chua's circuit has been the main source for studying chaos in electronic systems [1]. Numerous Chua's circuit variants have been extensively studied by many researchers [1,2,4]. In particular, inductorless realization of oscillators, that facilitate their implementations have been introduced in the literature [6-8]. Recent studies have shown that the influence of additional perturbation on Chua circuit is of considerable interest and it can alter the dynamical behaviour dramatically [4,9]. For example, the addition of periodic forcing to this Chua's circuit can introduce various dynamical phenomena such as chaos, phase-locking, mode-locking, coexistence of multiple attractors, period-doubling, quasiperiodicity, intermittency, and crises [1,2,4,9]. This circuit system, if subjected to quasiperiodic forcing or even periodic forcing, can often admit strange nonchaotic attractors [10]. Further, the combined influence of external periodic forcing and noise can give rise to the stochastic resonance [11]. It is now well known that chaos can occur in a second-order nonautonomous nonlinear circuit through the routes such as the period-doubling route to chaos, quasiperiodicity route to chaos, strange nonchaotic attractor and so on [12-15].

Similarly, the chaotic performance of the well known Colpitts oscillator is also investigated [16,17]. This study emphasizes that more interest should be given to studying chaos using conventional oscillator structure. But most of the proposed modified LC circuits are inconvenient to build for audio and lower frequencies and for Integrated Chip fabrication. On the other hand, chaotic circuits constructed with capacitor and resistor instead of inductors are more easy to deal with because of the simplicity and easy implementation, example Wien-Bridge oscillators [18–26]. Therefore, the need for simple RC chaos generators has urged some researchers to modify the Wien bridge oscillator for chaos realization in the experiments [18–23, 25, 27–32].

However, there is still room for simplifying and controlling the dynamics of the Wien-Bridge chaotic oscillators by adding external sinusoidal forcing. In this direction, a simple nonautonomous circuit, which is a simple modification of the Wien-bridge oscillator, is reported. An external sinusoidal forcing through a diode, which acts as a nonlinear element is introduced and this system shows interesting dynamics. The diode characteristic function is a two segment piecewise-linear form. The numerical results are identical to the observed experimental results.

II. SIMPLE NONAUTONOMOUS WIEN-BRIDGE OSCILLATOR WITH DIODE NONLINEARITY

A. Circuit model

The simple nonautonomous chaotic circuit by modifying the Wien bridge oscillator as shown in Fig.1 is constructed. The circuit comprises a standard Wien-bridge oscillator with one operational amplifier (μA741), two RC combinations at non-inverting input and two resistors at the inverting input of the operational amplifier to obtain required gain to start the oscillations [20]. A diode (1N4148) is connected as a nonlinear device along with an external periodic force to the non-inverting input of the operational amplifier. The state equations of the oscillator circuit shown in Fig.1 can be written using Kirchoff's laws. The dimensionless form of this oscillator circuit equations is given below as two first order coupled nonautonomous differential equations.

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Research Article

A Robust Biometric Authentication and PIN Distribution Technique for Secure Mobile Commerce Applications

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Abstract: In a mobile emerging world, user authentication, service provider authentication and security is very important in mobile commerce. User authentication is performed by using fingerprint based biometric methodology. Existing system used for Mobile purchasing/payment services in handheld devices does not analyze fingerprint matching and feature extraction techniques in an efficient way. Also the existing system is not secure and accurate for m-payments applications. We propose secure, efficient and accurate m-commerce architecture for m-commerce applications. This involves fusion of Minutiae Maps (MM) and Orientation Maps (OM) for fingerprint feature extraction. The fingerprint is sent to the biometric server in a secure way using Discrete Wavelet Transform (DWT) data hiding method. User fingerprint will be checked and compared using MM and OM methods to figure out the fingerprint threshold matching score. If the threshold is 80-99% PIN distribution process is initiated, otherwise user authentication is failed. The user PIN is converted into a unique sequence and divided into two parts. Along with the user PIN, user IP address, time stamp, user ID are encrypted using RC4 (stream cipher) algorithm. Also a hash function is appended to the cipher text using Secure Hash Algorithm (SHA4). One half is verified by the authentication server and the other half is verified by the external server. After verification both the servers sends only OK message to the bank. This study looks to provide a high secure and efficient solution for m-commerce applications.

Keywords: Biometric server, discrete wavelet transform, m-commerce, minutiae maps, orientation maps, secure hash function, stream cipher

INTRODUCTION

Mobile commerce (M-commerce) is a type of e-commerce technology attracted billions of users over the past few years. M-commerce is an emerging technology, where users can interact with the service providers through a mobile device with wireless network for information/service request, retrieval and transaction process. M-commerce is defined as "The delivery of trusted transaction services over mobile devices for the exchange of goods and services between consumers, financial institutions and merchants" (Arun Prakash *et al*., 2014).

Mobile devices also have the potential to provide unauthorized users with access to corporate networks and to introduce viruses and other harmful software into these networks (Han and Schyndel, 2012). M-commerce is subjected to several security vulnerabilities such as Theft/Loss of device and information, Clone, Hijacking, Malicious software (Malware), Phishing, and Wireless connection vulnerabilities (Arun Prakash *et al*., 2014). The above mentioned risks threaten were not only in the mobile device itself but also the networks, which the mobile device connects to. It has been identified that the most serious security threats with mobile devices are unauthorized access to data and credentials stored in the memory of the device. This threat can be mitigated only with an appropriate user identity authentication (Han and Schyndel, 2012). Access control is especially important for mobile devices. To ensure that only authorized people are able to access the device and the system is the most important point for enhancing the security level in M commerce applications.

Enabling high security is considered as the success of M-commerce applications. Thus implementing high security in M-commerce applications would invite

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Accepted Manuscript

Surface Enhanced Raman Scattering (SERS) of Silver ions embedded Nanocomposite Glass

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Synthesis and characterization of graphene oxide–polyimide nanofiber composites†

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Graphene oxide–polyimide (GO–PI) nanofiber composites were made by electrospinning poly(amic acid) (PAA) containing up to 2 wt% graphene oxide (GO), followed by thermal imidization of PAA. The resulting GO–PI nanofiber composites were characterized by Fourier transform infrared spectroscopy, X-ray diffraction, Raman spectroscopy, thermogravimetric analysis, transmission electron microscopy (TEM) and high resolution scanning electron microscopy (HRSEM). The formation of GO was confirmed by X-ray diffraction, infrared and Raman spectroscopy. Morphological analysis of the nanocomposites done with HRSEM indicates that the GO is bunched up into bead or spindle-like structures within the nanofibers. Dynamic mechanical analysis indicates that adding up to 2 wt% GO to PI leads to an improvement in the storage modulus from 1.4×10^8 to 3.8×10^8 Pa and an improvement in the glass transition temperature from 317 to 323 °C over neat PI. Thermogravimetric analysis also shows increasing thermal stability with increasing GO content.

1. Introduction

Aromatic polyimides (PI) are one of the most important high performance materials in microelectronics and aircraft industries because of their superior mechanical properties, excellent thermal stability, high glass transition temperature, and good resistance to solvents.[1,2] Electrospun nanofibers possess many unique properties including a large specific surface area and superior mechanical properties, and they have a potential use as nanoscale building blocks. Nanofibers have been successfully prepared for many applications such as filters, nanoelectronic[3] optical and chemical sensors, catalyst systems, scaffolds for tissue regeneration and immobilized enzymes.[3–6] The main advantage of electrostatic spinning is the ability to produce ultrafine fibers ranging from nanometer to submicron diameters.

G. Wu *et al.* reported polyimide-based composite films containing carbon black (CB), carbon nanotubes (CNTs) and carbon nanofibers (CNFs). They were prepared using low molecular weight poly(amic acid) (PAA), a precursor of PI, as an impurity-free dispersant. A significant improvement in the Young's modulus of the composites was observed compared to neat PI and the CNT-loaded composites showed a higher Young's modulus than the CB or CNF-loaded composites.[7] Hopkins *et al.* made PI and polyaniline nanofiber nanocomposites.[8] Cheng *et al.* synthesized non-woven polyimide and silica nanofiber composites combining electrospinning and controlled *in situ* sol–gel techniques. These composites with a 6.58 wt% of SiO_2 content showed an increase of 133 °C in the decomposition temperature and a four-fold increase in the ultimate tensile strength, compared to a neat PI fabric.[9]

Graphene and related materials, make attractive materials for electric, optoelectronic, and photonic devices,[10] due to their fascinating electrical and mechanical properties such as superior Hall mobilities, thermal conductivity, current-carrying capabilities, and room temperature ballistic transport. However, pristine graphene is unsuitable for intercalation of polymer chains, because graphene tends to agglomerate in the polymer matrix during processing. Graphene converted to graphene oxide shows improved dispersability in polymer matrices and organic systems. Wu *et al.* demonstrated that the functionalization of graphene oxide (GO) sheets with PI enables a layer-by-layer fabrication of a GO–PI hybrid resistive switching device and leads to high reproducibility of the memory effect.[11] Yuan-Li Huang *et al.* reported graphene nanosheet–polyimide (GNS–PA66) and polyvinylpyrrolidone-modified graphene nanosheet–polyamide (PVP-GNS–PA66) composite films with a surface resistance of up to 8.6×10^3 Ω per square, while maintaining 88% light transmittance.[12] Longun, *et al.* reported composites of polyimide with nanoscale graphene synthesized *via in situ* condensation polymerization. They reported that the presence of graphene significantly influenced the storage

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Adaptive Optimization using Grey Relational Analysis and PID Control of CNC Drilling Process

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***Abstract*— Adaptive optimization and control of machining process is of great significance due to cost saving and better tool utilization. This paper describes the adaptive optimization of drilling process using grey relational analysis. The PID control is used to implement the optimization strategy to automatically adjust the spindle speed and feed of the CNC servo drive system. For this purpose, the tool wear and the Metal Removal Rate are modeled using Neural networks. The inputs to the model are the spindle speed, feed and vibration signals produced as a result of machining. The models show an deviation of 3% and 2% respectively. The control strategy is simulated using MATLAB simulink. The simulation results shows that the servo mechanism tracks the optimized values with an overall accuracy of 97%.**

***Keywords*— Adaptive control, grey relational optimization, PID control, drilling process**

I. INTRODUCTION

In CNC machines, the machining parameters are usually selected prior to machining according to standards or user's experience. The parameters are selected in order to avoid machining failure and assure product quality. In practice, the optimal machining parameters are determined in off-line to increase process productivity. However, variations during the machining process due to tool wear, temperature changes, vibrations and other disturbances makes any off-line optimization methodology inefficient especially in high quality machining. Therefore, in-order to assure the quality of machining products, reduce costs and increase machining efficiency, cutting parameters must be optimized in real-time according to the actual state of the process. The metal removal rate (MRR) is another parameter which largely affects the machining process. The metal removal rate depends on three factors the drill diameter, spindle speed and the feed. Therefore, these parameters must be optimized to maximize the MRR.

In this paper, the online monitoring of the tool wear is carried out through vibration measurements. Neural network modeling of tool wear and MRR is used to determine the wear state and MRR with Speed, Feed and RMS of vibration signals as the input. Grey relational optimization determines the optimal machining parameters in on-line with changes in tool wear and MRR. A PID controller controls the spindle and feed motors of the CNC system based on the optimal values.

Vibration measurements are used for on-line tool wear measurement. The useful life of a cutting tool largely controls the economics of the machining operations. Hence, it is necessary that the condition of the cutting tool, as to when it requires changing is to be monitored[1]. Various techniques are proposed by several researchers to predict and detect chatter where the objective is to avoid chatter occurrence in the cutting process in order to obtain better surface finish of the product, higher productivity and tool life[2].Surface roughness and tool wear are strongly affected by the vibration amplitude and frequency[3]. Vibration measurement and analysis is widely considered as the most effective condition diagnosis method. The main advantage of vibration based machine diagnosis is the ability to detect different types of defects, either distributed or localized. Furthermore, low-cost sensors, accurate results, simple setups, specific information on the damage location, and comparable rates of damage are other benefits of the vibration measurement method.[4]

In recent years soft computing techniques such as neural networks, fuzzy logic, genetic algorithm and other evolutionary techniques have attracted more attention for process modeling. The application of neural networks for machine condition monitoring has been discussed by various researchers [3,5-9]. The need for automated and adaptive condition monitoring techniques is that it can learn and adapt to changes in environment when no mathematical models of the machine system are available. The rapid advances of evolutionary methods for multi-objective optimization as well as selecting an appropriate evolutionary approach that best suits the problem, the strength and weakness of different evolutionary methods proposed in literatures are analyzed in [10]. An approach for determination of the best cutting

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Original Research

Growth, structural, optical, thermal and dielectric properties of a novel semi-organic nonlinear optical crystal: Dichloro-diglycine zinc II

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Abstract

Dichloro-diglycine zinc II (DCDGZ II), a semi-organic nonlinear optical material has been synthesized and single crystals were grown from the aqueous solution up to dimensions $20 \times 10 \times 3$ mm^3. The title compound, DCDGZ II ($C_4H_{10}Cl_2N_2O_4Zn \cdot H_2O$) crystallizes into monoclinic structure with the space group of C2/c. The unit-cell parameters were found to be $a=14.4191(7)$, $b=6.9180(2)$, $c=12.9452(6)$ Å and $Z=4$. In the crystal structure, DCDGZ II layer is building up alternatingly with layers of water in which the zinc ions lie on a twofold axis. Theoretical calculations for polarizability, which are useful for device fabrication were made using Clausius–Mosotti equation and Penn analysis and the results were compared. Fourier transform infrared (FTIR) spectroscopic studies were performed for the identification of the different functional groups presented in the compound. The UV–vis–NIR absorption spectrum reveals that the lower UV cut-off wavelength is 240 nm. The optical band gap of the crystal was estimated as 2.2 eV. The surface morphology, thermal behaviour, dielectric properties have been studied using SEM, TG/DTA and LCR HITESTER analyzer. The nonlinear optical property of the crystal was also confirmed using Kurtz powder technique.
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Keywords: Crystal structure; Growth from solutions; Characterization; Non-linear optic materials

1. Introduction

Over recent years, high efficient nonlinear optical (NLO) materials has obtained more attention due to their potential applications, such as high-speed information processing, optical communications, optical communications, and optical data storage [1–3]. Among the class of NLO materials, the inorganic material possesses high melting point, high mechanical strength and high degree of chemical inertness. But, their optical nonlinearity is poor. Whereas, organic compounds are having high nonlinearity due to the weak van der Waals and hydrogen bonds and possess high degree of delocalization. However, the difficulty is to grow the large and optically good quality single crystals for device applications.

These drawbacks of organic and inorganic crystals may be overcome by semi-organic materials, which share both the properties of inorganic and organic materials [4]. Several semi-organic crystals belonging to aminoacid, thiourea and nitrophenol are exhibiting NLO properties [5–9]. However, in the family of aminoacids glycine plays a major role in forming better size and efficient semiorganic NLO crystals. Unlike the other aminoacids, glycine has three polymorphic crystalline forms α, β and γ. Also glycine and its methylated analogues form complexes with mineral acids exhibiting interesting physical properties like ferroelastic, ferroelectric or antiferroelectric behaviour [10]. The configuration of glycine ions interconnected by short O–H···O hydrogen bonds are regarded as particularly important for the ferroelectric behaviour of this crystal and the molecules are held

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In-Situ Preparation and Characterization of Acid Functionalized Single Walled Carbon Nanotubes with Polyimide Nanofibers

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Nanofiber composites (Polyimide/f-SWCNT) of Pyromellitic dianhydride, 4,4′-Oxydianiline, and 4,4′-(4,4′-isopropylidene diphenyl-1,1′-diyl dioxy) dianiline (PMDA-ODA/IDDA) and surface-functionalized single walled carbon nanotubes (f-SWCNT) were made by electrospinning a solution of poly(amic acid) (PAA) containing 0–2 wt% f-SWCNT followed by thermal imidization. X-ray photoelectron spectroscopy spectra verified the oxidation of SWCNT surface after acid treatment, and indicated possible hydrogen bonding interactions between the f-SWCNTs and polyamic acid. High-resolution scanning electron microscopy images showed the average diameter of nanofibers to be below 150 nm, and transmission electron microscopy images showed that SWCNTs were aligned inside the polymer nanofiber. In thermogravimetric analysis, all composites showed increased thermal stability with increasing f-SWCNT content compared to neat PI. Storage modulus also increased from 124 MPa to 229 MPa from neat PI to 2% f-SWCNT composite.

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Keywords: Polyimides, Electrospinning, Nanofibers, X-Ray Photoelectron Spectra, Thermal Properties.

1. INTRODUCTION

Nanoparticles-dispersed polymer fiber composites are known to possess improved thermal and mechanical properties compared to neat polymer fibers. Carbon nanotubes (CNT) have been an attractive material for such enhancement even at low loading levels, due to their high aspect ratio (greater than 1000), low density, and high strength, alignment[1] and the large interfacial areas between them and the polymer matrix. The improvement in material properties increases when the nanotubes are well-dispersed and aligned with the polymer fibers.[2,3] Mechanical dispersion and surface modification of CNTs by covalent (acid or amine functionalization)[4] or non-covalent means (using small molecules as dispersants) are commonly used for improved CNT dispersion. Direct covalent sidewall functionalization of CNTs by acid or amine treatment is associated with a change of hybridization from sp^2 to sp^3, a simultaneous loss of π-conjugation system, and formation of –COOH, –OH or $-NH_2$ groups on the side walls of SWCNT.[5] Such functionalization may facilitate improved interactions with the polymer, and thereby improved properties of the composites. Another approach that has resulted in greater improvement of properties has been polymerization in the presence of the nanotubes rather than the mere dispersion of the nanotubes in a preformed polymer matrix.[6]

Many polymers have been used to prepare polymeric nanofibers for several applications.[7–11] Polyimides are well known polymers with an excellent thermal stability, mechanical and electrical properties. In addition to films, polyimide nanofibers may be produced by electrospinning technique, and several works have been reported for obtaining ultrafine, uniform and non-woven or aligned nanofibers.[12–16] Studies have also been reported on electrospinning functionalized polyimides such as porphyrinated polyimide nanofibers,[17,18] polyimide nanofibers reinforced with polymer films,[19,20] and nanoparticles such as silica, silver, europium, and Fe–FeO.[21–24] Chen et al. investigated

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Investigation of structural and photoluminescence properties of gas and metal ions doped zinc oxide single crystals

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TECHNICAL NOTE

Harnessing power from sea water using nano material as photocatalyst and solar energy as light source: the role of hydrocarbon as dual agent

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SUMMARY

The splitting of water in the presence of ordinary and nano TiO_2 was carried out using hydrocarbon as a dual agent and solar energy as a light source for these experiments. The hydrogen gas evolved was tested and measured using downward displacement of water. The observed results show that more hydrogen was evolved when nano TiO_2 was used as catalyst due to the larger surface area of the nano material. The splitting of sea water yields more hydrogen compared with ordinary water due to the presence of electron donating sodium ions in water. The added hydrocarbon plays a dual role as electron donor and as a trapping agent, which enhances the production of hydrogen to a greater extent compared with the regular donors such as olefin. Copyright © 2013 John Wiley & Sons, Ltd.

KEY WORDS

solar energy; sea water; hydrogen energy; zinc oxide nano particles

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1. INTRODUCTION

Conventional energy resources such as coal, petroleum products, and so on are being used to meet most of the world's energy requirement that have been depleted to a greater extent. It is therefore necessary to produce an alternative fuel, which should in principle be pollution free, storable, and economical. Hydrogen satisfies the first two conditions and to fulfill the third requirement, this research work has been focused during the past two decades.

Fujishima and Honda [1] first reported the photocurrent generation using semiconductor electrodes in 1972. After that, the semiconductor materials are used in the form of electrodes [2,3] colloids [4], powders and thin films [5] in the process of solar energy conversion. Hydrogen has been produced electrochemically [6], biologically [7], photo electrochemically [8], (using semiconductor electrodes) and photo catalytically using semiconductor powders [9].

To date, various types of metal oxide semiconductors, including titanium, ruthenium, platinum, and rhodium are used for the purpose of splitting water into hydrogen and oxygen in the presence of olefinic compounds as sacrificial donors [10]. Many research works are going on in the field of energy using nanotechnology [11]. The titanium oxide, the widely used metal oxide semiconductor for photo catalytic decomposition of water, yields only a low quantum of hydrogen evolution from water. In order to promote the rate of hydrogen evolution, several research projects have focused on various methods to improve this evolution rate [12] using titanium oxide as photocatalyst. John *et al.* tried to improve the production of hydrogen using glucose as sacrificial agent and TiO_2 as photocatalyst [13]. Kiwi and Morrison investigated the effect of lithium doping on TiO_2 on the production of hydrogen [14]. Several aliphatic and aromatic hydrocarbons were used as sacrificial agent in order to improve the hydrogen production efficiency. The use of nanoparticles in the field of solar energy conversion is the backbone for future energy needs [15]. Enormous research works are going on for the storage of hydrogen. In our present work, we try to improve the efficiency of hydrogen production using hydrocarbon as sacrificial agent along with the TiO_2 photocatalyst. The goal of this research was to elucidate the effect of the hydrocarbon in the production of hydrogen using sea water as a non-polluting and economic fuel source.

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