ISBN
9 788195 596348

PROCEEDINGS OF

INTERNATIONAL CONFERENCE ON SCIENCE FOR SUSTAINABLE DEVELOPMENT

(ICSSD -2022)

9-10 December 2022

Editors
Dr. Jyotishkumar Parameswaranpillai
Dr. Chitrakara Hegde

DEPARTMENT OF SCIENCE &
CENTRE OF EXCELLENCE-WATER RESEARCH
ALLIANCE UNIVERSITY, BENGALURU

PROCEEDINGS OF INTERNATIONAL CONFERNCE ON SCIENCE FOR SUSTAINABLE DEVELOPMENT (ICSSD-2022)

9 -10 DECEMBER 2022

CONVENER

Dr. Jyotishkumar Parameswaranpillai

Dr. Chitrakara Hegde

Conference Organized by:

ALLIANCE UNIVERSITY

Private University established in Karnataka State by Act No.34 of year 2010
Recognized by the University Grants Commission (UGC), New Delhi

Department Of Science &
Centre Of Excellence-Water Research
Alliance University
Benagaluru, Karnataka
India

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Conference Date: 9 -10 December 2022

(Virtual Mode)

Conference website: https://www.alliance.edu.in/icssd-2022/

Edited By: Dr. Jyotishkumar Parameswaranpillai
Dr. Chitrakara Hegde

First Edition: 2022 December

ISBN: 978-81-955963-4-8

Cover Image: Designed by Freepik

Published by: Department of Science &
Centre of Excellence-Water Research

Alliance University
Chikkahagade Cross
Chandapura - Anekal Main Road, Anekal
Bengaluru – 562 106, Karnataka, India.

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Message from the Pro-Chancellor

03-12-2022

My heartfelt congratulations to the Department of Science & Centre of Excellence - Water Research, Alliance for organizing the International Conference on Science for Sustainable Development 2022 (ICSSD). The conference proceedings of ICSSD are a fruition of all the work invested thus far by every member of the Department and I sincerely hope that this platform is both a learning experience and a platform for us to come together to build a roadmap for a sustainable future. I firmly believe that the future lies in the hands of learned individuals who will create tools, materials, processes, and technologies that will lead towards development of a greener planet.

Exponential rise in population and urbanisation has led to ecologically critical resources getting scarce. The conference is a confluence of people who have extensively worked towards creating a sustainable tomorrow, the proceedings are a comprehensively drafted document in that direction. As the scriptures in India emphasize on the five elements; air, water, earth, fire, and space, it is important for us to conserve these elements and what they produce and ensure that these are accessible in purest forms for our children.

We at Alliance have been firm believers of building a sustainable ecosystem for our future generations. This reflects in our infrastructure, technology usage, investments in solar and electric components and machinery. We have most recently been recognized for our efforts in uplifting the Sustainable Development Goals.

I am extremely delighted over the idea of this conference that so strongly converges with our thought-process of building a better world through education. I wish that the proceedings of this conference will be thought insinuating tool for all the readers and be a foundation of the great research that this community at Alliance through numerous collaborations will do towards sustainability.

I am sure that you will be greatly benefited by this conference, and I welcome you to visit our campus in Bengaluru, India and experience the difference we are making in creating a positive impact on communities that are connected to us.

Best Wishes
Abhay G. Chebbi
Pro-Chancellor, Alliance University

Message from the DEAN (Research) Alliance University

Dear Participants,

On behalf of the organizing committee and Alliance University, I passionately welcome you all to the Two-day conference titled **"International Conference on Science for Sustainable Development (ICSSD-2022)"** held in virtual mode (https://www.alliance.edu.in/icssd-2022/) organized by the Department of Science and Centre of Excellence in Water Research, Alliance University, Bengaluru from 09th-10th December 2022.

Nowadays, sustainability has emerged as a prominent theme for conferences and events around the world. Numerous occasions are held every year across the world to discuss how technology might contribute to a more sustainable future for everyone. Businesses are starting to recognize sustainability as the next frontier of innovation as industries are changed by technological breakthroughs. By utilizing cutting-edge technologies and solutions, businesses may help hasten the sustainable transition and meet the demanding net-zero targets.

The convenor has taken a great number of themes on sustainability to conduct this two-day event suitable to the present-day needs creating awareness amongst all. The event has already taken shape in a very short time to be the best platform to showcase student talent, networking opportunities, and collaborations with lead speakers. ICSSD-2022 as of now set with speeches/lectures from eminent speakers and attracted several abstracts from internationally acclaimed individuals from the sustainability community, which may provide accommodating solutions and engage in a lively discussion about the most critical sustainability-related issues today at this two-day conference with many tracks. This could be the platform to discuss sustainable development goals and sustainable development innovations in their sector with multi-disciplinary and multi-sectoral problem-solving methods. Attending such events is a great way to learn about the most recent technological advancements in a variety of industries, meet like-minded individuals to expand your social network, and gain a deeper understanding of the pressing need for a sustainable future.

I combine my best wishes for a successful and fruitful debate at the conference. I look forward to learning the latest technological advancements towards applications in various sectors industry experts, government, and academic researchers/scientists on these topics. Looking forward to an excellent symposium with experts from different countries sharing their innovative and breath-taking outcomes.

With best regards,

Prof. Dr. techn. Murthy SSS CHAVALI Yadav
DEAN (Research), Alliance University, Bengaluru.

From the HOD desk

Dear participants,

Sustainable development is the need of the hour. Almost all the development activities lead to depletion of resources and thereby depriving our future generations.

It is a societal goal for long term survivability of the people to co-exist on the earth. For this we need science and technologies which help us to have development while ensuring no or minimum adverse impact on environment and resources as well as regenerative.

I am very glad to be part of the International Conference on Science for Sustainable Development (ICSSD-2022).

The convenors have chosen very relevant, critical and related themes like

Clean Water

Battery and Fuels

Organic Farming

Advanced Polymeric materials and composites

Applications of computer Science for sustainable development

Renewable energy

I take this opportunity to express my sincere wishes for fruitful interactions, sharing of ideas and technologies during the Conference which can lead to a better Earth.

With best wishes

Dr. Vipin Prasad
Head of the Department,
Department of Science,
Alliance University

Convenor's message

Dear Professors and Researchers

It is our immense pleasure to welcome you all to the "International Conference on Science for Sustainable Development, ICSSD 2022" on 9th and 10th December 2022 at the Department of Science, Alliance University, Bengaluru.

The main goal of the conference is to discuss and learn the importance of science in sustainable development. Many of the traditional materials used in industrial applications are toxic to the environment, therefore there is a quest for green or sustainable materials from renewable sources to replace toxic traditional materials. As you know, 2022 is a year of science for sustainable development as declared by UNESCO. Also, the Paris agreement for sustainable development emphasizes the need for zero or negative carbon emissions to control global warming and changes in climatic conditions. To make our planet better, we need to understand the actual problems and also, and we should know how to tackle these problems. I am sure ICSSD 2022 will give solutions to many of the environmental related issues.

We were honored to have Prof. Sabu Thomas (India) as the Guest of Honour, Dr. Dr. Vijayakumar Chakkooth (India) as Key Note Speaker, and Prof. Guillermo R. Castro (Argentina), Prof. Markus Gahleitner (Austria), Prof. Sarawut Rimdusit (Thailand), Prof. Mariana Buranelo Egea (Brazil), Prof. Nishar Hameed (Australia) and Prof. Prasanth Raghavan (India) as Invited speakers on this special occasion.

We welcome all to this important conference. Let us work together as a group for a better world.

With best wishes

Convenors
Dr. Chitrakara Hegde
Dr. Jyotishkumar Parameswaranpillai

Note from Guest of Honour

Circular Economy: New Opportunities in Sustainable Nano Materials and Polymer Bio-Nanocomposites

SABU THOMAS

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Green chemistry started for the search of benign methods for the development of nanoparticles from nature and their use in the field of antibacterial, antioxidant, and antitumor applications. Bio wastes are eco-friendly starting materials to produce typical nanoparticles with well-defined chemical composition, size, and morphology. Cellulose, starch, chitin and chitosan are the most abundant biopolymers around the world. All are under the polysaccharides family in which cellulose is one of the important structural components of the primary cell wall of green plants. Cellulose nanoparticles (*fibers, crystals and whiskers*) can be extracted from agrowaste resources such as jute, coir, bamboo, pineapple leafs, coir etc. Chitin is the second most abundant biopolymer after cellulose, it is a characteristic component of the cell walls of fungi, the exoskeletons of arthropods and nanoparticles of chitin (*fibers, whiskers*) can be extracted from shrimp and crab shells. Chitosan is the derivative of chitin, prepared by the removal of acetyl group from chitin (*Deacetylation*). Starch nano particles can be extracted from tapioca and potato wastes. These nanoparticles can be converted into smart and functional biomaterials by functionalization through chemical modifications (*esterification, etherification, TEMPO oxidation, carboxylation and hydroxylation etc*) due to presence of large amount of hydroxyl group on the surface. The preparation of these nanoparticles includes both series of chemical as well as mechanical treatments; crushing, grinding, alkali, bleaching and acid treatments. Transmission electron microscopy (TEM), scanning electron microscopy (*SEM*) and atomic force microscopy (*AFM*)

are used to investigate the morphology of nanoscale biopolymers. Fourier transform infra-red spectroscopy (*FTIR*) and x ray diffraction (*XRD*) are being used to study the functional group changes, crystallographic texture of nanoscale biopolymers respectively. Since large quantities of bio wastes are produced annually, further utilization of cellulose, starch and chitins as functionalized materials is very much desired. The cellulose, starch and chitin nano particles are currently obtained as aqueous suspensions which are used as reinforcing additives for high performance environment-friendly biodegradable polymer materials. These nanocomposites are being used as biomedical composites for drug/gene delivery, nano scaffolds in tissue engineering and cosmetic orthodontics. The reinforcing effect of these nanoparticles results from the formation of a percolating network based on hydrogen bonding forces. The incorporation of these nano particles in several bio-based polymers have been discussed. The role of nano particle dispersion, distribution, interfacial adhesion and orientation on the properties of the ecofriendly bio nanocomposites have been carefully evaluated.

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Keynote Address

Organic Thermoelectric Materials: Converting Waste Heat to Electricity for a Sustainable Future

Vijayakumar Chakkooth

Chemical Sciences and Technology Division,
CSIR-National Institute for Interdisciplinary Science and Technology (NIIST),
Thiruvananthapuram, Kerala.

Energy is an inevitable part of daily life, but energy utilization data reveals that various processes only utilize a lesser fraction of produced energy, while a larger pool is wasted mostly through heat generation.1 Using this waste heat and converting it to electrical power is a promising strategy for increasing energy efficiency and achieving sustainability. Thermoelectric (TE) materials can convert heat into electricity through a phenomenon called the Seebeck effect.2 They can efficiently harvest waste heat from sources like thermal and nuclear power plants, automotive exhausts, incinerators, hot water released from industries, etc. TE devices are advantageous due to their noise-free working, longer lifetime, requires no moving parts, and high scalability. While energy harvesting by inorganic TE materials has been explored well, organic TE materials have shown outstanding advancements in this decade.3 The research is driven by the broader merits of organic molecules, such as more accessible molecular tailoring, facile tuning of electronic properties, light-weightiness, flexibility to adopt any substrate, and lower processing temperature. In addition to these, the inherently low thermal conductivity of organic materials opens up promising avenues for efficient and low-cost TE technology. Our activities in this area will be discussed in detail.4-8

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Invited Lecture

Improving circularity and sustainability of polyolefins

Markus Gahleitner, Alexandra Albunia, Susanne Kahlen

Borealis Polyolefine GmbH, Innovation Headquarters, Linz / Austria

It has become fashionable these days to denounce conventional polymers as outdated dinosaurs posing an enormous threat to the planet and life on it, while only rather limited progress has been made in the performance of bio-based and biodegradable polymers over the last 20 years. In contrast to that, polyolefins are chemically inert materials with an incredibly wide application range, which have demonstrated their longevity and lasting performance in many diverse uses. Starting from a look at different materials' contribution to the carbon footprint of consumers, the possibility to save energy and emissions while also ensuring a safe and healthy life with polyolefins is presented. "Closing the loop" for recycling these materials at the end of their usage period can be achieved by mechanical and chemical recycling, as demonstrated by Borealis and its partners. The development of recycling technologies and suitable applications goes hand in hand with "Design for recycling", which is much more than just a reduction of material diversity. Still a lot remains to be done for politicians, scientists and economists – from landfill bans through energy-efficient synthesis processes to efficient multi-use packaging systems.

Invited Lecture

Lipid nanoparticles as potent tools for nanomedicine

Guillermo R. Castro

Nanobiomaterials Area. Max Planck Laboratory for Structural Biology, Chemistry and Molecular Biophysics of Rosario (MPLbioR, UNR-MPIbpC). CONICET SantaFe, Argentina
Nanomedicine nucleus, Universidad Federal do ABC, San Pablo, Brazil

The growth of useful carriers to deliver chemotherapeutic molecules to defined biological targets establishing proper drug release kinetics with high efficiency and minimum undesirable side effects is becoming a promising relevant tool in nanomedicine. Since about 70% of the available drugs in the market are hydrophobic, it is required to provide new carriers able to efficiently transport and deliver the molecules to the targeted site. In the global situation of emerging pathogens associated with respiratory pathologies, advances in solid lipid formulations can provide novel platforms of drug delivery for lung therapies. Now, many lipids are available in the market with high purity, low costs, and the advantage of being recyclable as a rich carbon source. Recent advances in lipid structures showed nanostructured lipid carriers (NLCs) developed with liquid oil and wax as promissory vehicles for drug delivery.

Levofloxacin (LV, XlogP3= -0.4) is a third-generation fluoroquinolone that is a broad-spectrum antibiotic widely used in the treatment of respiratory against recurrent infections of *Pseudomonas aeruginosa*, particularly in cystic fibrosis (CF) disease and urinary tract infections. LV has been associated with clinically hepatic injury observed by a short latency interval and a hepatocellular pattern of enzyme rises. To reduce the LV toxicity and enhance the biocide activity, different NLC formulations were developed and Biophysically characterized (*i.e.*, XRD, FTIR, TGA, TEM, DLS, etc.) as well as the biocide activity against *S. aureus* and *P. aeruginosa*. Solid lipid nanoformulations made of cetyl ester (SS), glyceryl dibehenate (CO), and glyceryl tristearate (DY) emulsified with poloxamer 188 as a surface stabilizer

and chitosan as cationic biopolymers were optimized. The mucoadhesiveness of the NLCs was studied by rheological methods, demonstrating a reduction in mucin cohesiveness and elasticity due to the mucoadhesive properties of NLCs coated with chitosan. Solid lipid nanoparticles (SLNs) of SS, CO, and DY encapsulated 58.0 ±3.2, 25.7 ±7.1, and 27.9 ±1.5% LV, respectively, meanwhile NLC formulations were able to encapsulate 80–90% LV and allowed the controlled release of the drug.

In addition, different strategies for lung therapies were developed using antioxidant molecules, alpha-tocopherol, or DNAse (type I) to hydrolyze mucus in the infected lungs by *P. aeruginosa* were developed and tested.

The results indicated that NLC containing LV could be an attractive model for the potential treatment of lung microbial infections

Invited Lecture

Sustainability at the table: the contribution of plant-based products

Dr. Mariana Buranelo Egea

Goiano Federal Institute (Rio Verde, Brazil)

ABSTRACT

There is a growing concern among the population about the consumption of animal products due to the way their production negatively affects the environment, increasing global warming, land degradation, air and water pollution, and the loss of biodiversity. In addition, there is concern about animal welfare and the impact of consumption of animal products on human health. In order to meet this consumer need, plant-based products emerge that can be analogous to the process, form of preparation, and/or consumption of products of animal origin, demonstrating the characteristics of color, flavor, texture, and appearance analogous to animal products, but is used raw material from plant origin in the its production. As ingredients of plant-based products are plant proteins that are considered alternative proteins and should provide a strategy in food production. Although globally there is a lack of identity and quality standards for plant-based products as well as standard reports to assess and publicize the impacts of their production due to their recent market introduction, it is estimated that the alternative protein market will reaching 60% of the total meat market in 2040. In addition to demonstrating high sustainability, plant-based products have also demonstrated higher dietary fiber content and lower addition of additives, sodium, and saturated fat in their formulations, indicating greater healthiness compared to animal products. In this sense, the food industry has invested in research in the area of alternative proteins for the development of plant-based products. One strategy to increase the availability of ingredients for the plant-based products

industry is the use of food processing by-products, such as the cake/meal resulting from the processing of grains (cotton, soy, sunflower, peanuts, etc.) for oil production. These byproducts are normally undervalued and used only in animal feed or in agriculture as fertilizer. They have demonstrated high protein content and can be used in the development of plant based ingredients and products.

Keyword: byproduct, alternative protein, food development.

Invited Lecture

Biobased Shape Memory Polymer Composites from Magnetic Nanoparticle-filled Benzoxazine/Epoxy Copolymer with Magnetic and NIR Actuation Capabilities

Lunjakorn Amornkitbamrung[a], Sitanan Leungpuangkaew[a], Chanchira Jubsilp[b], Sarawut Rimdusit[a,*]

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ABSTRACT

Thermosetting bio-based magnetic shape memory polymers (SMPs) were prepared from V-fa benzoxazine and epoxidized castor oil with Fe_3O_4 nanoparticles (NPs) as filler. The shape memory behaviors resulted from the polymerization of flexible epoxy segments and rigid benzoxazine structures. Thermomechanical and shape memory properties of the V-fa/ECO copolymers were studied. The nanocomposite can be effectively softened via NIR laser irradiation and deformed under magnetic attraction. Once the laser is removed and allowed to cool down, the actuated shape can be locked. The incorporation of magnetic filler helps facilitate the shape recovery by converting electromagnetic energy to joule heating. The shape memory performance was also improved with the filler addition with reported shape fixity and shape recovery as high as 93% and 95%. Moreover, functionalization of the copolymers with acid anhydride can grant self-healing capabilities, the SMPs

based on bio-based benzoxazine and epoxy is a promising multifunctional thermoset for various engineering applications.

Keywords: Polybenzoxazine, Biobased Polymer, Epoxy, Shape Memory Polymer, Nanoparticle.

Invited Lecture

Smart composite materials and digitalization

Nishar Hameed

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Recent innovations in rapid, automated manufacturing processes have revolutionised the way we make carbon fibre reinforced composite materials, with cycle times dramatically reduced from hours to minutes. Capitalizing on the latest technologies, the global market for composites is expected to grow exponentially with emerging applications in space, aerospace, automotive, wind energy and building infrastructure. It follows that the rapidly evolving landscape of automation and digitalisation, accurate and real-time information on the structure throughout its value chain is critical to achieving quality, safety and sustainability in composite manufacturing. Our research leverages the ability of carbon nanomaterials to manipulate the properties and integrate novel functionalities into composites, with recent breakthroughs made in achieving mechanical flexibility, electrical conductivity and strain sensing properties. We have developed a highly versatile and innovative research platform to establish multifunctionality in composites, providing unprecedented sensor intelligence, real-time digital data, along with structural robustness. Ultimately, the interrelationship between process, structure and properties of multifunctional composites have been developed to enable digitalization in composite manufacturing.

Contents

Performance study of the direct contact membrane distillation for the sustainable contaminated drinking water treatment

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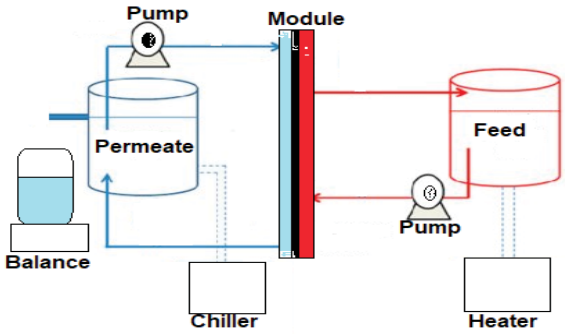
ABSTRACT

Membrane technology plays a vital role in water purification . One of the most persistent problems afflicting populace throughout the world is inadequate access to pure drinking water. Addressing these problems there is great need to identify sustainable methods of purifying water at lower cost and with less energy. It is a well-known fact that the direct contact membrane distillation technique can be used to produce pure water by de-salting sea water and by removing harmful ions such as fluoride, arsenic etc. present in the ground water.

There have been many reported cases of fluoride contamination of drinking water in Karnataka. Very high concentration of fluoride in drinking water has affected the health of the common people. Scientific studies have shown that optimal fluoride content in drinking water must be in the range of 1.0 - 1.5 mg/L. The current research has thoroughly investigated the performance of the direct contact membrane distillation method on fluoride removal in the drinking water using hydrophobic membranes. Experiments have successfully shown 99% of F^- rejection with excellent flux rate using our lab scale direct contact membrane distillation.



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Water quality studies different sources and containers

Sarika B, Layana M, Pooja V, Pavatharini V M

Department of Science, Christ College of Science and Management
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ABSTRACT

Water plays a vital role in human life. Water bodies are polluted by industries and tanneries. Which makes water unfit for human consumption and even for agriculture. Water pollution is a major global problem which requires ongoing evaluation and revision of water resource policy at all levels. The present study aims to determine quantitatively various physic-chemical factors such as TDS, PH, Alkalinity, Sulphate, Nitrate and etc for different water sources such as, Bore well, River, Pond water, open well. Water samples were collected by different containers such as plastic, clay, etc and the effect of container on polluted water were analysed.

Ultrasonic studies of polymer blends with natural materials as electrolyte solutions

Makesh Jeyabal, Gudipati Manikanta,
Ranjithkumar Muniraj

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ABSTRACT

Polymers play very important role in our day today life as they show significantly better processability and properties such as high strength, light weight, good flexibility, special electrical property, resistance to chemicals etc., with respect to materials such as metals, glass, and ceramics. As the solution properties of polymers form the basis for the quantitative characterization of polymer molecules, knowledge about the molecular interactions and the changes in physical properties of polymer solutions is needed. The ultrasonic investigation are very simple and of much more important to understand the molecular interactions present in liquid mixtures. The study on polymer electrolyte systems is more useful in the technological point of view as the polymer-electrolyte complexes find potential applications in the construction of power batteries. In the study of polymer-electrolyte it is decided to measure ultrasonic velocity, density and viscosity, compressibility, and excess values. The measured values are used to study the properties of the polymeric solutions.

Tensile properties and swelling behaviour of carbon black reinforced natural rubber and polyvinylpyrrolidone semi-interpenetrating polymer networks

Manju R Nath[a, b] and Mohanan A[a, c]

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b Post Graduate Department of Chemistry, Payyanur College, Payyanur.
c Department of Chemistry, Nehru Arts & Science College, Kanhangad.

ABSTRACT

Semi-interpenetrating polymeric network (semi-IPN) blends of natural rubber (NR) and polyvinylpyrrolidone (PVP) were prepared using glutaraldehyde (GA) as crosslinking agents. Swelling behaviour and tensile properties of NR/PVP semi-IPN were studied by varying blend ratio as well as GA concentration. By fixing the polymer composition which exhibited good results CB loadings were investigated. CB loadings were 0.1g, 0.2g and 0.3g. It was observed that tensile strength of IPN blends were improved with incorporation of CB. Swelling studies were carried out by taking toluene as the solvent. The kinetics and mechanism of swelling were studied. Diffusion coefficients were calculated. It proved that CB loading increased the cross-linking density of NR/PVP semi-IPN.

Key words: Blends, IPN, tensile strength, diffusion coefficient.

Advanced Semiconductor Alloy $Al_xIn_{1-X}P$ for Engineering and Medicine

Dr Alla Srivani[1], Gurram Vasanth[2], Dr. GVS Subbaroy Sharma[3], M. Srinivasa Rao[4], Dr. P Ramesh[5], Dr A Raghavendra[6], Dr G Krishna Kumari[7].

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ABSTRACT

Doped Advanced semiconductor materials with different properties are useful for early diagnosis and improved treatment in medical research. This is essential for advanced medical technology and lower mortality rates. New research on impurity-doped nano crystals is important. These dopants can directly affect electron transport in semiconductors, tune the optical properties of nano materials in desirable ways, and impart specific properties to the host. In this research report, we first discuss the factors that need to be considered to systematically control the production of these doped semiconductor materials, then describe various doped materials and typical synthetic approaches and techniques. Innovations in nanotechnology and materials design and their application in early diagnosis and treatment are believed to minimize the number of new cases of related diseases and reduce mortality.1,2,3 From natural to man-made materials, Doped semiconductor nanostructures, including inorganic and organic semiconductors, are increasingly attracting the attention of researchers and scientists worldwide

Keywords: Advanced Materials, Semiconductor Alloy AlInP, Engineering and Medicine

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Acceleration voltage and spot size of advanced biomaterial in nano scale

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ABSTRACT

Recently emerging advanced biomaterials, including hydrogels, films, micro/nanofibers and particles, have great potential for use as cell/drug carriers for localized drug delivery and as biomimetic scaffolds for future regenerative therapies. Biological properties such as biocompatibility, biodegradability, biomaterial immunogenicity, and current application strategies are presented. The final remarks and future prospects of such advanced biomaterials are discussed. This article covers various topics related to the design of biomaterials and devices applied in vivo and in vitro, as well as stem cell biology, biomaterials, and technological approaches. Specific topics include generating new functional liver substitutes, improving bone repair processes, neuro genesis, ground breaking models of cardiac fibrosis, and creating novel venous valve prostheses. This interdisciplinary approach highlights how diverse properties of biomaterials and devices are involved in promoting cellular integration and ultimately new tissue formation. This topic is essential for biomaterials scientists, tissue engineers, clinicians, and stem cell biologists involved in basic research and its applications.

Keywords: Acceleration Voltage, Spot size, Advanced Biomaterials

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Comparative investigation of MDRZ and RZ modulation techniques at 40Gbps x 32 channels in DWDM communication system.

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ABSTRACT

In DWDM Communication system we need to more data rate to transmit one end to another end and more channel multiplex together and transmit via one single mode fiber. In that current scenario of the world to reach high data rate need high efficiency also. So, that's why we work on finding out which modulation scheme is the best performance in DWDM communication system. Our work based on MDRZ and RZ modulation scheme analyses to finding out which modulation scheme is best performance in DWDM communication system. We used our previous work data to compare MDRZ and RZ modulation performance analyse based on Q factor and BER rate. Also, we use 100GHz, 90GHz and 80GHz channel spacing in both MDRZ and RZ modulation scheme to 32 channels x 40Gbps DWDM communication system. The DWDM communication is the one of the best optical communication systems because of so, many channels multiplexed together and transmit via one single mode fiber and another end we use demultiplexer to receiving the singles. This DWDM optical communication system is revolutionary due to little size, minimal expense and low power utilization. Benefit of this technique is besides of SDH, SONET, Ethernet, ATM, and so on [1,3]. Our work is done on RZ and MDRZ modulation technique we published it but we don't compare it so in this work we do it [4,5]. We use both modulation schemes with 32 channels multiplexed together and transmitting via one single mode fiber (SMF) and then we use 10km length Dispersion compensate fiber (DCF) and after that signal reach at receiving end. After signal complete their path at

receiving end, we use 32 channels demultiplexer and then received signal we use optical receiver we show BER rate of signal and Q- factor to show signals performance and data errors. C-band is use in RZ and MDRZ modulation for central frequency and then we add modulation wise require optical amplifiers. RZ modulation scheme we use post-compensate EDFA amplifier then DCF fiber and after that we use again EDFA amplifier then signal goes receiving at demultiplexer [10]. MDRZ modulation scheme in modelling we use after 32 channels multiplexed together, we use loop controller and number of loops is five and then we use SMF length of 25km then EDFA optical amplifier then DCF length of 10km then we use25km of single mode fiber then EDFA optical amplifier after that signal goes in loop control module and receives at 32 channels demultiplexers and receiving end. All EDFA optical amplifier have 10dBm gain only one EDFA has 5dBm gain and all EDFA amplifier has a noise figure is 6dBm.

Comparative evaluation of the long-distance dense wavelength division multiplexing system for dispersion compensating fibre scheme

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ABSTRACT

The dense wavelength division multiplexing (DWDM) approach was employed to increase system performance by combining many channels in a transmission line for long haul optical links. However, the system performance was constrained by the existence of dispersion. Dense wavelength division multiplexing (DWDM) performance was impacted by dispersion, one of the distortions in optical communication systems, which limited the bandwidth capacity. As a result, the DWDM system needed a tool to compress the effect of dispersion. In this study, the bit error rate (BER) and Q-factor parameter, which applied the symmetrical DCF to compress the dispersion effect, were used to analyze the performance of DWDM networks. A model of 16-channel DWDM with a bandwidth of 40 Gbps was seen across a 1050 km optical connection with a channel spacing of 100 GHz. Two DCF configurations were used in the construction of the DWDM system, and an EDFA was used to renew the optical signal. Two DCF configurations were used in the construction of the DWDM system, and an EDFA was used to renew the optical signal. Variations in the DCF technique and optical power launch of 0, 2, 4, 6, and 8 dBm were used to observe the system. According to the findings, Type-A performance is marginally superior than the B-type scheme in terms of Q-factor. Both type-A and type-b performance have an equivalent value based on BER. Using the Optisystem software, the generated model performs at four different bit rates in terms of Q-factor, bit error rate (BER), eye height, and threshold. Key words: Dispersion compensation fiber (DCF), Dense wavelength division multiplexing (DWDM), dispersion effect, Erbium doped fiber amplifier (EDFA), bit error rate (BER), Q-factor, Optisystem software.

Case Studies on Virtual Topology Reconfiguration for Wavelength Routed Network

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ABSTRACT

Future optical networks will include Wavelength Division Multiplexing (WDM), which has the ability to provide transmission capacity, routing capabilities, and a certain degree of transparency to the conveyed signals. As a result, WDM networking necessitates rethinking network analysis and its influence on the dimensioning process. In this article, we have discussed a detailed scenario of the optical network. The Internet's bandwidth needs are growing daily, and there are new applications on the horizon that will need even more bandwidth. The next stage in maximizing optical fiber's potential, particularly for wide-area backbone networks, is wavelength division multiplexing (WDM). Wavelength routing is the process of allowing a signal to be switched at intermediate nodes in a WDM network depending on their wavelengths. The ability to establish a virtual topology distinct from the actual topology of the underlying network is one of the biggest benefits of adopting wavelength-routing WDM. To enhance performance, this virtual topology may be changed as needed. One of the advantages to wavelength division multiplexing is that many signals can be transmitted simultaneously. These are all some reasons why Wavelength Division Multiplexing (WDM) is an important part of our society today. Wavelength division multiplexing is a physical layer technology that has the potential to provide much higher capacity to fiber networks. Wavelength division multiplexing has been around for a few years now, but it is still not widely used in commercial applications because of its limitations. The main reason why this technology did not become mainstream yet is due to its limitations in bandwidth, which are caused by the limited number of wavelengths that can be created at the same time. With this limitation, wavelength division multiplexing cannot support

more than 400 gigabits per second on a single fiber link while conventional Ethernet can easily transfer 10 gigabits per second on a single link.

Keywords: WDM, Virtual Topology Reconfiguration (VTR), Optical Network.

Prediction of Physical and Mechanical Properties of Bamboo fiber/ glass fabric reinforced Polymer Composites with Artificial Neural Network Technique

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ABSTRACT

Attaining the long life and higher characteristics of engineering structures is necessary to endorse sustainable advancement. Conventional steel is used in structural engineering applications, followed by the corrosive solution, sustained cyclic loading, alternating humidity, and temperature. Fabric-based polymer laminates can substitute steel for underground ocean engineering, oil extraction, and bridge cables due to resistance from corrosion, fatigue, lower density, and higher strength. In the present investigation, bamboo fiber/ glass fabric hybrid vinyl ester laminates were fabricated using the wet-layup technique. The exposure of constant water absorption for two years was performed to study the influence of synthetic and natural fiber hybrid modes on mechanical characteristics. The outcomes presented the synergetic effects between the vinyl ester, bamboo fiber, and glass fabrics can be entirely generated using the random fiber orientation. The higher flexural loading outcome in the rapid micro-crack production offered more storage capacity for accelerating the hydrolysis of polymer and water molecules with the interfacial bonding between the bamboo fiber/ glass fabric and resin. The detainment of flexural and tensile strength for the service period of two years was concluded to be 20-25% and 30-35%, respectively, which offered

the guideline of durability depending on fiber/ fabric hybrid design for the structural applications. Moreover, in the present investigation, an artificial neural network model was applied in forecasting the failure parameter to decrease the number of time-consuming and expensive experiments. The higher characteristics were collected from a neural network scheme with the Levenberg-Marquardt learning methodology. The artificial neural network was noticeably successful in forecasting the failure parameter because of higher R squared, and lower root means square error.

Keywords: Artificial Neural Network; Bamboo fiber; Mechanical Properties; Vinyl ester

Biowaste- derived chitosan/nanocellulose/ nanocurcumin coating for banana

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ABSTRACT

Banana is a widely grown fruit in Kerala, mainly cultivated for export and local consumption. However, a major constrain in the storage and distribution of banana is their short shelf-life. A large quantity of cultivated banana is being wasted due to poor postharvest handling. For extending the shelf life of banana biopolymer coating can be used. The main role of such active coating is to preserve fresh fruit quality, increase shelf life and avoid microbial deterioration. The current work put forward 'the wealth from waste' concept to help the local farmers, exporters and distributers to protect the banana from the farm to consumers. In the proposed work, an active Chitosan-based nanocomposite coating will be developed purely from bio source to enhance the postharvest shelf-life of banana. Investigation has been done by understanding how nanocurcumin incorporated chitosan-CNF nanocomposite affects the maintenance of banana after harvest. Chitosan is made from shrimp shell and has been shown to be biologically safe biopolymer coating for food by controlling a wide range of fresh fruit's pre- and post-harvest diseases. The protecting action of chitosan coating will be further enhanced with active filler such as cellulose nanofiber and nanocurcumin. Cellulose nanofiber is extracted from bio-waste (garlic skin).Similarly; biosynthesis of nanocurcumin can be done from curcumin. Weight loss

analysis, Total soluble solid (TSS), pH and titrable acidity used to analyse the coated banana utilising the aforementioned formulation. It was discovered that the nanocurcumin incorporated chitosan-CNF coating was successful in reducing weight loss and retaining the physiochemical attributes of banana in comparison with other formulations. This coating technique not only extends the shelf life of banana but also provides an efficient waste management system in aquaculture and agro industry, where huge amount of bio-wastes would be converted into useful product.

A novel strategy for developing green tyres using carbon black and chitin nanofibers: preparation and property evaluation

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ABSTRACT

A green future prompted the innovation of tyres which is completely from sustainable material. The research utilizes chitin nanofibers (CHNFs), from chitin powder by mild oxalic acid hydrolysis and characterized using Fourier transform infrared spectroscopy (FTIR), 13C Solid state NMR spectroscopy, X- ray diffraction analysis (XRD), Scanning electron microscopy (SEM), Transmission electron microscopy (TEM), Thermogravimetric (TG and DTG), and BET surface area analysis. The cure behavior, mechanical properties, swelling and dynamical characteristics of NR-Neat, NR/CB50, NR/CB/CHNF composites were examined. The results revealed that there is a rise in the tensile strength and tear strength upon the addition of CHNFs. The sorption studies revealed the enhanced mechanical properties of NR/CB/CHNF1.0 composite. Furthermore, all the composites showed comparable thermal stability regardless of the amount of CHNFs. DMA analysis exhibited an increase in the storage modulus and a decrease in the tan δ upon the

incorporation of CHNFs. This study will be a promising tool for the circular economy as it aims the development of green tyres using renewable resources.

Keywords: Carbon black, Chitin nanofibers, Green tyre, Natural rubber latex

Electrochemical Characterization and Miscibility studies of Polyvinylpyrrolidone with Tapioca starch

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ABSTRACT

The solutions of polyvinyl pyrrolidone and Tapioca blends of different compositions were prepared using water as solvent. The miscibility of these blends was probed by using viscosity and ultrasonic velocity. The interaction parameters of these blends of different compositions were computed with the relevant equations. The nature of polymer/polymer interaction and the effect of concentration on the molecular interaction are studied. The immiscible nature of these blends was confirmed by the ultrasonic velocity and polarized optical microscopic methods. The immiscible nature of these blends suggests that these two polymers are favourable for preparing polymer alloys using a suitable compatiabiliser. Polymer films were prepared by using compatiabiliser. The surface morphology was studied by atomic force microscopy (AFM). The films are characterized by FTIR to conform the complex formation in polymer films. Thermal studies of individual polymers and blends are recorded by DSC/ TGA. Conductivity of the films are studied and it is showing very low conductivity. The result obtained are useful to prepare polymer electrolyte for battery applications.

Key Words: Ultrasonic studies, Polymer films, plasticizer, conductivity

Wear test for waste corncob reinforced epoxy-based composites

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ABSTRACT

Natural fibres have recently become attractive to scientists and researchers as well as alternatives for fibre-reinforced composites because of their low cost, non-abrasive and eco-friendly nature. Natural fibres may play important role in developing bio-degradable composite to resolve the current ecological and environmental problems. The purpose of this research work is to study the wear test is performed for the different compositions of waste corncob reinforced epoxy-based composites. The eight laminates in different proportions of corncob and epoxy were fabricated by hand layup process. This report shows that natural fibre also possesses good wear properties and then fibre composite can also be used in different applications.

Key words: Natural fibres, Polymers, Wear properties

Study and finding feasible solution for composite laminates by TOPSIS method

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ABSTRACT

Development of nonconventional materials in growing environment has focused considerable interest in renewable, recyclable, biodegradable, sustainable and ecofriendly. Finding the best option from all of the feasible alternatives is the crucial task. Decision making is the process of finding feasible alternatives, the most preferable method to overcome this problem is, technique for order preference by similarity to ideal solution (TOPSIS). In this paper Decision Matrix, Normalization Matrix and Weight Normalized Matrix are considered and Ideal Positive and Ideal Negative Solution are calculated, and feasible alternatives are ranked.

Keywords: Decision matrix, Composites, Topsis, Ranking

Synthesis, biological and molecular docking studies of coumarin-benzothiazoles

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ABSTRACT

In this work, we have synthesized the some coumarin-benzothiazoles 3(a-j), characterized by using various analytical techniques such as UV, IR, NMR, and mass spectrometry. Solvatochromic properties were evaluated in ten different solvents owing different polarity and quantum chemical parameters were evaluated using DFT study. The synthesized compounds were screened for their biological activity, all the synthesized compounds exhibited significant potency towards the screened biological activity

Quantification of picric acid on nanospherepolypyrrole modified electrode by stripping voltammetry method

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ABSTRACT

The electrochemical studies of picric acid were carried out in acidic, neutral, and basic buffer media at bare glassy carbon (GC) and polypyrrole modified GC electrode. Cyclic Voltammogram (CV) of picric acid exhibited three reduction peaks at -0.4, -0.8 and -1.5V (vs. Ag/AgCl) and two oxidation peaks at 0.8 and 1.4V (vs. Ag/AgCl). Among the various pH studied, highly sensitive response was observed at pH 1.0at the optimal pH. The effect of scan rate was studied between 25 and 500 mV.s-1.CV results revealed the adsorption-controlled reaction at the electrode surface. The GC electrode was modified with polypyrrole conducting polymer film to enhance the electrocatalytic activity of the reductive species. Atomic force microscopy (AFM) images showed the nanosphere morphology of the polypyrrole film, which was coated uniformly on the electrode surface. Under optimum experimental conditions, the influence of concentration on the stripping signal was studied. The linear range of detection was found between 50 ppb and 250 ppb with the lower limit of detection of 10±3 ppb.

Keywords: Picric acid, Polypyrrole, AFM, Stripping Voltammetry

Copper nanoparticles incorporated manganese dioxide nanocomposites for electrochemical capacitance application

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ABSTRACT

Chemically produced copper containing MnO_2 nanoparticles were studied using FTIR, UV-Vis spectroscopy, XRD, AFM, cyclic voltammetric and charge/discharge behaviour. Mixed nanocomposites have a crystalline size of 50 nm was calculated through Debye Scherrer's equation from XRD analysis. The FTIR spectra were recorded region 400-4000 /cm of clean and doped Manganese dioxide nanoparticles. Mn–O can be ascribed to the stretching vibration band of MnO_2 nanoparticles at 631 /cm. The bending and stretching vibrations of the O-H group are ascribed to the fundamental absorption peaks at 1620 /cm and 3400 /cm. AFM is used to characterize the impact of surface roughness on the fundamental properties of MnO_2, copper induced nanocomposites of MnO_2 particles. Electrochemical impedance and voltammetric experiments are used to investigate the behaviour of individual and mixed nanocomposites as supercapacitors.

Keywords: Manganese dioxide, Copper, Nanoparticles, Voltammetry, Capacitor

Removal of basic orange 14 dye from water by a novel hydrochar prepared from biomass

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ABSTRACT

The current study involves the preparation of a novel hydrochar via hydrothermal carbonization of waste tectonagrandis seeds and its potential for the removal of basic orange 14 from aqueous media. The hydrochar was prepared in a hydrothermal reactor at 220°C for a residence time of 1 hour. The developed hydrochar was further characterized by means of XRD, FE-SEM and FTIR techniques in order to see the changes in the structure and morphology of the prepared material. It was found that the developed hydrochar served as an efficient adsorbent for the removal of basic orange 14 from aqueous systems. Langmuir and Freundlich isotherm models were also applied to the adsorption data and Langmuir model was found to be best fit for the experimental findings.

Mentha spicata L. mediated synthesis of Ag doped-$Bi_2Zr_2O_7$ nanomaterial for enhanced degradation of organic pollutants and its electrochemical sensing applications

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ABSTRACT

A novel visible light driven nanocomposite Ag doped $Bi_2Zr_2O_7$ (BZO) in Pudina (P) extract, (Mentha spicata L.) were synthesized by one-pot greener solution combustion method. The as-synthesized nanocomposite materials were characterized using various spectral (XRD, FT-IR, UV-Visible, UV-DRS, XPS), electrochemical (CV, EIS), analytical (SEM-EDX, TEM) techniques. The average particle size of the nanocomposite material was found to be between 24.8 nm and 39.2 nm by XRD. The well characterized Ag doped BZOP nanocomposite materials were exhibited enhanced photocatalytic degradation activity towards the hazardous dyes such as methylene blue (MB) and rose bengal (RB) under visible light irradiation. As a result, 7 mol % of Ag doped BZOP nanocomposite material exhibited excellent photodegradation activity against MB (D. E= 98.7%) and RB (D.E= 99.3%) as compared to other Ag doped BZOP nanocomposite materials and pure BZOP nanocomposite respectively due to enhanced semiconducting and optical behavior, high binding energy, mechanical and thermal stability. The Ag doped BZOP nanocomposite materials based electrochemical sensor were showed good sensing ability towards the determination of lead nitrate and dextrose. Based on the obtained experimental data a photocatalytic dye degradation mechanism was proposed in this present study.

Keywords: Green combustion synthesis; Visible light photocatalyst; Electrochemical sensor; Radical scavenger study; Dye degradation mechanism.

Incite casted ZnO-nanocellulose powder reinforced polyvinyl alcohol composite for sustainable packaging applications

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ABSTRACT

Green materials are becoming increasingly popular in all spheres particularly as a petroleum substitute. The study attempts a chemo-mechanical pathway for the isolation of cellulose nanofibers (CNF) from pineapple pomace using oxalic acid hydrolysis. CNF is used as the host polymer for the synthesis of ZnO via insitu solution casting method. The precursor for zinc, reaction time and reaction temperature was optimized to be zinc nitrate, 1 h and 80 °C respectively. The synthesized fillers (ZnO, CNF, and C-ZnO) were characterized using FTIR, XRD, EDX, SEM and UV analysis to determine their purity, structure, and crystallinity. Varying amount of C-ZnO was added to PVA solution (5%) and composite films were elaborated by solution casting method. The mechanical, optical, barrier, structural, and anti-bacterial activity of the filler incorporated films were compared with neat PVA film. C-ZnO remarkably influenced the tensile strength of the films. The swelling characteristics and the water vapour transmission rate of the PVA films reduced considerably with the C-ZnO content which is crucial for packaging applications. The UV absorbance and the opaqueness of the films increase as C-ZnO increases. The films also exhibited strong antibacterial activity against gram positive and gram negative bacteria. Subsequently, these films can be used as a sustainable packaging material.

Key words: Cellulose nanofibers, Zinc oxide, Polyvinyl alcohol, Sustainable film

Emerging Trends in Transmission Electron Microscopy for Medical Applications:

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ABSTRACT

This paper is an overview of imaging methods used for research and diagnosis that appear in the literature. There are several types of scientific research and imaging modalities, including photography, microscopy, ultrasound, X-ray, computed tomography (CT), magnetic resonance imaging (MRI), and positron emission tomography (PET). The type of images used will depend on the part of the body the researcher wants to see in the image and the types of images readily available to the patient. For many years,

medical imaging has played an important role in the early detection, diagnosis, and treatment of cancer and other diseases. In some cases, medical imaging tests are the first step in preventing the spread of cancer by detecting it early, and in many cases the cancer can be cured or eliminated. CT scans, MRIs, ultrasounds and X-ray imaging are very important tools in fighting various diseases. Medical imaging is also used to create accurate computer models of body systems, organs, tissues, and cells used in anatomy and physiology classes in medical school.

Keywords: Medical Physics, TEM, Imaging, Acceleration voltage, Vacuume and Medical Imaging

Spintronics and optical properties of advanced biomaterials

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ABSTRACT

Spintronics is one of the emerging fields for the next-generation Nano electronic devices to reduce their power consumption and to increase their memory and processing capabilities. Spintronics is an interactive combination of electronics and magnetics that has grown in popularity in the twenty-first century as nanotechnology has advanced. Spintronics is a new type of electronics that employs mutual control of magnetic and other physical signals, such as electrical and optical signals. Spin current has recently received a lot of attention as a basic idea in spintronics. Understanding spin current entails deciphering the mechanisms underlying the mutual control of diverse physical signals, which should lead to future advances in spintronics. The notion of spin current and its historical context are discussed by innovative materials for spintronics. Much attention is also dedicated to the physical phenomena that result from the coupling of spins.

Keywords: Spintronics, Spin current, Optical properties, Advanced Bio materials.

Extraction and characterization of cellulose nanofiber from an invasive plant-oriental bittersweet

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ABSTRACT

Oriental bittersweet is a woody vine plant mainly grows in the eastern part of Asia. It's aggressive and invasive nature prevents the growth of many other plants. It attacks like a boa constrictor and squeezes the life of the trees. [1] Even though this plant has lot of disadvantages fortunately they are having high cellulose content. So, in the present study, we focused on the cellulose nanofiber (CNF) extraction from the oriental bittersweet plant. Cellulose is the most abundant biopolymer which is present in the cell wall of the plant fiber.[2]. It has wide range of applications due to its high surface area, biocompatibility, crystallinity, biodegradability, and renewability.[3]. Pretreatment includes alkali treatment and bleaching in order to remove non-cellulosic components such as lignin and hemicellulose, followed by acid hydrolysis. Oxalic acid is a weak acid, so it is coupled with a high-pressure steam explosion. It was very clear evidence from FTIR analysis and XRD that the removal of non-cellulose content was very successful from this particular fiber. Thermal properties of the fiber was analyzed by TGA. The surface morphology of the raw fiber during different stages of treatment was analyzed by SEM. The exact size of the extracted nano cellulose was understood by TEM and particle size analyzer (DLS). The surface charge and stability of the cellulosic dispersion were analyzed by Zeta potential. So far this is a first approach that, the extraction of CNF from oriental bittersweet plant fiber.

This study will be very good platform for the development of value-added products from the oriental bittersweet fiber

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Electrochemical quantification of parathion pesticide on nanocomposites modified glassy carbon electrode

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ABSTRACT

In agriculture, pesticides are widely used to protect crops from diseases, insects, and weeds. Only a small percentage of pesticides employed reach their intended target, with the rest seeping through the soil and harming ground- and surface water resources. Alternative approaches for pesticide assessment have recently gotten a lot of attention, thanks to the growing interest in on-site detection of analytes that can replace standard chromatographic procedures. Analytical approaches for monitoring pesticides in environmental samples were the focus of a wide range of investigations. Chemical analysis methods with high sensitivity, selectivity, precision, and accuracy are used in the majority of pesticide control applications. The electrochemical behaviour of parathion pesticides is described using cyclic voltammetry, square wave stripping voltammetry, chronocoulometry and controlled potential coulometric techniques. An electroanalytical procedure to determine the pesticide using stripping voltammetry with square wave method is developed. Prior to the electrochemical measurement of parathion pesticides in real samples, the experimental parameters, such as pH and nanosensor concentration, were optimised. The LODs for parathion in the linear range of 50-300 ppb were determined on modified electrode system.

Keywords: Pesticides, Electrochemistry, Nanosensors, Parathion

A review on the isolation of Saponins in Guaiacum officinale L. A tree of life

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ABSTRACT

The Zygophyllaceae family includes the genera Guaiacum L. It is a South African native plant that was imported during the British era to USA and the West Indies. Larreagenin, sitosterol, and oleanolic acid were found in research that dealt with the screening of active chemicals. It has been noted that G. officinale aqueous ethanolic extracts have anti-inflammatory properties. G. officinale leaf, seed, and twig extracts were tested on primary peripheral blood mononuclear cells (PBMCs) infected with the reference HIV-1 BaL strain for their ability to combat the virus. The potential surfactant activity of crude saponin extracts from the leaf and stem of Guaiacum officinale (Zygophyllaceae) was studied. Additionally, Guaianin A, A1, A2, B, C, D, E, F, G, H, I, J, K, L, M, N, O, P, Q, R and S and Guaiacin A, B, C, D, E and F and 30 other saponins were identified. Along with these, the following compounds were isolated: sitosterole-3-D-glucopyranoside, officigenin-24-O-oleanolic acid-3-O-D-glucopyranoside, and acebonic acid-3-L-arabinopyranoside. In homoeopathy, the resin of G. officinale is used to treat the early stages of angina and arthritis. Guaiac gum is employed to stabilise a variety of substances, including soap, gasoline, lubricating oil, gasolin, essential oils, flavours, and fragrances, as well as natural and synthetic resins, rubber, cosmetics, paints, plastic, and pharmaceuticals. Oleanolic acid and acebonic acid are triterpenoid genins that are either mono or bidesmosidic in the guaianin and guaiacin saponins. Two novel saponins with the names guaiacin A (1) and B (2) from the same source's leaves were also the subject of reports. The sugar moieties of both saponins were discovered to be similar using 13C-NMR spectroscopy. Guaiacin A and B's aglycones have been identified as 30-norolean-1,2,20(29)-dien-28-oic acid.

Key words: G. officinale L. Guaiacin, Guaianin, Saponins, active compounds

Effect of COVID-19 on Environment: Case Studied inside of Betla National Park and Plamu Tiger Reserve area, Jharkhand, India

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ABSTRACT

The COVID-19 pandemic has significant affect on every aspect of human as well as animal's lives. The spread of virus has been controlled by taking certain measures that have slowed down the economic activities along with significant effect on the environment. This review intends to explore the various negative and positive impacts of COVID-19 pandemic on our environment. Various lockdown measures that were used to contain the spread of virus has improved the air quality, increase the numbers of animals inside the park, reduced noise and water pollution, restoration of ecological systems through reduction of tourist's activities. But there are some negative impacts such as increase in medical waste and loss of economic because due to lockdown no any tourist comes during June 2020 to August 2022. During this period Park was fully closed for safety purpose of human as well as animals.

Keywords: COVID-19, Environment, Pollution, Medical waste.

Physico-chemical analysis of ground water taken from Dharampur Village of Raipur District in Chhattisgarh

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ABSTRACT

Assessing water quality is of crucial importance to both society and the environment. Deterioration in water quality through issues such as eutrophication presents substantial risk to human health, plant, and animal life, and can have detrimental effects on the local economy. The ground water quality is determined in all four directions (East, West, South and North Road) of Dharampur Village in Raipur district, Chhattisgarh, where from each area eight ground water samples collected randomly and are under studied for physico-chemical status of ground water. In Physico-chemical analysis, we have used titration method and various quality parameter are measured including pH, turbidity, electrical conductivity, total dissolved solids (TDS), total hardness (TH), Total alkalinity (TA), content of calcium (Ca^{2+}), magnesium (Mg^{2+}), chloride (Cl^{-}), sulphate ($S0_4^{2-}$), dissolved oxygen (DO), Biological oxygen demand (BOD), and Chemical oxygen demand (COD) present in ground water. We have also compared all parameters with ICMR standards of water quality.

Keywords: Ground water, Wastewater, physico-chemical analysis, TH, TDS

Synthesis, characterization, and biological studies of (E)-2-(3-fluoro-4-methylphenyl)-N'-((6/7/8-substituted-2-hydroxyquinolin-3-yl) methylene)-1H-benzo[d]imidazole-5-carbohydrazides.

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ABSTRACT

The carbohydrazide derivatives were found to be having innumerable pharmacological properties and exhibit various biochemical and therapeutic applications depending upon the pattern of the substitution. A novel series of (E)-2-(3-fluoro-4-methylphenyl)-N'-((6/7/8-substituted-2-hydroxyquinolin-3-yl)methylene)-1H-benzo[d]imidazole-5-carbohydrazides have been synthesized by the condensation of 2-(3-fluoro-4-methylphenyl)-1H-benzimidazole-5-carbohydrazide and 6/7/8-substituted-2-hydroxyquinoline-3-carbaldehydes in ethanol medium and in the presence of glacial acetic acid. The synthesized products were characterized by their IR, NMR, and mass spectral data and were also screened for their antimicrobial activities. A few of the novel compounds exhibited significant bioactivities with normal drug.

Electrochemical Studies of Reactive Orange 12 on Glassy Carbon Electrode

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ABSTRACT

The cyclic voltammetric studies of reactive orange 12 (RO 12) was carried out in aqueous solution on glassy carbon electrode (GCE). The effect of pH on the electrochemical behaviour of reactive orange 12 was performed from pH 1.0 to 13.0 at scan rate 50 mV/s. The maximum peak current response was found in pH 4.0 others little bit less. At all pHs three anodic peaks in forward scan and two cathodic peaks in the reverse scan were observed. The dye solution of RO 12 was exhibits oxidation and reduction peaks potentials at around -190, 030, 650 mV and –220, -6750 mV respectively vs Ag/AgCl The voltammogram of. A systematic study of the experimental parameters that affect the anodic differential pulse stripping voltammetric response was carried out. Maximum peak current conditions were arrived. Calibration curve was made under the maximum peak current conditions at different concentration RO 12. The concentration range studied for the determination of 300 to 700 ppb. The lower limit of detection is 200 ppb for GCE and the RSD 3.2%. The suitability of this method for the quantisation of dye in textile industries effluents was also ascertained.

Key Words: Cyclic voltammetry, Reactive Orange 12, Stripping voltammetry, Glassy Carbon Electrode

Eco-friendly approach for synthesis of polyaniline and its nanocomposites for room temperature operatable gas sensor

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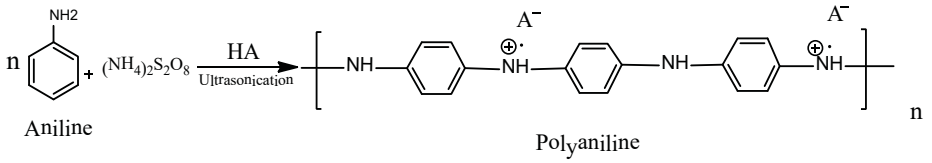
ABSTRACT

We report the cost effective, highly efficient green route approach towards the synthesis of conducting Polyaniline and its nanocomposites using ultrasonic irradiation. Sonochemical method required short reaction time with high yields. The structural, morphological study and composition analysis were performed by UV-visible, Fourier transform infrared spectroscopy (FTIR), X-ray powder diffraction analysis (XRD) and scanning electron microscopy (SEM). Pellets prepared from synthesized polyaniline and its nanocomposites used for ammonia sensing study.

Keywords: Green route**,** Ultra sonication, Polyaniline nanocomposites, Morphology, ammonia sensor.



Scheme 1. Synthesis of Polyaniline

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Efficient approach for information acquisition from remote sensing image

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ABSTRACT

High resolution remote sensing images serve as a significant and indispensable information for global sustainable development such as geological survey, disaster management etc. Most of the highly important applications rely information on remote sensing image. Information extraction from remote sensing can be categorized into two parts. Firstly, classification and object detection are done by using hybrid deep learning model to accurately classify remotely sensed image. Remote sensing image are given as input to two model i.e., VGG16 and inception V3 model, the outcome of these two models is fused together as an input to the fully connected layer with Relu activation function followed by SoftMax activation to classify the label image. Secondly, Extraction of information using the Hierarchical Multi-Scale segmentation with DenseNet model helps to produce the quality result in terms of semantic segmentation. This model is based out of encoder-decoder network. Multiple Self attenuation model are used as encoder and DenseNet are used as decoder to concatenate the heterogeneous feature. Further, this extracted image helps to compute newly defined indices such as vegetation indices and identification or prediction of special features such as disaster.

Keywords: VGG16, inception-V3, DenseNet, Image-segmentation

Synergistic effect of Copper Oxide/ Zeolite A composite in cationic dye adsorption

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ABSTRACT

Methylene blue (MB), a thiazine cationic dye, is a significant pollutant in wastewater. The literature evidences the capacity of copper oxide (CuO) and zeolite A to remove the MB from wastewater. But the combined effect of CuO and zeolite A in the methylene blue dye removal was not reported elsewhere. This work investigated the synergistic effect of CuO and zeolite A for removing MB from wastewater. CuO/zeolite A composite was synthesized by a facile, co-precipitation method. The physicochemical characteristics of the composite were analyzed using Fourier transform infrared (FTIR) spectroscopy and X-ray diffraction (XRD). Scanning electron microscopy (SEM) discloses uniform distribution of CuO and zeolite A in the composite. It was observed that the dye removal efficiency of CuO/zeolite A composite was higher than that of the individual materials. The effect of adsorbent dosage, contact time, and concentration of the dye in the percentage removal of the dye was investigated. The dye removal efficiency was found to increase with an increase in adsorbent dosage and contact time. However, it decreases with an increase in the concentration of the dye. The adsorption isotherms follow the Langmuir model with a maximum adsorption capacity of 42.26 mg/g. The electrostatic interaction between the material and MB makes the CuO/zeolite A composite an excellent adsorbent for efficiently removing methylene blue from wastewater.

Keywords: Copper oxide, zeolite A, composite, methylene blue, adsorption

A review on fabrication of encapsulants for underwater acoustic sensors

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ABSTRACT

Underwater imaging is a widely used tool for many major applications like tactical surveillance, earthquake and tsunami monitoring, offshore exploration and assisted navigation. Due to the stronger absorption and scattering of light waves in oceanic conditions, acoustic sensing techniques have pronounced significance because of the lower attenuation coefficient of sound waves in water.[1]Transducers used in underwater applications need to be encapsulated in some suitable material to protect the underlying sensor from harsh oceanic ambience. Rubbers are widely used in developing encapsulants for acoustic transducers due to the ease of fabrication and matching acoustic impedance with sea water.[2] A low temperature vulcanization process is essential in developing rubber based encapsulants for PZT (lead zirconate titanante) and polyvinylidene fluoride based acoustic transducers since the normal vulcanization temperature (≥150°C) damages the fragile and temperature sensitive sensor components.[3] The review focuses on the necessary features an encapsulant should possess and discusses the need for a low temperature curing process for the fabrication of encapsulants.

Keywords: low temperature vulcanization, underwater transducers, encapsulation, acoustic sensing

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Additive manufacturing techniques of polymer matrix composites

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ABSTRACT

In recent decades, additive manufacturing (AM) has attracted a lot of attention. This is primarily because it can produce parts with complicated geometries, has quick manufacturing lead times, and is suitable for both low-volume production and customization. Modern applications may require materials that combine many qualities that cannot be delivered by a single metal, polymer, or ceramic. In these situations, mixing two or more materials to create a composite material enables having the desired qualities in one material. The creation of composites with tribological importance can be achieved by the use of fibre reinforcement in polymer matrix. There are several different kinds of fibre reinforcement available, including discontinuous or short reinforcement, continuous or long reinforcement, and bidirectional reinforcement. Although continuous fibre composites even have superior mechanical performance, there are more commercially viable manufacturing techniques for short fibres. In this essay, an effort is made to review the additive manufacturing methods used by academics and researchers around the world. The most popular additive manufacturing process, according to this research review, is fused deposition modelling.

Keywords: Additive manufacturing, polymer matrix composites, fiber reinforcement & Fused Deposition Modeling

Extraction and characterization of nanocellulose from GETONIA FLORIBUNDA stalks by mild organic acid hydrolysis

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ABSTRACT

Presently, research world focus on the development of green polymers due to ecological aspects. As a result, cellulose based materials have become the focus of attraction nowadays. Cellulose being the most abundant natural polymer on the earth, nanocellulose extraction from different plant sources have gained considerable attention.[1,2] Good mechanical strength, ease of availability high aspect ratio and large surface area makes them an ideal candidate for various applications. [3] GETONIA FLORIBUNDA is a shrub seen in Kerala. The present study aim to extract nanocellulose from the stalks of Getonia Floribunda by an environmental friendly chemo mehanical approach in the presence of a mild organic acid. The nanocellulose have been characterized by Fourier Transform Infrared Spectroscopy (FTIR) (to identfy the removal of non-cellulosic components), Thermo gravimetric Analysis (TGA) (to anlyse the thermal stability of the cellulose), Scanning Electron Microscopy (SEM) (morphological analysis) and X-Ray Diffractogram (XRD) (crystallinity changes).

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Hydrophobic starch-based films incorporated with ZnO nanomaterial for potential use in food packaging

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ABSTRACT

Food packaging plays a significant role in the food supply chain. The inclusion of nanomaterials in the packaging matrix can improve the quality of packaging along with microbial protection. The present work discusses the synthesis of ZnO nanomaterial by chemical precipitation method, and the synthesized products were assessed by FTIR, UV-visible spectra, XRD, and TEM. The ZnO nanomaterial can be incorporated in starch-based edible films in varying weight percentages (0, 0.001, 0.005, 0.01, and 0.05 %) using glycerol as the plasticizer. A casting method followed by solvent evaporation was used to prepare the films. FTIR spectra can detect enhanced inclusion of ZnO in starch, along with better hydrophobicity. Moreover, ZnO/starch film can boost the antimicrobial activity against *E. coli* and *S. aureus*. Hence, the starch-based edible films could be used as low-cost and sustainable food packaging systems to prevent the oxidative deterioration of packaged foods.

Key words: ZnO, Nanomaterial, antibacterial

Renewable materials for additive manufacturing

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ABSTRACT

Additive Manufacturing (AM) allows the rapid development of sustainable products and has been increasingly used to produce lightweight components to save materials and costs. This particularly helps to save a considerable amount of material, energy and cost for the production of one-off or small volume products. AM has bought a significant revolution in the current manufacturing processes. It shows great potential in reducing the need for energy and resource intensive manufacturing processes. AM can fabricate complex and intricate shapes with ease. Material selection is an essential aspect in AM as a wide range of compatible materials available for AM. Appropriate material selection is necessary for cleaner production and sustainable development. When sustainable materials are discussed, filaments are usually meant. They have the broadest range of sustainable and renewed materials as of now. For any product, the choice of material used can have a wide impact - for example, in how the raw material is extracted or processed, in how much resources and energy are required in manufacturing, and in how the material/product is transported. Finding out this type of impact data requires careful research, but we can also think about the qualities of the materials themselves: are they renewable, are they recyclable and degradable. Some renewable materials are Wood PLA, Algae PLA, Coffee PLA and Biodegradable ABS etc. I this regard, this work presents a sustainable material selection of AM technologies.

Keywords: Additive manufacturing, Renewable materials, Cost, Energy and resource intensive manufacturing processes.

Algae - A Potential Source of Bioactive Compounds

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ABSTRACT

Microalgae are green, photosynthetic microorganisms that come under the classification of eukaryotes, and their habitat is found in both fresh as well as marine waters. The algae have been explored in a wide variety of applications ranging from biofuels, pharmaceuticals, the food industry, the cosmetic industry, and even the essential supplements industry in form of Vitamins and several other applications will be discussed in detail in this review paper. The main reason for the selection of these green photosynthetic organisms is because they are diverse photosynthetic microbial organisms that can be an excellent source and can be used in a wide variety of applications like the production of biofuels and various other chemicals, they are easy to cultivate, their doubling time is less when compared with other organisms, their yield is better when compared with others and the list of advantages keeps ongoing and it continues endlessly. There are many experiments on microalgae that are being done by various researchers across the globe and the used biomass after experiments are not being utilized efficiently. The spent biomass is rich in several other essential supplements and many essential by-products can be extracted during the downstream processing along with the main product.

Keywords: Biofuels, Biomass, downstream processing, photosynthetic organisms, essential supplements.

Revolutionizing The Lifecycle of Thermoplastics

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ABSTRACT

Thermoplastics are ubiquitous in modern current life yet have made a worldwide waste emergency driven by our dependence and interest for minimal expense, dispensable materials. Most commodities, thermoplastics, do not degrade and therefore they permanently pollute the environment. At present, less than 20% of post-consumer thermoplastic waste in developed countries is recycled, predominately for energy recovery or repurposing as lower-value materials by mechanical recycling. Compound reusing and upcycling of polymers might empower circularity through partition procedure. Polymer upcycling plans might empower lower-energy pathways and negligible natural effects contrasted and customary mechanical and substance reusing. The development of modern reception of reusing and upcycling approaches is empowering, hardening the basic job for these procedures intending to the destiny of thermoplastics and driving advances in cutting edge materials plan. For thermoplastic waste that is either cost prohibitive or infeasible to mechanically or chemically recycle, the nascent field of chemical upcycling promises to use chemical or engineering approaches to place thermoplastic waste at the beginning of a new value chain. In this paper state-of-the-art methods are elaborated for upcycling thermoplastic waste into value-added performance materials, fine chemicals and special polymers. By identifying common conceptual approaches, we critically discuss how the advantages and challenges of each approach contribute to the goal of realizing a sustainable thermoplastics economy. The significant opportunity exists for fundamental research to provide the foundational knowledge required to enable polymer upcycling, which holds the promise of changing the paradigm for discarded thermoplastic from waste to valued resource by moving to a circular lifecycle for thermoplastic.

Keywords: Thermoplastics; Environment; Reuse; Polymer, Advanced Polymers

Biofuels: Technologies, Policies, and Opportunities

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ABSTRACT

Conventional fuels are getting depleted, with fewer resources, alternative fuels usage has been in demand for their advantages like reducing pollution (low emissions, reuse of wastes), reducing costs, protecting against global warming, helping agricultural growth, can be produced locally, fuel economy and with more choices and convenience. The production of energy plays an important role in the economic growth of any country and the energy supplies from these sources are making an impact in environmental and economic sectors. Currently, energy supplies around the globe are being generated from various sources like plants, microbes, food sources, non-food sources, microalgae and various other sources. Alternative fuels also known as non-conventional fuels are any materials prepared from vegetable oils, and animal fats other than conventional fuels like; fossil fuels (petroleum (oil), coal, and natural gas). Various governments have made policies in ensuring energy security for the citizens of their respective countries. Biofuels have a huge benefit over traditional fuels in terms of carbon emissions, thus becoming an ideal choice to meet these requirements. Biofuels are produced from various bio-based materials which are preferred over petroleum-based products. Being categorised, as first-generation biofuels (conventional biofuels; mainly obtained from consumable food items such as sugar, starch, and vegetable

oil); second-generation biofuels (olive green or cellulosic-ethanol biofuels; and are mainly obtained from

supportable or nonfood feedstocks); third-generation biofuels (algae fuel or oilage; produced from the algae); and fourth-generation biofuels are from bio-engineered plants/tree/algae function as a carbon capture machine to lock carbon in their different parts, that is, leaves, branches, etc., for the feedstock generation, a result of developments in plant biology and biotechnology (metabolic engineering) in the field of carbon capture and storage technique.

The concern with second-generation biofuels, the production of second-generation biofuels is more challenging when compared with first-generation biofuels and the issues are related to production, harvesting, and transportation. Lignocellulose and lignin are major components being used and the cellulose from this material can be fermented into alcohol. Second-generation biofuels are defined as fuels produced from a wide variety of feedstocks like vegetable oil, corn, sugarcane, and even non-edible lignocellulosic biomass. These second-generation biofuels can solve many problems and are very advantageous to their predecessor providing greater environmental benefits. There are several challenges in the generation of secondary biofuels in the current scenario which differ hugely in terms of transportation, pre-treatment, microbial fermentation, and fuel separation when compared to third-generation biofuels.

Keywords: Policies, second-generation biofuels, biomass, Algae fuel, Lignocellulose

The decrease in the burden due to lymphatic filariasis in the state of Andhra Pradesh

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ABSTRACT

Vector-borne diseases are quite rampant. Of them, elephantiasis is the one wherein the adult filarial nematode worm, transmits by vectors, blocks the lymph vessels and causes lymphatic filariasis. The diseased subject is the carrier of microfilariae. The mosquitoes belonging to the genera Aedes, Culex and Mansonia transmit the microfilariae from the diseased individual to the naive individual. Hence, the spread of filariasis in the community is primarily due to the presence of potential insect vectors of microfilariae.

The elephantiasis disease data obtained from indiastat.com from the years 1995 to 2018 looks to be sporadic. Among the four South Indian states, the number of cases of lymphatic filariasis reported by indiastat.com is found to be significantly more in the state of Andhra Pradesh. However, the decreased trend of filariasis disease is noticed in all the four South Indian States by the year 2021 since 1995. The same possibly be due to the regular surveillance by the health workers and implementation of MDA (mass drug administration) with Diethylcarbamazine along with Albendazole and Ivermectin. The health awareness provided through media and health volunteers must have been contributed to improve the socioeconomic and sanitation conditions. The same must have yielded the trend to decrease in the recurrence of filariasis. The lymphatic filariasis data obtained from the office of the Dy. Director, NVBDCP, Andhra Pradesh is acknowledged.

Synthesis of novel substituted pyrazole-picolinamide derivatives and determination of their anticancer activity

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ABSTRACT

A series of substituted pyrazole-picolinimide derivatives were synthesized in high yields using Suzuki coupling, followed by acid amine coupling. The present procedure is operationally simple and work with a wide range of substrates and may thus be useful in further compound optimization. Many pyrazole containing molecules have shown biological activity towards several drug targets in the past. However, substituted pyrazole-picolinimide have not been synthesized and studied. The new compounds to be investigate for their anticancer activity in human cancer cell lines in comparison with the standard drug cisplatin. In conclusion, a facile and simple catalytic method for the synthesis of substituted pyrazole-picolinimide derivatives in high yields were developed using Suzuki coupling and followed by acid amine coupling. The proposed method represents a cost-effective, eco-friendly, and practical/scalable process for synthesis of substituted pyrazole-picolinimide derivatives.

Study on carbon fibre and comparison with other composite materials

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ABSTRACT

Throughout human history, composite materials have been crucial, from providing early civilizations with homes to spurring new discoveries. The major advantages of composites are their resistance to corrosion, design flexibility, durability, light weight, and strength. Composites are employed in a variety of goods that are used in construction, healthcare, oil and gas, transportation, sports, aerospace, and many other areas of daily life. Without composite materials, some applications, like rocket ships, probably wouldn't take off. The benefit of composite is its ability to significantly reduce weight and costs while maintaining high strength and performance. Composites can be manufactured in different ways by varying the ratios of Fiber & Matrix used to synthesize. Based on requirements and applications from industry, composites can be manufactured with different mechanical properties. This paper discusses about the mechanical properties of carbon fiber and compares the same with other composites made up of Kevlar, Glass etc.

Keywords: Composites, Carbon Fiber, Mechanical Properties, Aerospace

Sustainable scientific advancements modified Bi ZnO supported $SnFe_3O_4$ nanocomposite material differ-light irradiation and other application

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ABSTRACT

The nano composite material BiZnO-$SnFe_3O_4$ is revealed in the manuscript by co-precipitation method. This manuscript characterized by HR-SEM through EDS, UV–Vis-DRS and photoluminescence spectroscopy PL. The BiZnO-$SnFe_3O_4$ Under solar irradiation, azo-dye degradation in Trypan Blue (TB). Up to five runs of BiZnO-SnFe3O4 were creating to be reusable with no significant BiZnO-$SnFe_3O_4$. A mechanism for photo degradation of dyes, communication, and solar cell applications is proposed based on the energies of the band gap conformed material was done. Our findings shed light on how BiZnO-$SnFe_3O_4$ is made and how well it performs as an active photocatalyst. medicinal and electrochemical application material.

Keywords: Solar-Light, UV irradiation, Reusability, HRTEM, EDS, UV–Vis-DRS

Microplastic pollution in surface water and wastewater of Latvia and Lithuania

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ABSTRACT

This study reports the concentration of microplastics in surface water and wastewater collected from Daugavpils and Liepaja cities in Latvia as well as Klaipeda and Siauliai cities in Lithuania. The microplastic identification was made under an optical microscopy method, and their polymer compositions were characterized using a Raman spectroscopy method. The average abundance of microplastics in surface water and wastewater samples was 3.21±3.71 particles/L. The dominant shape group of microplastics in water was fiber, with dominant colors as blue (62%), black (36%), and red (2%) in Latvia. Similar distribution in Lithuania was found, i.e., fiber (95%) and fragments (5%) with dominant colors as blue (53%), black (30%), red (9%), yellow (5%), transparent (3%). The Raman spectroscopy spectra of visible microplastics were identified to be polyethylene terephthalate (PET) (33.34%) and polyvinyl chloride (PVC) (33.33%), nylon (NL) (11.11%), polyester (PS) (11.11%), and high-density polyethylene (HDPE) (11.11%). In the study area, municipal and hospital wastewater from catchment areas are the main reasons for the contamination of microplastics in the surface water and wastewater of Latvia and Lithuania. It is possible to reduce pollution loads by taking measures such as creating awareness and reducing plastic usage.

Virtual screening of novel curcumin analogues for pancreatic cancer

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ABSTRACT

Mutations and magnified expression of many proteins are the hall mark of malignancy of which KRAS activity is seen to be an important element of pathogenesis in pancreatic cancer. Mutated KRAS proteins is endowed with all the capabilities like proliferation, evasion of apoptosis, reprogrammed cell metabolism, angiogenesis, invasion and metastasis. To prevent pancreatic cancer extensive studies were carried out to bind this protein by synthesized drug molecules. To find the right drug molecule is quite difficult due to the high toxicity of most effective drugs. Curcumin a dietary phytochemical exhibited anticancer activity against a number of cancer cells.

In the present work to develop a novel drug for pancreatic cancer from natural source, seventy curcumin analogue were theoretically designed. To understand the drug receptor interaction binding ability of the seventy designed curcumin analogue with KRAS protein were assessed using advanced computational method. The results were compared with parent compounds Curcumin, Coumarin and Chromone along with the standard drugs Gemcitabine and Dabrafeninb of pancreatic cancer and their binding actions were reported.

Out of seventy designed curcumin analogue, five CA (CA-21, CA-22, CA-30, CA-50 and CA-1 in descending order of their docking scores) exhibited good docking results comparative to standard drugs and parent compounds. Among them CA-21 and CA-22 are giving maximum H bond interaction with amino acid of the target KRAS protein with binding energy - 54.62 and - 57.63. Comparative results of hydrogen bond interactions and binding for above five curcumin analogue with standard drugs revealed that these five curcumin analogues along with other hydrogen bond interactions bind up

with same amino acids which bind up with standard drugs also. This indicates that there is probability to exhibit similar anticancer activity by these five designed curcumin analogues as shown by the standard drugs.

Outcome of present study sheds light on the binding affinity of seventy designed curcumin analogue with KRAS protein which significantly provides insight to select the potential candidate/s to synthesize. Docking results of 70 designed CA show that CA-21, CA-22, CA-30, CA-50 and CA-1 are comprised of high docking scores thus they are promising lead molecules. Hence synthesis of these curcumin analogue is recommended for the anticancer activity against pancreatic cancer of which synthesis is underway.

Key words: Curcumin, Coumarin, Chromone, Gemcitabine, Dabrafenib, Curcumin analogues

Studies of selective laser melting (SLM) parameters for Corrosion Resistance properties: Pareto ANOVA approaches

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ABSTRACT

Nickel alloy (in particular, Inconel 625) are widely used in marine and other applications (nuclear, aerospace, petrochemicals and food processing industries) wherein their parts are likely to be operated in corrosive environment. Selective laser melting processing route is employed to fabricate parts with better quality. The part quality (i.e., corrosion resistance property) is influenced largely by laser power (LP), scan speed (SS) and hatch distance (HD). L9 experiments of Taguchi method is employed for experimentation, analysis, and optimization. LP had showed maximum percent contribution of 71.31%, followed by hatch distance and scan speed of 20.07%, and 8.62%, respectively. Taguchi determined optimal conditions (LP: 270 W; SS: 1000 mm/s; HD: 0.10 mm) resulted in reduced corrosion current with a value equal to 0.00001244 mA .

Keywords: IN625 alloy; Corrosion; Taguchi Method; S/N ratio; SLM Process.

IoT in Smart Grids: A Review

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ABSTRACT

In this review paper, the authors have discussed the implementation of Internet of Things (IoT) in Smart Grids. Smart grid is a duplex communication system, where interchange of energies takes place with substantial interaction of the hub and its clients. Due to the expansive growth of population and greater exigency of energy, there is a requirement of electrical grids which are clever, dependable, real-time operable and economically modest. A smart grid is an evolving interconnection of advanced monitoring, jurisdiction and automations for the supply of reliable and secure energy with the use of green energy resources such as wind, and solar energy. There is a necessity of employment of contemporary technologies such as: the IoT to eliminate the challenges of the deplorable power quality and reliability, which were the main concerns of the conventional energy grids. With the extensive participation of IoT, such smart grid will reconstitute the long-established framework of grid and suppliers can interact better with the consumers and among itself to aid the energy needs in a more efficient and intelligent manner. They help enable the grid to provide greater optimization and supervision of resources and authorize the consumers to manage their energy consumption patterns, for instance their electricity usage by computing a household's electricity consumption through smart metering systems. The extensive employment of smart devices which can be monitored, controlled and scheduled over the internet and smart devices. This smart grid sanctions the management and moderation of electricity usage with the active participation of consumers at the peak demand times. An outcome of this would be that the cost of operation will be minimized by restricting the electricity usage at peak hours thereby reducing the overall cost of the energy system. IoT enabled smart grids identify and rectify electricity outages before they happen in real time.

Key Words: Electricity; Green energy; Internet of Things (IoT); Smart Grid

AI and ML enabled Smart Grids: A Review

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ABSTRACT

In this review paper, a concise review of AI and ML concepts and their applications in smart grids is provided. A smart grid is an intelligent system that allows the electric grid to perform functions efficiently. A smart grid is a network that enables the flow of electrical energy and data, from which intelligent decisions are made regarding the operation of the power system. Smart grid enhances reliability, optimizes load balancing, and opens up new business opportunities for utilities. Grid technology has been continuously evolving alongside advancements in communication technology to improve the experience of mobile users. Recent years have seen a significant increase in the complexity of grid operations. The way energy is produced is rapidly changing- it is becoming more reliant on wind and solar energy, and less reliant on coal and fossil fuels. Utilities must adapt to weather conditions and energy demands to remain competitive. Network congestion, inconsistent energy delivery, and device failures are just a few of the problems associated with evolving distributed resources. Managing these complexities can be daunting. Innovation in the technological world is occurring at an equally rapid pace as in the natural world. Combining advanced technologies in innovative ways could transform the energy industry. In the future, electric vehicles (EVs), smart home systems, and many other subsystems are likely to interact with utilities and provide them with potentially valuable data. Data can be useful and insightful for utilities, but making it useful is a challenge. However, this challenge can be addressed with the help of artificial intelligence (AI) and machine learning (ML). Since smart grid infrastructure requires a tremendous amount of data for its proper operation, artificial intelligence will be able to analyze numerous data points, which include weather, requirements, locality,

etc., and proactively determine where and how much electricity will be provided to every home. By utilizing AI, we can forecast electricity production and demand, monitor various computer environments for cyber-attacks, and provide security to several systems. AI-powered sensor networks can also be used to optimize power output at generation stages and to predict solar radiation for solar energy production. The ML algorithms can analyze smart grid data, diagnose its health, provide better forecasting capabilities, and even control loads or services based on that data. In machine learning algorithms, few assumptions are made and computer processing capacity is used to extract complicated connections from historical statistics. With the aid of ML algorithms, complicated systems of smart grids can be mapped according to input-output relationships, thus Extending the physical knowledge base by overcoming existing limitations, and making it ideal for resolving the challenges associated with it.

Key Words: Artificial Intelligence (AI); Electric Vehicles (EVs),; Machine Learning (ML); Smart Grid.

Fuel Cells and Electric Vehicles: A Comprehensive Review

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ABSTRACT

Coal, petroleum and natural gas are fossil fuels that have become scarce in the past few years. They are used for generating power, heating, cooking, and as fuel in vehicles. Excessive consumption of these has also made Mother Nature a very detrimental place to live. Combating this situation and improving the state of the environment has been the prime motive for many countries. Conventional transport vehicles that use the combustion engine have been a major contributor to this contamination of the atmosphere because of the emission of air toxins like nitrous oxide, carbon dioxide etc. The Government of India has been encouraging the use of alternative vehicles. The substitute can be rechargeable batteries and fuel cell technology. These days, there is a drift from the age of old, conventional combustion engine vehicles to the new era of Electric Vehicles (EVs) and Fuel Cell Electric Vehicles (FCEVs). The electric vehicles that use energy stored in a rechargeable battery are EVs whereas the Electric Vehicles that use fuel cells that are powered by hydrogen as a fuel that reacts to produce energy are FCEVs. The only released by-products are warm air and water vapour. Thus, being the substitutes that work on the principle of zero tailpipe emission. This paper provides an in-depth understanding of the operation of EVs and FCEVs, while highlighting their use to increase energy resilience with the help of diversity and to strengthen the economy. This paper also analyses the challenges these technologies face due to lack of regulation, dependability and longevity and provides grounds for further research for solutions to these challenges.

Keywords: Battery, Electric Vehicle (EV), Fuel Cell Electric Vehicle (FCEV), Hydrogen

Extraction and isolation of resveratrol from peels of vitis vinifera and its antioxidant activity

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ABSTRACT

Resveratrol, a non-flavonoid polyphenol belonging to the stilbene family, is a phytoalexin naturally occurring in many plants, including berries, red wine, peanuts, dark chocolates, grapes, etc. It is known to possess excellent biological activities like antioxidant, antimicrobial, anticancer, anti-inflammatory etc. Literature reports that synthesis of resveratrol via chemical route involves toxic chemicals causing lots of health issues and is time-consuming. In this present work, a green extraction of resveratrol has been carried out from the peels of grapes (Vitis vinifera). Grape peel extract has been prepared via Soxhlet extraction and resveratrol has been isolated from the prepared extract using Flash chromatography. The content of resveratrol present in the extract was determined by the HPLC (High-performance liquid chromatography) technique. Further, structure elucidation of the isolated resveratrol was carried out by 1H-NMR (Nuclear Magnetic Resonance), 13C-NMR, LCMS (Liquid chromatography-mass spectrometry) and FTIR (Fourier transform infrared). Moreover, in vitro radical scavenging activity of the green extracted resveratrol was carried out by using 1,1-diphenyl-2-picrylhydrazyl (DPPH). Results reflected that it exhibited excellent antioxidant activity and could be used as an antioxidant supplement in functional foods or pharmaceuticals, impacting health improvement.

Keywords: Resveratrol; Vitis vinifera; Soxhlet extraction; antioxidant activity

Synthesis of novel triazole analogue for biological activity

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ABSTRACT

A new molecule of triazole analogue was synthesized with good yield. The structure of the synthesized triazole analogue was confirmed by spectral characterization, viz., 1H-NMR, LCMS, and FT-IR. The antimicrobial and antioxidant properties of the newly synthesised novel analogue were investigated further. Antimicrobial activity was conducted against Staphylococcus aureus (a Gram-positive strain; MTCC 96), Pseudomonas aeruginosa (Gram negative strain; MTCC 2453), and Candida albicans (MTCC 3958) fungi by the well diffusion method. Antimicrobial activity reflects that synthesized analogue possess better antifungal and antibacterial activity. Staphylococcus aureus (gram positive bacteria) exhibited strong resistance to the synthesized triazole analogue. Antioxidant activity was determined by using 1, 1-diphenyl-2-picrylhydrazyl (DPPH). In vitro antioxidant activity results revealed that the synthesised compound's IC50 values were comparable to those of the control, gallic acid, and that it exhibited better antioxidant activities. Hence, novel molecule with better antimicrobial and antioxidant activities may be further used for the formulation of new antimicrobial and antioxidant drugs. The observed IC50, MIC (minimal inhibitory concentration) values, and drug resistance of the Staphylococcus aureus strain against the synthesised novel triazole analogue in this study will be useful for auxiliary studies, and further evaluation is worth developing a new generation drug.

Keywords: Triazole; DPPH Assay; MIC.; Staphylococcus aureus

ADMET, Molecular Docking and Dynamics Simulation Analysis of Mono-carbonyl Curcumin Analogues that Inhibits T790M mutant: Probable Remedies for EGFR TK in Cancer Therapy

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ABSTRACT

Aim: To perform in silico design, synthesis, Dynamics Simulation Analysis, and anticancer screening of Mono-carbonyl Curcumin Analogues in Cancer Therapy.

Background: Epidermal Growth Factor Receptor (EGFR) is a protein kinase that has emerged as a target for cancer. Due to overexpression and amplification of this protein, many cancers like lung cancer, breast cancer, prostate cancer, etc. were likely to be seen in patients. Also, drugs acting on the target were found to have the problem of resistance. Curcumin is the most effective therapeutic agent has anticancer activity. But due to β-diketone moiety in curcumin it has weak pharmacokinetic profile. Therefore, mono-carbonyl curcumin derivatives were designed that can be proven to act on the wild-type and mutated crystal structures.

Objective: The aim is to identify the best candidate from the designed mono-carbonyl curcumin derivatives which binds with T790M mutated crystal structure having EGFR tyrosine kinase inhibition activity targets by computational approach.

Methods: 10 mono-carbonyl curcumin derivatives were designed based on Structure-Activity Relationship by carrying out a literature survey. Structures of designed compounds were prepared using ChemDraw Ultra 8.0 software and converted into its 3D PDB structure and minimized using Schrodinger Maestro 10.2. Their in-silico ADME studies were carried out on Qikprop tool. A comparative molecular docking was done on three different types of EGFR crystal structures which: wild-type(1M17 and 4I23) and

T790M mutated (PDB: 6LUD). Focusing on T790M mutated crystal structure (6LUD), NME 3 was then studied for molecular dynamics.

Results: 10 designed mono-carbonyl curcumin derivatives were found to have good ADMET properties. Thus, compounds were then subjected to molecular docking. Among all the New Molecular Entities, NME 1, 2 and 3 were found to have good binding affinity towards 1st, 2ndand 3rd generation EGFR crystal structures and greater dock score than standard curcumin. S4Osimertinib is the first line drug as EGFR tyrosine kinase inhibitor to act on T790M mutated crystal structure (6LUD). Therefore, NME 3 was further studied for molecular dynamics and results were compared with co-crystallized ligand S4(Osimertinib). It was found that RMSD (1.8 Å), RMSF (1.45 Å) and radius of gyration (4.87 Å) values of NME 3 were much lower than that of S4(Osimertinib). All this confirms that our designed NME 3 is stable than reference S4(Osimertinib).

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Keywords: Mono-carbonyl curcumin, ADMET, molecular docking, molecular dynamics, New Molecular Entities (NMEs), Epidermal Growth Factor (EGFR).

Conclusion: The careful evaluation of results of in vitro studies (simulation studies using CADD tools) dry lab work and wet lab work synthesis and screening for anticancer activity using MTT assay indicate that the result of wet lab study has endorse the results predicted by dry lab activity using molecular modelling studies.

Aluminium and Zinc co-substituted cobalt ferrites ($Co_{1-x}Zn_xFe_{2-x}Al_xO_4$, $0 \leq x \leq 0.15$) ceramics sintered from nanopowders: Structural, magnetic and magnetostrictive properties

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ABSTRACT

Magnetostriction is a smart property of ferro and ferri magnetic materials, where the materials changes its dimension when exposed to external magnetic field. A series of $Co_{1-x}Zn_xFe_{2-x}Al_xO_4$ ($0 \leq x \leq 0.15$) were prepared via glycine-nitrate autocombution method and studied the magnetic and magnetostrictive properties. The XRD patterns confirms the formation of cubic spinel phase with space group fd3m and also found that the lattice parameters are found to be decreased upon increasing '*x*' content. SEM images shows, all the co-substituted samples and unsubstituted sample consist both smaller and larger grains but, the co-substituted substituted samples possess intra and inter-granular pores between the grains, unlike unsubstituted sample. Magnetization studies shows that, there is no much variation in saturation magnetization of co-substituted samples, but coercivity, magnetocrystalline anisotropy and Curie temperature values found to be decreased found upon substitution. Magnetostriction studies reveals that the magnetostriction strain values found to be decreased but the obtained maximum strain values for co-substituted

samples are falling under the low field region compare to unsubstituted sample. The sample with x=0.15 is exhibiting a high strain value of $2.56*10^{-9}$ m/A at a field of 25 kA/m among all other samples**.**

Key words: Magnetostriction, cobalt ferrite, substitution, Magnetic field etc.

Design, Synthesis, Molecular Docking and Antioxidant Evaluation of Benzimidazole-1,3,4 oxadiazole Derivatives

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ABSTRACT

In this research, we synthesised novel benzimidazole-1,3,4 oxadiazole derivatives and studied their antioxidant properties using the DPPH Radical Scavenging Assay. A significant class of substances with a broad range of biological activities is the 1,3,4-benzimidazole family. Furthermore, enabling for various biological activities are the five-membered heterocyclic moieties. Thus, a number of benzimidazole derivatives have been created, there in vitro antioxidant activity has been evaluated, and they have been characterised by IR and 1H NMR spectral studies.Compounds 1A, 2A and 3A has the highest G-score i.e., -7.575, -6.932, -6.911, as compared to standards propyl gallate and Ascorbic acid, which had glide scores of -4.757and -4.50 respectively. The benzimidazole-1,3,4 oxadiazole containing compounds that were created demonstrated impressive antioxidant activity.When compared to the reference standard, ascorbic acid, (IC50-11.51±0.31 µg/ml) Compound 2A demonstrated the strongest antioxidant activity with an IC50 value (53.00±1.31 µg/ml) respectively.

Keywords: Molecular docking, protein tyrosine kinase-2 beta, ADMET, synthesis, DPPH free radical Scavenging assay.

Enhanced Magnetostriction of the Co-Ni-Ferrite Nanocomposites Derived from Hard ($CoFe_2O_4$) and Soft ($NiFe_2O_4$) Magnetostrictive Phases

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ABSTRACT

This paper presents the enhanced magnetostrictive characteristics of a nanocomposite derived from the hard cobalt ferrite ($CoFe_2O_4$; CFO) and soft nickel ferrite ($NiFe_2O_4$;NFO) nanomaterials. The CFO, NFO and CFO-NFO (CNFO) nanocomposites were synthesized employing a cost-effective and eco-friendly glycine-nitrate autocombustion method. The X-ray diffraction and electron microscopy analyses revealed that the CFO and NFO nanomaterials were phase pure, porous in nature, and nano-sized. The lattice parameter, a, of the sintered composite lies in between the lattice parameters of respective components (CFO-8.390 Å and NFO-8.343 Å) indicating that both phases co-exists as single-phase in the sintered composite. The magnetization curve of sintered CNFO nanocomposite exhibits symmetric nature (single loop), where its magnetization lies in between the magnetizations of NFO and CFO phases, indicating a proper exchange couple between the two phases. The CNFO nanocomposite demonstrates better magnetostriction at lower magnetic fields than the parent sintered CFO and NFO samples. At an applied magnetic fields of 2 kOe, the obtained magnetostriction value for CNFO nanocomposite

(-130 ppm) is nearly 800% higher than that of CFO (-20 ppm) and for CFO sample and 330% higher than that of NFO (-30 ppm). The structure-phase-property correlation established in these CNFO nanocomposites expected to provide a road-map for their possible applications in electromagnetic devices.

Keywords: Spinel ferrites; Nanomaterials; Magnetic parameters; Curie temperature; Magnetostriction; Sensors

Solar Energy: It's Incentives and Hurdles

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ABSTRACT

The global solar market, paving the way to the most copious and the cleanest source of renewable energy. Solar being more sustainable, inherently helps converting solar energy into heat and electricity in a better way. The need for alternative energies like Solar or Hydrogen are getting a great acceptance and creating new avenues for all sectors. In India, the largest solar power plant is Bhadla Solar Park, Rajasthan with total capacity of 2,245 MW is a symbol of the Government's gargantuan ambition to transform his nation into a green energy powerhouse. In this era of increasing pollution, the concern is to make India 50% dependent on renewable sources by 2030. The Paris agreement is also working on 5 year plan to control climate change and make nations accountable for carbon emissions. India is saving a large amount on fuel by using solar power to the tune of Rs 336 billion. In spite of all the advantages the major hurdle in solar energy is the installation cost factor, although a one-time investment. This challenge can be addressed by realizing the initial cost of installation during complete usage period.

Key Words: Renewable Sources, Solar Energy, Sustainable

Docking analysis of novel curcumin analogues with heterocyclic ring for pancreatic cancer

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ABSTRACT

KRAS proteins, one of the RAS family members (the other two being NRAS and HRAS), are primarily small GTPases.They pass on signals from outside the cell to the nucleus through the GDP-GTP link catalyzed by guanine nucleotide exchange factors like Sos. KRAS proteins are involved in many of the cell signalling pathways through which the progression and proliferation of tumour cells take place. So, it is also known as oncogenic KRAS, which is supposed to be the driving force behind the cause of pancreatic ductal adenocarcinoma. Pancreatic carcinoma is a malignant tumour with a high mortality rate. Its increased resistance to chemotherapy and severe side effects make it indispensable to look for alternative therapies. A series of molecules were designed and synthesised in search of a novel anticancer drug molecule or molecules using curcumin, to which an heterocyclic ring was tethered in place of one phenoxy methyl group and docked with KRAS protein (code: 4EPV).The ligand efficiency and binding affinity of novel curcumin derivatives were evaluated using molecular docking against a target protein (KRAS). The designed molecules' docking procedures revealed that they have a high binding affinity while being low in energy.The binding poses of two molecules with a lactone ring attached to the benzene ring and a glycosidic linkage to the lactone ring and another to the hydroxyl group of curcumin are far superior to the standard drugs Gemcitabine and Doxorubicin, which are used to treat pancreatic cancer.Their scores are superior to those of parent compounds and standard drugs.

The present study indicates that these novel molecules exhibit improved binding affinity, which may confer better anticancer properties. This opens the door for new ventures in designing and getting newer drugs with fewer side effects for the treatment of pancreatic cancer.

Keywords: Curcumin, Gemcitabine, Doxorubicin, Lactone, KRAS

Kaempferol: a natural flavonoid from golden shower tree plant flowers for remedial use

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ABSTRACT

Plants display a plethora of bioactive metabolites and are natural reservoirs of herbal medicines. The use of natural products in specified formulations for medicaments for innumerable ailments is an age old belief. Plant species therapeutic properties have been an excellent endowment to the evolution of traditional therapies; thus, the phytopharmaceuticals present in these have found a wide range of applications in different fields of medicine, agriculture, pharmaceuticals, material science, and so on. Cassia fistula L. (CFL) (Fabaceae), commonly called the Golden Shower, has an abundance of phytochemicals with pharmaceutical importance. It has been used in the treatment of various diseases for centuries due to its outstanding ethno-medicinal properties. In recent times, life-threatening diseases have escalated worldwide, which has led to the emergence of herbal medicines from natural products for chronic ailments. Kaempferol, also known as kaempferol-3 or kaempferide (KP, a flavonoid), is one such active metabolite present in CFL flowers that displays prominent bioavailability. It occurs naturally in several common vegetables, such as broccoli, beans, cabbage, apples, etc. Through epidemiological data, it was indicated that high consumption of KP has led to a reduction in the proliferation of different types of cancer as it triggers apoptosis, and comparatively, KP is less toxic to normal cell lines than commercially available standard chemotherapy drugs It also has a variety of other biological activities, such as anti-inflammatory, antioxidant, cardio protective, and anti-diabetic properties. In this paper, the aim is to thoroughly review KP's biological activities to enlighten and dispel future prospects for its wide applications for therapeutic use.

Keywords: Phytopharmaceuticals, Kaempferol, Flavonoid.

Qualitative Phytochemical Analysis of Allium Sativum L. Scapes

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ABSTRACT

Allium Sativum L. (garlic) is one of the oldest cultivated vegetables in history, and the most popular ingredient in the world. Garlic is a member of the Alliaceae family, and its bulb is used as a flavouring agent, particularly in Asian cooking, due to its strong, pungent odour and taste. Garlic is widely recognised as a preventative and therapeutic medicinal plant, and it is used to treat a variety of ailments such as the common cold, osteoporosis, heart disease, and so on. It has been proven to boost the immune system, possibly preventing cancer and cardiovascular disease, etc. It has a higher concentration of sulphur compounds and can therefore be used as a bioadsorbent for the treatment of wastewater. The main aim of the present study is the qualitative determination of the phytochemicals present in the scapes of garlic, which are the non-edible part considered to be vegetable waste. These phytochemicals are non-nutritive and possess disease-preventive properties. For this purpose, from the collected garlic waste, the garlic scapes were separated out and washed with double-distilled water. After sun-drying them for 7 to 10 days, they were ground and stored in an airtight bottle with a label. Extraction of phytochemical constituents totally depends on the type of solvent used. In the present study, 10 g of finely powdered garlic scapes were taken with a 1:1 ratio of water and ethanol as solvent. Extraction of powdered garlic scape was carried out for 48 h at 45-50ºC using a Soxhlet apparatus. The obtained extract was used for phytochemical analysis using standard tests such as the ferric chloride test, the Salkowski test, Drangendroff's test, the foam test, Legal's test, and so on. Results of qualitative estimation of extracted garlic scapes confirm the presence of phenols, saponin, tannin, terpenoids, alkaloids, flavonoids, carbohydrates, glycosides, and amino acids in the scapes. Based on the results, further study is going on to use the powdered and modified raw garlic scape as a bioadsorbent for the removal of heavy metals from simulated waste water.

Keywords: Allium Sativum L., Phytochemical, Drangendroff's Test, Extraction

Extraction of ethanol from potato, banana and taro wastes and their yield analysis

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ABSTRACT

Food waste poses a threat to the environment all across the world, so it must be recycled. Biomass from fruits and vegetables has the potential to be a substantial source of fuel for the production of electricity and steam, as well as fuel for human use and laboratory solvents. Biomass-derived ethanol made up 10–14% of the world's total energy supply and resolved issues like global warming and the depletion of fossil fuels. Though 80% of the current ethanol are generated from edible materials such as starch and sugar However, this is already generating food versus fuel debate among the members of civil societies. Therefore, there is a need to synthesize biofuels from non-edible waste materials. Biomass from lignocelluloses gathered more attention recently. In this study, ethanol has been extracted from waste biomass of potato, banana and taro by fermentation and the comparative output efficiency of three food waste samples taken.

In the present work, the bioethanol from bio wastes such as potato, banana, and taro was synthesized successfully. First, the bio wastes was crushed into a fine particle and tested for the presence of starch. After confirming the presence of starch, the crushed compounds were fermented for 7-8 days under inert atmosphere followed by distillation to get a clear solution of bioethanol. The synthesized bioethanol was confirmed by oxidation test and FT-IR spectroscopy and the quantitative output efficiency of the fuel has been noted.

Pervaporation performance of functionalized nanoparticles-based polymeric membranes: A Review

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ABSTRACT

Pervaporation is a process were the liquid feed meets one side of a membrane and a vacuum is drawn on the other side of the membrane to allow vapour to penetrate. An environmentally friendly and clean method for the modification is the doping of ionic liquid into a nanoparticle made of carbon. High permeability, high selectivity, and stability are the variables that control a pervaporation membrane's performance. Evaluating the separation factor and total flux allows one to evaluate each membrane's pervaporation performance. As the matrix's nano level dispersion rises, the contact between the polymer and the filler likewise intensifies, resulting in a higher separation factor. The filler was distributed evenly throughout the matrix, which maximises the polymer's potential attachment sites and raises the cross-linking density as well. The polymer-surface modified nanoparticle integrated membrane benefits from a better separation factor as a result. The 5 phr CNT inserted SBR exhibits a superior separation factor, performance separation Index (PSI), and good cross-linking density in the case of the toluene/heptane combination with modified CNT. The performance factors are strong for 5phr MWCNT in a toluene/methanol combination with modified MWCNT. The styrene groups on SBR engage with the cation- interactions found in the modified MWCNT and the benzyl group of ionic liquids interacts with the styrene groups on SBR with Π- Π interactions. The membrane containing 5phr functionalized MWCNT exhibited a total flux of 0.075 kg/m2 /hr and a separation factor of 128.40. Membranes made of PVA and PVA-PEO/POSS remove 95% of the

water from the water-THF azeotropic combination. The membrane reaches its maximum separation factor and increased flow with a PSS loading of 2 wt.%. The method of adding various nanoparticles to polymeric membranes is the major topic of this review study, which also examines the crucial factors that impact the performance index for the pervaporation process.

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Impacts of climate change on mental health a cross-cultural approach to meet the challenge

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ABSTRACT

Due to scientific inventions and rapid technological development, our life has been mediated by technology and we are living in an era of unprecedented change. Lifestyle changes coupled with economic, industrial, and technological development have brought new challenges of climate change and extreme weather conditions. The focus of this article is to highlight on the lesser-acknowledged and unnoticed impacts of climate change on mental health. The paper attempts to highlight the emerging mental health problems occurring as a result of changing climate across the nations of the world and recommended some sustainable measures. Extreme climatic conditions can adversely affect one's thought, feelings and emotions and reflected in behavioural disorders. Climate change can cause stress, anxiety and depression. Research evidences report adverse and extreme climate conditions causes post-traumatic stress disorder, major depressive disorders, hopelessness, various kinds of trauma, anger, aggression and suicidal tendency. Marginalized as well as disadvantaged groups are more vulnerable to develop mental illnesses in response to climate change because of resource inadequacy and weak social support system. In view of the mental health liabilities caused by climate change a number of mitigation and adaptation strategies has been adopted in both individual and collective level. Awareness among common people about the mental health hazards of climate change; formulating climate change resilient plans and more funding for mental health care are some steps that can be taken by both government and non-government agencies to mitigate the problem of global climate change. The development of connections and belongingness with the ecosystem can make people more resilient. This paper intends to explore the

relationship between cultural values and environment-protective measures across culture. Cultural values are guiding principles which determine people's attitude and direct behavior towards attainment of goal. Knowledge of cross-cultural practices of climate mitigation and adaptation can be advantageous to formulate strategy to meet the challenge of climate change. If human motive and action are responsible for adverse climate condition, changes in them can be brought about by inculcating appropriate cultural values and resulting restorative measures can lessen the effect. In some districts of Odisha people willingly volunteer to guard the forest to protect wildlife and maintain bio-diversity. Japanese people practice Shinrin-Yoko, preventive health care, and healing techniques. This paper attempts to develop a model to reduce mental health liabilities due to climate change.

Key words: climate change; mental health, stress, culture

$SrTiO_3$ synthesis for photocatalytic and solar cells applications

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ABSTRACT

Perovskite solar cells (PSCs) are the most emerging area of research among different new generation photovoltaic technologies due to its superpower conversion efficiency (PCE). The perovskite structure ABX_3 (E.g., $CaTiO_3$, $SrTiO_3$) such as an active light-harvesting layer PSC uses. Unlike silicon solar cells, PSCs are less expensive, and fabrication can be done by simple wet chemical process. In this work, we Present the synthesis of $SrTiO_3$ Catalyst with efficient UV light driven photocatalytic activity towards methylene blue. The phase purity, composition, surface morphology and band gap of as synthesized nanomaterials were characterized using various analytical techniques like XRD, UV, SEM. (major Application is photocatalytic activity and Solar Cells). The band gap is 3.2 eV, and the crystalline structure is identified to be perovskite. The photocatalytic efficiency of perovskite $SrTiO_3$ catalyst was tested on the degradation of methylene blue (MB) under ultraviolet light irradiation. By using the $SrTiO_3$ Catalyst 10 ppm MB dye solution in water was degraded under the uv light condition 68% for $SrTiO_3$ catalyst at 120 min. In the I-V measurements performed in the dark and under the visible light, it was observed that the device exhibited photodiode characteristics. Namely D1=ST0.0, D2 =STA0.5, D3=STA1.0, D4=STA5.0, D5=STA9.0, it was seen that the photo-generated current was extremely larger than the dark compare to light, current for the forward bias as well as reverse bias and thus the I-V measurements were performed by expanding it under different $SrTiO_3$:xAl^{3+} Perovskite solar cells named it as D1, D2, D3, D4, D5.

Keywords: Methylene blue dye, Photocatalysis, Strontium titanate, UV-Visible light, I-V characteristics.

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